# Oregon Statewide ITS Architecture and Operational Concept Plan

**Prepared for**

OREGON DEPARTMENT OF TRANSPORTATION

**Prepared by**

**DKS Associates**

TRANSPORTATION SOLUTIONS

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(See Appendix Q for acknowledgments for previous versions of the plan)

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| 1 | August 2006 | Although the Statewide ITS Architecture was originally created by ODOT in Turbo Architecture in 2000, the first documentation of the Oregon Statewide ITS Architecture (including the development of operational concepts) was completed in 2006. | DKS Associates |
| 2 | December 2010 | Major revisions:<br>• Updated the Oregon Statewide ITS Architecture from Turbo Version 3.1 to 5.0 and from National ITS Architecture Version 5.1 to 6.1.<br>• Reviewed and updated the architecture and operational concepts to reflect projects implemented since 2006.<br>• Developed a public transportation operational concept and updated the architecture to include full coverage of public transportation in Oregon. | DKS Associates |
| 3 | May 2011 | Developed an operational concept for road user charging and updated the Oregon Statewide ITS Architecture to include road user charging. | DKS Associates and D'Artagnan Consulting |

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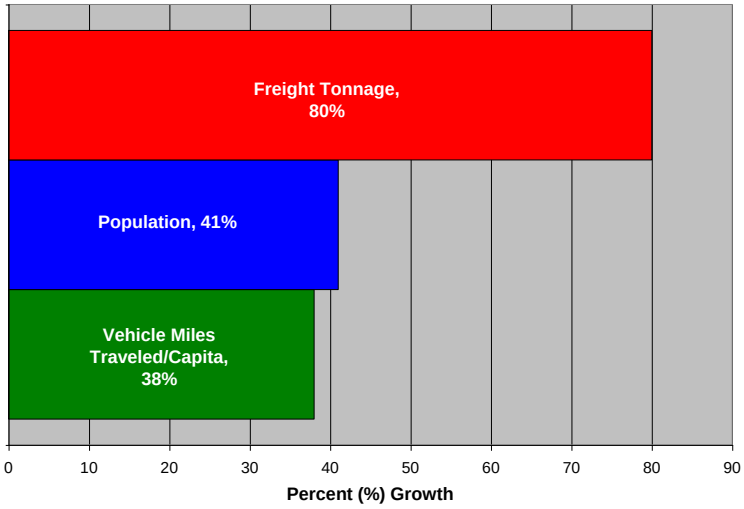
# INTRODUCTION

The objective of this report is to document the Oregon Statewide Intelligent Transportation System (ITS) Architecture, which was originally created in 1998. The Oregon Department of Transportation (ODOT) and the Federal Highway Administration (FHWA) collectively developed this plan and the outcome is a 10-year deployment of ITS projects, which include advanced technologies and management techniques, aimed to improve the safety and efficiency of the transportation system. This effort plays a key role in guiding institutional agreement and technical integration for ITS project deployment throughout the state to ensure that ITS strategies are complementary from region to region.

## The Problem

**2006 - 2030 Forecasted Trends**

(Source: *Oregon Transportation Plan, Public Hearing Draft*)




Increasing traffic congestion, due to capacity constraints and incidents, affects the mobility of travelers and freight throughout Oregon. Congestion results in travel delay, reduced productivity, and a frustrated driving public. According to the *2000 Census*, the population of Oregon grew 20 percent from 1990 to 2000 and most of the state's metropolitan areas grew at a much higher rate than the state for that same time period. ODOT forecasts that the state's population will grow 41 percent from 2006 to 2030 and freight tonnage will increase by 80 percent[1]. They also expect a 1.35 percent annual increase in vehicle miles traveled (VMT) per capita through 2030. The expected growth in population, freight tonnage, and VMT will place an enormous burden on the existing transportation infrastructure.

As the state grows, public agencies must realize that high land and construction costs and environmental constraints make it difficult to build new transportation infrastructure as the single means of relieving congestion. Therefore, a systematic approach is necessary to effectively manage the state's transportation system and capitalize on the existing infrastructure as the state grows. This includes a combination of intelligent transportation systems in conjunction with new roadway construction when applicable.

## The Opportunity

ITS applications offer a significant opportunity to improve the efficiency and safety of the surface transportation system in Oregon. These applications help improve transportation system operations by performing a function more quickly or reliably or by providing a service that was not previously available. As a result, ITS helps improve the mobility of people and goods on the existing roadway infrastructure and also offers the potential for substantial savings on future construction, particularly of highways. Often, the importance of investing in operations is easily

[1] *Oregon Transportation Plan, July 19, 2006 Public Hearing Draft*. Oregon Department of Transportation, Planning Section, Transportation Development Division, June 29, 2006.

overlooked, but is necessary to ensure that the traveling public makes safe and efficient use of existing roadways.

## What is ITS?

Intelligent transportation systems (ITS) involve the application of advanced technologies and proven management techniques to relieve congestion, enhance safety, provide services to travelers, and assist transportation system operators in implementing suitable traffic management strategies. ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add capacity (e.g., travel lanes). Efficiency is achieved by providing services and information to travelers so they can (and will) make better travel decisions and to transportation system operators so they can better manage the system. ITS technologies are used by ODOT and many other agencies throughout Oregon today and plans are in place to expand the use of ITS applications in the future.

## Why Develop an ITS Architecture?

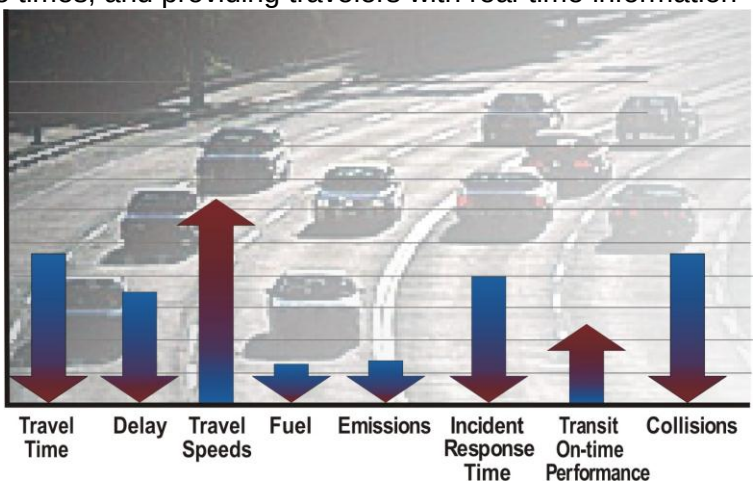
An ITS architecture provides a framework of policies, procedures, and strategies for integration of the state's existing resources to effectively meet future statewide transportation needs and expectations. The following reasons provide the basis for developing a statewide ITS architecture for Oregon:

- Oregon cannot build itself out of congestion.
- Oregon endeavors to maximize the efficiencies and improve the safety of the existing infrastructure.
- The public demands better information about traffic congestion.
- The architecture fosters multi-agency coordination for system operations.
- The architecture can be used during project development to assist with the project concept of operations, high-level and detailed requirements, design components, and specifications.
- The Federal Highway Administration requires that all ITS projects funded through the Highway Trust Fund shall be in conformance with the National ITS Architecture and applicable standards.

## What are the Expected Benefits?

ITS are aimed at improving the safety and operational efficiency of the existing transportation infrastructure by reducing vehicle delays related to recurrent and non-recurrent congestion, reducing crashes and incident response times, and providing travelers with real-time information to make informed route and mode choice decisions. Quantifiable benefits resulting from ITS include:

- Reduced vehicle delays
- Reduced crashes
- Improved air quality
- Reduced fuel consumption
- Improved travel times




Other accrued benefits, which are more difficult to quantify, include reduced driver frustration and

reduced driver anxiety from having real-time travel information. Additionally, improved efficiency due to coordinated and cooperative agency actions can produce long-term savings, particularly in relation to coordinating statewide and regional projects and a coordinated response to incidents. ITS deployments around the state of Oregon have yielded many of these; some of these are highlighted herein.

### *Traveler Information*

The dissemination of real-time traveler information provides travelers the ability to make informed travel choices, which could include changing a route, or selecting an alternate mode of travel. The resulting benefits include:

- 7- to 12-percent reduction in travel time
- Up to 33-percent reduction in emissions

### *Incident Management*

ODOT, in association with the Oregon State Police, currently operates an incident management program in Region 2 to assist disabled vehicles. The incident management program includes incident response vehicles that patrol the Region 2 roadways to assist motorists and reduce the duration of incidents and reduce the resulting traffic congestion. Based on an evaluation of the program, the following benefits have been identified:

- 15-percent reduction in average incident duration
- 35-percent reduction in vehicle-hours of incident delay

### *Coordinated Traffic Signal Timings*

State-of-the-art traffic signal systems, with communication to a central computer and coordinated signal timing plans have proven to produce substantial benefits to the public. Examples from local coordinated signal timing projects in Oregon have produced the following benefits:

- 10- to 40-percent reduction in stops 15- to 45-percent reduction in delay
- 5- to 25-percent reduction in travel time
- Up to 15-percent reduction in fuel consumption

## ITS Vision and Goals in Oregon

"The vision of ITS in Oregon is to adopt systems, technologies and partnerships that enhance mobility, transportation efficiency, safety, productivity and to promote economic prosperity and livability. The goals of implementing ITS in Oregon are to:

- Improve productivity of the transportation system users;
- Improve safety;
- Improve efficiency of the transportation system;
- Improve mobility and accessibility;
- Improve intermodal connections;
- Promote environmental responsibility and reduce energy use;
- Promote economic development in Oregon;
- Utilize technology as an asset of the transportation system."[2]

[2] *Oregon ITS Strategic Plan: 1997-2017, Executive Report*. Oregon Department of Transportation, 1998.

The ITS vision and goals support the five underlying fundamental themes of the *Oregon Transportation Plan*, which include: (1) accessibility and mobility, (2) economic development, (3) equity, (4) safety, and (5) sustainability.[3]

## Report Elements

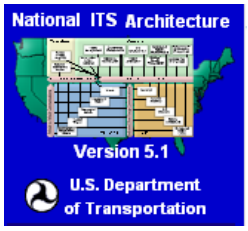
The Statewide Architecture Committee, which consisted of key members of the ODOT ITS Unit and FWHA, guided this project with additional input from expanded stakeholders. A key component of updating the Oregon Statewide ITS Architecture included the development of an operational concept plan that provides an overview of how Oregon's stakeholders and systems work together to provide ITS services. This report documents the following elements:

- Overview of the National ITS Architecture
- Systems engineering
- Geographic boundary, timeframe, and scope of the Oregon Statewide ITS Architecture
- ITS stakeholders within the state
- Inventory of existing and planned systems
- User services needed in the state
- Market packages that address user services
- Interconnects between systems
- Operational concept plan
- ITS standards
- Project sequencing
- Maintenance plan
- Future considerations

Appendix A includes a glossary of the acronyms used throughout this report.

[3] *Oregon Transportation Plan, July 19, 2006 Public Hearing Draft*. Oregon Department of Transportation, Planning Section, Transportation Development Division, June 29, 2006.

# NATIONAL ITS ARCHITECTURE OVERVIEW




The U.S. Department of Transportation developed the National ITS Architecture to ensure that intelligent transportation systems deployed around the country can communicate with one another and share information to maximize the return of investment on ITS. "The National ITS Architecture is a general framework for planning, defining, and integrating ITS. It was developed to support ITS implementations over a 20-year time period in urban, interurban, and rural environments across the country."[4] The National ITS Architecture, currently Version 6.1, is fully documented online[5]. The version number is updated when a number of changes or additions are made to the architecture.

For example, if a transportation agency wants to clear incidents faster, the architecture defines a function to monitor roadways and identifies the interconnection and information flows between the roadway, the traffic operations center, and the emergency management center needed to provide responders with incident information. The architecture provides the framework for the process, but does not define how this is done with technology or management techniques.

The Federal Highway Administration (FHWA) published a Final Rule policy[6] that all agencies seeking federal highway trust funding for ITS projects must develop a regional or statewide architecture that is compliant with the National ITS Architecture. The Federal Transit Administration (FTA) published a similar policy[7] that applies to federal funding from the mass transit account of the highway trust fund.

In summary, the primary reasons for developing a statewide ITS architecture that conforms with the National ITS Architecture include the following:

- Develop a framework for institutional agreements and technical integration for organized ITS project deployment that meets local transportation user needs.
- Build consensus among stakeholders about resource and information sharing and activity coordination.
- Meet federal funding requirements.

The National ITS Architecture is comprised of two components: the logical architecture and the physical architecture. The following subsections provide a brief overview of these concepts.

## Logical Architecture

The logical architecture defines the requirements needed to provide the selected user services. User services describe what functions ITS should perform from the user's perspective. The logical architecture is comprised of the following components:

---

4 *Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region*. Report FHWA-OP-02-024. U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, National ITS Architecture Team, Oct. 12, 2001.

5 *National ITS Architecture Version 6.1*. Developed by Iteris Inc. for the U.S. Department of Transportation, January 7, 2009. http://itsarch.iteris.com/itsarch/.

6 *Intelligent Transportation System Architecture and Standards: Final Rule*. FHWA Docket No. FHWA-99-5899. U.S. Department of Transportation, Federal Highway Administration, Jan. 8, 2001.

7 *Federal Transit Administration National ITS Architecture Policy on Transit Projects: Notice*. FTA Docket No. FTA-99-6147. Federal Transit Administration, Jan. 8, 2001.

- Processes: Activities and functions that must work together and share information to provide a user service.
- Terminators: Represent the people, systems, environment, and other subsystems that interact with intelligent transportation systems. These are described in more detail in the Physical Architecture subsection.
- Data Flows: Information exchange between processes or between processes and terminators. For example, light rail train arrival data is exchanged between wayside detectors in the tracks and traffic signal systems.
- Data Stores: Repositories of information maintained by the processes.

The logical architecture is typically described by data flow diagrams (DFDs) and process specifications (PSpecs) for specific project-related systems. Data flow diagrams graphically represent the processes, terminators, data flows, and data stores in a hierarchical format. The process specifications are used to write the specifications for specific project-related systems and consist of an overview, a set of functional requirements, and a complete listing of inputs and outputs. Public sector agencies tailor the logical architecture by identifying the processes, terminators, data flows and data stores that are existing or planned for a region.

## Physical Architecture

The physical architecture creates a high-level structure around the processes and data flows included in the logical architecture. It consists of subsystems, equipment packages, terminators, architecture flows, and architecture interconnects, which are all described in this subsection. Figure 1 illustrates the high-level physical architecture of the National ITS Architecture and includes the subsystems and architecture interconnects between subsystems. Figure 2 depicts the interaction between the logical and physical architectures.

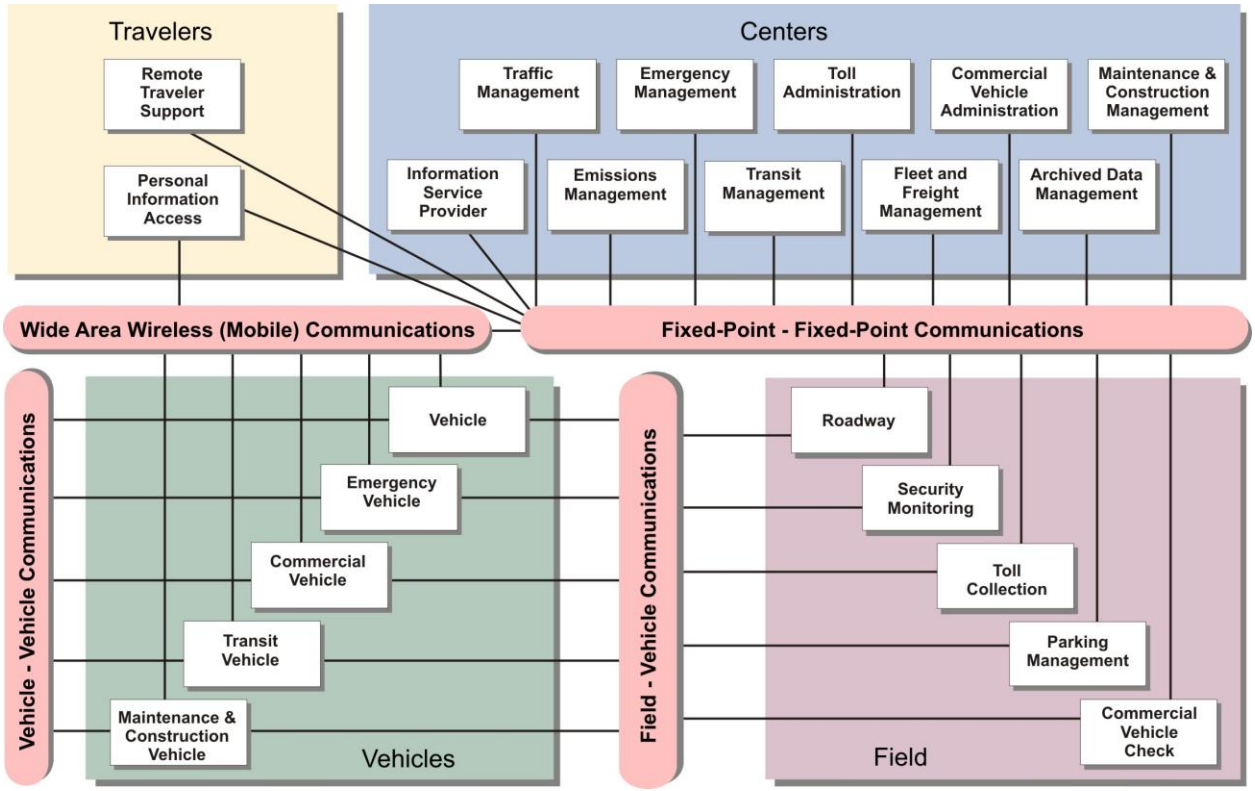



**Figure 1. High-Level Physical National ITS Architecture**

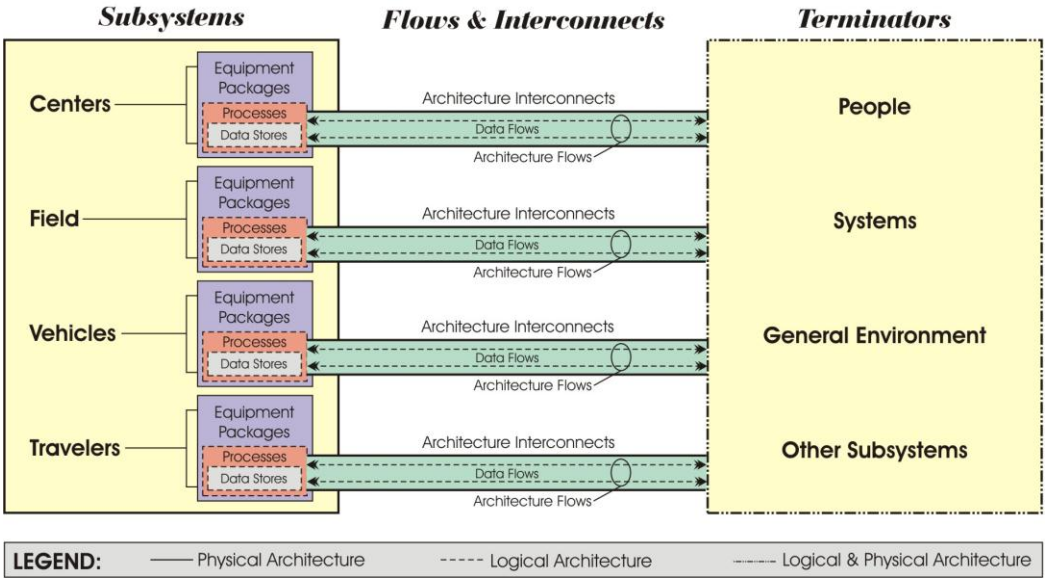



**Figure 2. Logical and Physical Architecture Components**

### *Subsystems*

A subsystem represents a grouping of processes defined in the logical architecture that may be defined by single entities. There are 22 subsystems in the physical architecture that are assigned to four overarching classes that correspond to the physical world as described in Table 1 and illustrated in Figure 1.

**Table 1. Subsystem Classes**

| Subsystem Class | Function | Real World Examples |
|---|---|---|
| Centers | Provide management, administration, and support functions for the transportation system. | ▪ ODOT Regional TOCs<br>▪ 911 Centers<br>▪ Oregon State Police Dispatch Centers |
| Field | Provide direct interface to the roadway network, vehicles traveling on the roadway network, and travelers in transit. | ▪ Traffic Signals<br>▪ Dynamic Message Signs<br>▪ Weather Warning Systems |
| Vehicles | Use the roadway network and provide safety systems and driver information. | ▪ Incident Response Vehicles<br>▪ Law Enforcement and Fire Vehicles |
| Travelers | Gain access to traveler information through the use of equipment. | ▪ TripCheck Website<br>▪ Smart Phones |

### *Equipment Packages*

Equipment packages group similar processes of a subsystem together into a package that can be implemented to address user services. The equipment packages are considered the building blocks of the physical architecture subsystems. Table 2 lists several examples of equipment packages in the National ITS Architecture.

**Table 2. Sample Equipment Packages**

| Equipment Package | Process Specifications (PSpecs) | User Service Addressed |
|---|---|---|
| Roadway Basic Surveillance | ▪ Process Traffic Sensor Data<br>▪ Process Traffic Images | Traffic Control |
| Mayday Support | ▪ Determine Coordinated Response Plan<br>▪ Communicate Emergency Status<br>▪ Process Mayday Messages<br>▪ Provide Operator Interface for Emergency Data | Emergency Notification and Personal Security |
| Traffic and Roadside Data Archival | ▪ Manage Roadside Data Collection | Information Management |

### *Terminators*

Terminators, also called entities, define the boundary of the architecture by representing the people, systems, other subsystems, and general environment that interface with intelligent transportation systems. The National ITS Architecture includes interfaces between terminators and subsystems and processes, but does not allocate function requirements to terminators. For example, an emergency system operator is a terminator that interfaces with the emergency management subsystem; however, the architecture does not define the functions performed by the operator to support the agency. The same set of terminators applies to both the logical and physical architectures, but the logical architecture processes communicate using data flows and the physical architecture subsystems communicate using architecture flows.

### *Architecture Flows*

Architecture flows, also called information flows, are groupings of data flows that represent the actual information exchanged between subsystems and terminators and are the primary tool used to define interfaces within an ITS architecture. For example, an accident report is an architecture flow that is exchanged between a 911 center (subsystem) and the appropriate emergency system operator (terminator).

### *Architecture Interconnects*

Architecture interconnects, also called information interconnects, are the communications paths that carry architecture flows between the subsystems and terminators. These interconnects, shown in Figure 1, are typically grouped into one of the four categories listed in Table 3.

**Table 3. Architecture Interconnects**

| Interconnect | Function | Real World Example |
|---|---|---|
| Fixed-Point to Fixed-Point Communications | Uses a communications network to link stationary entities. | ▪ Fiber optic connection between a traffic operations center and a CCTV camera |
| Wide Area Wireless Communications | Uses wireless devices to link users and infrastructure-based systems. | ▪ Mobile telephone used to access traveler information |
| Dedicated Short Range Communications | Uses wireless communications channels to link vehicles and the immediate infrastructure within close proximity. | ▪ Radio communications between the roadside and a vehicle |
| Vehicle to Vehicle Communications | Uses a wireless system to link communications between vehicles. | ▪ Future vehicle collision avoidance systems |

# SYSTEMS ENGINEERING

"Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem: operations, performance, test, manufacturing, cost and schedule, training and support, and disposal."[8] In addition to having a statewide or regional ITS architecture in place, FHWA also requires a systems engineering analysis commensurate with the project scope for all ITS projects that use federal funds. At a minimum FHWA requires the following elements as part of the systems engineering analysis:

- Identification of portions of the statewide architecture being implemented
- Identification of participating agencies with roles and responsibilities
- Definition of requirements
- Analysis of alternatives
- Procurement options
- Standards and testing procedures
- Resources for operations and maintenance

Figure 3 depicts the lifecycle of project development using a systems engineering approach. The main benefits of following this approach include a final product/system that meets all of the user needs, cost and schedule control, and risk reduction. ODOT uses a systems engineering approach on all their major ITS projects that exceeds the FHWA minimum requirements.

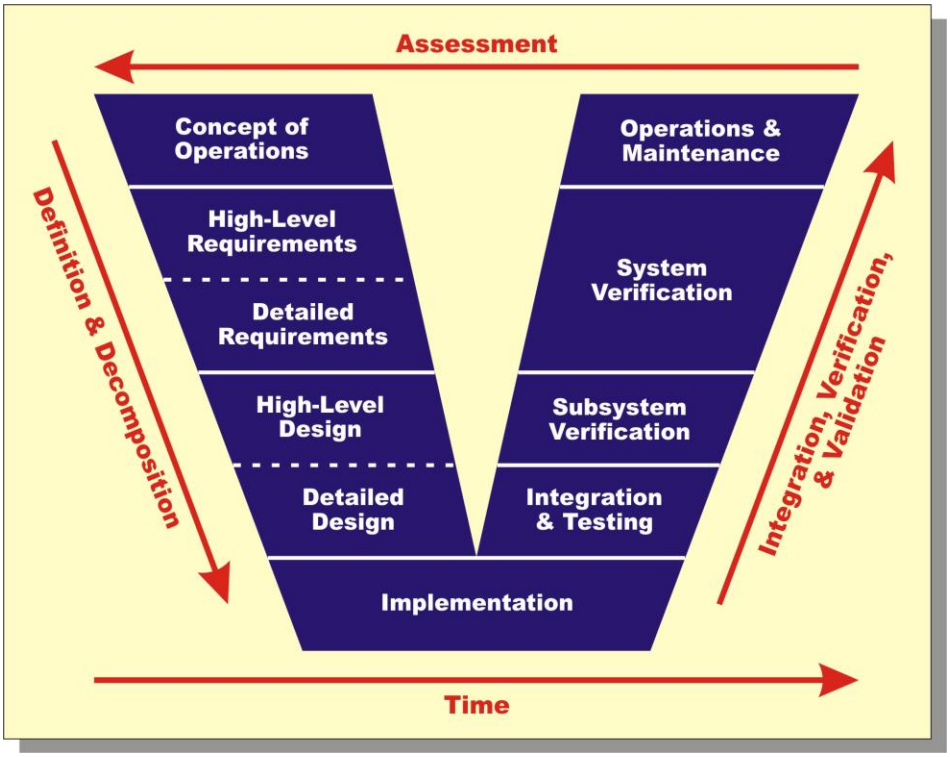



**Figure 3. Systems Engineering Lifecycle**

[8] *What is Systems Engineering?* International Council on Systems Engineering, June 14, 2004. http://www.incose.org/practice/whatissystemseng.aspx. Accessed Aug. 16, 2006.

# OREGON STATEWIDE ITS ARCHITECTURE

The Oregon Statewide ITS Architecture was originally developed in 1998 to guide the deployment of ITS applications in Oregon over a 20-year period and to meet federal funding requirements. It was later input into Turbo Architecture[9], which is a software tool designed to support development of statewide, regional, and project architectures based on the National ITS Architecture. The Turbo Architecture database is intended to be a living document that gets updated by the key stakeholders as the statewide needs change. The Turbo Architecture software is updated concurrently with National ITS Architecture updates and was first developed in conjunction with Version 3.0 of the National ITS Architecture. Table 4 provides development timelines for the National ITS Architecture, Turbo Architecture software, and the Oregon Statewide ITS Architecture.

**Table 4. ITS Architecture Timelines**

| Year | National ITS Architecture | Turbo Architecture | Oregon Statewide Architecture |
|---|---|---|---|
| 1996 | Version 1.0 | | |
| 1997 | | | |
| 1998 | Version 2.0 | | Strategic Plan |
| 1999 | Version 3.0 | | |
| 2000 | | Version 1.0 | Turbo Database |
| 2001 | | Version 1.1 | |
| 2002 | Version 4.0 | Version 2.0 | |
| 2003 | Version 5.0 | | |
| 2004 | | Version 3.0 | |
| 2005 | Version 5.1 | Version 3.1 | |
| 2006 | | | Versions 2006-1 and 2006-2 |
| 2007 | Version 6.0 | Version 4.0 | |
| 2008 | | | |
| 2009 | Version 6.1 | Version 4.1 | |
| 2010 | | Version 5.0 | Version 2010-1 |
| 2011 | | | Version 2011-1 |

## Oregon ITS Plans

In addition to a statewide ITS plan, a number of regional ITS plans have been developed throughout Oregon as shown in Table 5. These plans provide the institutional agreement and technical integration framework within each of these regions whereas the statewide ITS plan provides the framework for systems used throughout Oregon that tie together each of the regions. For example, a regional ITS plan may contain detailed elements about a local transit system whereas the statewide ITS plan includes a system for disseminating transit traveler information throughout the state for all local transit systems.

[9] *Turbo Architecture, Version 3.1*. Developed by Iteris, Inc. for the U.S. Department of Transportation, Federal Highway Administration, May 2005.

Five of the larger metropolitan areas (Salem-Keizer, Central Willamette Valley, Eugene-Springfield, Rogue Valley, and Deschutes County) used a multi-agency approach to develop a single ITS plan for the region. These plans were guided by consensus from key stakeholders from transportation, transit, and emergency management agencies as well as other expanded stakeholders and include, at a minimum, a regional architecture, operational concept, and 20-year deployment plan.

**Table 5. Oregon Statewide and Regional ITS Plans**

| ITS Plan | Completion Date | Plan Timeframe | Notes |
|---|---|---|---|
| **STATEWIDE** | | | |
| *Oregon ITS Strategic Plan: 1997 – 2017* | Oct. 1998 | 20-year | |
| **REGIONAL** | | | |
| *Deschutes County ITS Plan* | March 2005 | 20-year | Updated June 2011 |
| *Regional ITS Operations & Implementation Plan for the Eugene-Springfield Metropolitan Area* | Nov. 2003 | 20-year | |
| *Regional ITS Operations & Implementation Plan for the Rogue Valley Metropolitan Area* | July 2004 | 20-year | |
| *Salem-Keizer Metropolitan Area ITS Plan* | Aug. 2005 | 20-year | |
| *Central Willamette Valley ITS Plan* | Dec. 2010 | 20-year | |
| **PORTLAND METROPOLITAN AREA** | | | |
| *Clackamas County ITS Plan* | Feb. 2003 | 20-year | Updated May 2011 |
| *Gresham/East Multnomah County Traffic Signal System and Communications Master Plan Update* | Sept. 2001 | 10-year | |
| *City of Portland Intelligent Transportation System Implementation Plan* | June 1997 | 20-year | |
| *ODOT Region 1, Intelligent Transportation System Plan* | April 2000 | 5-year | Update programmed for 2011-2012 |
| | July 2005 | 5-year | |
| *Portland International Airport Intelligent Transportation Systems Master Plan* | Feb. 2002 | 10-year | |
| *Regional ITS Architecture and Operational Concept Plan for the Portland Metropolitan Area* | Oct. 2005 | 10-year | Update planned for 2014 |
| *TriMet 5-Year Intelligent Transportation System Plan* | 2001 | 5-year | |
| *Washington County ITS Plan* | Feb. 2005 | 5-year | Update underway for November 2012 |

The statewide plan and each of the regional plans includes an architecture. The *Regional ITS Architecture and Operational Concept Plan for the Portland Metropolitan Area* includes one architecture that encompasses all of the Portland metropolitan area ITS plans.

The Portland metropolitan area has taken a slightly different approach due to its large size and complexity. A number of agencies within the Portland metropolitan area have developed ITS plans specific to their agency or group of agencies/stakeholders as listed in Table 5. Each ITS plan varies in scope and timeframe, but all of the plans combined cover the geographic area of Portland and include some form of project sequencing. All of these ITS plans share one common regional architecture and operational concept plan, which is documented in the *Regional ITS Architecture and Operational Concept Plan for the Portland Metropolitan Area.*

## Architecture Update Process

This update to the Oregon Statewide ITS Architecture was driven by: two updates to the National ITS Architecture since 2006, the need to expand the public transportation service area; and the need to capture the ITS projects implemented since 2006 and planned for the next 10 years. Appendix B includes a summary of the changes to the National ITS Architecture between Versions 5.1 and 6.1 that impact the Oregon Statewide ITS Architecture. . A current evaluation of the FWHA Regional ITS Architecture Assessment Checklist for the newly updated architecture can be found in Appendix C.

Figure 4 illustrates the steps that were followed to update the Oregon Statewide ITS Architecture. The Statewide Architecture Committee provided input throughout the architecture update process to obtain consensus. Additionally the public transportation service area was developed under the guidance of the Public Transportation Advisory Committee (PTAC). Each of the following steps is described in this section of the report:

- Stakeholders: The stakeholder list was updated in Turbo Architecture.
- System Inventory: Existing and planned ITS elements were updated in Turbo Architecture.
- User Services: The user services in use or planned for use were documented.
- Market Packages: The market packages were updated in Turbo Architecture based on updates to the system inventory and user services. New market packages added to the National ITS Architecture since 2006 were also selected.
- Interconnect and Information Flows: Information flows between subsystems were updated in Turbo Architecture to reflect changes to the aforementioned architecture changes.

Appendix D includes a summary report from Turbo Architecture that includes a description of the statewide architecture, geographic boundary, timeframe, scope, and general revision and change log information. Appendix E includes an attribute change log that summarizes the changes to the statewide architecture attributes. Since Turbo Architecture does not generate any type of change log other than basic information (e.g. date of database maintenance, brief description), change log spreadsheets were created to document the changes to the stakeholder list, system inventory, and market packages and these are referenced throughout this section. A change log was not generated for the changes to the interconnects and information flows due to the large number of flows contained within the Oregon Statewide ITS Architecture.

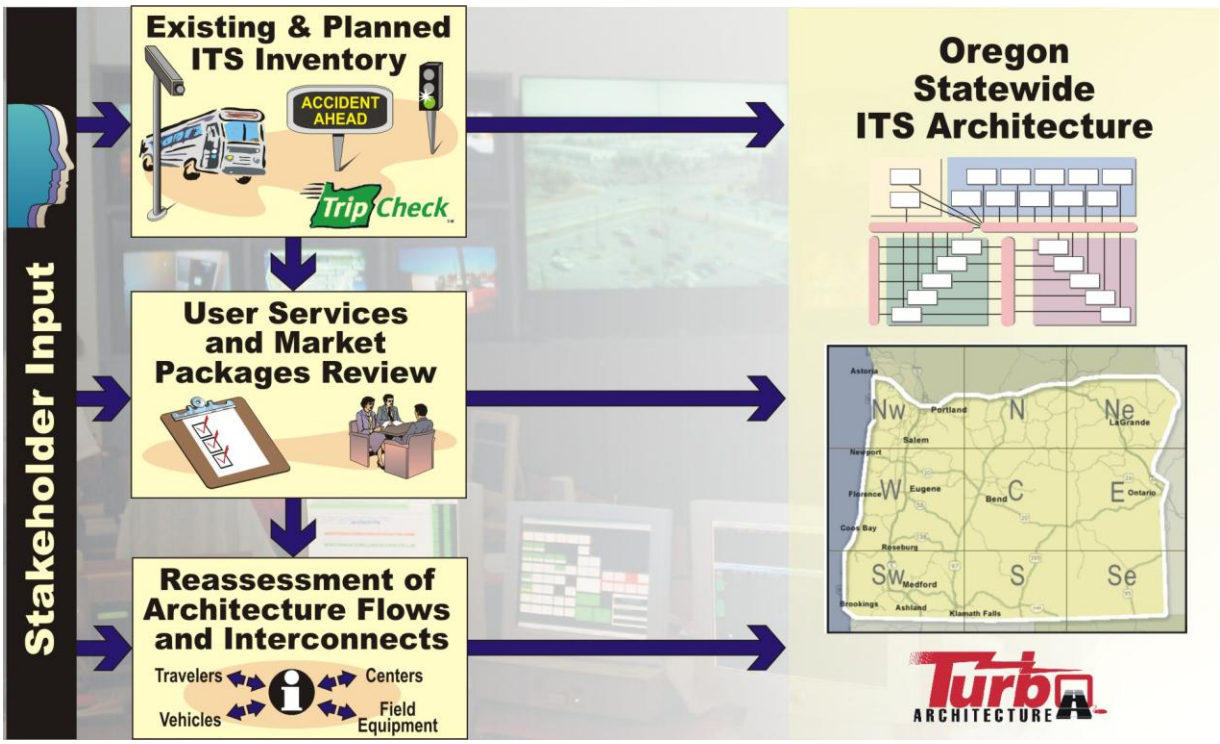



**Figure 4. Oregon Statewide ITS Architecture Update Process**

### *Status Field in Turbo Architecture*

Turbo Architecture allows the user to customize the status settings. The following status settings have been incorporated in the Turbo Architecture database for the Oregon Statewide ITS Architecture:

- Existing: Items that currently exist.
- Programmed: Items that are currently underway/under design or that have funding secured for deployment in the near future.
- Planned: Items that are included in statewide plans but do not yet have funding.
- Future: Items that may occur within the architecture timeframe but are not included in any current statewide plans and do not yet have funding.
- Not Planned: Items not currently planned for the state within the architecture timeframe.

These status fields were incorporated in the 2006 update to the Oregon Statewide ITS Architecture; however, in the 2010 update the status fields for all new elements, market packages, and flows were limited to: existing, existing/planned, planned, and not planned. Funding commitments constantly change, which makes it hard to track programmed funds. Future ITS projects that may happen later in the 10-year timeframe can be added during subsequent updates when more details are available to capture those types of projects in the architecture.

## Geographic Boundary

The geographic boundary of the Oregon Statewide ITS Architecture is the state of Oregon, which includes 36 counties and approximately 240 cities. ODOT has designated five discrete regions within the state for the practical purpose of overseeing their transportation infrastructure in more manageable pieces.

Figure 5 includes a map of Oregon that depicts cities, counties, and ODOT's five regions. ODOT has also divided the state into 15 maintenance districts to support daily maintenance operations. Although the architecture is defined by the ITS components within the state border, there are stakeholders, inventory elements, and information flows in the architecture that capture the cross-jurisdictional interfaces with Oregon's neighboring states (Washington, Idaho, Nevada, and California).

## Timeframe

This update to the Oregon Statewide ITS Architecture spans a 10-year timeframe from Years 2011 - 2021. The original strategic plan covered the 20-year period from Years 1997 – 2017 and the timeframe in the Turbo Architecture database was previously undefined. A 10-year timeframe best suits the state's needs and the fluid nature of technology advancements and changes.

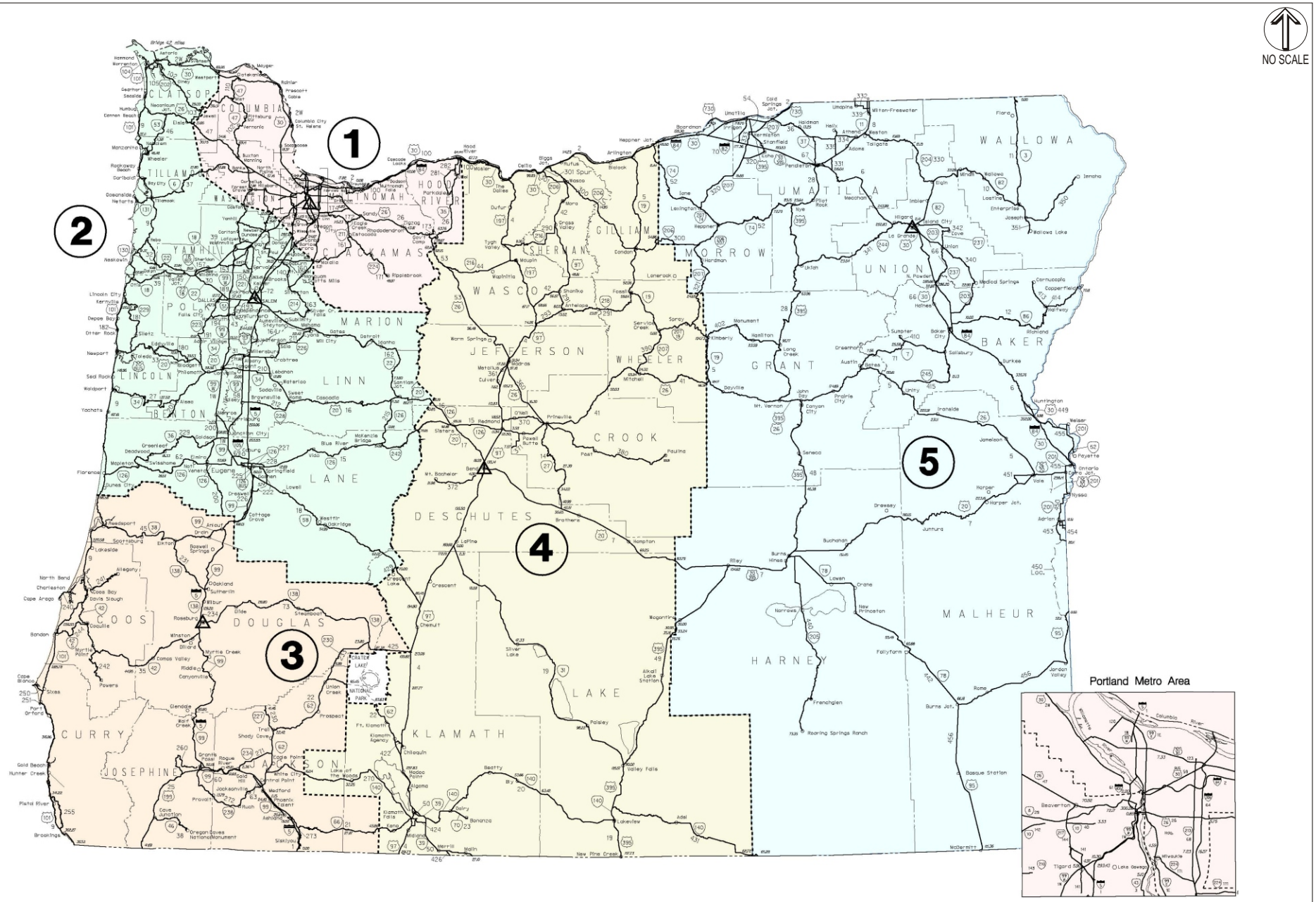
## Scope

The scope of the Oregon Statewide ITS Architecture includes the following ITS service areas:

- Transportation Operations Centers
- Regional Traffic Control
- Traveler Information
- Maintenance and Construction Operations
- Road Weather Operations
- Incident Management
- Emergency Management
- Archived Data Management
- Commercial Vehicle Operations
- Public Transportation (added in 2010)
- Road User Charging (added in 2011)

The transportation and emergency management agencies within Oregon currently perform these key services on a day-to-day basis.

The Committee chose not to include the following Advanced Vehicle Safety Systems service area for various reasons. Although important, this service area is a higher priority for the automotive industry at present than for public agencies. This service area should be reevaluated in the future after systems have matured and higher priority public agency projects have been deployed.




# Figure 5
# OREGON STATE MAP

Data Source:
Oregon Department of Transportation, GIS Unit (April 2004)

## Project Architectures

The Turbo Architecture software also allows the inclusion of project architectures within the statewide architecture for major projects. The Statewide Architecture Committee decided to include the following four project architectures:

- Transportation Operations Center System (TOCS)
- TripCheck System
- TripCheck Traveler Information Portal (TTIP)
- Road Weather Operations

These statewide projects are large in scope and involve the integration of a considerable portion of the Oregon Statewide ITS Architecture. In particular, these projects capture the principle existing or planned systems used by ODOT on a day-to-day basis in each of their five regions. These project architectures also provide an interface to ODOT and local agency elements included in the regional architectures. For example, ODOT uses the TripCheck system for distribution of traveler information statewide and one of the functions of TTIP is to pass traveler information from local agencies to the TripCheck system. The Oregon Statewide ITS Architecture captures traveler information flows from ODOT to the TripCheck system and from a generic local agency stakeholder to TTIP and from TTIP to the TripCheck system. The regional architectures describe the particular traveler information flows to TTIP from the numerous local agency systems within the region.

The Turbo Architecture software enables the user to select inventory elements and services within the statewide architecture that apply to a specific project. It also provides the user a way to filter the statewide architecture by project to assist with project development, systems engineering analysis, and project implementation. The Turbo Architecture summary report included in Appendix D also includes details, such as general description and scope, for each project architecture and Appendix E includes a change log of how these attributes have been updated.

## Stakeholders

Stakeholders are the backbone of the Oregon Statewide ITS Architecture and consensus amongst stakeholders has helped the state successfully deploy ITS projects in the past and will continue to ensure coordination and integration of future ITS endeavors. The key stakeholders include the transportation, transit, and public safety agencies who primarily own and operate ITS throughout the state. Expanded stakeholders include other public agencies, private sector organizations, and travelers/system users.

Appendix F contains the Turbo Architecture report of the complete list of the stakeholders/ stakeholder groups and Appendix G includes a detailed change log of all the changes made to the stakeholder list.

## System Inventory

The Oregon Statewide ITS Architecture includes a comprehensive inventory of the existing and planned ITS elements in Oregon. In Turbo Architecture each inventory element includes the element name, the associated stakeholder, and the associated subsystem(s) and/or terminator(s). There is also a field available for including a description. The Oregon Statewide ITS Architecture primarily focuses on the elements that comprise the subsystems, but does include a few key terminators. Terminators typically play a larger role in project-specific

architectures (e.g. the personnel that operate the actual subsystem and the people that interface to the system).

Appendix H contains the Turbo Architecture report of the complete list of the system inventory elements, and a detailed change log of all the changes made to the system inventory list can be found in Appendix I.

## User Services

User services describe what functions intelligent transportation systems should perform from the user's perspective. Users encompass a broad range of groups such as the traveling public, transportation agency personnel, emergency management personnel, and commercial vehicle operators. Although a user service is a functional requirement of the system, it does not describe where components fit into the architecture or how the service will be implemented. Selection of user services provides a high-level means of identifying the services to provide that address the statewide user needs and problems. To simplify the range of requirements in a broad area of services, the user services are logically grouped into eight user service bundles.

Table 6 includes these user service bundles and the 33 nationally defined user services and indicates the status of each one based on input from the Statewide Architecture Committee. A description of each user service may be found on the National ITS Architecture website[10].

[10] *User Services*. U.S. Department of Transportation. Jan. 7, 2009. http://itsarch.iteris.com/itsarch/html/user/userserv.htm. Accessed Dec. 3, 2010.

**Table 6. User Services in the Oregon Statewide ITS Architecture**

| User Services Bundles and User Services | | Status |
|---|---|---|
| 1 | Travel and Traffic Management | |
| 1.1 | Pre-Trip Travel Information | Existing |
| 1.2 | En-Route Driver Information | Existing/Future |
| 1.3 | Route Guidance | Existing/Planned |
| 1.4 | Ride Matching and Reservation | Planned |
| 1.5 | Traveler Services Information | Existing/Planned |
| 1.6 | Traffic Control | Existing |
| 1.7 | Incident Management | Existing |
| 1.8 | Travel Demand Management | Future |
| 1.9 | Emissions Testing and Mitigation | Not Planned |
| 1.10 | Highway Rail Intersection | Future |
| 2 | Public Transportation Management | |
| 2.1 | Public Transportation Management | Existing/Planned |
| 2.2 | En-Route Transit Information | Existing/Planned |
| 2.3 | Personalized Public Transit | Existing/Planned |
| 2.4 | Public Travel Security | Existing/Planned |
| 3 | Electronic Payment | |
| 3.1 | Electronic Payment Services | Existing/Planned |
| 4 | Commercial Vehicle Operations | |
| 4.1 | Commercial Vehicle Electronic Clearance | Existing |
| 4.2 | Automated Roadside Safety Inspection | Not Planned |
| 4.3 | On-Board Safety and Security Monitoring | Not Planned |
| 4.4 | Commercial Vehicle Administrative Process | Existing |
| 4.5 | Hazardous Materials Security and Incident Response | Existing |
| 4.6 | Freight Mobility | Not Planned |
| 5 | Emergency Management | |
| 5.1 | Emergency Notification and Personal Security | Existing/Programmed |
| 5.2 | Emergency Vehicle Management | Existing |
| 5.3 | Disaster Response and Evacuation | Not Planned |
| 6 | Advanced Vehicle Safety Systems | |
| 6.1 | Longitudinal Collision Avoidance | Not Planned |
| 6.2 | Lateral Collision Avoidance | Not Planned |
| 6.3 | Intersection Collision Avoidance | Future |
| 6.4 | Vision Enhancement for Crash Avoidance | Not Planned |
| 6.5 | Safety Readiness | Not Planned |
| 6.6 | Pre-Crash Restraint Development | Not Planned |
| 6.7 | Automated Vehicle Operation | Not Planned |
| 7 | Information Management | |
| 7.1 | Archived Data | Existing/Planned |
| 8 | Maintenance and Construction Management | |
| 8.1 | Maintenance and Construction Operations | Existing |

## Market Packages

Market packages are deployment-oriented groupings of physical architecture entities that address specific user services. The user services identified in the previous section are too broad in scope to aid in the planning of actual deployments. Market packages are made up of one or more equipment packages that work together to deliver a transportation service and the architecture flows that connect them with subsystems and terminators. Figure 6 illustrates a sample market package that includes subsystems (the large rectangular boxes), the equipment packages (the small rectangular boxes), the terminators (the ovular boxes), and the architecture flows (the arrows).

The status of market packages previously selected for Oregon were reviewed and newer market packages were also reviewed and selected based on statewide needs. Table 7 lists the market packages selected by the Statewide Architecture Committee and includes both existing market packages already deployed and market packages that will be deployed within the next 10 years. Eight broad categories of interest are used to group the 91 market packages. Appendix J contains the Turbo Architecture market packages report, which includes a brief description of each market package, its statewide status, the applicable statewide inventory elements associated with the market package, and any comments on how the market package applies to Oregon. Appendix K includes the change log of all the changes made to the market packages. Additional details about each market package may also be found on the National ITS Architecture website[11].

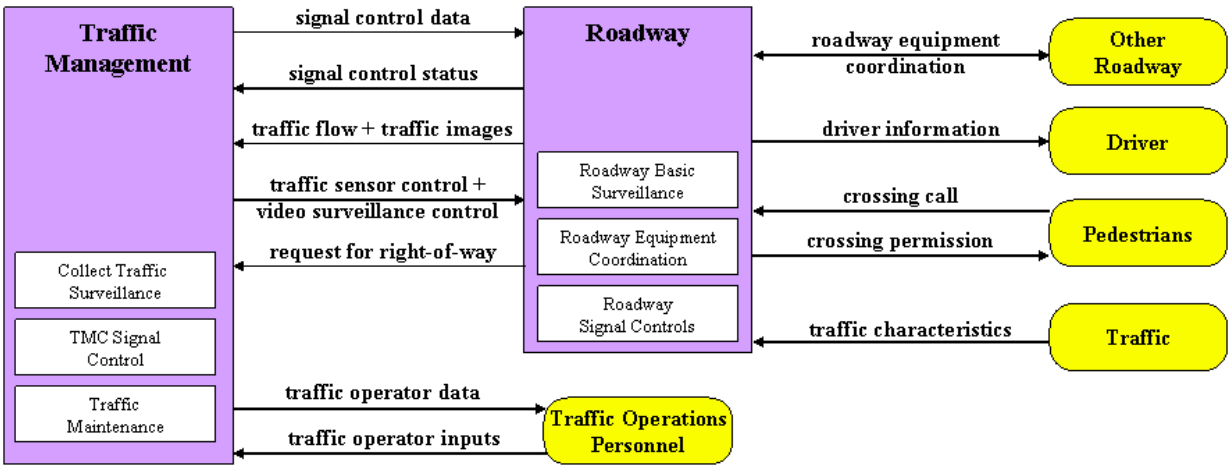



**Figure 6. Sample Market Package Graphic: Surface Street Control (ATMS03)[12]**

[11] *Market Packages*. U.S. Department of Transportation. Jan. 7, 2009. http://itsarch.iteris.com/itsarch/html/mp/mpindex.htm. Accessed Dec. 3, 2010.

[12] *ATMS03- Surface Street Control*. U.S. Department of Transportation. Jan. 7, 2009. http://itsarch.iteris.com/itsarch/html/mp/gatms03.htm. Accessed Dec. 3, 2010.

**Table 7. Market Packages in the Oregon Statewide ITS Architecture**

| Market Packages | | Addition to Turbo Architecture | Status |
|---|---|---|---|
| **Archived Data (AD) Management** | | | |
| AD1: | ITS Data Mart | Version 1.0/1.1 | Existing/Programmed |
| AD2: | ITS Data Warehouse | Version 1.0/1.1 | Existing/Planned |
| AD3: | ITS Virtual Data Warehouse | Version 1.0/1.1 | Not Planned |
| **Advanced Public Transportation Systems (APTS)** | | | |
| APTS01: | Transit Vehicle Tracking | Version 1.0/1.1 | Existing/Planned |
| APTS02: | Transit Fixed-Route Operations | Version 1.0/1.1 | Existing/Planned |
| APTS03: | Demand Response Transit Operations | Version 1.0/1.1 | Existing/Planned |
| APTS04: | Transit Fare Collection Management | Version 1.0/1.1 | Existing/Planned |
| APTS05: | Transit Security | Version 1.0/1.1 | Existing/Planned |
| APTS06: | Transit Fleet Management | Version 1.0/1.1 | Existing/Planned |
| APTS07: | Multi-Modal Coordination | Version 1.0/1.1 | Existing/Planned |
| APTS08: | Transit Traveler Information | Version 1.0/1.1 | Existing/Programmed |
| APTS09: | Transit Signal Priority | Version 4.0 | Existing/Planned |
| APTS10: | Transit Passenger Counting | Version 4.0 | Planned |
| **Advanced Traveler Information Systems (ATIS)** | | | |
| ATIS01: | Broadcast Traveler Information | Version 1.0/1.1 | Existing |
| ATIS02: | Interactive Traveler Information | Version 1.0/1.1 | Existing/Planned |
| ATIS03: | Autonomous Route Guidance | Version 1.0/1.1 | Not Planned |
| ATIS04: | Dynamic Route Guidance | Version 1.0/1.1 | Not Planned |
| ATIS05: | ISP Based Trip Planning and Route Guidance | Version 1.0/1.1 | Not Planned |
| ATIS06: | Transportation Operations Data Sharing | Version 4.0 | Existing/Planned |
| ATIS07: | Yellow Pages and Reservation | Version 1.0/1.1 | Planned |
| ATIS08: | Dynamic Ridesharing | Version 1.0/1.1 | Planned |
| ATIS09: | In Vehicle Signing | Version 1.0/1.1 | Future |
| ATIS10: | VII Traveler Information | Version 4.0 | Not Planned |
| **Advanced Traffic Management Systems (ATMS)** | | | |
| ATMS01: | Network Surveillance | Version 1.0/1.1 | Existing |
| ATMS02: | Traffic Probe Surveillance | Version 1.0/1.1 | Existing/Planned |
| ATMS03: | Surface Street Control | Version 1.0/1.1 | Existing |
| ATMS04: | Freeway Control | Version 1.0/1.1 | Existing |
| ATMS05: | HOV Lane Management | Version 1.0/1.1 | Not Planned |
| ATMS06: | Traffic Information Dissemination | Version 1.0/1.1 | Existing |
| ATMS07: | Regional Traffic Management | Version 1.0/1.1 | Existing |
| ATMS08: | Traffic Incident Management System | Version 1.0/1.1 | Existing |
| ATMS09: | Traffic Decision Support and Demand Management | Version 1.0/1.1 | Future |
| ATMS10: | Electronic Toll Collection | Version 1.0/1.1 | Existing/Planned |
| ATMS11: | Emissions Monitoring and Management | Version 1.0/1.1 | Not Planned |

| Market Packages | | Addition to Turbo Architecture | Status |
|---|---|---|---|
| ATMS12: | Roadside Lighting System Control | Version 4.0 | Not Planned |
| ATMS13: | Standard Railroad Grade Crossing | Version 1.0/1.1 | Not Planned |
| ATMS14: | Advanced Railroad Grade Crossing | Version 1.0/1.1 | Not Planned |
| ATMS15: | Railroad Operations Coordination | Version 1.0/1.1 | Future |
| ATMS16: | Parking Facility Management | Version 1.0/1.1 | Planned |
| ATMS17: | Regional Parking Management | Version 1.0/1.1 | Not Planned |
| ATMS18: | Reversible Lane Management | Version 1.0/1.1 | Not Planned |
| ATMS19: | Speed Monitoring | Version 2.0 | Existing |
| ATMS20: | Drawbridge Management | Version 2.0 | Not Planned |
| ATMS21: | Roadway Closure Management | Version 3.0 | Existing/Programmed |
| **Advanced Vehicle Safety Systems (AVSS)** | | | |
| AVSS01: | Vehicle Safety Monitoring | Version 1.0/1.1 | Not Planned |
| AVSS02: | Driver Safety Monitoring | Version 1.0/1.1 | Not Planned |
| AVSS03: | Longitudinal Safety Warning | Version 1.0/1.1 | Not Planned |
| AVSS04: | Lateral Safety Warning | Version 1.0/1.1 | Not Planned |
| AVSS05: | Intersection Safety Warning | Version 1.0/1.1 | Future |
| AVSS06: | Pre-Crash Restraint Deployment | Version 1.0/1.1 | Not Planned |
| AVSS07: | Driver Visibility Improvement | Version 1.0/1.1 | Not Planned |
| AVSS08: | Advanced Vehicle Longitudinal Control | Version 1.0/1.1 | Not Planned |
| AVSS09: | Advanced Vehicle Lateral Control | Version 1.0/1.1 | Not Planned |
| AVSS10: | Intersection Collision Avoidance | Version 1.0/1.1 | Future |
| AVSS11: | Automated Highway System | Version 1.0/1.1 | Not Planned |
| AVSS12: | Cooperative Vehicle Safety Systems | Version 4.0 | Not Planned |
| **Commercial Vehicle Operations (CVO)** | | | |
| CVO01: | Fleet Administration | Version 1.0/1.1 | Not Planned |
| CVO02: | Freight Administration | Version 1.0/1.1 | Not Planned |
| CVO03: | Electronic Clearance | Version 1.0/1.1 | Existing |
| CVO04: | CV Administrative Processes | Version 1.0/1.1 | Existing |
| CVO05: | International Border Electronic Clearance | Version 1.0/1.1 | Not Planned |
| CVO06: | Weigh-in-Motion | Version 1.0/1.1 | Existing |
| CVO07: | Roadside CVO Safety | Version 1.0/1.1 | Not Planned |
| CVO08: | On-Board CVO and Freight Safety and Security | Version 1.0/1.1 | Not Planned |
| CVO09: | CVO Fleet Maintenance | Version 1.0/1.1 | Not Planned |
| CVO10: | HAZMAT Management | Version 1.0/1.1 | Not Planned |
| CVO11: | Roadside HAZMAT Security Detection and Mitigation | Version 3.0 | Not Planned |
| CVO12: | CV Driver Security Authentication | Version 3.0 | Not Planned |
| CVO13: | Freight Assignment Tracking | Version 3.0 | Not Planned |
| **Emergency Management (EM)** | | | |
| EM01: | Emergency Call-Taking and Dispatch | Version 1.0/1.1 | Existing |

| Market Packages | | Addition to Turbo Architecture | Status |
|---|---|---|---|
| EM02: | Emergency Routing | Version 1.0/1.1 | Existing/Planned |
| EM03: | Mayday and Alarms Support | Version 1.0/1.1 | Existing/Programmed |
| EM04: | Roadway Service Patrols | Version 2.0 | Existing |
| EM05: | Transportation Infrastructure Protection | Version 3.0 | Existing/Future |
| EM06: | Wide-Area Alert | Version 3.0 | Existing |
| EM07: | Early Warning System | Version 3.0 | Not Planned |
| EM08: | Disaster Response & Recovery | Version 3.0 | Not Planned |
| EM09: | Evacuation and Reentry Management | Version 3.0 | Planned |
| EM10: | Disaster Traveler Information | Version 3.0 | Not Planned |
| **Maintenance and Construction (MC) Management** | | | |
| MC01: | Maintenance and Construction Vehicle and Equipment Tracking | Version 2.0 | Planned |
| MC02: | Maintenance and Construction Vehicle Maintenance | Version 2.0 | Not Planned |
| MC03: | Road Weather Data Collection | Version 2.0 | Existing |
| MC04: | Weather Information Processing and Distribution | Version 3.0 | Planned |
| MC05: | Roadway Automated Treatment | Version 2.0 | Existing/Planned |
| MC06: | Winter Maintenance | Version 2.0 | Future |
| MC07: | Roadway Maintenance and Construction | Version 2.0 | Existing/Future |
| MC08: | Work Zone Management | Version 2.0 | Existing/Planned |
| MC09: | Work Zone Safety Monitoring | Version 2.0 | Existing/Future |
| MC10: | Maintenance and Construction Activity Coordination | Version 2.0 | Existing/Programmed |
| MC11: | Environmental Probe Surveillance | Version 4.0 | Not Planned |
| MC12: | Infrastructure Monitoring | Version 4.0 | Not Planned |

## High-Level Physical Architecture Interconnects

Figure 7 illustrates the subsystems and architecture interconnects that make up the high-level physical architecture for Oregon. This figure includes both existing and planned physical entities. The following general updates were made to the architecture interconnects:

- Update of interconnects to reflect changes to the system inventory.
- Tailoring of the new interconnects to the system inventory as applicable.
- Review of interconnects for completeness and accuracy.

Architecture interconnects have been included in the Turbo Architecture database that link the Oregon Statewide ITS Architecture to the regional architectures within the state and to the statewide architectures of neighboring states.

Appendix L includes the Turbo Architecture report for the architecture interconnects that carry architecture flows between the subsystems and terminators and Appendix M includes the architecture flows. There are far too many architecture interconnects to depict in a single graphic or to document in a change log.

## Functional Requirements

ODOT identifies functional requirements as part of their systems engineering process at the project level for statewide significant systems with interfaces that cross agency boundaries. Therefore, functional requirements are not included as part of the Oregon Statewide ITS Architecture.

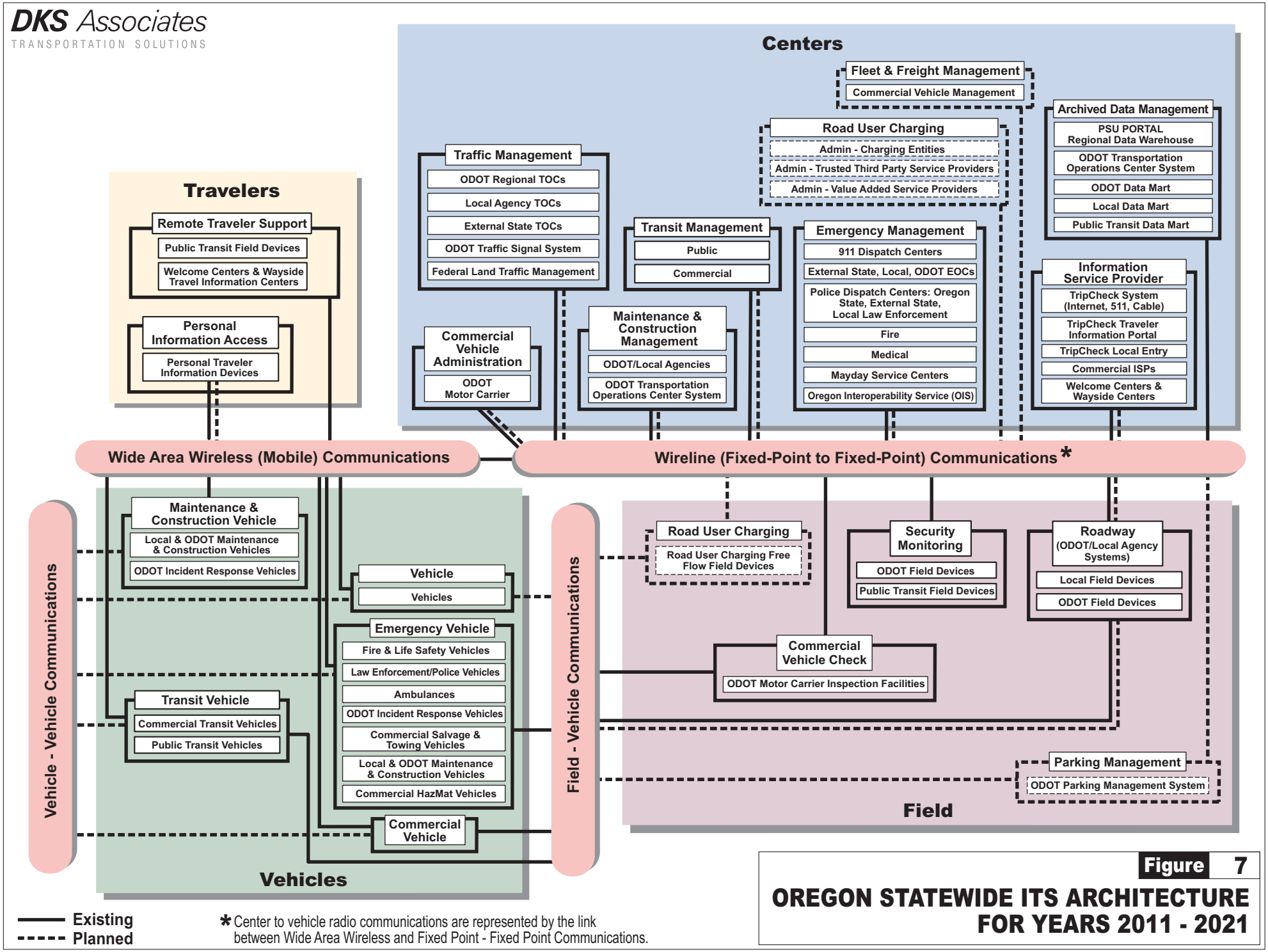



**Figure 7**

**OREGON STATEWIDE ITS ARCHITECTURE FOR YEARS 2011 - 2021**

# OPERATIONAL CONCEPT PLAN

This section includes a summary of the ITS operational concept for the state of Oregon, which is an overview of how the state's stakeholders and systems work together to provide ITS services. The main objectives of the operational concept are to:

- Identify current and future stakeholder roles and responsibilities in the implementation and operation of regional and statewide systems[13].
- Achieve buy-in on these roles and responsibilities and lay the groundwork for future agency agreements[13].
- Document and communicate statewide ITS strategies.
- Provide a clear framework for coordination between statewide and regional strategies.

Additionally, an operational concept has been added as a required component of a regional/ statewide ITS architecture per the FHWA Final Rule and FTA Policy since the Oregon Statewide ITS Architecture was originally created.

This section documents the operational concept development approach and agency roles and responsibilities for the ITS service areas identified in the scope of the architecture.

## Introduction

The deployment of ITS projects is unique because many of the benefits are realized only when ITS projects are implemented together on a regionwide or statewide basis, rather than on an individual basis. As a result, the implementation of ITS projects requires coordination and ongoing cooperation between various agencies within Oregon and across state boundaries. The ITS operational concept presented in this report provides an overview of ITS programs that require regional or statewide coordination and cooperation, such as providing traveler information through the new TripCheck Traveler Information Portal. This ITS operational concept defines the roles and responsibilities of the key transportation, transit, and emergency management agencies and key private sector organizations over the next 10 years and identifies shared information flows between these agencies. It is not intended to describe agency-specific ITS systems such as the Port of Portland's airport parking system.

### *Operational Concept Development Approach*

The statewide operational concept was developed based on input from the Statewide Architecture Committee and a review of ITS documents, which include statewide and regional ITS project documentation, regional ITS plans, and regional ITS architectures. The Statewide Architecture Committee and ITS documentation provided insight into stakeholder roles and responsibilities as well as consensus. The results discussed in the operational concept may not represent all of the potential interactions, but present key relationships, roles and responsibilities, and information flows that make up a day in the life of ITS in Oregon.

Implementation and operation of ITS in Oregon on a daily basis involves numerous stakeholders and intelligent transportation systems. So much so that it would be too complex and difficult to manage an operational concept that describes all ITS activities as a single operational concept. Therefore, the Oregon statewide operational concept has been split into several smaller service area operational concepts; each one covering a particular aspect of the

[13] *Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region*. Report FHWA-OP-02-024. U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, National ITS Architecture Team, Oct. 12, 2001.

transportation system. Operational concepts have been defined for each of the following ITS service areas:

- Transportation Operations Centers
- Regional Traffic Control
- Traveler Information
- Maintenance and Construction Operations
- Road Weather Operations
- Incident Management
- Emergency Management
- Archived Data Management
- Public Transportation
- Road User Charging

These service areas overlap in a number of areas and some of the individual operational concepts refer to other ones. For instance, components of all the service areas are tied in to ODOT's Transportation Operations Center Software project. Likewise, the functions of the traveler information operational concept are used to provide information about most of the other service areas (e.g. incidents, maintenance and construction).

Each service area operational concept described in this report includes the following:

- General description of the service area based on the National ITS Architecture.
- A statewide vision for the service area and goals that support the vision.
- A summary of key issues facing the service area.
- High-level descriptions of the applications used today and planned for tomorrow.
- Detailed roles and responsibilities of key stakeholders.

## Transportation Operations Centers (TOCs) Operational Concept

ODOT's regional transportation operations centers (TOCs) and other TOCs (local traffic management agencies and external state departments of transportation) are the hub for the operations, management, and maintenance activities related to the Oregon transportation network. This TOCs section includes the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities.

### *Transportation Operations Centers Vision*

The vision for TOCs in Oregon is for ODOT, local traffic management agencies, and neighboring states to actively coordinate the day-to-day operations of the transportation infrastructure and respond to events[14] within their own jurisdictions and across jurisdictional boundaries through regional partnerships. ODOT's vision is to use the Transportation Operations Center System (TOCS), which is a comprehensive hardware and software platform for all ODOT TOCs, to provide "a unified, statewide platform for around the clock coordination of transportation related services between internal and external customers."[15] The following goals support the statewide vision:

- Use TOCS to integrate traffic management, incident management, and event response applications to support efficient and safe travel as well as maintenance activity management and information dissemination.
- Implement TOCS so that each ODOT TOC may operate autonomously with the ability to provide back-up for the other regional ODOT TOCs.
- Facilitate shared responses between ODOT regional centers.
- Establish public and private partnerships to support coordinated cross-jurisdictional traffic control/operations and event response.
- Implement ITS standards (e.g. incident management message sets) as a part of TOCS and local TOC systems.
- Standardize operational procedures throughout Oregon.
- Automate electronic information exchange and device control (as applicable) between centers/systems (e.g. TOCs, Oregon State Police, 911 centers, emergency operations centers, etc.)
- Develop management reporting capabilities for measurement of metrics/performance and to support decision making.

The goals listed above are high-level goals pertaining to the TOCs. Many of the specific goals included in the operational concepts for the other service areas also pertain to the TOCs since the TOCs play an integral part in all of the other service areas selected for the Oregon Statewide ITS Architecture.

### *Transportation Operations Centers Applications Today*

TOCs are operated today by ODOT, local traffic management agencies, and external state DOTs. The following describes the applications used at each type of TOC:

[14] An "event" is considered any non-standard occurrence such as an incident, special event (e.g. fair, sports match, concert), maintenance/construction activity, inclement weather, or a major emergency that occurs on or affects the roadway.

[15] *Transportation Operations Center System Concept of Operations, Final Version*. Oregon Department of Transportation, ITS Unit, Nov. 10, 2004.

- **ODOT TOCs:** ODOT operates a TOC for each of its five regions as generally described in Table 8[16]. Overall the TOCs perform the following functions for the state highway system:
  - *Traffic Management:* Operation of traffic control devices.
  - *Incident Management:* Detection/identification, response (e.g. dispatch), and management of incidents.
  - *Maintenance Support:* Dispatch and communications for ODOT maintenance crews.
  - *Information Service Provider:* Dissemination of traveler information to the public regarding events that impact the roadway.

The Transportation Operations Center System (TOCS) is used by all ODOT TOCs for incident management, maintenance support, and information provision to the public. The main platform used for traffic management is the TransPort Advanced Traffic Management System (ATMS) software used by the Region 1 TMOC. Supplemental systems are used as well but are not described here in detail since ODOT is currently working to implement additional features of one common system at all its TOCs as described in the Transportation Operations Centers Applications Tomorrow section[17].

**Table 8. Overview of ODOT Transportation Operations Centers**

| ODOT TOC | Hours of Operation | Primary Responsibility | Back-Up Responsibility |
|---|---|---|---|
| **Region 1 TMOC (Portland)** | ▪ All hours, all days | ▪ Region 1 | ▪ none |
| **Region 2 NWTOC (Salem)** | ▪ All hours, all days | ▪ Region 2 | ▪ Regions 1, 3, 4, 5 |
| **Region 3 TOC (Central Point)** | ▪ All hours, all days | ▪ Region 3<br>▪ District 11 (located in Region 4) | ▪ Regions 4 & 5<br>▪ District 5 (located in Region 2) |
| **Region 4 TOC (Bend)** | ▪ All hours, all days | ▪ Region 4<br>▪ Region 5 after hours | ▪ Regions 2, 3, 5 |
| **Region 5 Virtual TOC (District Offices)** | ▪ 9 hr/5 days* | ▪ Region 5 | ▪ Region 4 |

* Although Region 5 does not have a formal TOC, the District Offices (Districts 12 and 13) within Region 5 operate as TOCs during normal business hours except they do not currently have access to LEDS and do not dispatch incident management vehicles/personnel.

- **Local Traffic Management Agency TOCs:** A variety of TOCs are currently used throughout Oregon by Cities, Counties, and Port Authorities. Some agencies have a physical center (e.g. City of Portland, Port of Portland) while others have virtual TOCs that consist of a workstation(s) with desktop access to an agency's traffic signals and field devices (e.g. Clackamas County, City of Eugene). A number of agencies have identified TOC or virtual TOC projects in their regional ITS architectures. Most of the local traffic management agency TOCs solely perform traffic management functions, but some perform incident management, maintenance management, and information service provider functions on a limited basis. A few agencies in the Portland metropolitan area (e.g. City of Portland, Clackamas County) have access to the ATMS software used

[16] *Transportation Operations Center Concept of Operations*. Oregon Department of Transportation. May 2010.
[17] *Transportation Operations Center System Assessment of the Current System (P120S), ver. 2.0*. Prepared by TransCore for the Oregon Department of Transportation, Feb. 21, 2003.

by the ODOT Region 1 TMOC and have agreements in place for device sharing (e.g. CCTV camera pan/tilt/zoom functionality).

- **External State DOT TOCs:** Neighboring states (Washington, Idaho, Nevada, and California) operate TOCs that perform similar statewide functions as the ODOT TOCs. ODOT coordinates with these TOCs when day-to-day operations or events impact interstate travel. The Washington State Department of Transportation (WSDOT) Southwest Region TOC in Vancouver also has access to the ATMS software used by the ODOT Region 1 TMOC and has agreements in place for device sharing (e.g. CCTV camera pan/tilt/zoom functionality).

### *Transportation Operations Centers Issues*

Current issues associated with TOCs in Oregon include the following:

- Nationwide, congestion caused 3.5 billion hours of delay and wasted 5.7 billion gallons of fuel in year 2002 costing the nation $63.2 billion (year 2002 dollars)[18]. Over half of congestion is caused by non-recurring events as shown in Figure 8. Non-recurring congestion, and its negative impacts, can be reduced by developing and utilizing strategies described in the operational concepts for most of the other service areas and implementing many of them throughout Oregon at the TOCs.

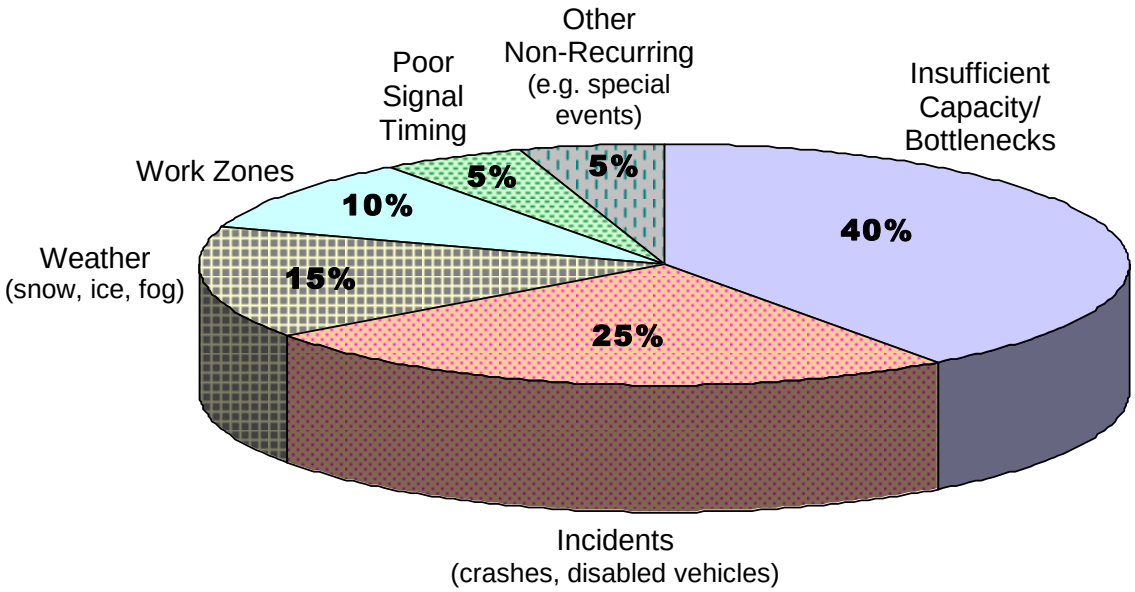



**Figure 8. Causes of Congestion[19]**

- Non-recurring events and their ripple effects dramatically reduce the available capacity and reliability of the entire transportation system. Travelers and shippers are especially sensitive to the unanticipated disruptions to tightly scheduled personal activities and manufacturing distribution procedures.
- Transportation forecasting models show that currently planned transportation investments will not keep up with traffic growth in Oregon's major metropolitan areas, which will result in severe recurring congestion delays. This will affect how well the State

[18] Schrank, D. and T. Lomax. *The 2004 Urban Mobility Report*. Texas Transportation Institute, Texas A&M University, Sept. 2004.

[19] *Congestion Mitigation*. Office of Operations, Federal Highway Administration. http://www.ops.fhwa.dot.gov/congestionmitigation/congestionmitigation.htm. Accessed March 29, 2006.

can compete for new jobs and will cost each household additional dollars that result from the additional travel time, travel cost, and crashes that congestion causes.

- The lack of a common operating platform at ODOT TOCs creates a number of challenges, which all reduce the efficiency of the services provided:
  - Different operating procedures at the TOCs results in inconsistent responses throughout the state.
  - Back-up capabilities between TOCs are limited.
  - Efforts are duplicated when software packages are developed for different TOCs that use similar functionality.
  - There is a lack of integration and information sharing between systems (traffic management, incident/emergency management, maintenance and construction operations, and traveler information dissemination).
  - Communication systems are not integrated and a number of functions are still performed over the telephone. This creates a gap in activity tracking for auditing purposes.
  - Systems are not optimized for event response, particularly maintenance and construction operations.
  - The reporting capabilities for metrics/performance measurement and operations management decision making are limited.
- In general there is a need for more integration and information sharing between all TOCs throughout Oregon and other centers (e.g. 911 centers, Oregon State Police, emergency operations centers). Coordination with emergency operations centers is particularly important when dealing with disasters and emergencies. For example, extensive cross-jurisdictional coordination was required in the U.S. during the September 11$^{th}$, 2001 terrorist attacks and during Hurricanes Katrina and Rita in 2005.

### *Transportation Operations Centers Applications Tomorrow*

The main application of tomorrow is the full deployment of the Transportation Operations Center System (TOCS) that ODOT is currently developing in phases to provide a common, integrated system for use at ODOT TOCs statewide. The system also supports a field office module for use by region managers, area offices, district offices, Salem/headquarters offices, public information officers, and the Motor Carrier Division. Figure 9 illustrates ODOT's concept of operations for its regional TOCs and Table 9 includes a high-level summary of the functions TOCS performs today and will perform in the future. TOCS will continue to be implemented in several stages and will fulfill the vision and goals described earlier in this section.

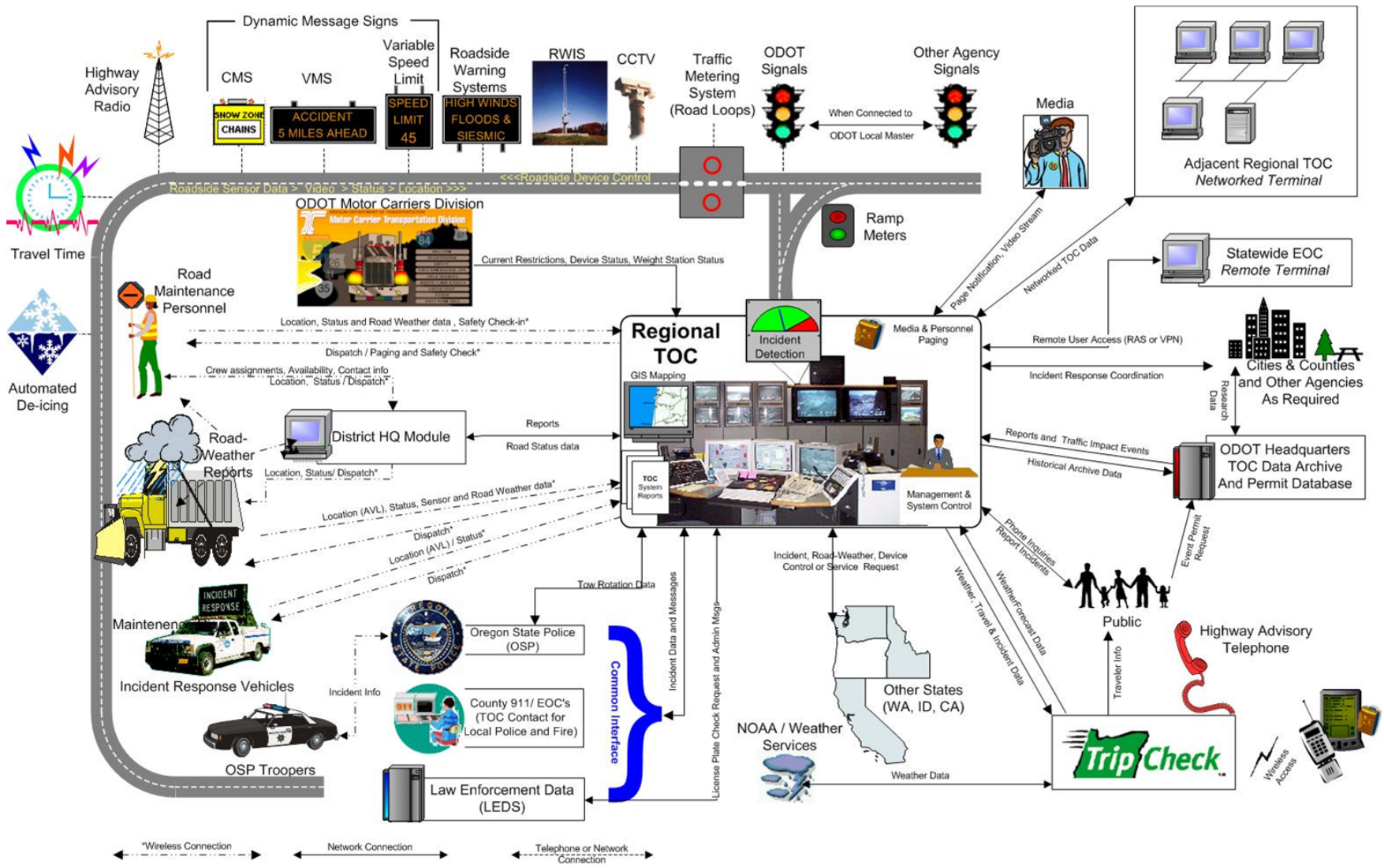



**Figure 9**
**ODOT REGIONAL TOC CONCEPT OF OPERATIONS**

Source: *Transportation Operations Center System Concept of Operations, Final Version*. Oregon Department of Transportation, ITS Unit, Nov. 10, 2004.

**Table 9. Summary of TOCS Functions[20]**

| Functional Area | TOCS Functions *(planned functions shown in italics)* |
|---|---|
| Traffic Management | ▪ *Monitor operational status of traffic signals, provide alerts based on pre-defined conditions, and provide information on traffic pattern changes for future timing updates.*<br>▪ *Manage ramp meter operations, adapt timings to actual conditions, suggest alternative timing plans in response to incidents, and provide control interface.*<br>▪ *Manage DMS message library and provide control interface.*<br>▪ *Manage HAR message library and provide control interface.*<br>▪ *Provide control interface with variable speed limit signs, archive date and time of speed zone changes, and notify enforcement agencies of speed limit changes.* |
| Incident Management | ▪ Manage incident notification call out lists and support paging.<br>▪ Notify ODOT PIO of incidents, distribute press releases.<br>▪ Generate maintenance tracking logs.<br>▪ Provide templates for property damage forms.<br>▪ *Automate media paging.*<br>▪ *Monitor detection sensors and report potential incidents.*<br>▪ *Suggest pre-planned response plans and enable automated responses where appropriate.* |
| Emergency Management | ▪ *Same functions as incident management with an emphasis on implementing emergency operations plans.* |
| Maintenance Operations | ▪ Manage and store contact/call out information and manage security of personal information (e.g. home telephone numbers).<br>▪ Provide notification for critical maintenance needs and provide incident reports.<br>▪ Track vehicle location and activity and archive data.<br>▪ Display available and assigned crews/individuals.<br>▪ Automate maintenance activity reports.<br>▪ Forward activities impacting travel to TTIP.<br>▪ *Display vehicle location on map.*<br>▪ *Provide automated system to call back GPS coordinates for current crew/individual locations.* |
| Winter Operations | ▪ Monitor weather sensors and report potential winter driving hazards.<br>▪ Provide potential alarm for severe weather based on location and environmental sensor device specific criteria.<br>▪ Display available and assigned crews/individuals.<br>▪ *Change DMS and HAR messages based on weather/chain restrictions entered in system.* |
| Device Mgmt | ▪ *Automatically detect failures and create notification alarms for ramp meters, environmental sensors, HAR, and DMS.*<br>▪ *Log failures/status of ramp meters, environmental sensors, RWIS, HAR, and DMS when polled.*<br>▪ *Provide control interface for CCTV, HAR, DMS, and PVMS.*<br>▪ *Automate DMS travel time messages in urban areas.*<br>▪ *Track PVMS deployment locations and status and manage message library.* |
| Traveler Information | ▪ Manage incident data, automate reporting to ISP, LEDS, and NOAA, and notify media based on severity.<br>▪ Manage maintenance and construction data and height/width restrictions and automate reporting to ISP. |

[20] *Transportation Operations Center System Concept of Operations, Final Version*. Oregon Department of Transportation, ITS Unit, Nov. 10, 2004.

| Functional Area | TOCS Functions *(planned functions shown in italics)* |
|---|---|
| | ▪ *Manage RWIS data, automate RWIS reporting to ISP, LEDS, and NOAA, notify TOC operator of reports, and notify media based on severity.*<br>▪ *Determine travel times and automate reporting to ISP.* |
| Data Archival and Reporting | ▪ Automate back-ups of current and archival data.<br>▪ Automate purging of historical records to an archival system. |

### *Stakeholder Roles and Responsibilities*

The key stakeholder roles and responsibilities for the transportation operations centers service area are listed in Table 10.

**Table 10. Transportation Operations Centers Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Develop, implement, operate and maintain TOCS. | ▪ Existing/Planned |
| | ▪ Actively monitor and manage the ODOT roadway network (e.g. video, traffic flow conditions, road/ weather conditions). | ▪ Existing |
| | ▪ Manage/control freeway ramp meter system and SWARM module. | ▪ Existing (Reg. 1)/ Future (Reg. 2) |
| | ▪ Implement coordinated traffic signal timing plans for incidents. | ▪ Future |
| | ▪ Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching ODOT incident responders, ODOT maintenance crews, and towing/salvage operators. | ▪ Existing/Planned |
| | ▪ Monitor and manage maintenance work, construction activities, and road closures. | ▪ Existing |
| | ▪ Manage and dispatch ODOT maintenance crews. | ▪ Existing |
| | ▪ Disseminate traffic information to travelers (e.g. DMS, HAR, TripCheck). | ▪ Existing |
| | ▪ Coordinate with other ODOT TOCs, Local TOCs, External State TOCs, OSP, Emergency and Incident Management Teams, and 911 centers. | ▪ Existing |
| | ▪ Take calls from the public and the media. | ▪ Existing |
| Local Traffic Management Agencies | ▪ Actively monitor and manage the local roadway network (e.g. video, traffic flow conditions, road/weather conditions). | ▪ Existing/ Programmed |
| | ▪ Implement coordinated traffic signal timing plans for incidents. | ▪ Existing/Future |
| | ▪ Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching local incident responders and maintenance crews. | ▪ Existing/Planned |

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| | ▪ Monitor and manage maintenance work, construction activities, and road closures. | ▪ Existing/Planned |
| | ▪ Disseminate traffic information to travelers (e.g. DMS, local agency website, TTIP). | ▪ Existing/Planned |
| | ▪ Coordinate with Regional ODOT TOCs, other Local TOCs, and 911 centers. | ▪ Existing/Planned |
| | ▪ Take calls from the public and the media. | ▪ Existing |
| External State Departments of Transportation | ▪ Actively monitor and manage the DOT roadway network (e.g. video, traffic flow conditions, road/weather conditions). | ▪ Existing |
| | ▪ Manage/control freeway ramp meter system. | ▪ Existing/Planned |
| | ▪ Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching incident responders, maintenance crews, and towing/salvage operators. | ▪ Existing |
| | ▪ Monitor and manage maintenance work, construction activities, and road closures. | ▪ Existing |
| | ▪ Manage and dispatch DOT maintenance crews. | ▪ Existing |
| | ▪ Disseminate traffic information to travelers (e.g. DMS, HAR, state DOT website, TTIP). | ▪ Existing/Planned |
| | ▪ Coordinate with ODOT TOCs, State Police, Emergency and Incident Management Teams, and 911 centers. | ▪ Existing |
| | ▪ Take calls from the public and the media. | ▪ Existing |

## Regional Traffic Control Operational Concept

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times. This regional traffic control section includes the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. Figure 10 depicts the regional traffic control operational concept[21].

### *Regional Traffic Control Vision*

The regional traffic control vision is for public agencies to manage and respond to the dynamic traffic conditions of Oregon's transportation network through cross-jurisdictional coordination, information sharing, and the use of integrated and automated systems while also improving and maintaining travel time reliability. Goals that support this vision include the following:

- Establish public agency partnerships and information exchanges to support regional traffic control and management strategies.
- Build on the long Oregon public agency tradition of utilizing common standards-based traffic control hardware and systems to support statewide traffic control and surveillance systems.
- Integrate multi-jurisdictional traffic control strategies with communication links between traffic operations/management centers, common information exchanges, and shared control of field devices.
- Integrate freeway and surface street systems so that traffic management is coordinated along a corridor that transitions between the two systems.
- Automate traffic signal control and freeway control responses so that traffic signals and ramp meters, working together, dynamically adjust to changes in vehicle volumes based on current, network-wide roadway conditions.
- Gather surface street and freeway information from multiple public and private sources to support network monitoring, data collection, event response, and dissemination of traveler information.
- Actively manage and respond to transportation system conditions to maintain travel time reliability and preserve existing system capacity.

### *Regional Traffic Control Applications Today*

Regional traffic control applications in use today include regional traffic signal control, freeway control, network surveillance, and probe surveillance.

**Regional Traffic Signal Control:** The State of Oregon has a long tradition of utilizing common traffic signal control hardware and software. Many agencies use or are migrating towards the use of a central signal system. The central traffic signal systems are used to monitor traffic signal operations, implement coordinated signal timing plans, implement adaptive signal timing, and collect volume, speed, and traffic density information from system detectors. The use of national standards is what allows agencies to share and control data electronically.

[21] "Traffic/Event Management" and "Dispatch" on Figure 10 represents all of the systems used at a TOC such as ATMS, TOCS, or other applications.

DKS Associates
TRANSPORTATION SOLUTIONS

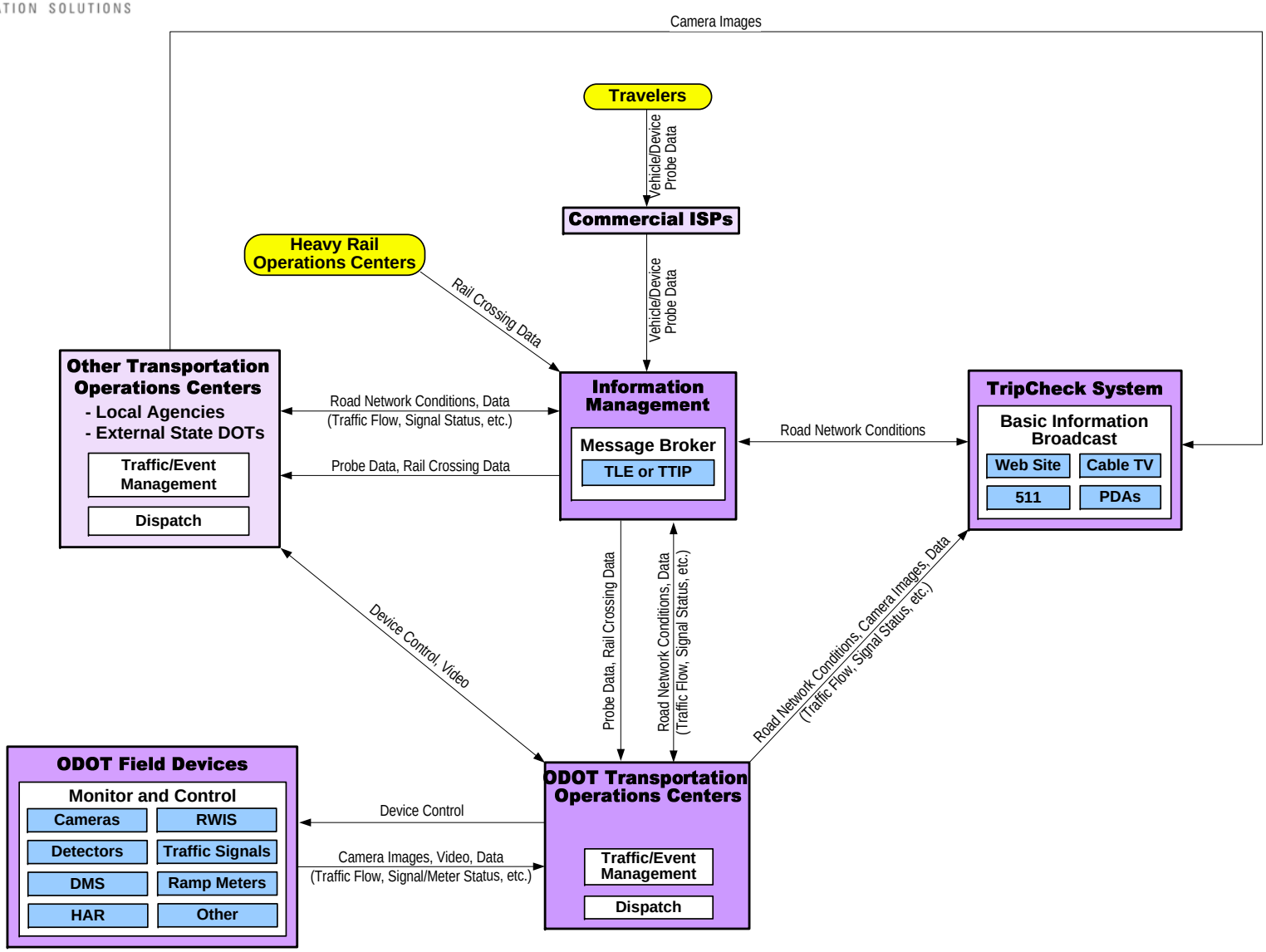
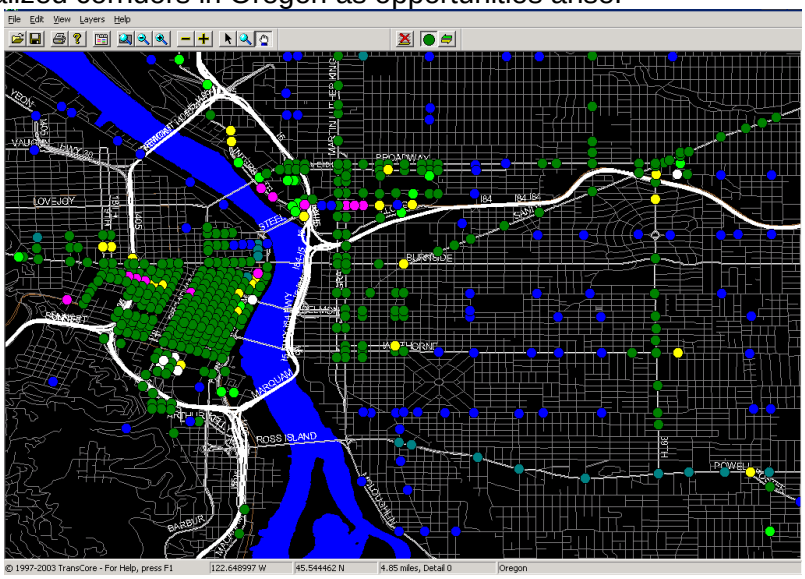



**Figure 10**
**OREGON REGIONAL TRAFFIC CONTROL OPERATIONAL CONCEPT FOR YEARS 2011-2021**

ODOT and other public agencies throughout the state operate common traffic signal control hardware and systems as follows:

- ODOT: They have two statewide systems- a common central traffic signal system (TransSuite) and an adaptive signal system (SCATS). A portion of ODOT's traffic signals currently communicate with the TransSuite system and ODOT is working on phased funding plans to bring the remaining traffic signals online. In Region 1, ODOT has a center-to-center connection with the City of Portland, who also uses the TransSuite system. This allows ODOT Region 1 to share signal data with a number of agencies in the Portland metropolitan area. The SCATS system is used in Redmond today and will be expanded to other signalized corridors in Oregon as opportunities arise.
- Portland Metropolitan Area: They have taken a unique approach to managing traffic signals for a major metropolitan area. Based on a long history of working together and sharing the same local traffic signal hardware and software, the Portland region has jointly selected and implemented a common central traffic signal system (TransSuite). This common central signal system provides the region with the unique opportunity to share resources required to manage and operate the region's traffic signals. The common system also supports back-up servers at separate physical locations in the region, and it supports shared control of traffic signal operations for special events or unplanned incidents. Clackamas County, Washington County, and the Cities of Portland and Gresham currently use the common central signal system.




*Portland Area Traffic Signal Control System*

- Cities of Eugene and Springfield: They operate common traffic signal systems and have communications to the majority of their signalized intersections.
- City of Medford: They operate a central traffic signal system from the same vendor as the Cities of Eugene and Springfield and they have communications to over 90 percent of their signalized intersections.

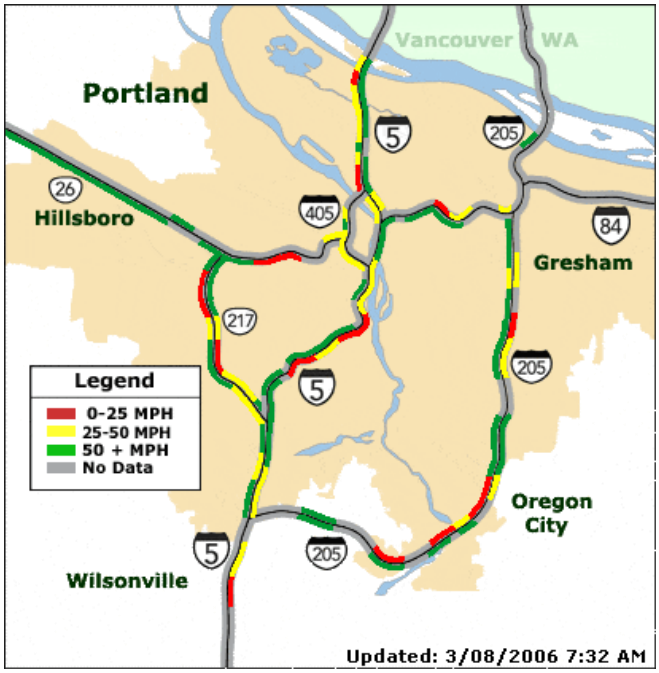
All major metropolitan areas in Oregon utilize coordinated signal timing plans on their major arterial roadways and this often includes the coordination of traffic signals operated by different jurisdictions that are located on the same corridor. Many of these plans are implemented based on the time of day and are not influenced by changes in traffic congestion; however, many agencies have installed or are currently installing adaptive signal timing on heavily congested corridors. Adaptive signal timing systems adjust cycle lengths and phase splits based on real-time changing traffic conditions.

**Freeway Control:** Freeways in Oregon are generally better instrumented to monitor congestion than arterial roadways. Operators in ODOT's Transportation Operations Centers (TOCs) monitor and control Oregon's freeway and highway system using cameras, ramp meters, dynamic message signs, dynamic speed signs, ramp closure systems, and incident response vehicles. The TOC operators, in conjunction with emergency service providers, determine the best response to incidents and other events, which are described in other service area operational concepts. ODOT also uses the following applications:

- Incident Detection: The ODOT freeway management system utilizes algorithms to analyze data from the detection systems discussed under Network Surveillance and to provide an alert to TOC operators about potential incident locations. The Portland metropolitan area alone has over 485 detectors that report freeway volumes and vehicle speeds every 20 seconds.
- Adaptive Ramp Metering System: ODOT uses adaptive ramp metering algorithms at a number of freeway ramps in Portland that dynamically adjust the ramp metering rate in real-time based on current vehicle volumes and speeds. The metering rate at all other freeway ramps is adjusted based on time-of-day. Ramp meters are located on almost every ramp in the Portland metropolitan area. Currently the Eugene-Springfield area is the only other part of the state planning to deploy ramp meters in the future.

**Network Surveillance:** Current network surveillance technologies used throughout Oregon include camera monitoring systems and detection systems for data collection:

- Camera Monitoring Systems: These systems are in place at key points along many of ODOT's roadways throughout the state and a limited number of systems have been installed on County and City roadways. TOC operators use the camera systems to monitor road and traffic conditions and to identify and verify roadway hazards and incidents. Video images and camera control are shared on an interstate level (between ODOT, WSDOT and CalTrans), a statewide level (between ODOT TOCs), and on a local level (e.g. between ODOT Region 1 TMOC and the City of Portland).
- Detection Systems: These systems on major roadways provide volume, speed, and occupancy (vehicle density) information. Additionally, automated traffic recorders and weigh-in-motion systems collect classification information and system detector loops are also used to provide a traffic condition map for the Portland metropolitan area. ODOT has vehicle detection coverage on many of the major state highways. Other local agencies including Multnomah County and the Cities of Portland, Gresham, Salem, Eugene, Springfield and Medford currently have detection systems that provide volume, speed and occupancy information from central traffic signal systems. Most of the data collected on arterial roadways is not currently shared outside the local agency.




*ODOT TripCheck Speed Map for Portland Metro Area*

**Probe Surveillance:** This application area uses vehicles or personal digital devices to provide congestion related information and predicted travel times on arterial roadways. ODOT is currently implementing a pilot project to use Bluetooth devices as probes to provide congestion related information on Pacific Highway (OR 99W) in the City of Tigard.

### *Regional Traffic Control Issues*

The prominent regional traffic control issues today include the following:

- Although ODOT and local traffic management agencies throughout the state have taken great strides to reduce the impacts of congestion, more efforts are needed to improve the efficiency of the statewide transportation network as congestion continues to increase. As previously discussed in the TOCs Operational Concept section, recurring and non-recurring congestion cause countless delays and economic impacts to travelers and freight.
- Real-time coordination is needed between freeway and arterial management systems. Coordinated traffic signal plans are not always able to accommodate congested conditions at freeway interchanges.
- TOC operators do not currently have the ability to implement alternate coordinated timing plans at traffic signals. Most signal timings are updated by engineers from their offices and only during normal business hours. This limits the ability of an agency to impact signal timing changes to improve traffic flow when needed.
- Surveillance coverage on arterial roadways is currently limited. Most surveillance efforts have been concentrated on the interstate system and major ODOT highways.
- Approximately half (21,000 of 43,000) of annual traffic fatalities on nationwide highways result from roadway departure and intersection related incidents[22]. Although these types of incidents typically occur due to driver error, communications between vehicles and roadside devices may help provide drivers with warnings and in turn reduce incidents and related fatalities.

### *Regional Traffic Control Applications Tomorrow*

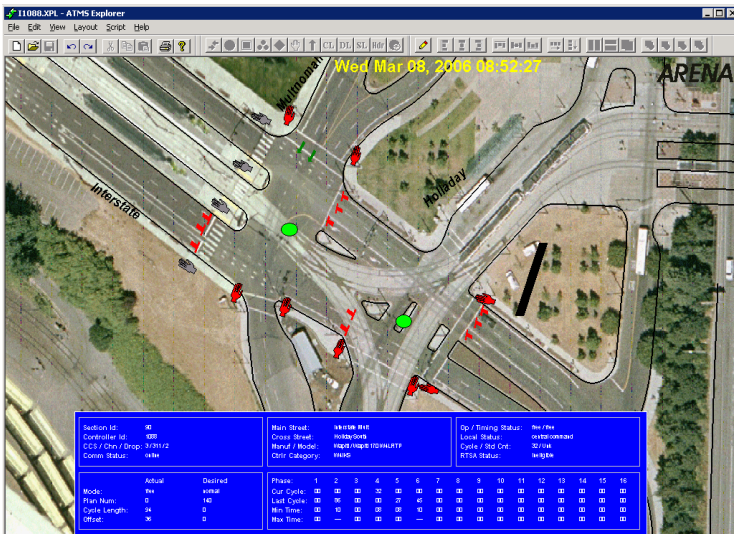
Regional traffic control functions tomorrow will incorporate significant integration between freeway and arterial management systems. Agencies will respond in real-time to events on the roadway network and manage traffic by dynamically adjusting signal timings, ramp meter timings and providing roadway condition information to travelers. Automotive and public agency initiatives will work toward the deployment of vehicle-to-vehicle and vehicle-to-infrastructure communications to enhance safety. This subsection includes an overview of the regional traffic control applications of tomorrow.

**Regional Traffic Signal Control:** Traffic signal controllers will utilize common standards and support multiple applications including adapting coordinated signal timings based on current traffic conditions. Public agencies will select the traffic signal control software that suits their application and needs and that software will communicate to a common central system and will support cross-jurisdictional coordination and control. Public agencies will share monitoring and control capabilities to implement traffic signal timing response plans to respond to incidents and special events. TOC operators will have the ability to implement special coordinated timing plans developed for alternate routes used during events that impact the roadway. Operations

[22] *Connected Vehicle*. ITS Joint Program Office, United States Department of Transportation. http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm. Accessed May 24, 2011.

and maintenance of the central systems, servers and data storage servers will be shared by multiple agencies.

Traffic volume, density and speed data collected by traffic signal systems will be easily accessible to support congestion mapping, traffic analysis and monitoring system performance measures (i.e. travel time reliability). Traffic volume turn movement counts and 24-hour counts will be collected and stored automatically by the traffic signal systems.




*City of Portland Intersection Control*

Detection systems will be developed and implemented for collecting reliable, real-time arterial congestion data. Traveler information maps will use the data collected by the traffic signal system detectors.

**Freeway Control:** Ramp meters will continue to automatically adjust the metering rate based on congestion measured on a system wide basis using the vehicle detection systems. Additional ramp metering systems will be implemented in the Eugene-Springfield metropolitan area. Freeway control using ramp meters, detectors and traveler information devices will be integrated with arterial control (traffic signals, detectors and traveler information) to support event management operations and to support coordination between traffic signals and ramp meters. This integration will also minimize queue spillover on ramps and arterial roadways at freeway interchange terminals.

**Network Surveillance:** ODOT and local agencies will continue to deploy more network monitoring systems (cameras and system detectors). Additional system detectors will collect real-time vehicle volume, density and speed data to support incident detection, congestion monitoring, and congestion flow maps for travelers. The State's major arterial roadways will include camera images and City and County operations personnel will monitor the roadways to identify and verify road and traffic conditions. Local agencies will expand network monitoring with detection systems that will be used for congestion/speed flow maps on the TripCheck website or a local traveler information website linked to TripCheck. More Cities and Counties will share viewing capabilities with ODOT and other regional partners. The state will have a common network of surveillance systems that will support managing the regional transportation network as a complete system during roadway-impacting events and traffic incidents and for displaying the information on TripCheck for traveler information.

**Probe Surveillance:** Probe vehicle data will be collected to provide travelers with congestion related information and predicted travel times on key arterial roadways throughout the state. The information will be displayed via a common source for traveler information regardless of roadway jurisdiction

**Connected Vehicle:** Transportation agencies and the automotive industry are working together on the Connected Vehicle initiative in order to reduce roadway departure and intersection crashes[23]. The following trends have led to this initiative:

- Automobile manufacturers have been installing an increasing number of sensors on vehicles for numerous functions related to safety and efficiency.
- The Federal Communications Commission (FCC) and the United States Department of Transportation (U.S. DOT) established a Dedicated Short Range Communications (DSRC) at 5.9 GHz to enable vehicle-to-vehicle and vehicle-to-roadside communications.
- Agencies have realized that communications between vehicles and the roadside is necessary to achieve major safety improvements.

As part of the Connected Vehicle initiative automobile manufacturers will install “on board units” (OBUs) in vehicles and transportation agencies will install “roadside units” (RSUs) at signalized intersections and at key points on urban freeways and major rural highways. The OBUs and RSUs will communicate anonymously with one another to prevent crashes. The Connected Vehicle initiative also supports the collection of probe data discussed above. These systems are still being tested.

ODOT is looking forward to the results of the testing because of the many potential benefits Connected Vehicle can provide for Oregon including the following:

- Safety Improvements: Interaction between vehicles and the roadside could greatly reduce roadway departure crashes, red-light running, and intersection collisions in Oregon.
- Probe Surveillance: ODOT could use vehicle probe data to monitor roadway mobility and road weather conditions. This information would enhance ODOT’s operational efficiency and provide additional data that can be disseminated to travelers.
- In-Vehicle Signing: ODOT could transit dynamic signing directly into the vehicle to provide information about upcoming intersections (i.e. red light ahead), work zones, variable speed limits, and so forth.
- Traffic Signal Timing Optimization: ODOT and local agencies could use vehicle probe data to support traffic responsive or dynamic traffic signal operations based on real-time traffic volumes and queuing at intersections.

### *Stakeholder Roles and Responsibilities*

Detailed regional traffic control roles and responsibilities for key stakeholders are included in Table 11.

[23] *Concept of Operations*. ITS Joint Program Office, United States Department of Transportation. http://www.its.dot.gov/vii/vii_concept.htm. Accessed March 28, 2006.

**Table 11. Regional Traffic Control Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Design/construct/maintain/operate surveillance and traffic control equipment on state freeways, highways and arterial roadways. | ▪ Existing/Planned |
| | ▪ Implement and operate central traffic signal systems. | ▪ Existing/Planned |
| | ▪ Design/implement/operate coordinated traffic signal timings across jurisdictional boundaries. | ▪ Existing/Planned |
| | ▪ Design/implement/operate ramp meter timings and coordination with surface street traffic signals. | ▪ Existing/Planned |
| | ▪ Share traffic control actions with other agencies. | ▪ Existing/Planned |
| | ▪ Share real-time traffic information and device control (as applicable) with Local TOCs and External State TOCs. | ▪ Existing/Planned |
| | ▪ Contribute to regional and interstate traffic control planning. | ▪ Existing/Future |
| | ▪ Establish cooperative agreements for local and regional traffic management. | ▪ Existing |
| | ▪ Deploy RSUs at traffic signals and on key highways for Connected Vehicle. | ▪ Future |
| Local Traffic Management Agencies | ▪ Design/construct/maintain/operate surveillance and traffic control equipment on arterial roadways. | ▪ Existing/Planned |
| | ▪ Implement and operate central traffic signal systems. | ▪ Existing/Planned |
| | ▪ Design/implement/operate coordinated traffic signal timings across jurisdictional boundaries. | ▪ Existing/Planned |
| | ▪ Share real-time traffic information and device control (as applicable) with other Local and ODOT TOCs. | ▪ Existing/Planned |
| | ▪ Contribute to regional traffic control planning. | ▪ Existing |
| | ▪ Establish cooperative agreements for local and regional traffic management. | ▪ Existing |
| | ▪ Deploy RSUs at traffic signals and on key highways for Connected Vehicle. | ▪ Future |
| External State Departments of Transportation | ▪ Share real-time traffic information and device control (as applicable) with ODOT TOCs. | ▪ Existing/Future |
| | ▪ Contribute to interstate traffic control planning. | ▪ Existing/Future |
| Heavy Rail Service Providers | ▪ Share information (e.g. train arrivals/interaction with at-grade crossings) with TOCs. | ▪ Future |
| Public Transportation Service Providers | ▪ Provide transit operation status, incident, parking, and transfer operational information to TTIP, where ODOT and local traffic management agencies may access the information. | ▪ Planned |
| Auto Manufacturers | ▪ Deploy OBUs in all new vehicles for Connected Vehicle. | ▪ Future |
| Travelers | ▪ Provide personal vehicle/device probe data. | ▪ Future |

## Traveler Information Operational Concept

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck. This traveler information section includes the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. Figure 11 generally depicts the Oregon traveler information operational concept.

### *Traveler Information Vision*

The vision for traveler information is to use the TripCheck system as a comprehensive source for all static and real-time multi-modal traveler information in Oregon that allows travelers to make informed choices about mode, route, trip time, and services. Goals that support this vision include the following:

- Market the TripCheck system brand statewide and disseminate traveler information using multiple formats such as the Internet, social media, kiosks, 511 phone system, portable digital devices, cable television system, highway advisory radio, dynamic message signs (along roadway and at transit stations/stops), in-vehicle systems, and fleet systems.
- Establish partnerships with public agencies and the private sector throughout Oregon and for targeted areas in neighboring states.
- Gather information from multiple public and private sources.
- Expand the quality and reach of traveler information.
- Customize information to provide each traveler with accurate, timely information at opportune times to support their individual travel decisions.
- Provide information to public and private subscribers from one common standards-based portal on a non-exclusive basis.
- Provide a trip planner on the TripCheck website that allows for interactive multi-modal trip planning in Oregon and Washington.
- Work with neighboring states to post information that impacts interstate travelers on dynamic message signs.

### *Traveler Information Applications Today*

Currently the primary source for roadway traveler information in Oregon is ODOT's TripCheck traveler information system, which is supplemented by field devices and other traveler information systems. The TripCheck system is operated by ODOT and also includes traveler information provided by numerous partners. The TripCheck system currently includes the following components, which are described in more detail in this section:

- Award-winning website (www.tripcheck.com)
- TripCheck Mobile
- TripCheck Twitter feed
- TripCheck Traveler Information Portal (TTIP)
- TripCheck Local Entry (TLE)
- TripCheck 511 telephone system
- Highway advisory radio (HAR)
- Cable television broadcasts (TripCheck TV)

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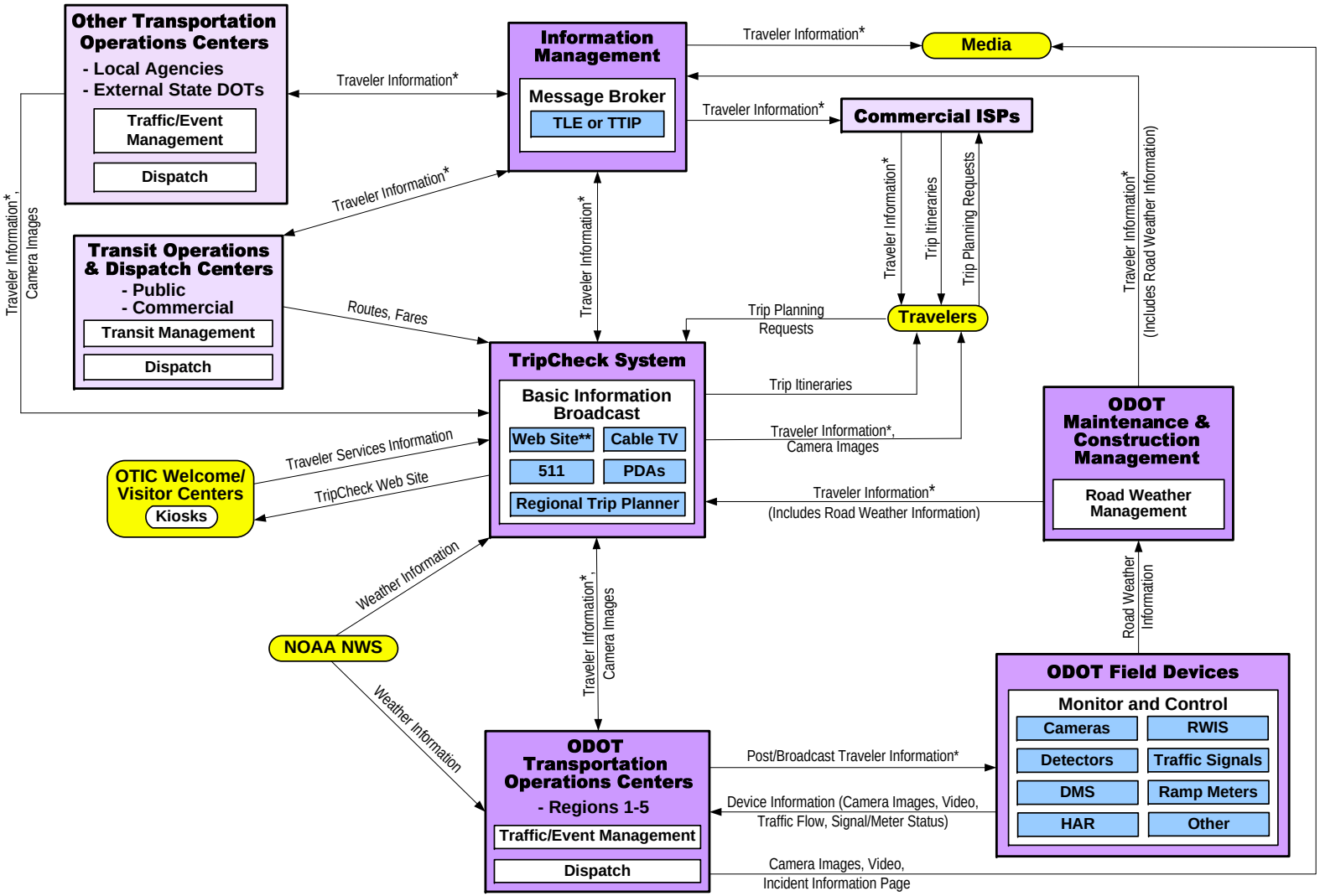


* Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events and traveler services.

** The TripCheck Web site is the main Web site for traveler information in Oregon. Numerous other public agencies and private companies provide traveler information on their own Web sites (many are linked to TripCheck.com).

**Figure 11**
**OREGON TRAVELER INFORMATION OPERATIONAL CONCEPT FOR YEARS 2011-2021**

*TripCheck Website*

Of all the components the TripCheck website, launched in 2000, provides the most comprehensive source of information. The website is navigable by the following tabs, which each feature a subset of tabs with interactive maps (state, regional, and major cities) and clickable icons:

- **Road/Weather Tab:** This tab includes camera images (with an option for setting up a customized view of up to 10 cameras), road closure and delay advisories, general information, weather station data, NOAA forecasts, weather hazards/warnings, winter travel information, construction information, truck restrictions, trucking center locations, trucking Web site links, and links to neighboring state's traveler information websites. This tab includes a congestion/speed flow map of the Portland metropolitan area. This tab also allows travelers to sign up for the TripCheck Twitter feed, which is discussed in an upcoming section.
- **Travel Center Tab:** This tab includes traveler services (lodging/camping/RV, food, fuel, attractions), tourism links, rest areas, sno-parks, scenic byways, and a mileage calculator.
- **Transportation Options Tab:** This tab includes intercity transit routes, links to transit and dial-a-ride providers throughout the state, rideshare links, airport locations and links, and bicycle links.

*TripCheck Mobile*

TripCheck Mobile is a website formatted specifically for mobile devices (e.g. various smart phones). It uses a simple menu structure formatted for navigation by mobile keypads. TripCheck Mobile presents the same real-time travel condition information found on the TripCheck website; however, some static information (e.g. rest areas) is not presented in mobile format since the target audience is travelers making en-route decisions.

*TripCheck Twitter Feed*

ODOT has tailored the real-time travel condition information from the TripCheck system so that subscribers can receive it through Twitter feeds. Subscribers can choose to receive text messages from TripCheck through a variety of mediums (mobile devices, RSS feeds, and twitter.com) for selected cities, mountain passes, or specific highways throughout Oregon. The Twitter alerts provide travelers with information to make pre-trip and en-route travel decisions.

*TripCheck Traveler Information Portal (TTIP)*

ODOT developed a centralized web-enabled clearinghouse for statewide and Portland region traveler information called the TripCheck Traveler Information Portal (TTIP)[24]. The clearinghouse collects traveler information from multiple sources, and provides a data portal to subscribers, formatting the consolidated data as standardized traveler information messages and internally in graphical presentations. It enables the sharing of real-time information from multiple sources to any subscriber who is interested in the current status of the roadway system. This centralized system provides a "one-stop shopping center" for all traveler information including all modes. Multiple providers (public and private) have non-exclusive access to the information free of charge and can tailor it for their uses.

[24] *TransPort Advanced Traveler Information Implementation Concept of Operations, Release 4 Final*. Oregon Department of Transportation, ITS Unit, 2005.

*TripCheck Local Entry (TLE)*

ODOT developed a TripCheck Local Entry (TLE) tool that allows local agencies to input information about their roadway network to the TripCheck system. Inputs include:

- Type of Event: bridge opening, construction, crash, emergency response, flooding, inclement weather, maintenance, obstruction, or planned event
- Impact: information, minimal delays, or substantial delays
- Direction of Travel
- Date and Time
- Traffic Control: bicycles on road, bus only, crowds of people, detour, flagger, height restriction, lanes closed, no through traffic, none, runners on road, sidewalk closed, speed restriction, traffic flow change, unknown, weight restriction
- Published Information: optional field that allows agencies to provide additional information about the event

The data input into TLE is transmitted to both the TripCheck system and TTIP. Local agencies are just now starting to use TLE and ODOT plans to promote this tool statewide.

*TripCheck 511 Telephone System*

The 511 telephone system is accessible throughout Oregon from any telephone and provides users with the travel condition information from the TripCheck system. In 2001 the Federal Communications Commission designated 511 as the single travel information phone number for use throughout the country. The 511 system provides users with the ability to use voice recognition and the system includes eight main menu options:

1. Road conditions by highway
2. Road conditions in mountain passes
3. Road conditions in major cities
4. Commercial vehicle restrictions
5. Chain requirements
6. Road condition phone numbers for bordering states
7. Information about TripCheck 511 telephone system
8. Alerts review

*TripCheck Highway Advisory Radio*

HAR is site-specific and is installed at strategic locations throughout Oregon. It allows travel condition information from the TripCheck system to be broadcast over a three- to five-mile radius. HAR sites are often supplemented with static or dynamic signs that alert drivers to tune into the appropriate radio station when important traveler information is being disseminated.

*TripCheck TV*

ODOT provides TripCheck travel condition information and camera images to a number of cable television companies throughout the state. Each company displays the information in different formats and some provide full-motion video from ODOT's cameras.

*Other Traveler Information Applications*

In addition to the TripCheck system, other traveler information applications in use today include the following:

- **Dynamic Message Signs (DMSs):** Operators at ODOT, local, and neighboring state Transportation Operations Centers (TOCs) post information to DMSs along the roadway.

This information includes road/traffic conditions (e.g. incidents, lane/road closures, work zones, alternate routes) and weather conditions. Agencies coordinate across jurisdictional boundaries for message posting when appropriate. For example, ODOT coordinates with WSDOT when lane closures on Interstate 5 or 205 impact interstate travel. Transit agencies post real-time arrival information to DMSs located at transit stations and stops.

- **Highway Advisory Radio (HAR):** Other than ODOT the Port of Portland is the only other agency within the State to operate HAR. They broadcast information at the Portland International Airport.
- **Kiosks:** The Oregon Travel Information Council and various Visitor Associations operate kiosks throughout the state at locations such as welcome/visitor centers, airports, and national/state parks that allow travelers live Internet access to the TripCheck website.
- **Telephone Systems:** A number of agencies provide static recorded information over the telephone or allow travelers to speak with operators. TriMet provides both static and real-time transit information through their transit tracker phone system.
- **Public Agency Websites:** Many public agencies post traveler information on their own websites. Most post static information (e.g. parking, construction schedules, bicycle and pedestrian facilities) but some also post real-time information (e.g. Port of Portland parking availability, TriMet transit vehicle arrivals). Many websites include a link to the TripCheck website.
- **Private Sector Websites:** The private sector provides traveler information to varying degrees. Some merely include a link to the TripCheck website while others post information from TTIP (e.g. www.trafficgauge.com and www.beatthetraffic.com) or their own sources. Some news websites in the Portland area include streaming public agency video.
- **Media Broadcasts:** The media provides traveler information via radio and television broadcasts. Some television companies provide live streaming video feed from public agency cameras or their own cameras during news broadcasts. Some of the media video feeds provide general aerial views of roadways from a helicopter or on-site images from an incident.

### *Traveler Information Issues*

Uninformed travelers make inefficient transportation choices, which places a greater strain on the transportation infrastructure. Current traveler information issues in Oregon include the following:

- There is a lack of roadway condition, weather, incident, and maintenance/construction activity information about ODOT arterial roadways and local agency roadways (e.g. County, City, Port). Information about ODOT state highways is the most readily available today. This lack of information is in part due to limited ITS applications in existence as well as a lack of communications or systems integration to provide information to the TripCheck system.
- Travelers are frustrated by the lack of timely information as it relates to their specific travel plans. For example, a driver on the freeway impacted by an incident wants to know if it will take 10 minutes or two hours to get to their destination and whether or not there is an alternate route that will reduce their overall travel time.
- Travelers in large urban areas (e.g. Portland, Salem-Keizer, Eugene-Springfield, Bend, and Medford) need to know how traffic is flowing in order to plan their trips, particularly during the peak periods, so they may avoid congestion. The Portland freeway speed map on the TripCheck website needs to be expanded to include major arterial roadways.

Speed maps for the other large urban areas need to be added to the TripCheck website. Raw speed data also needs to be added to TTIP for use by commercial ISPs.

- Special event information needs to be added to the TripCheck system using the TLE tool. For example, pre-trip and en-route information about University of Oregon football games in Eugene and Oregon State University football games in Corvallis would help travelers avoid congestion along Interstate 5 and near the football stadiums. Travelers often add to the congestion when they are uninformed about their travel options to and from the event or in the vicinity of the event.

### *Traveler Information Applications Tomorrow*

The Oregon traveler information applications of tomorrow will address the issues described in the previous section and will include the following:

- **TripCheck Local Entry:** Partnerships will be the key to ensuring that TripCheck is the most comprehensive statewide source for traveler information. The next steps include promoting the use of TLE for public agencies to share their information with TripCheck and TTIP. This will broaden the information currently available and provide more detailed and localized road/weather conditions information from local traffic management agencies and special event information from multiple sources.
- **Increased Data Collection:** Regional ITS plans currently include planned projects for the deployment of public agency systems or devices that will increase the amount of information that may be provided to travelers. These planned projects include central traffic signal systems, system detectors, cameras, weather stations, and bus/vehicle probes on highways and major arterial roadways. This will provide more data that can be posted to TTIP and the TripCheck system and will also allow for the development of congestion/speed flow maps of large urban areas (e.g. Salem-Keizer, Eugene-Springfield, Bend, Medford, Corvallis, Albany). This data can also be used to monitor travel times on highways and arterial roadways and to make this information available to travelers.
- **Widespread Travel Time Information Availability:** Real–time and predicted travel times will be available for highways and arterial roadways across the state to allow travelers to make informed travel decisions regarding route selection, mode selection, and optimal times for making trips. An extensive archive of historic travel time data will support the prediction of travel times.
- **Personal and In-Vehicle Devices:** The Connected Vehicle initiative is exploring options for communicating traveler specific information between vehicles and the roadside. The vision for the future is for public agencies or the private sector to tailor information from TTIP to systems on personal and in-vehicle devices based on the location of the traveler. For example, a traveler heading westbound on Interstate 84 from Boise to Baker City may receive an alert from their in-vehicle system as they approach Fruitland, Idaho to direct them to an alternate route through Fruitland because of an incident blocking all lanes of the Snake River Bridge on the Oregon-Idaho border. The widespread use of personal and in-vehicle devices may reduce the need for public agencies to install expensive roadside equipment (e.g. DMS, HAR) and focus on data collection instead.

### *Stakeholder Roles and Responsibilities*

Table 12 includes the detailed traveler information roles and responsibilities of key stakeholders.

**Table 12. Traveler Information* Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs, highway advisory radio, weather stations). | ▪ Existing/Planned |
| | ▪ Manage TripCheck system and disseminate traveler information* through the system. | ▪ Existing/Programmed |
| | ▪ Manage TripCheck Traveler Information Portal (TTIP) infrastructure and disseminate traveler information* through the system. | ▪ Existing/ Programmed |
| | ▪ Manage commercial information service provider and other subscriber access to TTIP. | ▪ Existing/ Programmed |
| | ▪ Maintain/operate interface between the TripCheck system and TTIP. | ▪ Existing |
| | ▪ Maintain/operate TLE and interface to the TripCheck system and TTIP. | ▪ Existing |
| | ▪ Monitor direction of traveler information industry and tailor traveler information* for devices most commonly used by the public. | ▪ Future |
| Local Traffic Management Agencies | ▪ Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs). | ▪ Existing/Planned |
| | ▪ Provide traveler information* to TLE. | ▪ Existing/Planned |
| | ▪ Disseminate traveler information* through local systems (e.g. local websites). | ▪ Existing/Planned |
| External State Departments of Transportation | ▪ Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs, highway advisory radio, weather stations). | ▪ Existing/Planned |
| | ▪ Provide traveler information* to TLE. | ▪ Existing/Planned |
| | ▪ Disseminate traveler information* through external state systems (e.g. state websites). | ▪ Existing/Planned |
| Public Transportation Service Providers | ▪ Design/construct/maintain/operate ITS equipment to support transit traveler information (e.g. transit arrival signs, on-board systems). | ▪ Existing/Planned |
| | ▪ Provide transit traveler information (e.g. routes,schedules, special accommodations, fares) to the TripCheck system for Transportation Options. | ▪ Planned |
| | ▪ Create/maintain open GTFS data. | ▪ Existing/Planned |
| | ▪ Provide transit vehicle location information to TTIP. | ▪ Future |
| | ▪ Disseminate transit traveler information through public transportation agency systems (e.g. transit websites and phone systems) and commercial information service providers. | ▪ Existing/Planned |
| | ▪ Develop and maintain a statewide ridesharing system (website and phone system). | ▪ Planned |

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Commercial Transportation Service Providers | ▪ Provide transit traveler information (e.g. routes, schedules, special accommodations) to the TripCheck system for Transportation Options.<br>▪ Provide transit vehicle location information to TTIP.<br>▪ Disseminate traveler information through commercial transportation company systems (e.g. websites) and commercial information service providers.<br>▪ Create/maintain open GTFS data. | ▪ Existing<br>▪ Planned<br>▪ Existing/Planned<br>▪ Existing/Planned |
| Heavy Rail Service Providers | ▪ Provide rail information (e.g. train location, maintenance and construction activities) to TTIP and TLE. | ▪ Future |
| NOAA | ▪ Provide weather information to the ODOT TOCs and TripCheck system. | ▪ Existing |
| Oregon Travel Information Council | ▪ Operate traveler information kiosks, which access the TripCheck website, at State Welcome Centers.<br>▪ Provide traveler services information (e.g. fuel, dining, lodging, tourist attractions) to the TripCheck system. | ▪ Existing<br>▪ Existing |
| Visitor Associations | ▪ Operate traveler information kiosks, which access the TripCheck website, at strategic locations (e.g. national/state parks, visitor centers, airports). | ▪ Existing/Planned |
| Commercial Information Service Providers | ▪ Subscribe to TTIP to obtain current real-time traveler information*. Use public transportation GTFS data to provide transit traveler information to wider audience.<br>▪ Disseminate traveler information* through commercial systems (e.g. websites). | ▪ Existing/Planned<br>▪ Existing/Planned |
| Media | ▪ Subscribe to TTIP to obtain current real-time traveler information*.<br>▪ Disseminate traveler information* through the media (e.g. television and radio broadcasts). | ▪ Existing/Planned<br>▪ Existing/Planned |
| Event Promoters | ▪ Provide special event information to transportation service providers, ODOT, and local traffic management agencies. | ▪ Existing/Planned |

* Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

## Maintenance and Construction Operations Operational Concept

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities. This section provides a summary of the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities for maintenance and construction operations. Figure 12 illustrates the operational concept for maintenance and construction operations. Although road weather condition monitoring is a maintenance function, the operational concept for road weather operations is covered in the section on road weather operations.

### *Maintenance and Construction Operations Vision*

The statewide vision of maintenance and construction operations in Oregon is to enhance efficiency and coordination while also improving safety. The following goals support this vision:

- Improve work zone safety for travelers and workers.
- Provide mobility by maintaining east-west and north-south routes for people and goods traveling within Oregon or to adjacent states.
- Inform travelers of maintenance and construction activities and anticipated travel times.
- Automate maintenance and construction monitoring and activities to improve efficiency.
- Streamline and automate asset management.
- Monitor the performance measures of maintenance and construction activities, including travel delays in work zones.
- Reduce the cost of operating and maintaining transportation facilities and services.
- Efficiently report maintenance and construction activities statewide using a central system.
- Establish partnerships with public agencies and private sector utility companies throughout Oregon.

### *Maintenance and Construction Operations Applications Today*

Limited ITS applications are used today throughout Oregon for the maintenance and construction operations service area although this area is slowly expanding as technology advances. Current maintenance applications include the following:

- **InView:** ODOT District maintenance offices use InView, which is an Intranet application linked to TOCS. It allows maintenance managers to input maintenance and construction activities, track resources, view incident details from TOCS, and run reports on TOCS data.
- **Equipment Feedback/Alerts:** Some traffic signals and ITS field devices provide alerts when non-routine maintenance is needed. For example, a traffic signal connected to a central signal system sends out an alarm when a detector loop fails.
- **Asset Management System:** Street sweeper crews in the City of Salem use handheld global positioning system (GPS) devices during routine cleaning to log items such as potholes or downed signs that require maintenance. Once back at the operations center they download this information onto a maintenance system that automatically generates work orders.
- **Fleet Management System:** TriMet uses fleet maintenance management to a limited degree. They use Bluetooth communications to read maintenance data status codes on their rail vehicles on a periodic basis to assess maintenance needs. They also use an automated system to monitor fluids at the fuel rack and to retrieve data from controllers in the engines.

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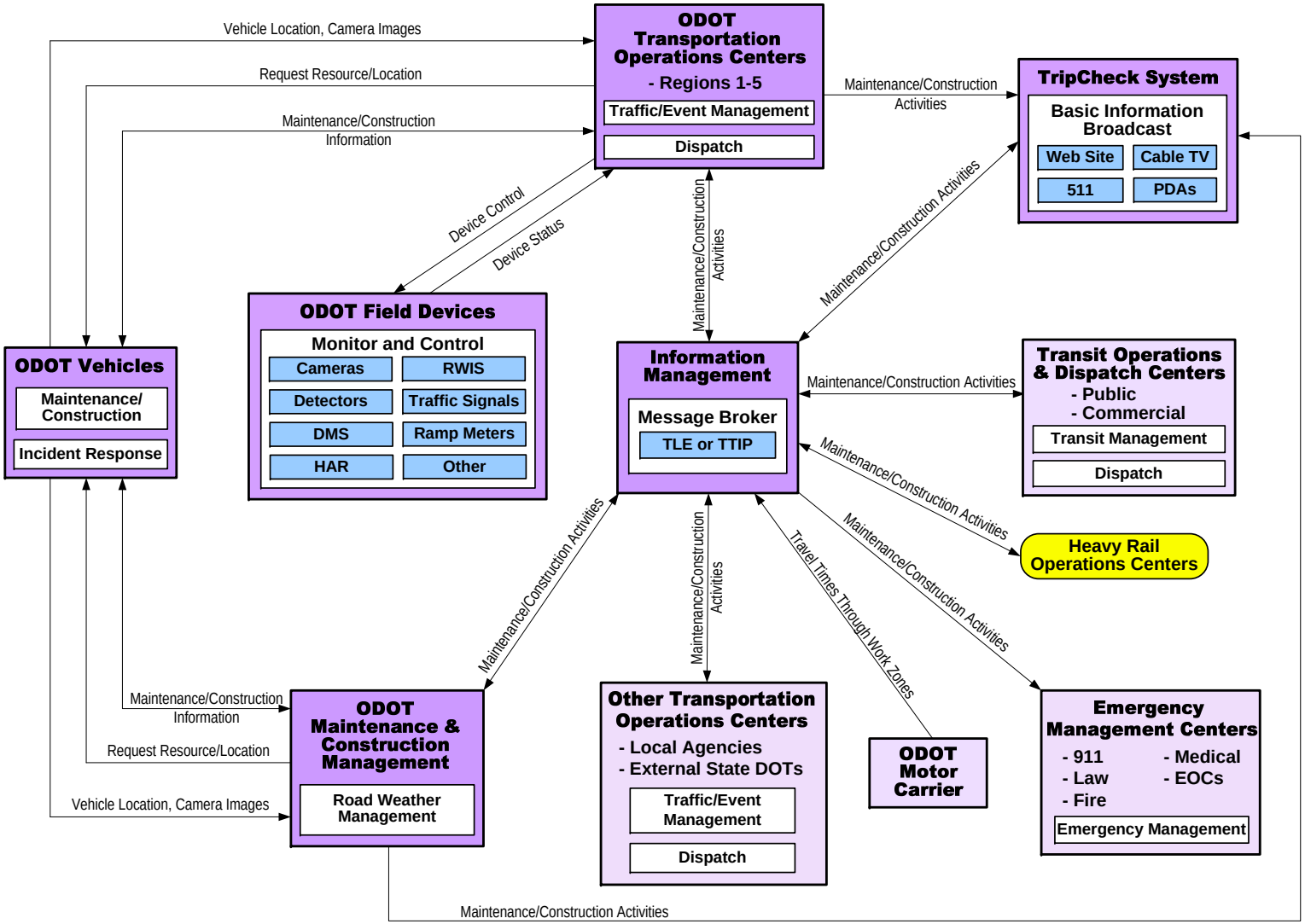



See Figure 14 for maintenance and construction information flows related to road weather operations.

**Figure 12**
**OREGON MAINTENANCE AND CONSTRUCTION OPERATIONS OPERATIONAL CONCEPT FOR YEARS 2011-2021**

The following work zone ITS elements are used in construction applications today:

- **Portable Variable Message Signs (PVMSs):** A number of agencies use PVMSs to provide warning messages or advance notification of closures and delays.
- **Highway Advisory Radio (HAR):** ODOT uses HAR to provide work zone information (e.g. closures, delays, duration).
- **CCTV Cameras:** Agencies use CCTV cameras for monitoring work zones on significant road construction projects.
- **Variable Speed Limit Signs:** ODOT has used variable speed limit signs supplemented with police enforcement on a number of projects.
- **Over-Dimension Warning Systems:** ODOT has used both over-height and over-length warning systems that detect over-dimension vehicles and provide a warning (e.g. dynamic message sign or static sign with flashing beacons) for over-dimension vehicles to detour to an alternate route.
- **Traffic Management Plans (TMPs):** The Oregon Bridge Delivery Partners, who are under contract to ODOT to manage bridge construction projects on the state highway system, and ODOT require the development of TMPs for construction projects with large impacts on mobility. The goal of the TMPs is to address the traffic-related impacts of construction projects in a cost-effective and timely manner while minimally impacting mobility. These TMPs include strategies for using ITS applications to provide construction traveler information using some of the applications listed above and the TripCheck system.

### *Maintenance and Construction Operations Issues*

The maintenance and construction operations service area faces the following issues today:

- Until now there was not a central source for all current and planned maintenance and construction activity information throughout Oregon. This has hampered coordination efforts and made it difficult to identify active construction projects on potential detour routes, particularly when a detour is needed immediately on a local agency facility due to a major incident on the state highway system.The new challenge is to convince local agencies and utility companies to input their maintenance and construction activities into TLE.
- Numerous maintenance activities are conducted manually today such as asset management and fleet management. This makes it harder to track when to conduct preventative maintenance.
- Many construction projects restrict heavy, wide, or tall commercial vehicles resulting in detours, which causes freight delays and negative economic impacts.
- Every year motor vehicle crashes in U.S. work zones kill an average of 1,020 persons and injure more than 40,000 people[25]. Approximately half of the fatalities occur during the day and two times as many fatalities occur on weekdays than on weekends. Eighty-five percent of the work zone fatalities are typically the drivers or passengers and the other 15 percent are the workers.
- Crashes in Oregon work zones have been on the as shown in Figure 13. On average there were approximately 530 annual work zone crashes in Oregon from Year 2005 to 2009 and these include approximately ten fatalities and 280 injuries each year.

[25] *Work Zone Safety Facts & Statistics*. Federal Highway Administration. http://safety.fhwa.dot.gov/wz/wz_facts.htm. Accessed Aug. 24, 2005.

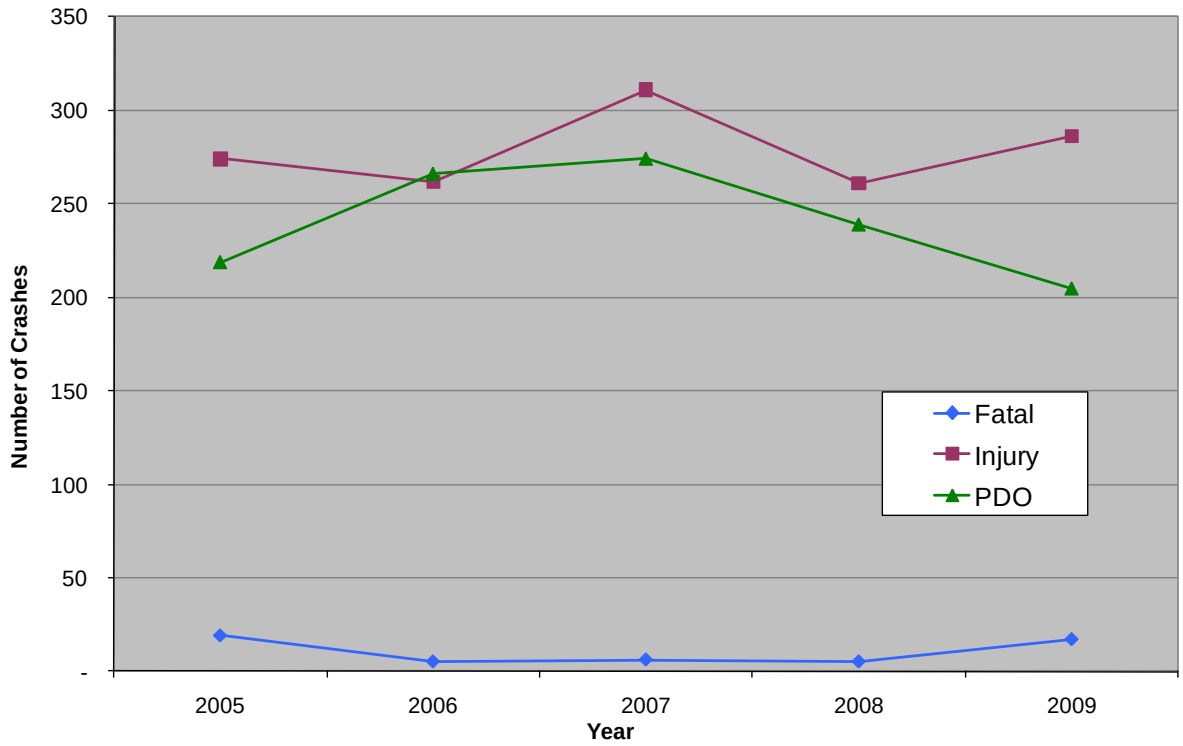



**Figure 13. Oregon Crashes in Work Zones for Years 2005 to 2009[26]**

### *Maintenance and Construction Operations Applications Tomorrow*

The maintenance and construction operations of tomorrow will address current issues and will include the following applications:

- **Activity Coordination Database:** TLE and TTIP, which are described in the Traveler Information Operational Concept, will support a statewide maintenance and construction coordination system. This system will include information input by stakeholders regarding active and planned maintenance/construction, vehicular restrictions, anticipated work zone travel times, and other pertinent information. This system will help transportation managers monitor construction activities and schedules, coordinate different work on the same corridor, and ensure that there is always an open east-west route and north-south route for freight movement. Additionally, filters may be used to provide commercial information service providers with information that is ready for distribution to the public.
- **Traveler Information:** The information from the activity coordination database as well as work zone travel times (estimates based on real-time data and forecasts) will be disseminated using work zone ITS elements and the applications discussed in the Traveler Information Operational Concept section (e.g. TripCheck system and TTIP).
- **Asset Management Systems:** Asset management will be streamlined by agencies throughout Oregon using technology such as global positioning systems (GPS). Systems similar to the City of Salem's will be implemented. ODOT's ITS Support Coordinators plan to barcode ITS devices as part of their asset management strategy.

[26] *Statewide Crashes Involving Work Zones*. Crash Analysis & Reporting Unit, Oregon Department of Transportation, December 2009.

- **Fleet Management Systems:** As technology advances agencies throughout Oregon will use fleet management systems to schedule routine vehicle maintenance and to track vehicles in the field. Although the tracking of maintenance vehicles is less critical for daily routine operations it is essential during a major emergency situation.
- **Work Zone Standards and Management Techniques:** Public agencies will develop standards and management techniques for safety enhancements such as variable speed limits, incident detection and management, lane merge controls, queue detection with electronic driver feedback signs, and intrusion detectors to alert workers of vehicles entering prohibited areas.

### *Stakeholder Roles and Responsibilities*

Table 13 includes the key stakeholder roles and responsibilities for the maintenance and construction operations service area.

**Table 13. Maintenance and Construction Operations Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Integrate HTCRS with TOCS and TTIP. | ▪ Existing |
| | ▪ Coordinate maintenance and construction activities with local traffic management agencies, external state DOTs, public and commercial transportation service providers, and private utility companies using HTCRS/TTIP. | ▪ Existing |
| | ▪ Automate maintenance and construction activity scheduling. | ▪ Future |
| | ▪ Track maintenance/construction vehicle location and activity throughout the state. | ▪ Future |
| | ▪ Develop statewide standards and requirements for work zone safety. | ▪ Planned |
| | ▪ Manage work zones using cameras, dynamic message signs, highway advisory radio, and variable speed limits. Provide travelers with delay and detour information. | ▪ Existing |
| | ▪ Deploy over-dimension warning systems in work zones when over-dimension vehicles are required to detour to an alternate route. | ▪ Existing |
| | ▪ Monitor travel times through work zones and provide travel time information to the public. | ▪ Planned |
| | ▪ Deploy work zone intrusion sensors and alarms to improve safety during construction. | ▪ Planned |
| Local Traffic Management Agencies | ▪ Coordinate maintenance and construction activities with other public agencies (including public transportation agencies)and private utility companies using TLE and TTIP. | ▪ Planned |
| | ▪ Manage work zones using cameras, dynamic message signs, and variable speed limits. Provide travelers with delay and detour information. | ▪ Existing/Planned |
| External State Departments of Transportation | ▪ Coordinate maintenance and construction activities near the state line with ODOT using TLE and TTIP. | ▪ Programmed |

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Heavy Rail Service Providers | ▪ Coordinate maintenance and construction activities for at-grade rail crossings with public agencies and private utility companies using TLE and TTIP. | ▪ Future |
| Public Transportation Service Providers | ▪ Coordinate maintenance and construction activities with other public agencies and private utility companies using TLE and TTIP. | ▪ Planned |

## Road Weather Operations Operational Concept

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events. This road weather operations section includes the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. A graphical depiction of the road weather operational concept is shown in Figure 14.

### *Road Weather Operations Vision*

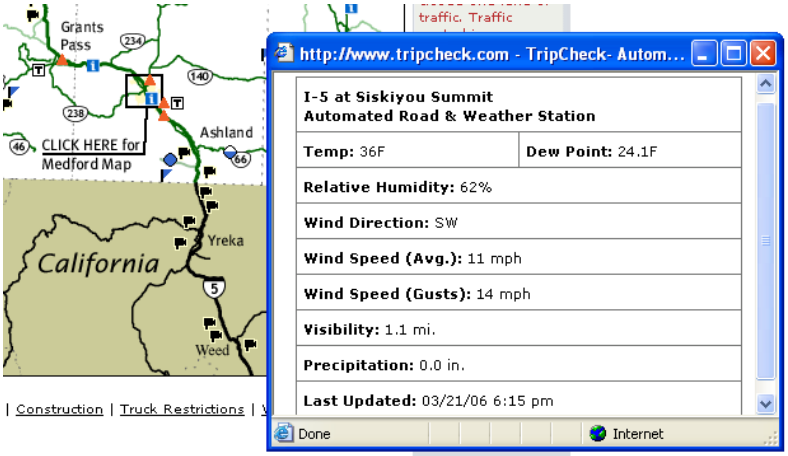
The Oregon vision for road weather operations is to efficiently and safely manage the transportation infrastructure during inclement weather events. Goals that support this vision include the following:

- Efficiently manage and schedule road weather maintenance activities statewide using a central system.
- Provide better access to and more accurate weather forecasts and pavement condition models to aid in decision making.
- Enhance mobility for people and goods traveling within Oregon or to adjacent states during inclement weather events by promoting awareness of alternate routes when roads are closed or impacted by the weather.
- Reduce the cost of operating and maintaining transportation facilities and services.
- Improve the safety of roadways typically impacted by severe weather events.
- Provide current and forecasted road and weather conditions to travelers using automated systems.

### *Road Weather Operations Applications Today*

The following road weather operations applications are in use today:

- **Road Weather Information Systems (RWISs):** RWISs are used to varying degrees throughout the state. ODOT has deployed 79 and a limited number of public agencies (e.g. Clackamas County, Marion County, City of Keizer) have deployed their own RWISs. A typical RWIS installation measures atmospheric conditions such as temperature, humidity, precipitation, and wind speed while more sophisticated RWIS installations may also include pavement sensors that measure surface temperature, surface condition (wet, dry, frost, snow, ice, etc.), and the freeze point of the road surface while other atmospheric sensors measure visibility distance and precipitation intensity.




*RWIS Data on TripCheck Website*

Information from the RWIS installations is used to more efficiently determine the appropriate operational responses (e.g. apply anti-icing strategies, activate warning systems, disseminate inclement weather information to travelers). Real-time RWIS data is also posted to the TripCheck website.

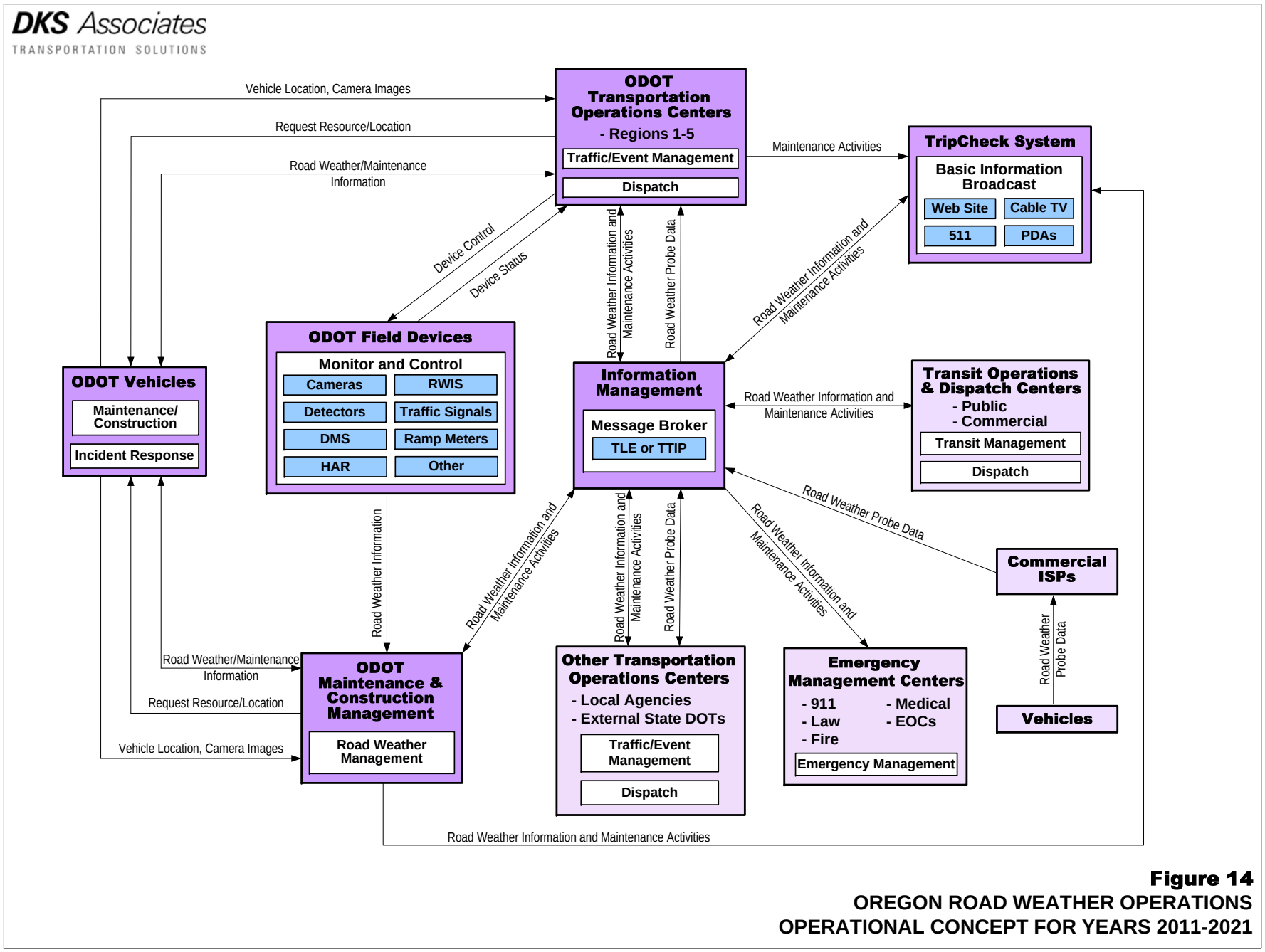



**Figure 14**
**OREGON ROAD WEATHER OPERATIONS**
**OPERATIONAL CONCEPT FOR YEARS 2011-2021**

- **RWIS Web Database:** Data from ODOT's RWIS equipment is currently accessible through an intranet-accessible SCAN Web database. This includes current and historical data as well as graphic depictions of data.
- **Maintenance Kiosks:** ODOT recently installed maintenance kiosks, which include an Internet-accessible personal computer, at 64 of its maintenance stations throughout Oregon. These kiosks are linked to the RWIS Web Database, the TripCheck system, NOAA, and ODOT's digital video log. The kiosks are centrally located so that all maintenance crew personnel have access to the system.
- **RWIS Notification System:** ODOT developed a notification system that alerts subscribers via text page or e-mail for the following six conditions at a particular RWIS site: 1) Frost/Ice Alert, 2) Fog Alert, 3) Wind Speed Alert, 4) Visibility Alert, 5) Freezing Precipitation Alert, or 6) RWIS Failure Alert. The wind speed and visibility alerts are user defined and users can subscribe to any number of RWIS and alert combinations. This system could be expanded to include other agencies' RWIS sites or could be used as a model for other agencies.
- **Automated Roadway Treatment:** ODOT has several automated roadway treatment systems in place today: two heating systems that activate to prevent black ice when temperatures near the freezing point and a spray system that applies anti-icing fluid to the roadway. The technologies used in these systems have not yet proven to be reliable.

**Weather Warning Systems:** ODOT has deployed a number of automated or remotely controlled weather warning signs related to wind, snow, ice, or flood conditions throughout the state. This allows ODOT personnel to alert travelers of high winds, which mostly impact high-profile vehicles, or to use traction tires and/or chains in snow/ice areas. ODOT has a flood warning system on US 101 near Seaside that detects water levels on the roadway and alerts drivers about the road conditions and detours using an automated sign. Dynamic message signs, snow zone drum signs, and highway advisory radio have also been installed in strategic locations to provide this information in addition to other traveler information. These systems enable ODOT to focus on maintenance activities instead of manually updating weather information signs.

### *Road Weather Operations Issues*

Issues that impact road weather operations today include the following:

- Winter weather in Oregon causes roadways to accumulate snow, ice, or both while melting snow and heavy rains may cause roadways to flood or become obstructed by landslides. Inclement weather often results in road closures or crashes. In 2004, approximately 22 percent of crashes in Oregon occurred during wet pavement conditions and approximately five percent occurred during snowy or icy pavement conditions[27].
- Weather and pavement conditions in remote rural areas (e.g. mountain passes) are not always available other than from the National Weather Service or other local forecasts for nearby areas. Maintenance managers could make more efficient resource decisions with better access to and more accurate local weather forecasts and pavement condition models.
- A number of warning signs related to high winds and heavy snow must still be manually rotated by maintenance crews when needed.
- Reliable technology has not yet been developed for automated roadway treatment on the state highway system. There are a number of roadway locations on bridges and

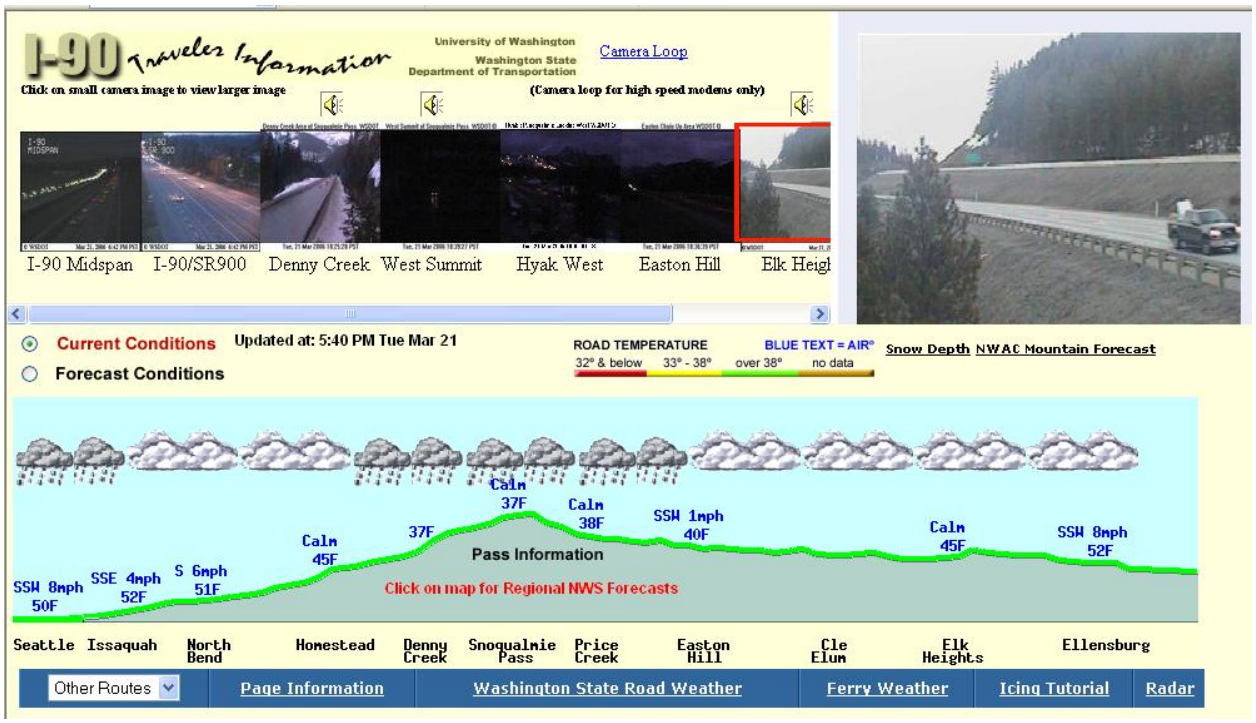
[27] *2004 Oregon Traffic Crash Summary*. Oregon Department of Transportation, Transportation Data Section, Crash Analysis and Reporting Unit, July 2005, p. 26.

mountain passes that routinely accumulate black ice and must be dealt with manually by maintenance crews.

### *Road Weather Operations Applications Tomorrow*

The following applications of tomorrow are planned to expand the road weather operations service area and to address the current issues:

- **RWIS Expansion:** Regional ITS architectures have identified locations on ODOT, County, and City facilities throughout Oregon where RWIS stations should be installed over the next 20 years to improve the monitoring and response capabilities of maintenance personnel.
- **Automated Roadway Treatment:** Regional ITS architectures have identified locations on ODOT facilities throughout Oregon where automated roadway treatment systems should be installed to prevent the formation of black ice during winter storms. These systems should only be deployed when the technology has proven to be reliable and cost-effective.
- **Flood/Slide Warning Systems:** Clackamas and Multnomah Counties have identified a future need for flood/slide warning systems on roadways within their jurisdictions that frequently flood during heavy rains and must manually be closed.
- **Winter Traveler Information:** Future enhancements to the TripCheck website will include graphical displays of weather conditions and camera images in mountain pass areas such as the Siskiyou Pass on I-5 near the California border. These graphical displays will illustrate a profile of the pass with road temperature, current weather conditions, forecasted weather conditions, and camera images similar to the I-90 Traveler Information website shown below. Data displayed for each mountain pass will come from ODOT or other traffic management agency RWIS sites and CCTV cameras as well as from National Weather Service sources.




*I-90 Traveler Information in Washington (http://www.atmos.washington.edu/maciver/roadview/i90/)*

- **Weather Probes:** Many commercially available automated vehicle location (AVL) systems have a component that measures ambient conditions and provides weather information to the driver using an in-vehicle component. In addition, several use cases in the Connected Vehicle initiative describe using private vehicles as probes to gather information such as pavement temperature, friction, and the presence of rain. In the future these systems may provide public agencies with more complete weather coverage to aid in decision making and traveler information dissemination.
- **Road Weather Forecasting and Maintenance Decision Support System:** A system that uses RWIS data, weather probes, and National Weather Service forecasts to develop road weather forecasts about pavement and weather conditions along a route is a desired future application that would serve Oregon public agencies and travelers well. The U.S. DOT and NOAA are currently working on the Clarus initiative to test a system that integrates weather observing, forecasting, and data management. In addition, they are working on a winter maintenance decision support system (MDSS) that will incorporate forecast information and model various treatment options to help a maintenance manager select the right resource strategy to deal with a coming storm.
- **Weather-Based Variable Speed Limits:** Roadways will be equipped with variable speed limit signs in areas that frequently experience inclement weather. The standard posted speed limit will be lowered when warranted by weather conditions such as snow, ice, rain, heavy fog, or other conditions.
- **Automated Vehicle Location:** ODOT will use automated vehicle location technology for all of their road weather maintenance vehicles.
- **Automated Road Weather Maintenance Logs:** ODOT will keep automated logs for road weather maintenance activities such as sanding and deicing roadways. These logs will be automatically updated based on real-time information from maintenance vehicles.

### *Stakeholder Roles and Responsibilities*

Table 14 includes the detailed road weather operations roles and responsibilities for the key stakeholders.

**Table 14. Road Weather Operations Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Design/construct/maintain/operate weather monitoring and pavement sensor systems. Areas of concern include passes, bridges, and other critical roadway sections. | ▪ Existing/Planned |
| | ▪ Share weather information with other agencies using TTIP. | ▪ Existing |
| | ▪ Design/construct/maintain/operate systems that detect adverse winter weather conditions and automatically treat the roadway when needed. | ▪ Existing/Future |
| | ▪ Notify maintenance personnel of severe winter weather events. | ▪ Existing |
| | ▪ Automatically track maintenance vehicle location (e.g. snow plows, deicers) and activity throughout the state to support resource allocation decisions. | ▪ Future |
| | ▪ Coordinate winter weather maintenance activities within ODOT and with other agencies using TTIP. | ▪ Existing |
| | ▪ Disseminate road weather hazard information, travel restrictions, and chain requirements to travelers (e.g. DMS, HAR, TripCheck system). | ▪ Existing |
| | ▪ Expand winter traveler information for mountain passes on the TripCheck website. | ▪ Planned |
| Local Traffic Management Agencies | ▪ Design/construct/maintain/operate weather monitoring and pavement sensor systems. | ▪ Existing/Planned |
| | ▪ Share weather information with other agencies using TLE and TTIP. | ▪ Programmed |
| | ▪ Coordinate winter weather maintenance activities within agency and with other agencies using TLE and TTIP. | ▪ Programmed |
| External State Departments of Transportation | ▪ Design/construct/maintain/operate weather monitoring and pavement sensor systems. | ▪ Existing |
| | ▪ Share weather information with ODOT using TLE and TTIP. | ▪ Programmed |
| | ▪ Coordinate winter weather maintenance activities near the state line with ODOT using TLE and TTIP. | ▪ Programmed |
| NOAA | ▪ Provide weather forecasts, watches, and warnings for Oregon to TTIP. | ▪ Existing |

## Incident Management Operational Concept

Per the *ODOT Emergency Operations Plan*, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle crashes, or any other situation which affects normal traffic flow or poses a hazard to the public."[28] The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies. This section includes the incident management vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. Figure 15 illustrates the operational concept for both incident management and emergency management.

### *Incident Management Vision*

The vision for incident management is to proactively prevent, quickly detect, and enable rapid pre-planned responses to safely and efficiently manage incidents that impact the Oregon transportation system through a coordinated effort by ODOT, local traffic and transit management agencies, and emergency management agencies. The vision includes actively engaging the public to empower them with information that will enable them to avoid potential or current incidents. The following goals support this vision:

- Improve and enhance the safety and security of emergency responders, the traveling public, and the environment.
- Maximize the coverage and consistency of ODOT and local agency incident response programs.
- Improve mobility on Oregon's transportation system and reduce the economic impact caused by incident-related congestion.
- Get traffic moving (on a shoulder, single lane, or other means) within 90 minutes of a full highway closure.
- Use technology and partnerships to reduce time to detect, verify, respond, and clear incidents.
- Improve traffic management during incidents to mitigate traveler delays. This includes integrating traffic device control with incident response systems as part of TOCS.
- Develop and strengthen partnerships on state, regional, and local levels.
- Integrate systems and communications between statewide partners.
- Provide incident information and transportation system impacts to travelers in a timely manner.

[28] *Oregon Department of Transportation Emergency Operations Plan*. Revision 6. Oregon Department of Transportation, Office of Maintenance, Emergency Preparedness Committee, Feb. 2004.

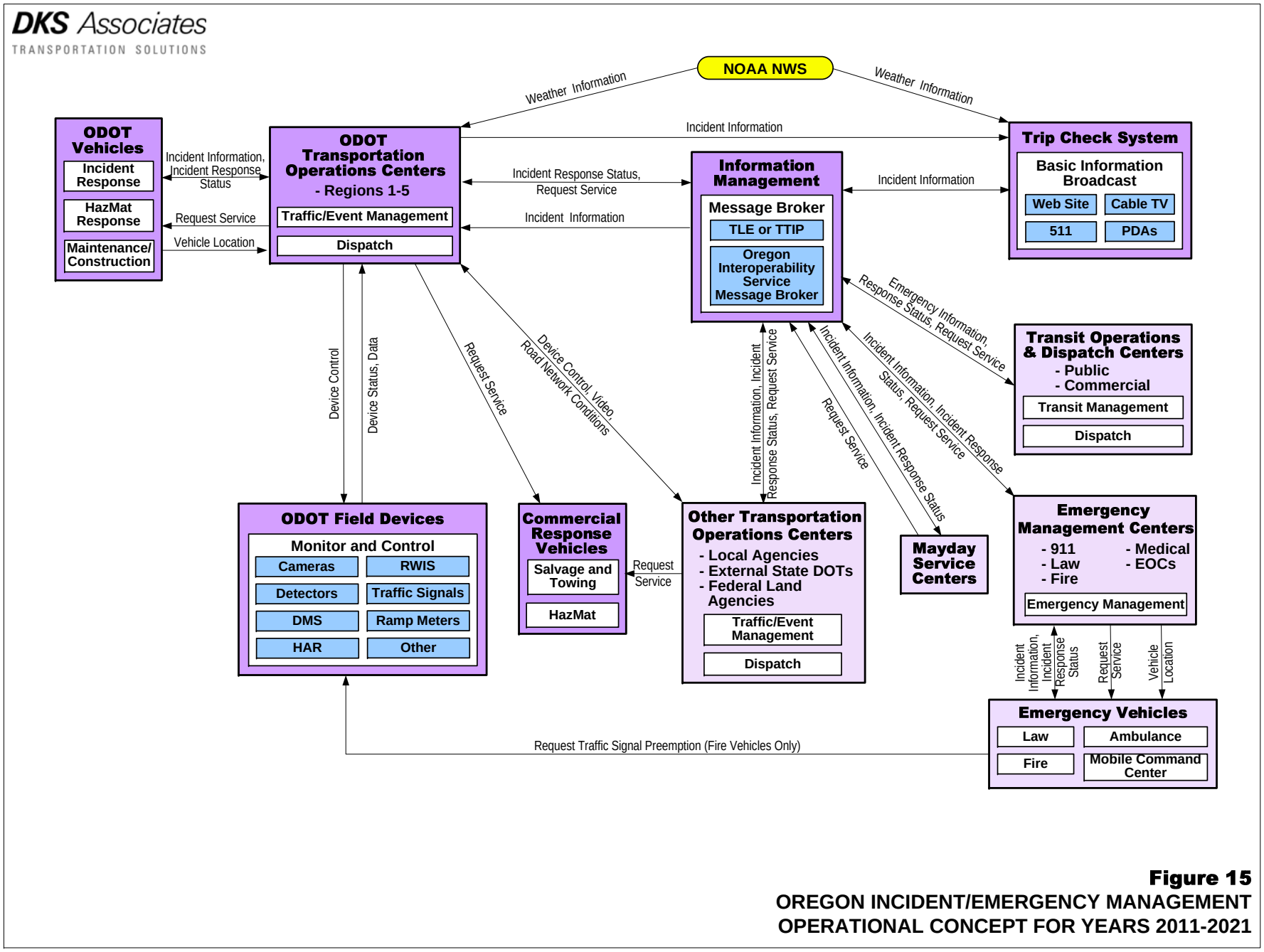



**Figure 15**
**OREGON INCIDENT/EMERGENCY MANAGEMENT OPERATIONAL CONCEPT FOR YEARS 2011-2021**

### *Incident Management Applications Today*

As described in this section ODOT and neighboring state DOTs provide comprehensive incident management services in coordination with emergency management agencies today while local traffic management agencies provide services on a more limited scale. ODOT currently uses the following incident management applications:

- **Quick Clearance Legislation (Move It Law):** Oregon law (ORS 811.717) requires drivers to move motor vehicles from the roadway if there are no apparent personal injuries, the motor vehicle is operable, and it is safe to move the vehicle.
- **Incident Detection:** ODOT uses system detectors, CCTV cameras, and input from incident responders, other agencies, and the public to detect incidents. Vehicle detector loops installed on the highway alert TOC operators when congestion is present due to preset vehicular volume thresholds. CCTV cameras are used to detect incidents during frequent monitoring as well as to verify incidents identified by system detectors or outside sources.
- **Highway Service Patrols:** Highway service patrols are one of the cornerstones of ODOT incident management. ODOT currently uses incident response vehicles in Regions 1, 2, and 4 to actively monitor, detect, and respond to incidents on the state highway system. These vehicles are equipped with flat tire repair gear, gasoline, jumper cables, water, traffic control devices, dynamic message signs, and other essentials for assisting motorists and responding to incidents. Region 1 Incident responders are also equipped with GPS units in their mobile phones so they can be tracked by TOC operators. Incident responders coordinate closely with the ODOT TOCs and emergency responders, particularly those with the Oregon State Police, local fire and life safety agencies, and emergency medical service providers.

*ODOT Incident Response Vehicle*

- **Maintenance Crews:** ODOT maintenance crews perform incident response for areas without service patrols and assist with incident response activities in areas served by highway service patrols.
- **Mobile Camera Phones:** ODOT Region 2 incident responders carry mobile camera phones to transmit images taken onsite back to the TOC and other decision makers.
- **Traffic Control Devices:** In the Portland metropolitan area ODOT uses ramp meters to control the flow of traffic entering the freeway during incidents. They also have special traffic signal timing plans that may be used along the Interstate 5/Barbur Boulevard (OR 99W) and Interstate 205/82nd Avenue (OR 213) corridors during an incident. These plans favor heavier movements at traffic signals on the arterial or at interstate ramp terminals when vehicles divert from the freeway.
- **Incident Notification Paging System:** Each ODOT TOC uses a paging system to provide incident information to other stakeholders, the media, and anyone who wishes to subscribe to the system. The extent of media subscribers varies throughout the state. The system sends text messages to pagers and telephones.
- **Computer Aided Dispatch (CAD):** 911 centers and other emergency services dispatchers such as the Oregon State Police use CAD systems to dispatch emergency responders to an incident, map addresses, and provide other useful information. The Oregon Interoperability Service (OIS) was developed as a message broker that provides

CAD system interoperability between various vendors' systems. It is a push only system that allows information to flow from one agency to other pre-designated agencies depending on the information type. Subscribers are not able to extract information from the broker. The OIS has been implemented in several areas of the state.

- **License Plate Checks:** Certified operators at ODOT TOCs (Regions 1 – 4) perform license plate checks on vehicles prior to ODOT contact with the driver and passengers to provide safety for incident responders and maintenance personnel. The operators use ForseCom to check the plates in Oregon's Law Enforcement Data System (LEDS) and the National Crime Information Center (NCIC) system to check for any warrants (e.g. stolen vehicle).
- **Salvage and Towing Coordination:** The ODOT TOCs dispatch salvage and towing service providers when needed. They dispatch preference tows as well as non-preference tows, which are taken from a tow rotation list maintained by the Oregon State Police. The dispatchers also contact an automobile club (e.g. AAA) if a person involved in an incident is a member of one.
- **Collision Reconstruction:** ODOT personnel assist the Oregon State Police or other police agencies with collision reconstruction when needed.
- **Alternate Route Maps:** Several ODOT publications include alternate route maps for a number of major freeways and highways throughout Oregon.
- **Incident Management Operational Plans:** ODOT and the City of Portland developed incident management operational plans for the Interstate 5/Barbur Boulevard and Interstate 205/82nd Avenue corridors in Portland that include a concept of operations that outlines each agency's roles and responsibilities (including control of the other agency's devices as appropriate) as well as specific operational scenarios for each segment of the corridor for use during an incident. As part of the plan, incident coordinated signal timing plans were developed for each of the scenarios and arterial dynamic message signs were installed at key locations along the arterials to alert drivers of detours or locations where diverted vehicles could re-enter the interstate past the incident or once the incident is clear.
- **Traveler Information:** ODOT provides travelers with information about incidents and the impacts to the transportation network using the TripCheck system and other applications described in the Traveler Information Operational Concept.
- **Mayday Support Services:** OnStar, a General Motors service, currently provides traveler assistance via communications between a mayday service center and a personal vehicle. ODOT worked with OnStar to develop systems interfaces that allows OnStar to alert ODOT when ODOT's incident response services may be needed. Other mayday service providers may be incorporated in the future.

Emergency management agencies currently provide law enforcement, fire and life safety, and emergency medical response at incident locations when warranted by the severity of an incident. Their presence is required for any incidents that involve injuries or fatalities. Emergency responders are coordinated on-scene by an incident commander, which is typically a representative from the responding fire agency, and through call-taking and dispatch centers (911 centers, Oregon State Police dispatch centers, other emergency management agency dispatch centers, ODOT TOCs, and neighboring state TOCs).

In particular, the Oregon State Police (OSP) work closely with ODOT to provide incident management services. In several locations ODOT TOCs are co-located with OSP dispatch centers allowing the two agencies to communicate and coordinate directly during an incident and to share resources (e.g. streaming video).

The Departments of Transportation (DOTs) in neighboring states manage incidents on their state highway systems using similar applications as ODOT to varying extents. Their TOCs coordinate with ODOT TOCs when incidents occur at or near the state border or impact interstate travel.

Local traffic management agencies respond to incidents on their roadways using maintenance vehicles/crews and local emergency management agencies on an as-needed basis. For example, a citizen may call an agency about road debris on a busy arterial roadway and a County or City agency may send a maintenance crew to remove the debris. Similarly, if there is a major incident on a key roadway the police or fire personnel on-scene may request aid (e.g. placement of cones/barrels, route diversion signs) from the appropriate County or City agency. Multnomah County recently acquired three incident response vehicles that they are using on an as-needed basis.

### *Incident Management Issues*

The following issues affect incident management today:

- In 2007, congestion caused urban Americans to travel 4.2 billion hours more and to purchase an extra 2.8 billion gallons of fuel for a congestion cost of $87.2 billion – an increase of more than 50 percent over the previous decade.[29]
- Figure 16 depicts the number of statewide traffic impacting incidents in Oregon from October 2009 through September 2010 and the average incident duration in minutes. Incident duration is measured from the time an incident is detected until the time ODOT leaves the scene. During this timeframe, the greatest number of incidents occurred in December, followed by the summer months (July, August and September). December and October both averaged the highest incident duration times of approximately 160 minutes. During the other months of the year the average incident duration times were generally below 100 minutes.
- A number of detour routes have been identified for the interstate system, select state highways, and other major roadways. However, these routes have not been evaluated to determine if existing ITS applications may be used to support diversions during major incidents or if additional ITS applications are needed (e.g. changeable fixed message signs, system detectors, CCTV cameras, coordinated incident signal timing plans). Additionally, pre-defined detour routes have not been identified on a number of major travel and freight corridors throughout Oregon.
- Although most agencies provide incident training to their own personnel, there is a lack of cross-agency drills, training, or tabletop discussions. This sometimes reduces the efficiency of incident response, which in turn increases traveler delay. For example, sometimes incident and emergency vehicles block more travel lanes than is necessary for a response and that creates an additional bottleneck at the incident location.

[29] *Urban Mobility Report 2009.* Texas Transportation Institute.

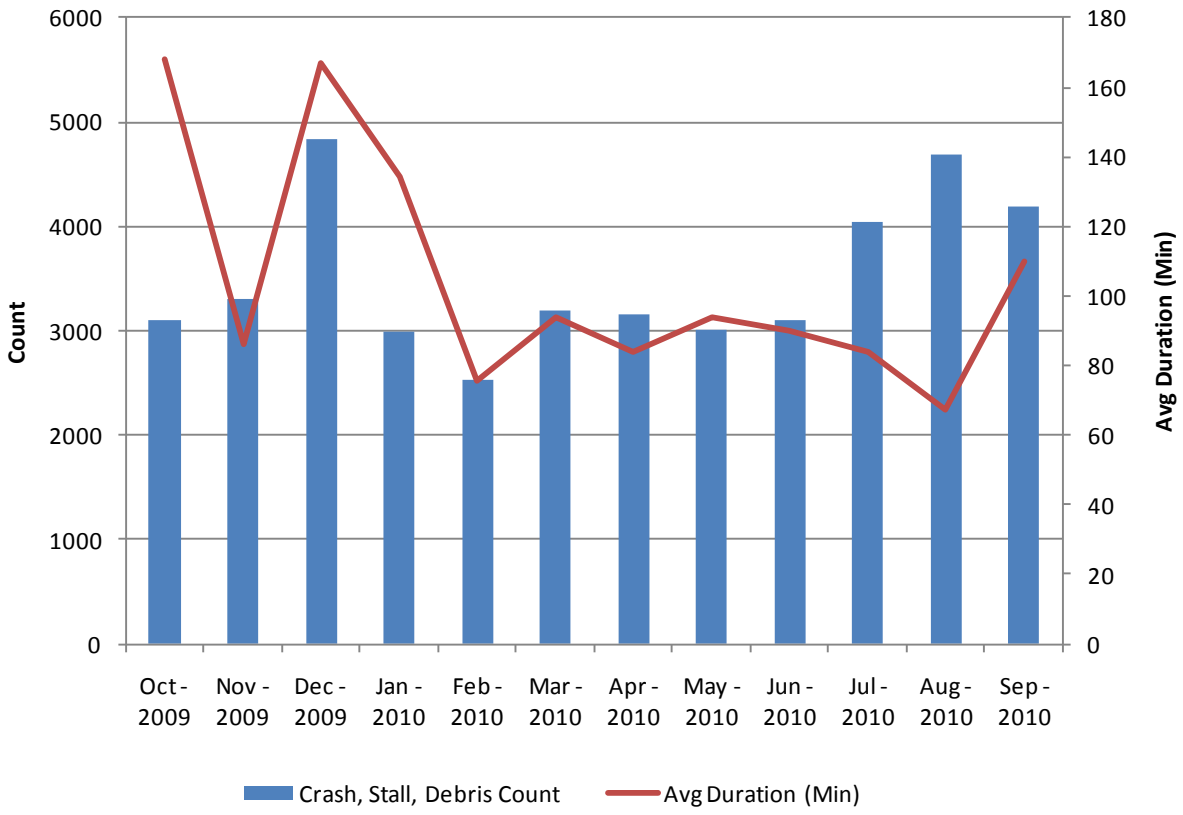



**Figure 16. Oregon Statewide Traffic Impacting Incidents and Clearance Times for October 2009 through September 2010**

### *Incident Management Applications Tomorrow*

The following incident applications will be implemented tomorrow to expand existing systems and address current issues:

- **Incident Response Programs:** Incident response programs will be expanded or developed to address congestion on ODOT's arterial roadways in urban areas and on local agency arterial roadways.
- **Oregon Interoperability Service Expansion:** The OIS may be expanded to a statewide level or may be duplicated in other regions to provide a seamless interface between key incident and emergency management agencies.
- **Incident Management Operational Plans:** ODOT and local traffic management agencies will develop incident management operational plans for key roadways that frequently experience incident-related lane reductions or closures. These plans will include existing practices and procedures, roles and responsibilities, description of existing ITS applications, identification of ITS applications needed to improve operations, criteria for system activation, and operational scenarios. The operational scenarios should include maps and procedures for device control and placement such as CCTV camera utilization, messages to post on DMS, use of portable DMS if necessary, ramp closures, and implementation of traffic signal timing plans. TOCS will include an alternate route planning tool, which will allow ODOT to input the components of these

incident management operational plans that can be automatically implemented by TOCS based on actual incident conditions.

- **Training:** TOCS will include a simulation for conducting incident drills. Used within ODOT and in coordination with other incident response partners this will improve the efficiency of incident response.

Other states have implemented a number of innovative incident management policies, laws, practices, and technologies that may be applicable to the Oregon transportation system such as:

- Quick clearance legislation
- Quick clearance static signage for motorists
- Emergency reference markers every 2/10th mile
- On-call maintenance volunteers
- Accident investigation sites
- Heavy vehicle identification guides
- Heavy vehicle recovery equipment
- Automated debris recovery systems
- Median cross-over plans for emergency vehicles
- Photogrammetry
- Ambulance-hospital information systems
- Incident record databases
- Inter-agency cross-training

### *Stakeholder Roles and Responsibilities*

Detailed incident management roles and responsibilities for key stakeholders are included in Table 15.

**Table 15. Incident Management Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Monitor CCTV cameras, system detectors, and radio broadcasts for incidents. | ▪ Existing |
| | ▪ Verify incidents using CCTV cameras and radio communications with ODOT crews. | ▪ Existing |
| | ▪ Patrol state highways for incidents. | ▪ Existing/Planned |
| | ▪ Dispatch ODOT incident responders, HazMat responders, or maintenance crews to an incident site when needed. | ▪ Existing/Planned |
| | ▪ Dispatch towing/salvage vehicles to incident sites. | ▪ Existing |
| | ▪ Provide all on-scene motorist assistance for minor incidents that do not require the presence of emergency management agencies. | ▪ Existing |
| | ▪ Provide on-scene support to emergency management agencies for major incidents. | ▪ Existing |
| | ▪ Implement alternate routes for major incidents. | ▪ Existing |
| | ▪ Post incident messages on permanent and portable dynamic message signs. | ▪ Existing |
| | ▪ Turn ramp meters on or off to manage traffic near an incident or on an alternate route. | ▪ Existing |
| | ▪ Implement coordinated traffic signal timing plans for incident operations. | ▪ Future |

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Oregon Department of Transportation | ▪ Share information and device control (as applicable) with other TOCs.<br>▪ Share information with 911 centers using OIS message broker.<br>▪ Provide support to local traffic management agencies when resources are available.<br>▪ Provide incident information to travelers using the TripCheck system. | ▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing<br>▪ Existing |
| Local Traffic Management Agencies | ▪ Post incident messages on permanent and portable dynamic message signs.<br>▪ Implement coordinated traffic signal timing plans for incident operations on alternate routes.<br>▪ Share information and device control (as applicable) with other TOCs.<br>▪ Share information with 911 centers using OIS message broker.<br>▪ Provide incident information to travelers using TLE and TTIP. | ▪ Existing/Future<br>▪ Existing/Future<br>▪ Existing/Planned<br>▪ Future<br>▪ Programmed |
| External State Departments of Transportation | ▪ Post incident messages on permanent and portable dynamic message signs.<br>▪ Share information and device control (as applicable) with ODOT TOCs.<br>▪ Share information with 911 centers using OIS message broker.<br>▪ Provide incident information to travelers using TLE and TTIP. | ▪ Existing/Future<br>▪ Existing/Planned<br>▪ Future<br>▪ Programmed |
| Local Public Safety Dispatch Agencies | ▪ Dispatch law enforcement, fire and life safety, and emergency medical services when required.<br>▪ Contact ODOT TOC when ODOT incident responders are required.<br>▪ Share information with TOCs and other 911 centers using OIS message broker. | ▪ Existing<br>▪ Existing<br>▪ Programmed |
| Oregon State Police | ▪ Exchange calls for service with ODOT TOCs.<br>▪ Provide ODOT TOCs with access to TOW rotation application data.<br>▪ Provide OSP vehicle(s) and personnel at an incident site on state highways when dispatched.<br>▪ Share information with TOCs and 911 centers using OIS message broker. | ▪ Existing<br>▪ Existing<br>▪ Existing<br>▪ Existing/Planned |
| Local Law Enforcement | ▪ Provide local law enforcement vehicle(s) and personnel at an incident site per roadway jurisdiction when dispatched. | ▪ Existing |
| Local Fire and Life Safety | ▪ Provide fire and life safety vehicle(s) and personnel at an incident site when dispatched.<br>▪ Lead the incident command at the incident site per the *Emergency Operations Plan*. | ▪ Existing<br>▪ Existing |

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Emergency Medical Service Providers | ▪ Provide ambulance(s) and medical personnel at an incident site when dispatched. | ▪ Existing |
| Commercial Salvage and Towing Operators | ▪ Provide salvage or towing vehicle(s) and personnel at an incident site when dispatched by ODOT. | ▪ Existing |
| Mayday Service Providers | ▪ Take service calls from customers.<br>▪ Share information about Oregon incidents with ODOT. | ▪ Existing<br>▪ Existing/Planned |

## Emergency Management Operational Concept

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the *ODOT Emergency Operations Plan*[30] and the *State of Oregon Emergency Management Plan*[31] for detailed documentation of emergency management in Oregon. This section includes a summary of the emergency management vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. The emergency management operational concept is illustrated with the incident management operational concept in Figure 15.

### *Emergency Management Vision*

The vision for the emergency management service area is to safely and efficiently manage the Oregon transportation infrastructure during major emergencies through a coordinated effort to promote the safe travel/evacuation of the public, safe travel of emergency responders and life saving supplies, and economic recovery after disaster. This vision is supported by the following goals:

- Improve and enhance the safety and security of emergency responders, the traveling public, and the environment.
- Develop and strengthen partnerships on state, regional, and local levels.
- Integrate systems and communications between statewide partners to improve information sharing.
- Deliver key information to the decision makers at emergency operations centers.
- Inform travelers of emergency information and transportation system impacts in a timely manner.

### *Emergency Management Applications Today*

The following emergency management applications impact the Oregon transportation network today:

- **Emergency Operations Centers (EOCs):** A number of emergency operations centers (EOCs) have been established throughout the state of Oregon and are activated when needed during a major emergency situation. The Oregon Emergency Coordination Center (ECC) is the single point of contact for an integrated state response to a major emergency or disaster. The ECC is a dual-function facility in that it is the day-to-day office of the Oregon Office of Emergency Management (OEM) and becomes the ECC in a state of emergency. When activated, the ECC is considered an operational extension of the Governor's Office. Table 16 includes a list of key EOCs that traffic management agencies coordinate with during major emergencies.

[30] *Oregon Department of Transportation Emergency Operations Plan*. Revision 6. Oregon Department of Transportation, Office of Maintenance, Emergency Preparedness Committee, March 2010.

[31] *State of Oregon Emergency Management Plan, Vol. II: Emergency Operations*. Oregon Office of Emergency Management, September 2010.

**Table 16. Key Emergency Operations Centers for Traffic Management Agencies**

| Local Traffic Management Agencies | | ODOT* | |
|---|---|---|---|
| **Scope of Emergency** | **Center Activation** | **Scope of Emergency** | **Center Activation** |
| Statewide | ECC | Statewide | ECC/Agency Operations Center (AOC) |
| Countywide | County EOC | Regionwide | Region EOC |
| Citywide | City EOC | Districtwide | District EOC |

* ODOT operates a number of EOCs/command centers. The EOCs listed in this table include the main points of contact for TOCs when emergencies affect the state highway system.

- **Oregon Emergency Response System (OERS):** OEM operates OERS, which is the single contact point for help from any state emergency response agency 24 hours a day. OERS notifies ODOT when the ECC is activated and when an ODOT representative is needed. ODOT notifies OERS when other agencies require ODOT assistance with emergency response.
- **Emergency Management Software:** The Office of Emergency Management (OEM) uses OpsCenter as their primary emergency management software tool and requires that counties and other agencies use OpsCenter for interaction with the OEM. ODOT uses WebEOC as its primary emergency management tool and also uses OpsCenter for interaction with the OEM.
- **Emergency Alert System (EAS):** The EAS is a national system that allows the President to address the public in the event of a national emergency using broadcast stations, cable systems, and satellite systems. The EAS is also used on a statewide level for emergencies in Oregon.
- **Emergency Warning/Alert Systems:** Numerous warning systems are used throughout Oregon to provide widespread notification of emergency situations. Information from these systems is disseminated to the public through various means including OERS, EAS, and the applications described in the Traveler Information Operational Concept section (e.g. TripCheck, TTIP). The following is a sampling of emergency warning systems used in Oregon:
  - Amber Alerts: These alerts are used to provide timely emergency information to the public regarding child abductions. TOC operators post amber alerts on dynamic message signs based on an agency's message hierarchy system and ODOT posts the alerts to the TripCheck system.
  - National Weather Service Alerts: The National Weather Service issues watch and warning information for severe weather and floods in Oregon. These are a key feature on the TripCheck website.
  - Earthquake Warning System: The National Earthquake Information Center provides notification about earthquakes within or near Oregon.
  - Tsunami Warning System: The U.S. West Coast and Alaska Tsunami Warning Center issues tsunami warnings through the Oregon Tsunami Warning Network.
  - Debris Flow Early Warning System: The Oregon Department of Forestry issues advisories and warnings regarding debris flow.
  - Chemical Stockpile Emergency Preparedness Program (CSEPP) Alerts: County emergency management officials (Morrow and Umatilla Counties) will issue warnings in the event of a chemical accident involving nerve or mustard agents at the Umatilla Army Depot. ODOT and local agencies have specific plans for CSEPP emergencies

that include the use of ITS for disseminating evacuation information and contingency plans for TOC back-up.

### *Emergency Management Issues*

The main emergency management issues include the following:

- System integration between TOCs and EOCs (primary and back-up) is currently limited. System interfaces do not exist between TOC and EOC systems. This presents obstacles to providing a timely coordinated response during major emergencies particularly since the key decision makers are typically stationed in an EOC and do not have immediate access to TOC information. Most TOCs and EOCs are located in separate buildings often separated by great distances although there are some local agency TOCs that are located in the same building as local agency EOCs.
- Major emergencies occur infrequently and emergency plans are often large and comprehensive. More frequent operator training is needed to ensure efficient emergency response procedures are in place.

### *Emergency Management Applications Tomorrow*

Emergency management applications of tomorrow will address system integration issues and include the following:

- **EOC and TOC Integration:** Integration of EOC and TOC systems will streamline coordination activities and allow easier sharing of information between centers as well as shared traffic device control (e.g. CCTV cameras, dynamic message signs, traffic signal operations). This will provide key decision makers with comprehensive information and the flexibility to operate ITS applications from a number of various centers while also providing systems back-up functionality. The TOCS, OIS Message Broker, and WebEOC Software currently under development will play a key role in systems integration. Their functionality may be expanded to achieve integration or a separate interface may be developed to allow interaction.
- **TOCS Software:** ODOT plans to develop a module in TOCS to communicate with WebEOC. TOCS will also include a simulation mode that will make it easier to conduct drills on the emergency response plans and procedures.

### *Stakeholder Roles and Responsibilities*

Table 17 includes the high-level roles and responsibilities for managing the Oregon transportation network as part of the emergency management service area.

**Table 17. Emergency Management Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities* | Status |
|---|---|---|
| Oregon Office of Emergency Management | ▪ Activate the Oregon Emergency Communication Center (ECC) per the State of Oregon Emergency Management Plan.<br>▪ Act as an extension of the Governor's Office during statewide emergencies. Lead emergency management/operations coordination.<br>▪ Share information with EOCs throughout Oregon. | ▪ Existing<br>▪ Existing<br>▪ Existing |
| Oregon Department of Transportation | ▪ Activate ODOT EOCs per the ODOT EOP. These may include the Agency Operations Center, Region EOCs, District EOCs, Resource Management Center, Bridge Section Command Center, and Information Systems Command Center.<br>▪ Report to ECC during statewide emergencies and support their coordination efforts.<br>▪ Share information and device control (as applicable) between TOCs and ECC/EOCs. | ▪ Existing<br>▪ Existing<br>▪ Existing/Planned |
| Federal Land Agencies | ▪ Request assistance from ODOT or local traffic management agencies through the EOC/OERS. | ▪ Existing |
| Local Offices of Emergency Management | ▪ Activate local EOCs per local protocols.<br>▪ Report to ECC during statewide emergencies and support their coordination efforts. | ▪ Existing<br>▪ Existing |
| Local Traffic Management Agencies | ▪ Report to local EOCs during emergencies and support their coordination efforts.<br>▪ Share information and device control (as applicable) between TOCs and EOCs. | ▪ Existing<br>▪ Existing/Planned |
| External State Offices of Emergency Management | ▪ Activate the State EOC per state protocols.<br>▪ Lead emergency management/operations coordination statewide.<br>▪ Share information with Oregon ECC. | ▪ Existing<br>▪ Existing<br>▪ Existing |
| External State Departments of Transportation | ▪ Activate DOT EOCs per state protocols.<br>▪ Share information and device control (as applicable) with ODOT TOCs and ODOT EOCs. | ▪ Existing<br>▪ Existing/Planned |
| Public Transportation Service Providers | ▪ Provide transportation services for evacuations and reentry during emergencies. | ▪ Existing/Planned |
| Commercial Transportation Service Providers | ▪ Provide transportation services for evacuations and reentry during emergencies. | ▪ Existing/Planned |

* Detailed emergency management roles and responsibilities are included in the *ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan*. The roles and responsibilities listed in this table provide a high-level overview of agency interaction for traffic management and operations during a major emergency.

## Archived Data Management Operational Concept

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data. This section provides a summary of the vision, current applications, current issues, future applications, and stakeholder roles and responsibilities. Figure 17 generally depicts the operational concept for archived data management.

### *Archived Data Management Vision*

The vision of archived data management is to create systems that will improve the understanding of the relationship between operational, maintenance, and other ITS activities and roadway system performance by providing tools for collecting, archiving, and sharing information/data throughout ODOT and partner agencies. Goals that support this vision include the following:

- Archive agency-specific ITS data in-house.
- Archive non-secure ITS data in the centralized PORTAL data warehouse and make it available to the public.
- Develop analytical planning tools for performance measure assessment, alternative operational actions, asset management, and financial decision making. Automate these tools as much as possible.
- Develop predictive algorithm applications using archived data to generate travel forecasts based on real-time data.

### *Archived Data Management Applications Today*

Applications of the archived data management service area today include the following:

- **Agency Data Marts:** A number of agencies operate and maintain their own data marts (e.g. Port of Portland, TriMet, ODOT). These data marts typically archive data for agency-specific systems and most are not currently shared with any other agencies. Some data marts such as TriMet's Enterprise Data Mart use real-time data for daily operations in addition to archiving data.
- **ODOT Data Warehouse:** ODOT uses the Highway Management Information System (HMIS) to warehouse all of its data marts and has developed a strategic plan for the execution and delivery of data warehousing and business intelligence (DW/BI) capabilities. The HMIS Data Warehouse delivers a number of capabilities that collect data from operational systems, organize the data to support analysis activities, and provide tools for business analysis, reporting, modeling, and geospatial analysis. Capabilities delivered by the HMIS Data Warehouse:
    - Access to relevant, timely, and accurate financial, project, and performance data
    - Faster generation/turnaround of standard reports
    - Data extracted from different operational ODOT systems is integrated into a format that supports analytics
    - Validated and cleaned data to prevent bad data from entering the data warehouse environment or user analytics or reports.
    - Data transformed into a single, standard format that is based on a single, accepted definition
    - Query processing is high performance, so that users are not unnecessarily waiting for results
    - Standard reports that are authoritative, reliable, and present the data in a manner that is easy to understand and easy to access.

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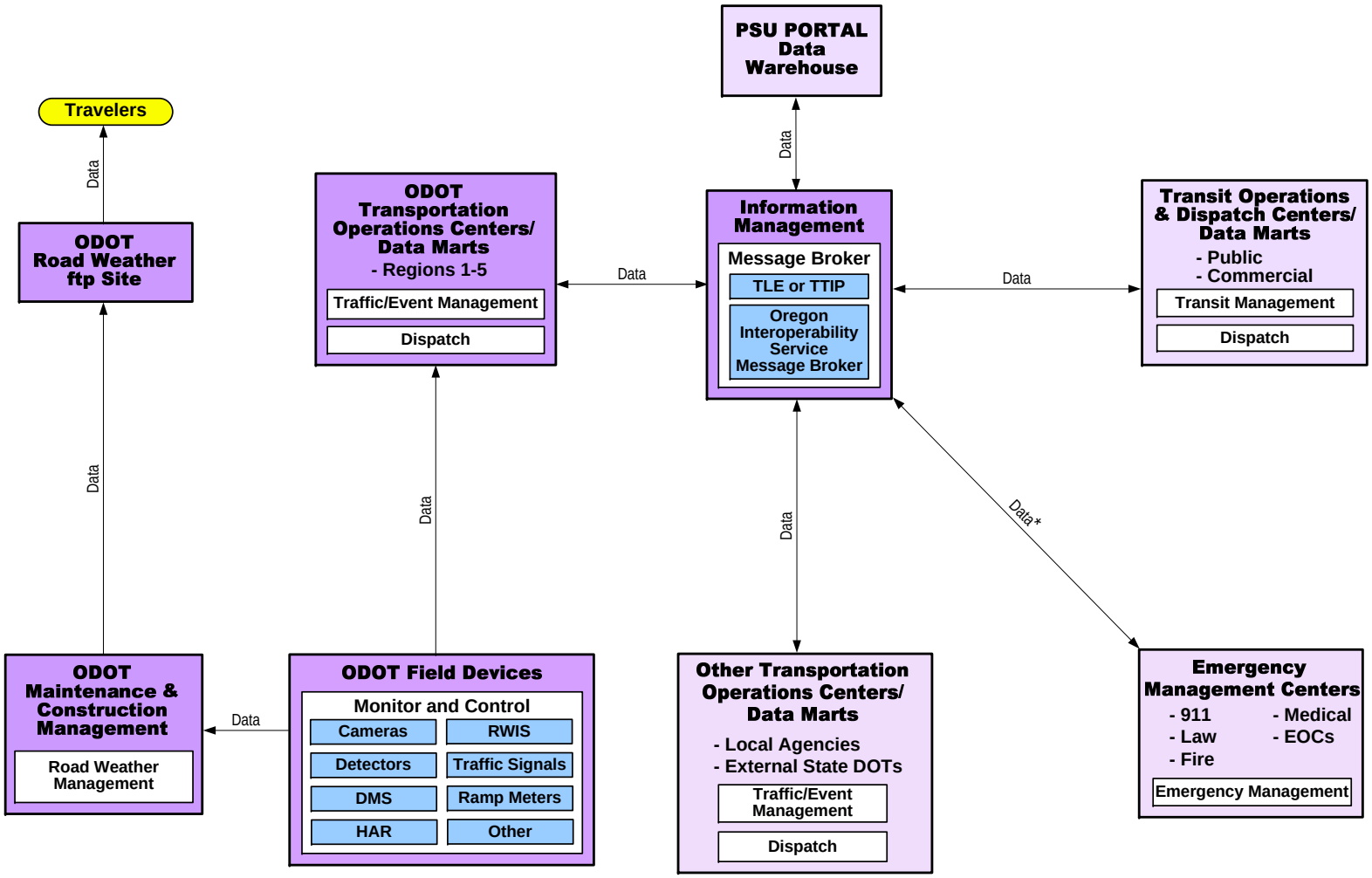
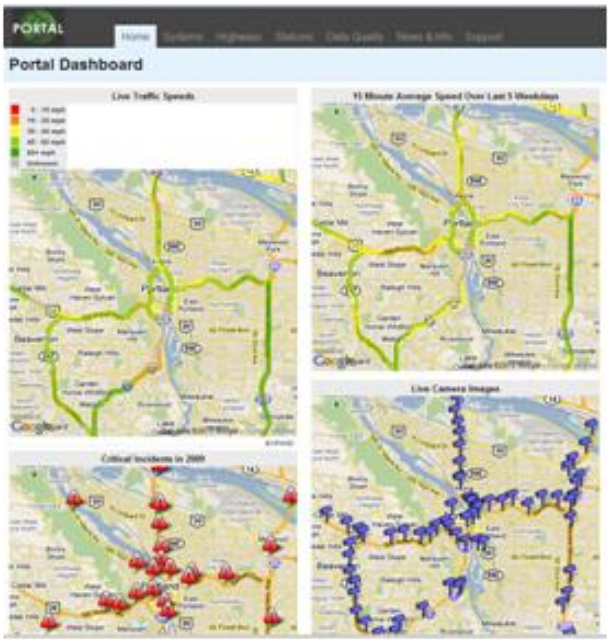



* Only secure data (e.g. general incident information) will be archived externally from emergency management agencies.

**Figure 17**
**OREGON ARCHIVED DATA MANAGEMENT OPERATIONAL CONCEPT FOR YEARS 2011-2021**

- **PORTAL Data Archive:** Portland State University (PSU) houses the regional ITS data warehouse for the Portland and southwest Washington metropolitan areas. The PORTAL system currently archives freeway system detector loop data from ODOT and WSDOT, traffic signal system detector data from the Portland regional TransSuite central signal system, TriMet transit data, and local weather data from NOAA. PSU is already working closely with other regional stakeholders in the Portland and southwest Washington metropolitan areas to expand the system to include more data. The PORTAL data is accessible via the Internet and is designed for use by researchers, transportation planners, and transportation operators. PSU is currently developing tools to measure system performance.




*PORTAL Home Page*

### *Archived Data Management Issues*

Issues currently associated with archived data management include the following:

- There are vast amounts of data being collected every second of the day by existing ITS devices and systems. Archiving and sorting this data in a usable format is a challenge.
- Limited efforts have been made to develop and quantify performance measures of ITS implementations. This is in part due to the lack of readily available data for analysis.
- Techniques and methods for utilizing archived data to produce traffic forecasts have yet to be fully developed.
- Future federal funding programs will likely require the use of performance measures to demonstrate the benefits of ITS projects.
- Data quality improvements are needed to achieve the vision for archived data management.

### *Archived Data Management Applications Tomorrow*

The archived data management applications of tomorrow will support a comprehensive data warehousing and management strategy that will interface with existing and/or future ITS data sources. These include the following:

- **ODOT Data Warehouse Expansion:** Expand the ODOT data warehouse to include asset management and budget data.
- **Archived Data Expansion:** The future archived data expansion will address the archived data needs of the entire state either through the expansion of the PORTAL system or through other solutions. Each agency will archive the data to the detail they deem necessary for sharing with other regional and statewide agencies.
- **Data Exchange Interfaces:** Automatic data exchanges between ODOT and local traffic and transit management agencies will be key to the archived data management strategy. The interfaces to push, pull, and translate data between agencies will need to be developed so that it is usable in activities such as transportation planning, design,

research, and analysis. This includes developing data exchange interfaces with new equipment as it is deployed in the field.

- **Transportation System Network Monitoring:** ITS data are critical to understanding how well ODOT operates the highway network. The ability to generate and report performance measures using ITS data will be an integral piece of the future archived data management systems in Oregon.
- **Performance Measurement:** The archived data systems will be expanded to monitor performance measures on the entire transportation system. In particular, performance measures will be expanded to arterial roadways. Reporting tools will be automated to provide performance measures, manage assets, and guide financial decisions. These tools will be used by local, regional, and statewide planners and decision makers.
- **Predictive Algorithm Applications:** The ITS data captured and stored will be used to refine predictive algorithms that can be used to provide better feedback regarding the condition and operations of the transportation system performance. Improving travel time and traveler delay estimates are examples of applications with a predictive algorithm element.

### *Stakeholder Roles and Responsibilities*

Table 18 includes the detailed key stakeholder roles and responsibilities for the archived data management service area.

**Table 18. Archived Data Management Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Portland State University | ▪ Maintain existing PORTAL data warehouse for Portland and southwest Washington metropolitan areas. | ▪ Existing |
| | ▪ Collect and archive data from additional archived data sources at other agencies.<br>▪ Develop system upgrades to PORTAL to include statewide archived data.<br>▪ Develop interface between PORTAL and regional/statewide data warehouses in neighboring states.<br>▪ Develop analytical tools to guide planning decisions.<br>▪ Monitor transportation system network performance.<br>▪ Develop predictive algorithm applications to forecast travel conditions. | ▪ Existing/Planned<br>▪ Planned<br>▪ Existing/Planned<br>▪ Planned<br>▪ Existing/Planned<br>▪ Future |
| Oregon Department of Transportation | ▪ Design/construct/maintain/operate field equipment that supports automated data collection.<br>▪ Maintain ODOT data marts (TOCS, ATMS, etc.).<br>▪ Define performance measurement standards to monitor transportation system network performance.<br>▪ Design/maintain infrastructure that supports data transfer to ODOT data marts and the PORTAL data warehouse. | ▪ Existing/Planned<br>▪ Existing<br>▪ Existing/Planned<br>▪ Existing/Planned |
| Local Traffic Management Agencies | ▪ Design/construct/maintain/operate field equipment that supports automated data collection.<br>▪ Maintain agency-owned data mart(s).<br>▪ Design/maintain infrastructure that supports data transfer to agency-owned data mart(s) and the PORTAL data warehouse. | ▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned |
| Public Transportation Service Providers | ▪ Design/construct/maintain/operate field equipment and in-vehicle systems that support automated data collection.<br>▪ Maintain agency-owned data mart(s).<br>▪ Design/maintain infrastructure that supports data transfer to agency-owned data mart(s) and the PORTAL data warehouse. | ▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned |

## Public Transportation Operational Concept

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon.[32] It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles. The operational concept is intended to be a high level planning document because the number of stakeholders, and variety of systems applied in Oregon varies significantly. As stakeholders consider the public transportation operational concept, understand that each public transportation provider will likely not deploy all the systems presented in this concept. But, the advanced systems presented here could be used by any public transportation agency as they grow and take advantage of new technologies. Therefore, this operational concept should be a resource for public transportation stakeholders considering new technologies to improve service and the customer experience.

The public transportation operational concept primarily describes the roles and responsibilities of the stakeholders as they relate to advanced public transportation systems such as automated vehicle location (AVL), transit signal priority (TSP), transit security systems and traveler information. To achieve this end, the operational concept presents the statewide public transportation vision, applications in use today, issues impacting implementation, applications envisioned tomorrow (in the future), and concludes with a description of stakeholder roles and responsibilities relative to the “future” applications. Figure 18 depicts the Oregon public transportation operational concept.

Stakeholders should understand that the systems presented in the Oregon Architecture and Operational Concept categories have some overlap. For example, the public transportation operational concept describes transit traveler information applications, but these systems are also described briefly in the traveler information operational concept. Therefore, when considering traveler information projects, the reader should also refer to the other operational concepts for a complete description of the envisioned services.

### *Public Transportation Vision*

The role of public transportation is to support and enable the attainment of the vision for transportation as outlined in ODOT’s *Oregon Transportation Plan*. That vision is:

> “By 2030, Oregon’s transportation system supports people, places and the economy. We travel easily, safely and securely, and so do goods, services and information. Efficient vehicles powered by renewable fuels move all transportation modes. Community design supports walking, bicycling, travel by car and transit wherever appropriate. Our air and water are dramatically cleaner, and community sensitive and sustainable transportation solutions characterize everything we do.”

[32] See Attachment A for example public transportation ITS projects as defined by the Federal Transit Administration (FTA). The attachment summarizes the following document: *National ITS Architecture Consistency Policy for Transit Projects*, which can be accessed via http://www.fta.dot.gov/documents/dc2003.pdf

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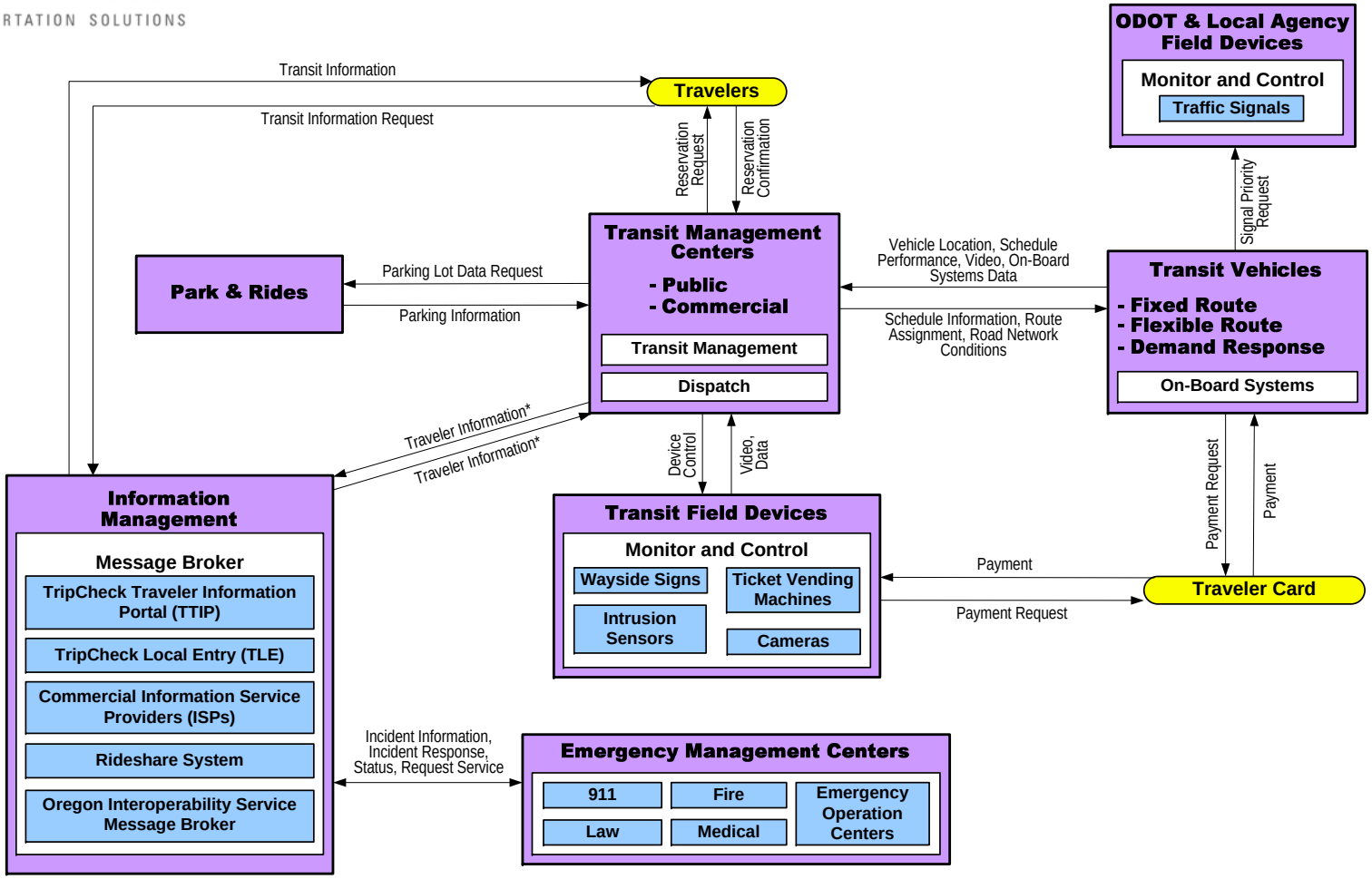


*Traveler information includes, but is not limited to, transit schedule and route information, road network conditions, maintenance and construction activities, road weather information, and emergency and incident information.

See Figure 11 in the Oregon Statewide ITS Architecture for traveler information flows related to public transportation.
See Figure 12 in the Oregon Statewide ITS Architecture for maintenance and construction information flows related to public transportation.
See Figure 15 in the Oregon Statewide ITS Architecture for incident/emergency management flows related to public transportation.
See Figure 17 in the Oregon Statewide ITS Architecture for archived data management flows related to public transportation.

**Figure 18**
**OREGON PUBLIC TRANSPORTATION OPERATIONAL CONCEPT FOR YEARS 2011-2021**

### *Public Transportation Applications Today*

Currently the focus of public transportation applications in Oregon is in the areas of transit management, transit traveler information, transit security, and archived data management. The degree of transit technology in use varies from one community to another.

*Transit Management*

Transit management includes technology services that improve transit operations by automating systems, deploying monitoring capabilities, and improving communications. Transportation providers around the state use the following transit management applications to varying degrees:

- **Fixed-Route Transit Dispatch Systems:** Some transit agencies use automated systems to dispatch, monitor, and schedule fixed-route services. These systems are often used in conjunction with transit vehicle tracking.
- **Transit Vehicle Tracking:** Some transit agencies equip transit vehicles with devices to track the vehicle location. Tracking vehicles supports dispatch activities and the dissemination of real-time transit traveler information.
- **On-Board Vehicle Systems:** Some agencies equip transit vehicles with systems such as automated passenger counters, voice communication systems, and other technologies to support route planning and improving the customer experience.
- **Transit Signal Priority:** Some transit agencies use transit signal priority along corridors with fixed-route transit services. Fixed-route transit vehicles are equipped with a device that communicates with traffic signals and extends the green time of a signal phase to reduce transit travel times and improve reliability.
- **Fleet Maintenance Systems:** Some transit agencies use automated vehicle data to track when regularly scheduled maintenance is due for vehicles.

*Transit Traveler Information*

Traveler information allows transit users to make pre-trip and en-route plans using phone, web-based, or kiosk systems. Transit agencies around the state use the following traveler information technology services:

- **Pre-Trip Traveler Information:** Numerous transit agencies provide a web or phone based system that provides travelers with route and fare information.
- **En-Route Traveler Information:** Several transit agencies provide a web or phone based system that allows travelers to access real-time schedule information while en-route. En-route transit information is also provided remotely on electronic signs at transit stops or at information kiosks. Real-time information often includes, but is not limited to, next arrival times, trip planning, and detour information.
- **Automated Stop Announcements:** Transit agencies use automated announcements on fixed-route transit vehicles to inform passengers of the next stop. These announcements are typically verbal but some transit vehicles also include visual announcements on electronic signs.

More information about connections between traveler information systems and public transportation is included in the Traveler Information Operational Concept of this Oregon Statewide ITS Architecture and Operational Concept Plan document.

*Transit Security*

Transit security applications allow transit agencies to monitor transit areas and improve the safety of transit users. Transit agencies around the state use the following transit security technology services:

- **Closed-Circuit Television (CCTV) Cameras:** Several transit agencies use CCTV cameras to monitor security on-board vehicles, at transit stops or centers, at park and ride facilities, or at agency facilities (e.g. transit garage or lot).
- **Intrusion Sensors:** Intrusion sensors are used on a limited basis to monitor key transit infrastructure (e.g. tunnel used for light rail).
- **Emergency Telephones:** Some transit agencies provide telephones at transit stops, centers, or park and rides that travelers may use for emergency assistance.

*Archived Data Management*

Several transit agencies use automated methods to transfer data from transit vehicles or systems to a database for archiving. The archived data is used for performance measurement, transit planning, and federal transit reports. For example, TriMet uses an automated method to transfer their transit data to the Portland regional transportation data warehouse (PORTAL). More information about connections between data management systems and public transportation is included in the Archived Data Management Operational Concept of this Oregon Statewide ITS Architecture and Operational Concept Plan document.

### *Public Transportation Issues*

The prominent public transportation issues affecting implementation in Oregon today include the following:

- Few public transportation service providers are currently able to provide comprehensive real-time transit traveler information, which is in high demand from the traveling public.
- Lack of a statewide transit plan limits our ability to move to common system standards.
- Smaller public transportation service providers must dedicate most or all of their resources to providing services instead of advancing transit technology.
- Federal reporting does not take full advantage of automated transit systems.
- The lack of common system standards presents difficulties sharing data between public transportation service providers as well as providing statewide transit traveler information.
- Coordination between public transportation service providers and emergency management agencies is done through phone calls and does not use automated data exchange between systems.

### *Public Transportation Applications Tomorrow*

Public transportation applications of tomorrow will automate many transit management activities, provide comprehensive statewide transit traveler information, enhance transit security, archive transit data, and support emergency management.

*Transit Management*

Tomorrow's applications will continue to automate as many transit management processes as possible to streamline operations:

- **Fixed-Route Transit Dispatch Systems:** Transit agencies will use an automated system to dispatch, monitor, and schedule fixed-route services. This will be used most effectively in conjunction with transit vehicle tracking.
- **Demand Response Reservation and Dispatch Systems:** Transit agencies will use a system to take reservations and to dispatch, monitor, and schedule demand response transit services.
- **Integrated Fixed-Route and Demand Response Reservation and Dispatch Systems:** Integration of these systems supports automated coordination at transfer points, optimizes service options, and maximizes the efficiency of reservations and route assignments for special transit user needs.
- **Transit Vehicle Tracking:** Transit vehicles will be equipped with vehicle tracking devices to improve transit system management and transit traveler information.
- **On-board Systems:** More transit vehicles will be equipped with automated passenger counters, voice communication systems, or other technologies to support operations.
- **Transit Signal Priority:** Transit signal priority will be used on corridors with fixed-route transportation services to improve on-time transit performance and reliability.
- **Road Network Conditions:** Transit dispatchers will have access to a variety of road network conditions from traffic management agencies and will adjust transit service as needed. Road condition information includes real-time and predictive travel speeds on key regional corridors, traffic incident impacts, and planned maintenance and construction activities.
- **Fleet Maintenance Systems:** Transit fleets will use automated monitoring services that indicate when routine maintenance is due for activities such as engine maintenance (e.g. oil changes, battery replacement), lift service, or other on-board system maintenance.
- **Regional Fare Cards:** Fare cards will be used to allow travelers to pay for transit services throughout a region using a single card.

*Transit Traveler Information*

Tomorrow's applications will include comprehensive static and real-time transit traveler information that is seamless throughout Oregon:

- **Statewide Multimodal Trip Planning Tool:** Travelers will plan multimodal trips (transit, car, bicycle, walking) throughout the state of Oregon from a single website or smart phone application. To support statewide trip planning transportation service providers will use standardized data (general transit feed specification, GTFS) and share it with TripCheck and commercial information service providers.
- **En-Route Traveler Information:** En-route and real-time transit information (such as next arrivals, connections, delays, detours, and parking availability at transit parking lots) will be readily available to transit users.
- **Personalized Traveler Information:** Technology applications that provide information specific to individual users based on unique requests, past transit patterns and traveler preferences will be used to provide personalized information.
- **Rideshare System:** A single website and telephone rideshare system will be used statewide to match interested travelers. This system will integrate rideshare programs currently used in different areas of Oregon. ODOT currently plans to implement a system called RideShare Online (managed by King County, Washington) in 2011.

*Transit Security*

Transit security systems (CCTV cameras, intrusion sensors, and emergency telephones) will continue to be installed on transit vehicles and at transit stops, centers, park and rides, and other transit facilities.

*Archived Data Management*

Data will automatically be archived in agency data marts and regional or statewide data warehouses. This data will be used for system network monitoring, performance measure evaluation, asset management, financial decision making, and federal transit reporting. More information is included in the Archived Data Management Operational Concept of this Oregon Statewide ITS Architecture and Operational Concept Plan document.

*Emergency Management*

Transportation service providers will coordinate with emergency management agencies to support emergency evacuation and reentry using transit vehicles. Emergency management systems will be integrated with transit dispatch systems so emergency management agencies are able to track transit vehicle locations in real time. More information is included in the Emergency Management Operational Concept of this Oregon Statewide ITS Architecture and Operational Concept Plan document.

### *Stakeholder Roles and Responsibilities*

Table 19 includes the stakeholder roles and responsibilities for the public transportation service area.

**Table 19. Public Transportation Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities | Status |
|---|---|---|
| Public Transportation Service Providers | ▪ Design/construct/integrate/maintain/operate transit systems and transit field devices.<br>▪ Dispatch fixed-route vehicles.<br>▪ Manage reservations and dispatch demand response and flexible route vehicles.<br>▪ Coordinate service with other public transportation service providers at system transfer points.<br>▪ Lead the installation of transit signal priority with ODOT and local traffic management agencies. Provide transit signal priority equipment on transit vehicles.<br>▪ Manage the logistics of determining eligibility for special categories of transit riders (low income, elderly, students, etc.) | ▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned |
| Commercial Transportation Service Providers | ▪ Manage reservations and dispatch vehicles. | ▪ Existing/Planned |
| Oregon Department of Transportation | ▪ Encourage and support using the ITS Architecture for project planning and implementation.<br>▪ Act as a liaison for the rest of ODOT.<br>▪ Fund advanced public transportation system improvements.<br>▪ Provide coordination and oversight in the procurement and implementation of new ITS projects.<br>▪ Design/construct/maintain/operate transit signal priority equipment associated with traffic signals.<br>▪ Operate traffic signals with transit signal priority and monitor performance. | ▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned<br>▪ Existing/Planned |
| Local Traffic Management Agencies | ▪ Design/construct/maintain/operate transit signal priority equipment associated with traffic signals.<br>▪ Operate traffic signals with transit signal priority and monitor performance. | ▪ Existing/Planned<br>▪ Existing/Planned |
| Travelers | ▪ Provide feedback on transit system, passenger amenities, and transit information to transit management.<br>▪ Pay for public transportation services using a traveler fare card. | ▪ Existing/Planned<br>▪ Planned |
| Event Promoters | ▪ Coordinate with transportation service providers in advance of special events for transportation services. | ▪ Existing/Planned |

## Road User Charging Operational Concept

This Road User Charging Operational Concept is the starting document to harmonize and rationalize the approach to road user charging operations in the State of Oregon. While the legal definitions and rationale to employ tolling to raise revenue as a financing measure for specific facilities (e.g. bridges), congestion pricing to manage travel demand on congested facilities in urban centers, existing weight-distance tax collection system for trucks and distance based taxes for electric and hybrid vehicles accessing the road network, may all be different, the revenue collection mechanisms should provide drivers, both in and out of state, a common interface and harmonized approach to payment of all charges due. Likewise, the incorporation of the above road user charging mechanisms should integrate seamlessly with the existing and future ITS architecture to provide synergy of traffic data, information, and systems management.

This road user charging operational concept includes the vision, current applications, current issues, future applications, link to the National ITS Architecture, and stakeholder roles and responsibilities. This introduction section provides definitions for road user charging terminology, definitions for generic stakeholders, and a graphical depiction of the operational concept.

Road user charge and the variety of charges that fall under this category are defined as:

- Charge: This is a generic term for the price required for using the transportation network and it encompasses taxes, tolls, fees, and fares.
- Tax: All taxes require legislative approval and the money generated from transportation taxes goes into the Highway Trust Fund, which is allocated using a specific rule set. Existing taxes in Oregon include the fuel tax and weight-distance tax for trucks. A proposed tax is under legislative review for electric and hybrid vehicles since these unique vehicles do not currently pay their fair share of road user charges imposed on internal combustion engine vehicles through the fuel tax. A similar distance tax may be considered in the future for all vehicles to supplement or replace the fuel tax.
- Toll: This is the amount of money charged to use or access a particular facility (e.g. bridge, tunnel, roadway) and the revenue is used to pay back the debt for building that facility and to fund ongoing operations, maintenance, and management of the facility.
- Fee: Although similar to a toll, fees may be set by the legislature or local jurisdictions such that revenue may be used as the agency sees fit, subject to enabling statute or ordinance. Example fees include vehicle registration, parking, and cordon (e.g. traveling through a downtown area).
- Fare: A fare is payment for a service and is generally associated with public transportation or commercial transportation (e.g. shuttles, taxis).

Figure 19 shows the variety of potential road user charges that are in use or may be used in the future in Oregon. Collection of the road user charges that apply at a statewide level (e.g. existing weight-distance tax and potential future distance tax) are key factors in this operational concept because they drive the system requirements for road user charge collection. All other charges are additive but should be collected using the same system as the statewide charges.

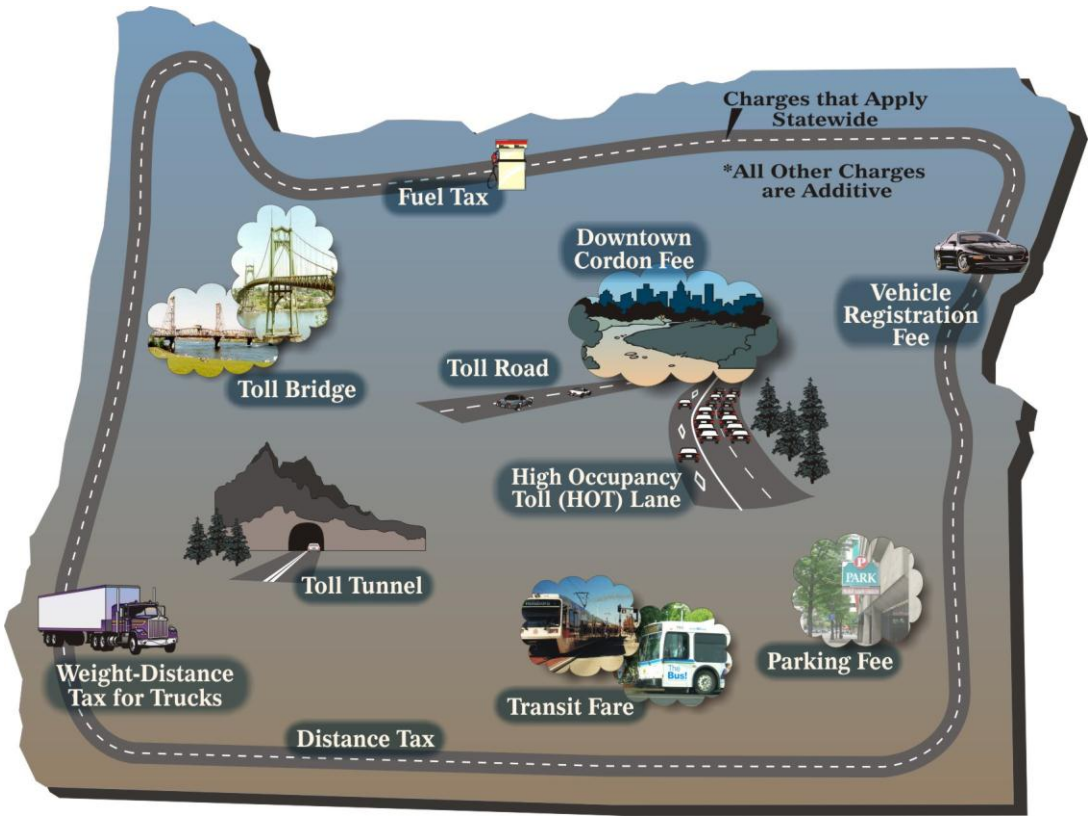


**Figure 19. Existing and Potential Oregon Road User Charges**

Unlike other well-defined stakeholders (e.g. ODOT) in this plan, there are a few generic stakeholders specific to road user charging used throughout this operational concept that require some definition:

- Road Owners are the entities responsible for the roads/bridges/tunnels/facilities and their maintenance to standards in the State of Oregon. For most state and public roads the Road Owner is ODOT, counties, and incorporated cities, but this title can also include other local jurisdictions and private operators.
- Charging Entities are the primary administrators or road user charges and they manage user accounts, collect transaction data (e.g. road usage and payment), handle exempt accounts, help set pricing, operate roadside equipment and work with enforcement to address non-compliant travelers. A Charging Entity may also be the Road Owner, a local jurisdiction, a private operator, or a contractor hired by a Road Owner.
- Trusted Third Party Service Providers (TTSPs) act as a middleman between Charging Entities and travelers who wish to use an intermediary. TTSPs are typically entities such as mobile phone service or credit card providers or financial institutions that travelers already entrust with financial and private information. The TTSP may also provide other value added services of interest to travelers, which enhances the rationale of why travelers choose to use an intermediary.
- Certification Agents are independent parties that test, manage configuration control, and certify that TTSPs' electronic road user charging collection systems meet the protocol standards set by the Charging Entities.
- Enforcement Agents are the responsibility of the Road Owner and Charging Entities for monitoring and ensuring compliance of travelers to pay their fair share of road usage

and may use all legal means available to ensure a high level of compliance. The party responsible for enforcement will vary for each different type of road charge.

Figure 20 depicts the Oregon road user charging operational concept using mostly generic stakeholders because many political and institutional decisions about road user charging roles and responsibilities have yet to be made. The figure includes details about how specific stakeholders such as ODOT will likely fit into the operational concept.

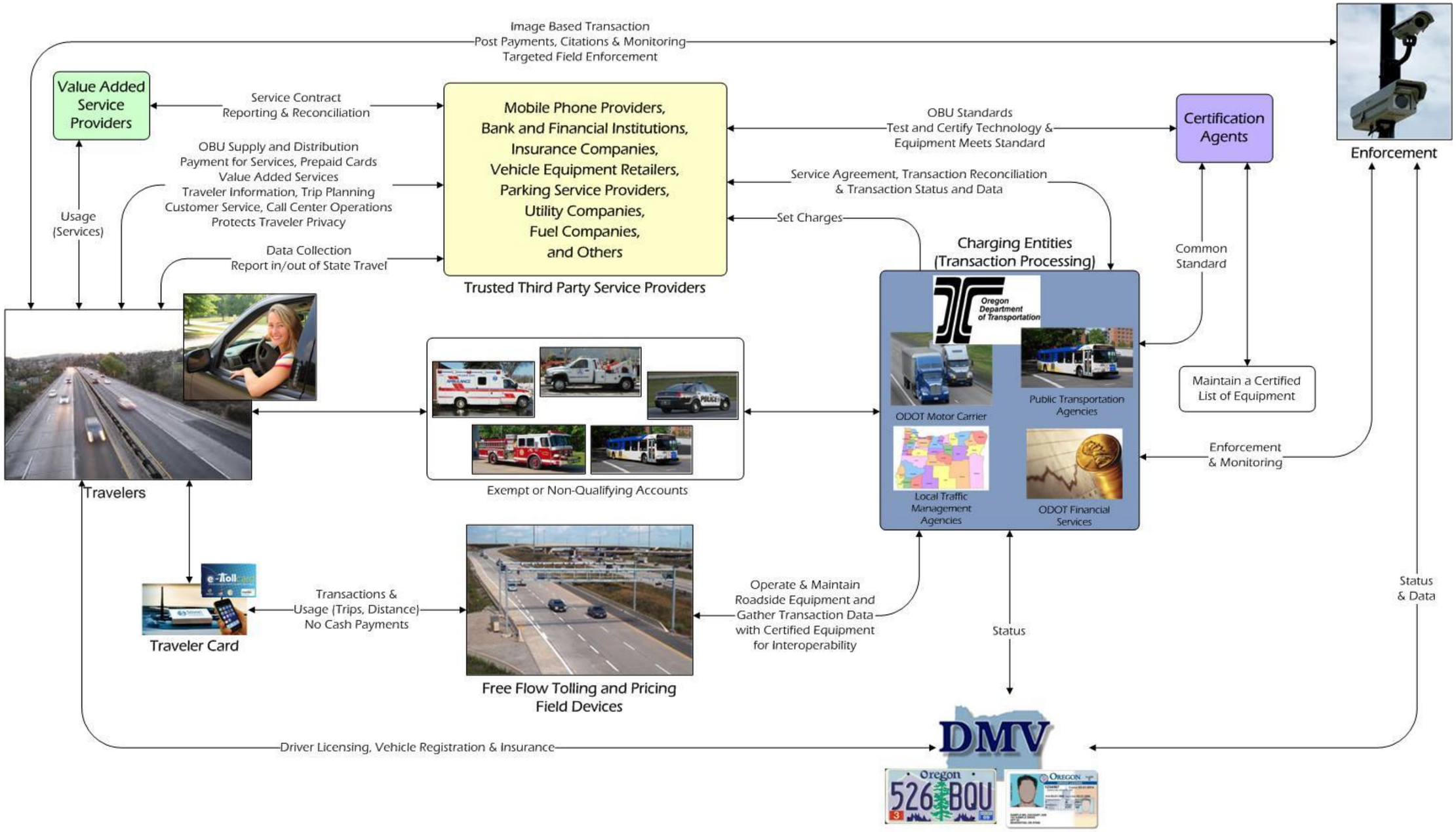


**Figure 20. Oregon Road User Charging Operational Concept for Years 2011 – 2021**

### *Road User Charging Vision*

The Oregon road user charging vision is to operate a reliable, easy to use, relatively low cost, enforceable, publicly acceptable "open" system that collects road user charges using interoperable components that conform to common standards[33]. The aim is to provide a common user interface to seamlessly pay all road user charges in Oregon. This vision is supported by the following goals:

- **Establish public and private partnerships** to develop a system that allows travelers to interface with the Trusted Third Party Service Provider of their choice but pay multiple Charging Entities (e.g. ODOT, local agencies, public transportation providers, parking providers).
- **Protect privacy** by not mandating GPS-based charging systems but allow Trusted Third Party Service Providers to use GPS-based charging technology for interested travelers.
- **Support collection of a variety of transportation charges** including, but not limited to, a statewide mileage based user tax, congestion pricing, facility tolls, and local options.
- **Provide free-flow electronic charging systems** that allow charging without vehicles being required to stop or slow down.
- **For mileage based systems, only charge Oregon residents for in-state travel** unless travelers report mileage undifferentiated by geographic location and until systems in Oregon and neighboring states have matured enough to consider addressing non-Oregon residents.
- **Verify exempt travelers** such as public service providers (e.g. emergency vehicles).
- **Operate an efficient government-owned back office system** that allows the flexibility for modules for various subsystems (e.g. Motor Carrier Transportation Division) and interfaces to back office systems operated by Trusted Third Party Service Providers. The system will provide one place for travelers to access all their road user charges.
- **Use industry standards** for the system components that need to be interoperable for an efficient and cost-effective system.
- **Offer incentives** to encourage the private sector to act as the Trusted Third Party Service Providers and provide data collection, payment services, and other value added services.
- **Provide travelers with choices** regarding road usage reporting, selection of technology and Trusted Third Party Service Providers, and methods for invoicing and payment.
- **Enforce payment violations** to ensure compliance of travelers.

### *Road User Charging Applications Today*

Oregon uses limited road user charging applications today for automobiles but does have a well-operated weight-distance tax system for heavy trucks. This section describes applications in use in the United States, other countries, Oregon (weight-distance truck tax, Hood River-White Salmon Bridge), and Washington (Tacoma Narrows Bridge). But first, it is important to understand the difference between closed and open system road user charging architecture models.

#### *Overview of Closed and Open System Architecture Models*

The primary difference between closed and open system architecture models is the degree of user choice. In a closed system model a traveler's only option is to interface directly with the Charging Entity whereas in an open system model a traveler may choose to interface with the

[33] Vision statement is based on Road User Fee Task Force policy objectives.

Charging Entity or any number of Trusted Third Party Service Providers who provide account management services along with possible value added services.

The definition of a Closed System is an internally integrated system controlled by a single entity with essential components that cannot be substituted by other external components, which could perform the same functions. This is essentially a monopolistic model because the Charging Entity selects a charging system (e.g. software, tag and reader system) from one manufacturer., who typically has intellectual property rights to the equipment, both hardware and software, and "Locks-in" the Charging Entity and the users[34]. Travelers who wish to use the Charging Entity's facilities must comply with the Charging Entity's rates and rules (e.g. requirement to purchase a specific tag reader). This system does not provide travelers with any options for how they interface with the system[35]. Figure 21 illustrates a closed system road user charging model.

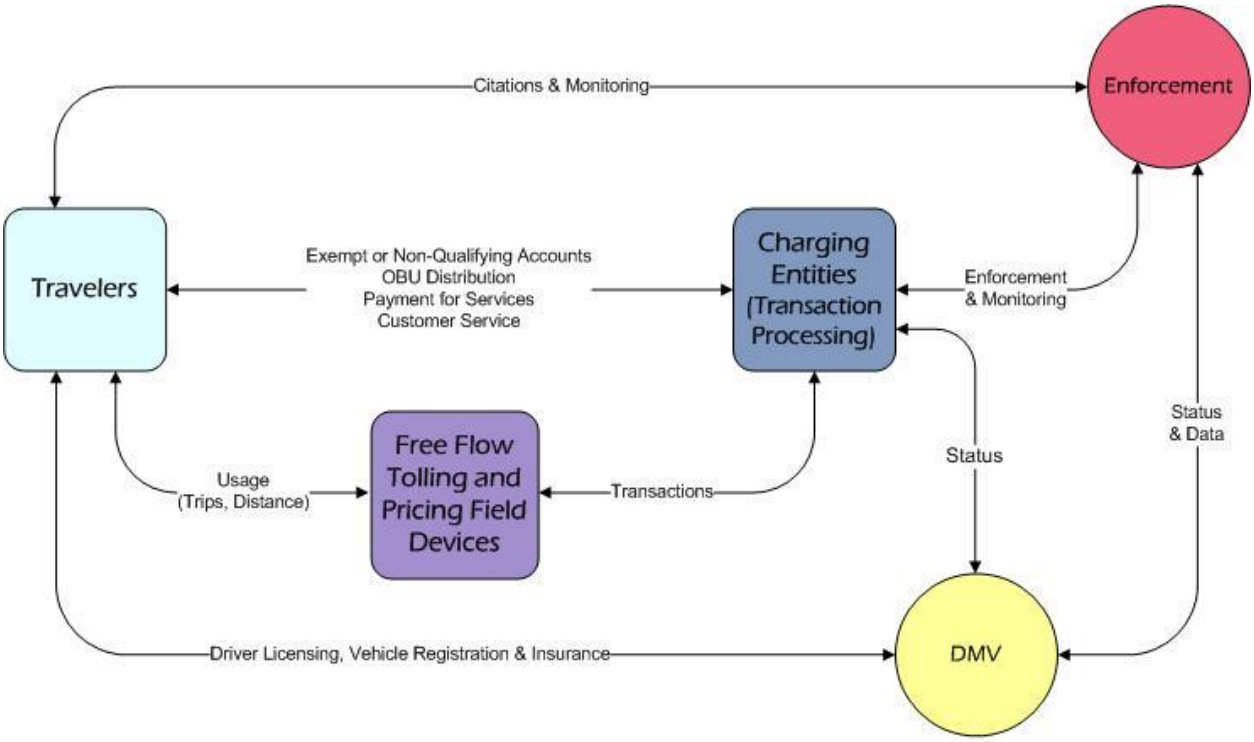


**Figure 21. Closed System Road User Charging Model**

An open system architecture model, on the other hand, is run by one or multiple Charging Entities using an integrated system based on common standards whereby interoperable components performing the same function can be readily substituted. Under this model travelers have accounts and submit payment for transportation services to the TTSP of their choice. The TTSP forwards the applicable payment to the Charging Entity. To appeal to travelers, TTSPs typically offer other services or structure the account and payment service plans that appeal to travelers. For example, a mobile phone company may act as, or partner

[34] RITA, ITS Joint Program Office Report, *ITS technology adoption and observed market trends from ITS deployment tracking*, Final Report, October 8, 2010, p.13, p.28 & p.34.
[35] IBID

with, a TTSP to allow travelers to use their mobile phones to interface with a charging system and to pay for toll charges as well as their parking payments and local transit usage in conjunction with the daily trips they make. Their billing is posted on their monthly mobile phone bill, which they pay to the mobile telephone company that shares the revenue with the TTSP. Figure 20 shows an open system model system for Oregon. This system is described in more detail under the *Road User Charging Applications Tomorrow* section.

*Background on Road User Charging in the United States*

Agencies throughout the United States use a small number of closed proprietary systems for road user charging as shown in Figure 22. The manufacturers of these systems compete intensively to procure exclusive contracts with road user charging authorities, which are then "locked-in" to use only that manufacturer's equipment. The operational costs (road user charge collection, administration of accounts, and enforcement) of these "closed systems" is 37%[36] as a percentage of revenues of road user charging authorities in the USA. The proprietary hardware and software of these manufacturers is not interoperable with other manufacturers' systems and the cost to change out individual components and the system is prohibitive.

As road user charging has become more of a mainstay for transportation financing, some agencies have been forced to use proprietary systems already in use by other agencies in the region. Interoperability exists to some extent on a regional basis, but as an exception rather than a rule. For example, Texas has selected a proprietary technology as their state standard. California created their "Title-21" tags and the standard is readable only by the tag supplier's equipment. The Interagency Group procures all of its readers and tags from one manufacturer. In many cases, each government agency tasked to operate road user charging facilities procures their system separately and tends to procure what they consider the best "deal" for themselves without regard for other charging facilities in the region or state. Some regions, such as Central Texas, have recognized the efficiencies and cost savings of an open system model and are working towards introducing TTSPs to their existing systems; however, there is a limited number of TTSPs who risk their business model on a single, sole source of supply.

These practices have promoted "closed systems" rather than "open systems" and have limited both interoperability and the addition of value-added services. Historic system codependences also limit the market's ability to change. Road user charging administration in the past collected cash for each driver's trip. The accounts and the management were controlled and operated by the road user charging administration. As electronic road user charging collection entered the market, although these were new business functions more aligned by the commercial and financial world, the road user charging administration shouldered the responsibility. As a result, rather than evolving with the new technology and reinventing the industry along more efficient lines, road user charging industries in foreign countries, without any historic system codependences, evolved in "open system" models and corroborated with commercial partners and the financial markets to reduce their ratio of operating costs to revenue percentage less than 10 percent.

[36] *NCHRP Project No. 19-08 (Costs of Alternative Revenue-Generation Systems), Interim Report #1*. Dec. 2009, p.57.

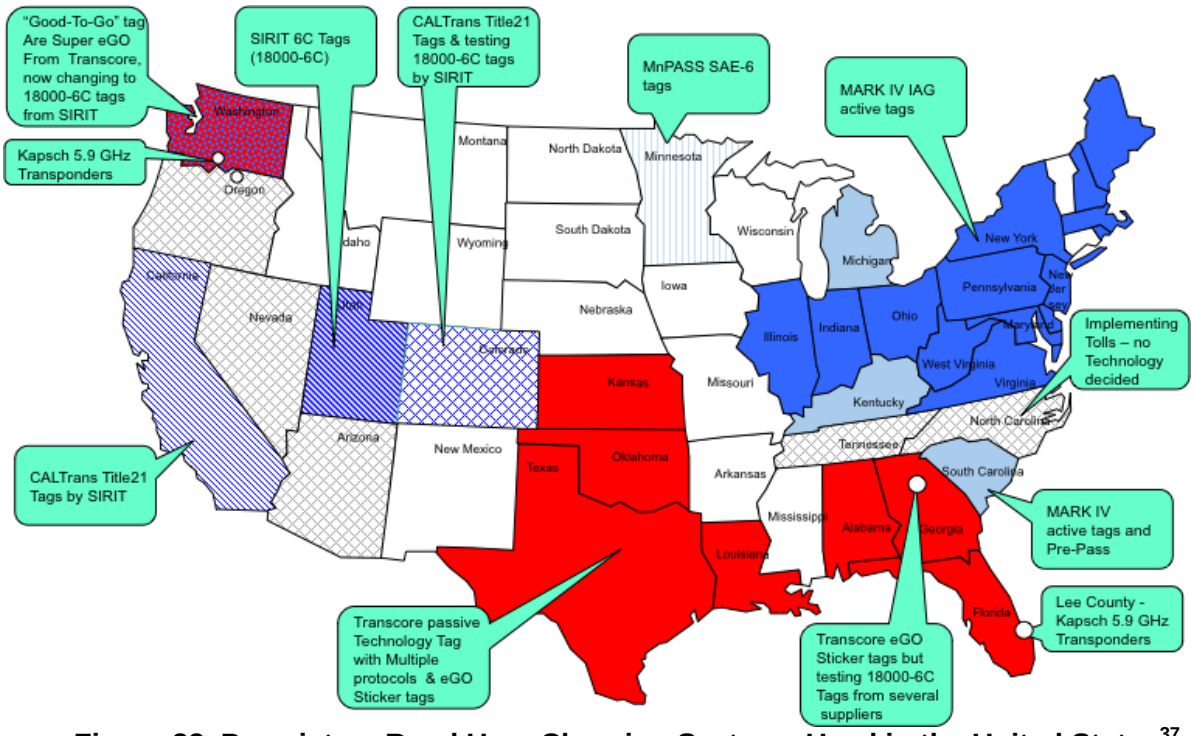


**Figure 22. Proprietary Road User Charging Systems Used in the United States[37]**

*Background on Road User Charging in Other Countries*

Newer road user charging systems in other countries are following open system models. A few highlights:

- The overhead for public agencies to operate open systems in Singapore, Portugal, and the United Kingdom averages 8 to 10 percent.
- Scandinavia successfully developed an interoperable electronic toll collection system in 2007. EasyGo, a TTSP, provides service for 40 Charging Entities, including several ferry operators, for customers in Norway, Sweden, and Denmark.
- New Zealand successfully replaced its 1977 closed Road User Charging system for diesel vehicle mass and distance charges to an open system in 2007.

*Oregon Weight-Distance Tax for Heavy Trucks*

The ODOT Motor Carrier Transportation Division (MCTD) operates a weight-distance tax system for vehicles that weigh more than 26,000 pounds. The current system relies on manual reporting. Most motor carriers report their weight-distance tax on a monthly basis. Motor carriers meeting certain conditions may report their tax on a quarterly or annual basis. MCTD is currently taking steps to implement an electronic reporting system and envisions the use of TTSPs in the future.

*Hood River-White Salmon Interstate Bridge Tolling System*

The Port of Hood River was the first to introduce electronic tolling to Oregon in 2007 and is still the only agency in the state to use electronic tolling. The Hood River-White Salmon Interstate Bridge originally was opened to traffic in 1924 by the Oregon-Washington Bridge Company. The west end of the bridge is in Hood River, Oregon, and the east end of the bridge is in White

[37] *Ibid*. Figure 21.

Salmon, Washington. From 1924 until 2007, the Hood River-White Salmon Interstate Bridge operated manual tolling. In 2007, an electronic system was added to the existing manual tolling lanes to address the congestion and over demand at the toll collection booths. Electronic tolling is accepted in all four lanes and cash is also accepted in the inside two lanes by manual toll collection. This section describes the software, tag and reader system, accounting, auditing procedures, and customer system used for electronic tolling of the Hood River-White Salmon Interstate Bridge.

*Software*[38]

The software used for the Hood River-White Salmon Interstate Bridge tolling system provides users with web access to their accounts and must be compatible with both the hardware (gates, readers, lights) and accounting system. The tolling software used is Toltag, which is also used in Florida and on the New Jersey Turnpike. There are no licensing fees for the software, but ongoing customization is billed as needed by task.

*Tag and Reader System*[39]

The electronic toll collection system, BreezeBy, was launched in November of 2007 at the Hood River-White Salmon Interstate Bridge. Electronic, 915MHz TransCore eGo sticker tags and TransCore 2210 readers are used in the current tolling system. This system relies on Idris smart loops in the pavement that detect, track, and classify vehicles. The tags are radio based and are affixed to the windshield of the vehicle. There are a few problems with trucks because of the vertical windshields and metal visors. The system operates under slow speeds from 10-20 mph.

The Port of Hood River is also currently testing the 5.9GHz Kapsch readers and transponders in parallel with the current system. The 5.9GHz system is a nonproprietary standard and is expected to have better accuracy, localization, encryption, speed, and other performance aspects than the 915MHz devices. Early test results comparing the two technologies indicate these performance aspects to be true. The 5.9GHz transponder is also proving to offer better localization (determination of the position of the vehicle in the roadway).[40] The standard being used is the 802.11p protocol approved by IEEE.

Accounting, Auditing Procedures, and Customer System

The electronic tolling tasks are performed by the Port of Hood River. To set up an account, users can apply online, over the phone, by mail, or in person at the Port office. The Port office has six total staff; three people can set up electronic tolling accounts. A temporary employee worked part time to set up new accounts during the first month of operation. Approximately 4,100 accounts were opened for the BreezeBy electronic system and 10 to 20 new accounts are opened each week. The toll charged is based on the number of axles the vehicle has. Users who have a BreezeBy account receive a 20 percent discount on the cost of the bridge toll.

The Port provides the first three tags free to users. Tolling agencies in other states typically do not provide any free tags. Additional tags for the Hood River-White Salmon Interstate Bridge cost $15 for a standard tag and $27 for external tags for motorcycles or vehicles with dark tinted windows.

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[38] Garth Appanaitis', DKS Associates, phone interview with Linda Shames, Port of Hood River Finance Manager, Aug. 2010.

[39] *5.9 GHz ET Test at Hood River OR-White Salmon WA Toll Bridge over Columbia River.* TOLLROADSnews. Sept. 13, 2010 http://www.tollroadsnews.com/node/4897. Accessed Oct. 8, 2010.

[40] Telephone interview with Jerry Hautamaki, Hood River, February 2011. Note, no test results provided, but verbal confirmation received.

*Tacoma Narrows Bridge Tolling System*

The Tacoma Narrows Bridge, which is the first facility in Washington to use an electronic toll collection system, is located approximately eight miles west of Tacoma and approximately 40 miles south of Seattle and is operated by WSDOT. The new Tacoma Narrows Bridge (SR 16) is a parallel span to the south of the existing bridge. The new Narrows Bridge carries eastbound traffic, while the westbound traffic uses the 1950 Narrows Bridge. The new Narrows Bridge opened to traffic in July 2007. It had been nearly twenty years since the last facility had been tolled in Washington. This section describes the tag and reader system, accounting, auditing procedures, and customer system used for electronic tolling of the Tacoma Narrows Bridge.

*Tag and Reader System*

The Good To Go! system is the electronic tolling option used in the state of Washington that uses TransCore eGo sticker tags. The sticker tags are using 915 MHz technology with the 18000-6B (proprietary) standard for the Tacoma Narrows Bridge tolling and for the SR 167 HOT Lanes Pilot Project. Tolling on the SR 520 bridge will begin in spring 2011. WSDOT recently awarded a new contract to Sirit Inc. for supply of a newer generation 18000-6C sticker tag (which still uses 915 MHz technology) and are in the process of changing over to this standard.

On the Tacoma Narrows Bridge, there are two options for paying the toll. Drivers can stop and pay manually with cash or credit at the toll plaza or they can pay electronically without stopping. The WSDOT had originally planned to accomplish electronic tolling by having travelers use a prepaid Good To Go! Account, which requires a transponder on the vehicle's windshield and can be prepaid online. The transponder is supposed to allow the driver to maintain highway speeds by remaining in the express lanes without stopping at the toll plaza. However, it turns out the Good To Go! transponders are not interoperable with the transceiver equipment on the Tacoma Narrows Bridge[41]. For now WSDOT plans to use image based tolling to keep traffic moving.

*Accounting, Auditing Procedures, and Customer System[42]*

There is no charge to sign up for a Good To Go! account and applications are accepted online, over the phone, or by mail. Now that image based tolling is being used, license plates captured on video will be checked to see if there is a corresponding Good to Go! account and charges will be applied automatically through the Good To Go! account. Travelers without Good to Go! accounts will receive a bill in the mail. Currently, violators without a Good To Go! transponder and that skip the toll booths are issued a $52 citation. Pay By Mail will give them up to 80 days to pay their toll bill before being issued a citation[43].

WSDOT has a toll operations contract with TransCore. TransCore operates and manages aspects of the Tacoma Narrows Bridge toll system including in-lane operations, violations processing, customer service, maintenance, accounting, and financial reconciliation for a fixed monthly fee. As part of WSDOT and TransCore's toll collection and accounting system and operating agreements, WSDOT tracks and expects the following accuracy and performance measurement:

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[41] *WA's new toll sticker unreadable on Tacoma Bridge*. Associated Press. March 17, 2011.

[42] *Statewide Tolling Operations Contracts for the Tacoma Narrows Bridge and SR 167 HOT Lanes Information Packet*. Washington State Department of Transportation. Feb. 2008.

[43] *Citizens Group Considers New Ways to Pay Narrows Bridge Tolls*. Washington State Department of Transportation. Sept. 27, 2010. http://www.wsdot.wa.gov/News/2010/09/_27AdvisoryCommitteeMeeting.htm. Accessed October 8, 2010.

- Handling 80 percent of inbound phones calls to the service center in 30 seconds
- Keeping the number of calls abandoned at three percent or less
- Fulfilling requests for new or replacement transponders within three days
- Processing 98 percent of license plate data from the video-toll system and sending to the Department of Licensing within two business days
- Correctly entering 99.9 percent of all license plate data on the first review

In addition, a high level of accuracy in electronic toll collection, vehicle classification, violation imagery, lane availability, and customer service center computer system availability is expected. These and other contractual measures are used by WSDOT to evaluate tolling operations with TransCore. WSDOT is responsible to pay direct reimbursable cost items including replacing and installing capital toll system equipment and significant system enhancements.

### *Road User Charging Issues*

In Oregon and the United States, the following road user charging issues exist today:

- Throughout the United States the road user charging industry operates more like a set of local monopolies than a real market. The systems currently in operation are closed systems that use proprietary equipment.[44]
- Little has been done at the federal level to develop interoperable road user charging services. The National ITS Architecture includes limited standard protocols for road user charging and the electronic toll collection market package framework is set up for closed systems. The International Bridge, Tunnel and Turnpike Association (IBTTA) has held several conferences on interoperability but has not agreed on a way to change the status quo.[45]
- Historically the manufacturers and vendors in the market have not had strong enough incentives to overcome the challenges involved to establish interoperability. To the contrary, the manufacturers and vendors have actually spent lobby efforts to protect their current market.[46]
- Administrative and account management costs of closed system models are high. The estimated revenue to overhead ratio for handling transactions averages approximately 37 percent in the market[47].
- Development of an integrated back office system that captures all the functions associated with road user charging is challenging.
- The public is more hesitant to give their personal information (e.g. vehicle location, financial information) to a public agency than to private establishments.
- Non-Oregon residents are harder to charge and to enforce payment.
- Some travelers will refuse to participate in charging systems and try to avoid payment. Enforcement of violators is difficult because may travelers do not update their mailing address with the Department of Motor Vehicles and prosecution is expensive.

### *Road User Charging Applications Tomorrow*

The Oregon road user charging applications of tomorrow will use an open system architecture model to collect mileage-based taxes to supplement or possibly in lieu of the current fuel tax, to improve the existing tax collection system for trucks, to collect tolls to raise revenue for specific facilities, and to use congestion pricing to manage travel demand on congested facilities. The

[44] RITA, ITS Joint Program Office Report, *ITS technology adoption and observed market trends from ITS deployment tracking*, Final Report, October 8, 2010, p.28
[45] IBID, p.30
[46] IBID
[47] NCHRP Project No. 19-08, Interim Report #1, December 2009.

open system architecture model will also support the collection and processing of public transportation fares and parking charges for public agencies that wish to share the efficiencies of the system. This section describes the technology options for the roadside equipment and back office system, pricing and payment concepts, enforcement, principles for operating an effective open system, and a discussion of how road user charging systems fit with other statewide systems.

*Technology Options for Road User Charging*

Although the technology options may vary by the type of road user charge, the system components needed for road user charging fall into two main categories: roadside equipment and back office system. Travelers interact with both parts of the system as shown in Figure 23. This section provides a high level overview of roadside equipment and the back office system.

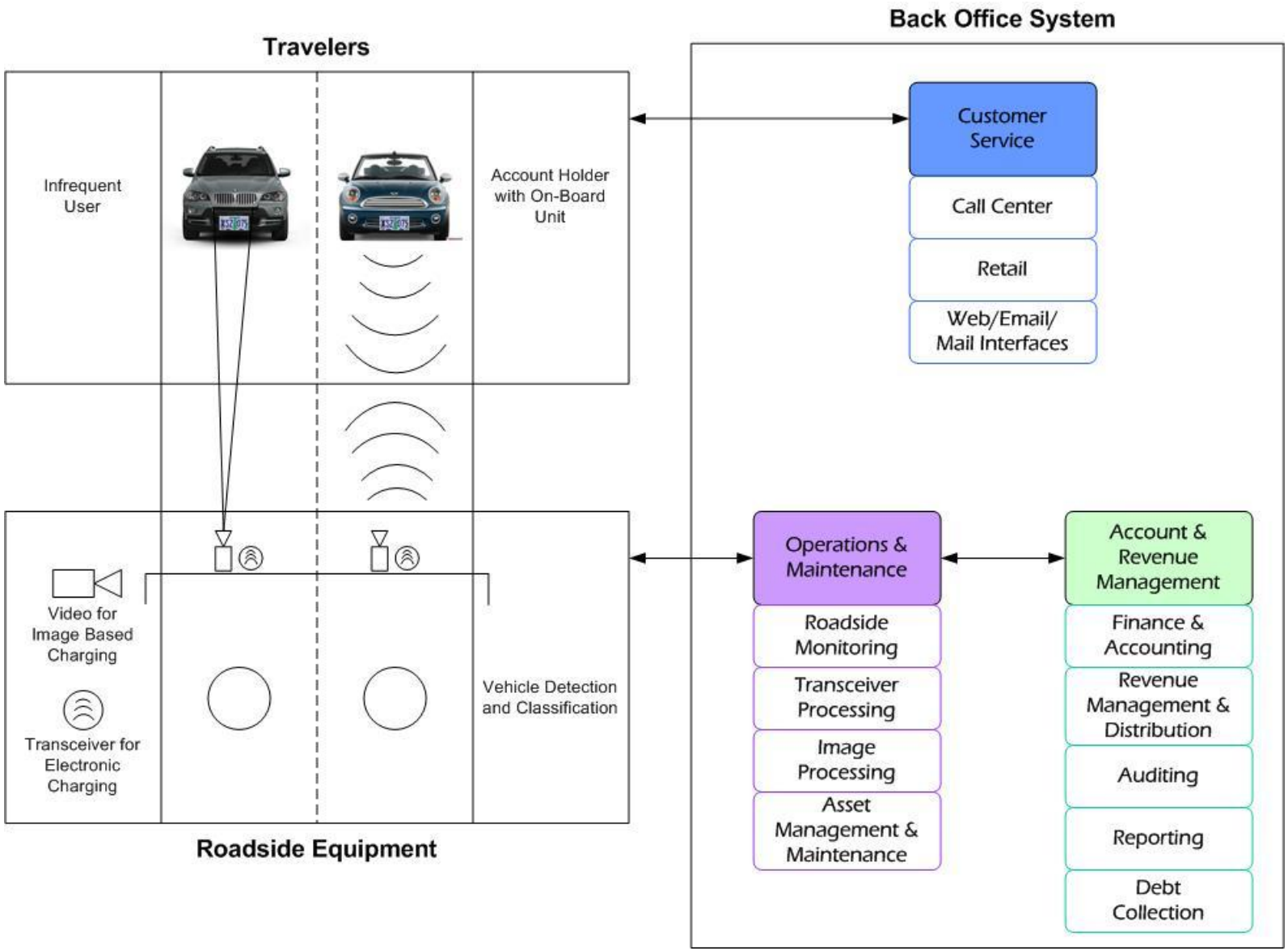



**Figure 23. Road User Charging System Components**

*Roadside Equipment*

For typical free flow road user charging applications, Oregon plans to deploy roadside equipment that supports three main functions:

1. Electronic road user charging
2. Image based road user charging
3. Vehicle detection and classification

Plazas with manual road user charge collection (e.g. cash or credit transactions in the field) are not desired to be used in order to keep traffic flowing and to minimize traveler and freight delays and overhead costs for road user charge collection. Cash payment will still be an option but collection methods other than physical plazas are being explored. This section describes each of the three roadside equipment functions for most charges, such as tolls and fees, as well as some variations for other road user charging applications.

Electronic road user charging will be accomplished by using a transceiver for each travel lane to communicate with vehicles that have an on-board unit (OBU). OBUs may be available in various forms such as tags (typically affixed to the windshield), an odometer subsystem, or mobile phones. Distribution and sale mechanisms for OBUs will vary by type of road user charge. Developing a standard protocol for communications between the transceiver and an OBU is one of the key pieces to a successful open system. The standard protocol must allow private industry the flexibility to develop innovative technologies for OBUs that attracts customers while also simplifying the requirements of the transceiver, which will be installed and maintained in the field by the Charging Entity.

Image based road user charging, also called video road user charging, will use a video camera for each travel lane to capture occasional users who choose not to obtain an OBU. The video camera will capture an image that will likely be used to identify a vehicle's license plates or other distinguishing vehicular features. The owner of the vehicle captured on video will be sent a bill for the road user charge. Image based road user charging will be operated by a Charging Entity or a third party through a contract with a Trusted Third Party Service Provider.

Detection equipment will be used to count and classify vehicles to support accountability and payment reconciliation activities. In some cases this data will also be used to determine the appropriate price of the charge (e.g. rates based on number of axles or rates based on lane usage). This detection equipment is the same as that discussed in the Regional Traffic Control Operational Concept.

Additional hardware and software will be required in the field to run the equipment and to communicate with the back office system.

The exact configuration of the roadside equipment will vary by the road user charging application:

- Specific roadway or facility tolls or fees: Transceivers and video cameras will likely be installed over each travel lane on a gantry, which is an overhead structural support. Vehicle detection equipment may be installed overhead, in the pavement, or on the side of the roadway.
- Mileage based taxes: Oregon is still exploring options for the collection of mileage based taxes. One option currently under consideration is to install transceivers at key locations (e.g. Wi-Fi hot spots) to communicate with OBUs. In this case an OBU may be an

odometer subsystem. Vehicles without an OBU will likely be taxed through a separate non-roadside system where travelers report their road usage and pay accordingly.

- Public transportation fares: The fare box on-board the public transportation vehicle or at a station will likely act as a transceiver that communicates with an OBU carried on the traveler themselves.
- Parking fees: Transceivers will likely communicate with OBUs. Parking agencies may choose to continue the use of parking meters for occasional users, they may use video cameras, or they may develop an alternate system to capture vehicles without OBUs.

*Back Office System*

The back office system is the heart of the road user charging system that performs all of the functions necessary to account for travelers and their applicable charges and to facilitate funds transfers between participating parties. In a simplified view, the back office system handles the following major functions:

- Account creation and maintenance
- Road and customer data collection and processing
- Reconciliation and audit of road usage data and revenue collection and distribution
- Financial data processing and statistical reporting
- Administrative and operational supporting activities

ODOT envisions they will operate an integrated back office system[48] for the entire state that allows the flexibility for modules and interfaces with various subsystems. ODOT Motor Carrier Transportation Division already operates a back office system for the truck weight-distance tax system. This system will likely be a module within the statewide system. The ODOT system will be the default back office system should a traveler choose to process with the state rather than a TTSP. The back office will provide all the elements of a back office system (account management, customer service, invoicing, and accounts payable) in addition to a link to Treasury and to all certified TTSPs. Revenue will typically be accounted for in the Financial Services Branch regardless of who collects it. Debit accounts and pre-processing of transactions will be the only type of accounts managed by the ODOT back office system. The main back office system will need to be set up to be flexible and allow for future expansion.

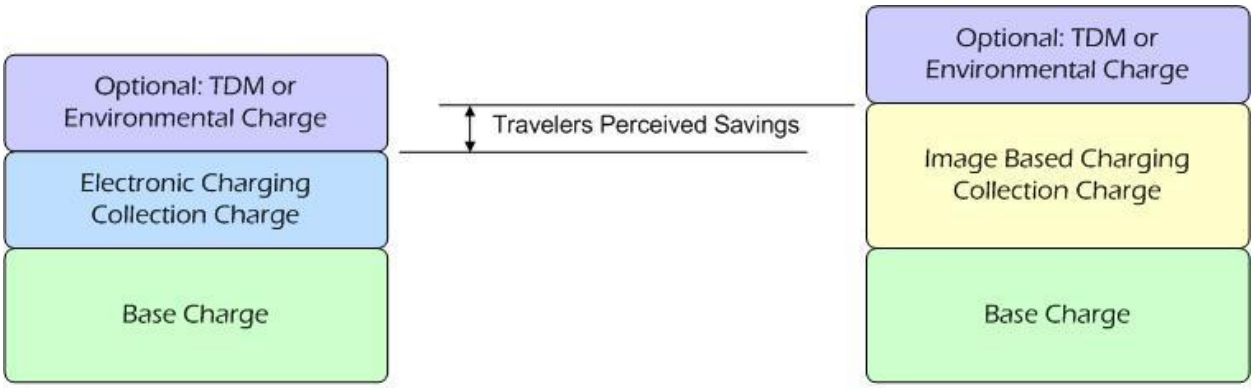
Trusted Third Party Service Providers will operate their own back office systems but standard protocols must be established so that their systems will interface with the statewide system. Transactions accumulated by the Charging Entities will be aggregated by the ODOT state back office system and batched daily to the respective TTSPs who own the accounts of the Travelers. Reconciliation of the transactions and any discrepancies will be performed within 24 hours of receipt of a batch of daily transactions. Irregularities and abnormal transactions will be reported and reconciled in this time frame. It is envisioned that TTSPs will handle accounts for users on a post-pay basis. Risk of handling and receipt of payments will be the responsibility of the TTSP. Debt collection will also be the responsibility of the TTSP; however, the risk of recovery of non-payment or avoidance of payment for road charges once the TTSP properly notifies the Charging Entity of all attempts to recover overdue or past due charges becomes a shared responsibility with the Charging Entity. The Charging Entity will in turn alert Enforcement with the information provided by the TTSP and will assist the Charging Entity if travelers attempt to avoid paying their fair share of the charges due.

[48] The statewide back office system may be one system or an integrated collection of several systems.

*Pricing and Payment Concepts*

This section describes charge components, pricing methodology, payment options, and account types.

Figure 24 shows and defines the components of a roadway charge: base charge, collection charge, and optional charge. The collection charge is typically what influences a traveler's decision about whether or not to set up an account with a Trusted Third Party Service Provider. The equipment and overhead to operate electronic road user charging is typically less than image based road user charging; therefore, the collection charge for image based road user charging is higher. This also provides incentive for travelers who frequently use facilities with road user charges to work with a TTSP. Additionally, TTSPs who offer value added services (e.g. traveler information) at little or no cost also entice travelers to use their services because they perceive a better value in what they are purchasing.




**Legend**
Base Charge: Finances the construction, operation, and maintenance of transportation infrastructure
Collection Charge: Finances the operation and maintenance of the tolling system
Optional Charge: May include travel demand management or environmental charges designed to influence traveler behavior

**Figure 24. Charge Components**

Prices for road user charging may be set using a variety of methods:

- Distance: Everyone pays a fair share through a rate applied to the vehicle characteristics and the distance traveled within the Charging Entity's domain or along a specific link in the network.
- Event: A charge is set at a specific point or event along a facility (e.g. entrance to a bridge or tunnel) or is based on distance traveled since the last payment event.
- Zone: A charge is assessed if travelers choose to drive in a particular area or zone (e.g. downtown).
- Time Duration: A charge is based on how long a vehicle is present at a specific location or area (e.g. parking facility, state park, recreation area).
- Lane: A charge is established for use of part or the entire length of an express lane as a premium service during peak time and congestion periods (e.g. high occupancy toll lane).

Prices may vary by vehicle type, vehicle weight, (actual, rated gross vehicle weight, or weight bands), fuel efficiency, time of day, location of travel, or other incentive-based pricing schemes.

Although electronic payment is preferred, road user charging in Oregon will support the following methods of payment:

- Cash
- Check (bank or electronic)
- Money order
- Credit and debit cards
- Electronic funds transfer.

Approximately one-third of the population uses cash only and so it is vital to provide a cash payment option.

All travelers must set up an account with either a TTSP (preferably) or a Charging Entity. Each TTSP and Charging Entity must decide if they want to collect charges using pre-payment or post-payment:

- Pre-payment: Under this scenario travelers must keep a specified minimum amount of money in their account. As road user charges are incurred they are deducted from the money in the account. Pre-payment is a common practice in the road user charging industry.
- Post-payment: Under this scenario travelers are required to pay their account within a specified time period after road user charges are incurred. Post-payment is most familiar to travelers who are used to paying for services or utilities after they have consumed or used them.

Charging Entities will most likely require pre-payment to minimize risk of non-payment. TTSPs may make pre-payments to Charging Entities but allow travelers to provide post-payment. For road user charges administered by the state, payments are required to adhere to prescriptive legal requirements. Additionally, Charging Entities must allow for anonymous accounts to address some travelers' concerns over privacy. Anonymous accounts are recognized by a number rather than a name and do not provide any personal details to Charging Entities.

*Enforcement*

Enforcement is a key tool for fostering payment compliance and the type of enforcement used is dependent on the type of road user charge. Enforcement for road user taxes will be established by legal statute. For tolls, fees, and fares the enforcement system will be developed by the Charging Entity. Common enforcement methods used elsewhere include record comparison, targeted manual field enforcement of frequent violators, and mobile enforcement. Citations will be issued to travelers who do not pre-pay or post-pay for road user charges.

*Principles for an Effective Open System Architecture Model*

To operate an effective open system architecture model for road user charging, six principles should be followed:

1. **Principle 1: Travelers are required to self-declare their road usage.** Ideally travelers set up an account with a TTSP, who collects road usage and reports it to the Charging Entity. However, travelers may also report their road usage directly to the Charging Entity.
2. **Principle 2: Charging Entities set quality requirements for TTSPs.** TTSPs demonstrate their ability to report the road usage of their subscribers with no more than a certain error percentage in the amount paid per time period.

3. **Principle 3: TTSPs design their own solution for user choices.** This allows TTSPs to develop and use technology of their choice to measure and report road usage. This encourages innovation and creative solutions.
4. **Principle 4: Charging Entities monitor and control TTSPs.** Charging Entities measure accuracy and audit the reconciliation of revenues with each TTSP. TTSPs may be required to post surety bonds or guarantee their fiduciary standing.
5. **Principle 5: TTSPs monitor and control travelers.** TTSPs check compliance of travelers by remote OBU checks, statistical analysis, and process audits.
6. **Principle 6: Charging Entities monitor and control non-subscribing travelers.** Charging Entities use image based tolling to charge travelers the appropriate tolls. For mileage-based taxes alternate methods will be needed to monitor non-subscribing travelers.

*How Road User Charging Systems Fit with Other Statewide Systems*

The charging systems described in this operational concept introduce new interfaces with existing statewide systems as shown in Figure 25. Most importantly, traffic conditions data (e.g. vehicle count, classification, and speed) needs to conform to a common standard that interfaces with both charging systems and traffic management systems. Traffic conditions data collected by charging systems will be used by traffic managers in their day-to-day operations of the system and will also be fed to information service providers as traveler information and to archived data systems to support performance evaluation and transportation planning. Traffic conditions data that is channeled to charging systems will most likely be used for auditing and congestion pricing applications.

The open system architecture model lends itself to applications for public transportation fare and parking charge collection. Once the back office system and TTSPs have been established, public transportation and parking agencies could develop their own back office system modules to interface with TTSPs. This would allow travelers to pay for multiple services through one source. For instance, if a mobile phone service provider is a TTSP or partnered with a TTSP travelers could use their mobile phones to pay for roadway charges, public transportation fares, and parking charges as part of their normal monthly bill. A few agencies that may be interested in participating in the statewide open system during the next 10 years:

- Salem Cherriots: They plan to replace their fare box within the next few years with a system that allows the flexibility to perform electronic fare collection. They would like to run an electronic fare collection pilot study within the next year. Cherriots envisions the use of an open system and would like it to be interoperable with other public transportation agencies in Oregon.
- TriMet/C-TRAN: Within the next five years these two agencies plan to jointly procure an electronic fare system to replace their current fare boxes. They want to use an open system and are starting to explore available options.
- Rogue Valley Transit District: Their software includes an application for electronic fare collection but they do not own transceivers to support it. Currently they have other higher priority needs they must attend to.
- City of Portland: They conducted a business case study on a fully electronic parking system several years ago and will soon be conducting a pilot project that will likely use mobile phones for parking charge payments. As part of a future electronic system the City envisions the ability for travelers to reserve off-street parking and the ability to adjust parking prices based on congestion.

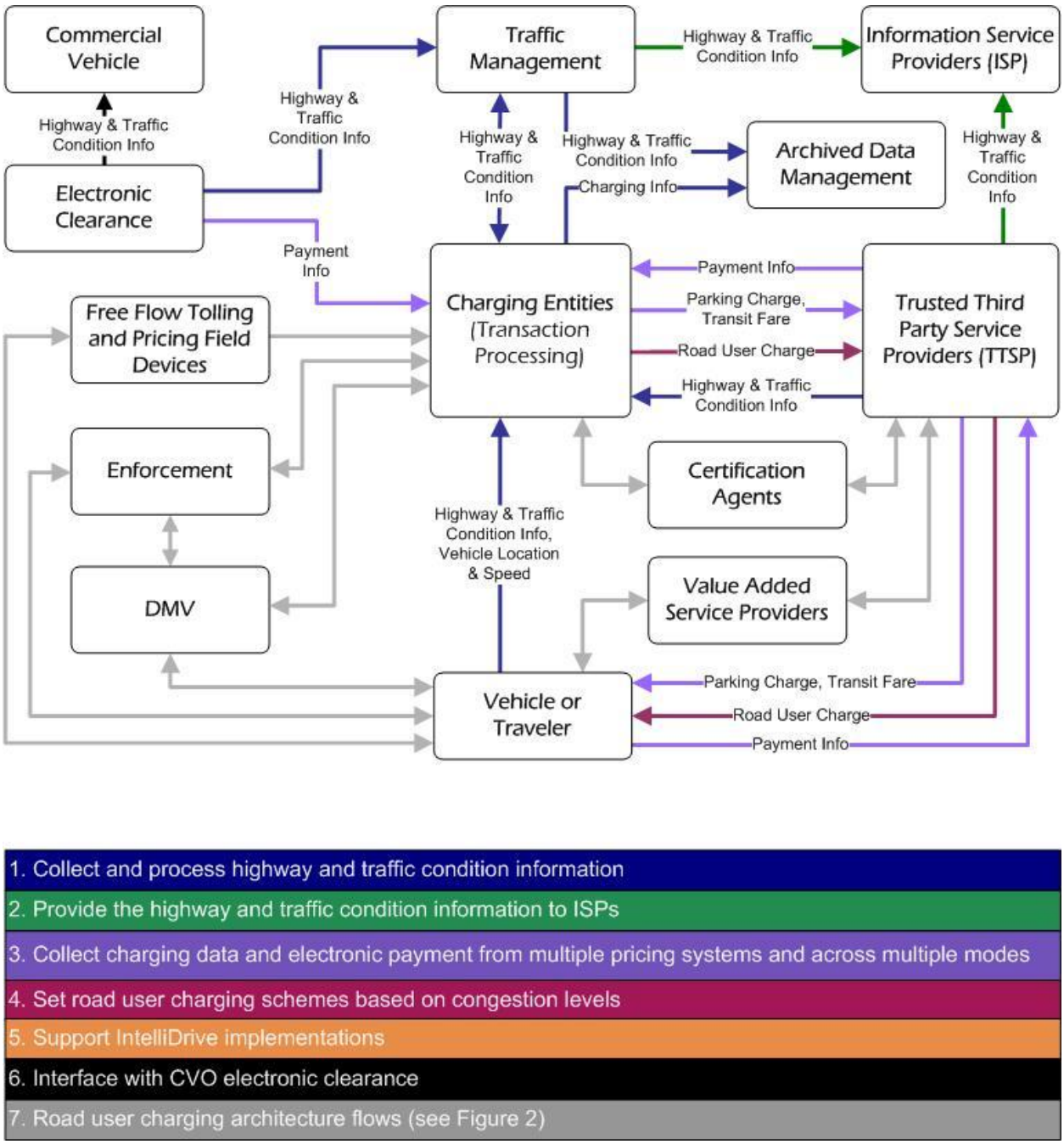



**Figure 25. How Tolling Systems Fit with Other Statewide Systems**

### *Road User Charging and the National ITS Architecture*

The National ITS Architecture includes a user service for Electronic Payment Services that addresses electronic toll collection, transit fare payment, and parking payment. These areas are covered under three market packages: 1) Electronic Toll Collection (ATMS10), 2) Transit Fare Collection Management (APTS04), and 3) Parking Facility Management (ATMS16). The electronic toll collection market package is set up with a closed system architecture with a focus on interactions directly between the toll administration center and the toll collection field device.

It does not include TTSPs within the market package architecture. However, TTSP elements may be added to the statewide ITS architecture along with custom information flows to map the interfaces shown in this operational concept (Figure 19).

While the National ITS Architecture does include a few ITS standards associated with the electronic toll collection market package, much work still needs to be done to develop interoperable ITS standards. The data flow for "toll probe data" has been flagged as a candidate for future standardization and the following standards have been developed for use in some vehicle payment data flows:

- DSRC 5 GHz: Dedicated Short Range Communication at 5.9 GHz Standards Group
- DSRC 915 MHz: Dedicated Short Range Communication at 915 MHz Standards Group
- IEEE 1455-1999: Standard for Message Sets for Vehicle/Roadside Communications

The following automotive industry standards may be applicable for use by TTSPs:

- SAE J2266: Location Referencing Message Specification
- SAE J2735: Dedicated Short Range Communications Message Set Dictionary

ODOT and other road user charging stakeholders will need to work with national standards organizations to push for the development of ITS standards for an open road user charging system. This process needs to start now. The standards are constantly evolving to keep up with advancements in technology and most of the time they are backward compatible with earlier standards.

### *Stakeholder Roles and Responsibilities*

Many political and institutional decisions still need to be made before defining specific road user charging roles and responsibilities; so Table 20 describes the typical roles and responsibilities for generic stakeholders and Table 21 identifies what potential stakeholders may fill these roles in Oregon. At the end of this section there is a discussion about the roles and responsibilities that ODOT anticipates taking on.

**Table 20. Road User Charging Planned Roles and Responsibilities**

| Stakeholder | Roles and Responsibilities |
|---|---|
| Statewide Charging Standards Committee | ▪ Identify data flows that require standardization for interoperability.<br>▪ Work with national standards organizations on the development of road user charging ITS standards.<br>▪ Establish interface and protocol standards for road user charging collection in Oregon. |
| Charging Entities | ▪ Design/construct/maintain/operate roadside equipment (electronic toll transceivers, image based system, and vehicle count/classification system).<br>▪ Set prices, through the Oregon Transportation Commission as applicable, for all charging applications within the Charging Entity's domain. These may be set by legislation (e.g. taxes). Pricing may also include base charges, travel demand charges, and environmental charges.<br>▪ Collect transaction data (road usage) from travelers either directly or indirectly through another Charging Entity. |

| Stakeholder | Roles and Responsibilities |
|---|---|
| Charging Entities (continued) | ▪ Consolidate transactions by TTSP and reconcile with TTSP on payments.<br>▪ Audit and monitor TTSPs, customer surveys, and overall efficiency of system.<br>▪ Work with Enforcement Agent to enhance compliant behavior for travelers. Ensure non-compliance travelers who do not report road usage directly or travelers who attempt to avoid payments are prosecuted.<br>▪ Handle exempt accounts that legally are not required to pay charges. Once established by legislation, these may include transit vehicles, police vehicles, fire and life safety vehicles, state vehicles, military vehicles, etc. [One way to handle exempt accounts is to provide an OBU for vehicle tracking.]<br>▪ Handle accounts that do not qualify or choose not to do business with a TTSP. |
| Trusted Third Party Service Providers (TTSPs) | ▪ Provide subscribing travelers with on-board units for their vehicles or provide alternate technology that is certified and compliant by the Certification Agent (e.g. smart phones with verified and compliant apps).<br>▪ Provide a service profile that offers travelers value over the Charging Entity service profile and operates at a lower operational fee (value for money).<br>▪ Optional: provide travelers with other value added services (e.g. traveler information) to entice them to use a particular TTSP over other TTSPs or the Charging Entity.<br>▪ Collect road usage data of subscribing travelers and collect payment from those travelers for charges and other value added services. |
| Certification Agents | ▪ Test and certify that Charging Entities' and TTSPs' road user charging collection equipment meets the interface, common standards and protocol standards established by the Statewide Charging Standards Committee.<br>▪ Maintain and record configuration management of all road user charging collection equipment.<br>▪ Maintain and keep current a list of all certified road user charging collection equipment.<br>▪ Maintain and keep current on all changes to the common standards and keep the Charging Entities and TTSPs appraised of any changes and their impact. |
| Enforcement Agents | ▪ Monitor travelers for charge compliance.<br>▪ Issue citations for non-compliant behavior.<br>▪ Report monitoring and enforcement activities to Charging Entity.<br>▪ Provide DMV with updated information about travelers and their vehicles when this information is collected through the enforcement process. |
| Value Added Service Providers | ▪ Provide value added services either directly to travelers or as part of a package provided to travelers through TTSPs.<br>▪ Identify and provide unique value added services for the travelers' end-to-end experience. |

| Stakeholder | Roles and Responsibilities |
|---|---|
| Value Added Service Providers (continued) | ▪ Be open to expanded markets and TTSP access to wider markets for services. |
| Oregon Driver and Motor Vehicle (DMV) Services Division | ▪ Provide Enforcement Agent with access to statewide vehicle registration database. |
| Exempt (Non-Revenue) Account Holders | ▪ Set up exempt accounts with Charging Entity.<br>▪ Optional: Maintain an operable road user charging on-board unit (OBU) in exempt vehicles. |
| Travelers (also called Road Users) | ▪ Choose any TTSP or the Charging Entity to handle road user charge records and payments.<br>▪ Optional: Maintain an operable road user charging on-board unit (OBU) in the traveler's vehicle or maintain alternate technology (e.g. mobile phone with GPS).<br>▪ Retain road usage mileage and facility usage records.<br>▪ Report road or facility usage to Charging Entity either directly or through the assistance of a TTSP.<br>▪ Promptly pay fair share of road or facility usage consumed. |

**Table 21. Potential Oregon Road User Charging Stakeholders**

| Generic Stakeholder | Potential Oregon Stakeholder |
|---|---|
| Charging Entities | ▪ ODOT<br>▪ ODOT Financial Services<br>▪ ODOT Motor Carrier Transportation Division<br>▪ Public-Private Partnership Corporate Group or JV<br>▪ Local Traffic Management Agencies (for road use and/or parking)<br>▪ Public Transportation Service Providers<br>▪ External State Departments of Transportation<br>▪ External State Departments of Motor Vehicles<br>▪ External State Local Traffic Management Agencies |
| Trusted Third Party Service Providers (TTSPs) | ▪ Bank or Financial Institutions<br>▪ Mobile Network Operators<br>▪ Credit Card Companies<br>▪ Utility Companies<br>▪ Navigation Unit Providers<br>▪ Insurance Companies<br>▪ Vehicle Equipment Retailers<br>▪ Fuel Credit Card Companies<br>▪ Traveler Information Service Providers<br>▪ Many other possibilities |
| Certification Agents | ▪ Independent Electronics Laboratory<br>▪ University |
| Enforcement Agents | ▪ Oregon State Police<br>▪ Local Law Enforcement<br>▪ Third Party law enforcement agency |

| Generic Stakeholder | Potential Oregon Stakeholder |
|---|---|
| Exempt (Non-Revenue) Account Holders | ▪ Commercial HazMat Clean-Up Operators<br>▪ Commercial Salvage and Towing Operators<br>▪ Emergency Medical Service Providers<br>▪ External State Police Agencies<br>▪ Local Fire and Life Safety<br>▪ Local Law Enforcement<br>▪ Oregon State Police<br>▪ Public Transportation Service Providers |

*Anticipated ODOT Road User Charging Roles and Responsibilities*

As the owner of the state highway system, ODOT will either take on all the roles and responsibilities of the Charging Entity for state facilities or will more likely take on some of the Charging Entity roles and responsibilities and contract the remaining ones to third parties. Road user charging roles and responsibilities that will likely be carried out by ODOT:

- ODOT:
  - Set pricing and implement road user charging systems based on direction from the Oregon Transportation Commission.
  - Design/construct/maintain/operate roadside equipment.
- ODOT Financial Services:
  - Collect charges from Charging Entities or TTSPs.
  - Perform charge collection accounting and auditing.
  - Conduct financial analysis and develop performance reports.
  - Perform enforcement.
- ODOT Motor Carrier Transportation Division (MCTD):
  - Introduce TTSPs and Certification Agents to MCTD's existing weight-distance tax collection system for trucks to change it from a closed system to an open system.

Specific Oregon Transportation Commission (OTC) roles and responsibilities have been adopted into state legislation (e.g. ORS 184, ORS 383) regarding road charges. ODOT will work closely with OTC to carry forward any decisions made by OTC. For instance, OTC will likely approve all contracts for public-private partnerships that will establish the TTSPs.

# ITS STANDARDS

ITS standards, developed through industry consensus, define how system components should work within the National ITS Architecture to support deployment of interoperable systems at local, regional, state, and national levels. The U.S. Department of Transportation (U.S. DOT) ITS Standards Program has developed cooperative agreements with standards development organizations (SDOs) for development of non-proprietary, industry-based standards (approximately 100 separate standards are in various phases of development) and has been encouraging the use of standards for ITS interoperability. They maintain a website[49] that provides ITS standard development status and activities as well as deployment resources (technical assistance, training, publications, standards testing, and forums).

This section includes a summary of why standards should be used, the standards development and adoption processes, interface classes and standards application areas, and a description of how standards are applied to the Oregon Statewide ITS Architecture.

## Why Use ITS Standards?

ITS standards should be used for the following reasons[49]:

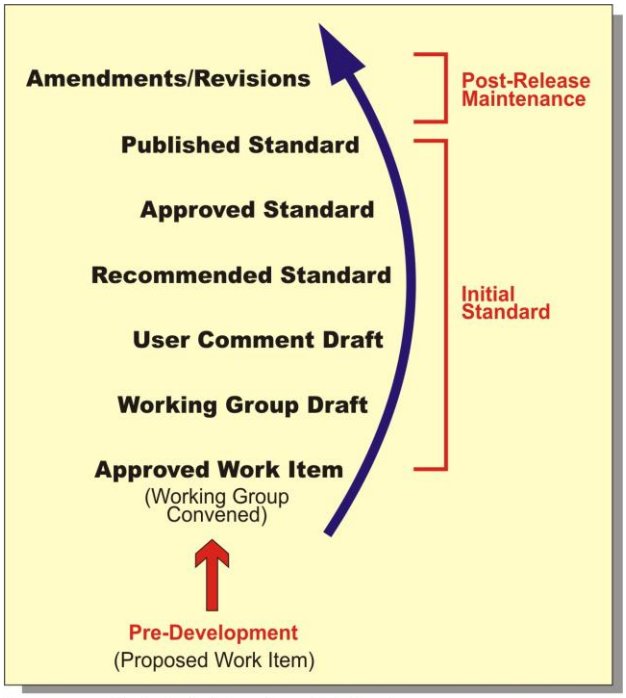
- ITS standards are open and non-proprietary, helping state and local transportation managers avoid costly single-source procurements and locked-in maintenance relationships with vendors.
- ITS standards support the deployment of interoperable ITS systems, helping agencies link together different types of ITS technologies and making system expansions easier to plan and implement.
- ITS standards are being developed for many different types of ITS technologies and their use is being supported by the U.S. DOT through technical assistance programs, training, and deployment outreach and guidance.
- Using ITS standards in project development is a key aspect of conformity with the FHWA Rule/FTA Policy on ITS Architecture and Standards.

## ITS Standards Development and Adoption Processes

The SDOs are developing standards that can be used across many different types of transportation applications. It is important to understand that it takes time to develop, approve, and publish a standard and that it takes even more time for manufacturers to incorporate these standards and place them on the market. It is important to note that ITS standards are typically functional standards that give transportation agencies confidence that components from different manufacturers will work together (e.g. the equipment will talk a common language), without removing the incentive for designers and manufacturers to compete to provide products that are more efficient or offer other features. However, there are also a limited number of ITS standards that provide specific equipment standards to ensure device compatibility between manufacturers. An ITS standard undergoes two separate processes: a development process and an adoption process.

The standards development process is led by the SDOs, which are professional industry associations such as the Institute of Transportation Engineers (ITE) and National Electrical Manufacturers Association (NEMA), and may be developed by a single SDO or jointly by

[49] *ITS Standards Program*. U.S. Department of Transportation. May 2006. http://www.standards.its.dot.gov/default.asp. Accessed May 9, 2006.

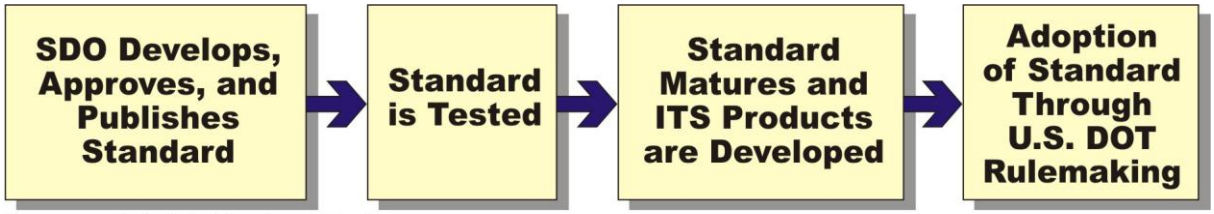



*Source: www.standards.its.dot.gov/learn_StdsDevel.asp*

**Figure 26. ITS Standards Development Process**

several SDOs. Figure 26 illustrates the ITS standards development process. Each standard is first developed by a working group, which consists of professionals with expertise about an ITS component to which the standard is expected to apply, and is then subjected to thorough review. Once review comments have been incorporated the standard is put to ballot for SDO voting. If approved, the standard is then published by the SDO. Appendix O includes a full list of ITS standards and their current development status. Currently 88 standards are published, four are approved, two are in ballot, and four are under development.

Once a standard is published it goes through an adoption process as depicted in Figure 27. A standard must be tested under realistic transportation operating conditions to measure the correctness and completeness of the standard. A standard gradually matures through testing and revisions and attracts vendor competition to develop products with features exceeding the minimum functional requirements. Finally, a mature standard may be considered for adoption by the U.S. DOT if it meets established criteria. Adopted standards must then be used on any project funded from federal sources. Although the U.S. DOT has yet to adopt any ITS standards there are a number of standards that are slowly maturing through testing and product development.




*Source: www.standards.its.dot.gov/learn_Lifecycle.asp*

**Figure 27. Life Cycle of an ITS Standard**

## Interface Classes and Standards Application Areas

Interface classes and standards application areas help determine which standards may be applicable to a project. The interface classes define the subsystem class (center, field, vehicle, or traveler) at each end of the communications path. Standards application areas, which are deployment-oriented categories, focus on common ITS deployments within each interface class. Table 22 lists the relationship between the interface classes and standards application areas. More applications will be added to this table on a national level as additional ITS standards become available.

**Table 22. Standards Application Areas by Interface Class**

| Interface Classes | Standards Application Areas | |
|---|---|---|
| Center-to-Center (C2C) | ▪ Data Archival<br>▪ Incident Management<br>▪ Rail Coordination | ▪ Traffic Management<br>▪ Transit Management<br>▪ Traveler Information |
| Center-to-Field (C2F) | ▪ Data Collection/Monitoring<br>▪ Dynamic Message Signs<br>▪ Environmental Monitoring<br>▪ Ramp Metering | ▪ Traffic Signals<br>▪ Vehicle Sensors<br>▪ Video Surveillance |
| Center-to-Vehicle/Traveler | ▪ Mayday<br>▪ Transit Vehicle Communications | ▪ Traveler Information |
| Field-to-Field | ▪ Highway Rail Intersection | |
| Field-to-Vehicle | ▪ Signal Priority | ▪ Toll/Fee Collection |

The National Transportation Communications for ITS Protocol (NTCIP) is the most applicable for transportation agencies because it defines C2C and C2F communications standards. The NTCIP defines a common set of rules for communicating (called protocols) and the vocabulary (called objects and definitions) to allow electronic devices (at centers and in the field) made by different manufacturers to operate with one another as a common system. The three primary types of NTCIP standard types are similar to the human language as described in Table 23.

**Table 23. Standard Types and Relationship to Human Communications**

| Computer Language | Human Communications |
|---|---|
| Object definitions/data elements | Vocabulary of words |
| Message sets | Sentences with grammar rules |
| Communication protocols | Describes how the data is exchanged<br>(similar to the rules used to address a letter) |

## ITS Standards in Oregon

Although standards development is broad and many standards have yet to reach maturity there are a number of ITS standards that either are currently in use or may be considered for use based on the architecture flows selected in the Oregon Statewide ITS Architecture. Out of all the stakeholders ODOT has spent the most time analyzing, approving, and utilizing ITS standards for use around the state. The following practices highlight ODOT's experience with the adoption of ITS standards:

- Common Standards: ODOT is currently using most of the approved message set and data definition standards when available and applicable, particularly: *ITE TM 1.03: Standard for Functional Level Traffic Management Data Dictionary (TMDD)* and *ITE TM 2.01: Message Sets for External TMC Communications (MS/ETMCC)*.

- Center-to-Center Standards: ODOT currently uses XML[50] for center-to-center communication, as opposed to DATEX[51].
- Center-to-Field Standards: Most NTCIP standards for field devices are still in development. ODOT is currently utilizing *NTCIP 1203: Object Definitions for Dynamic Message Signs* and *NTCIP 1204: Environmental Sensor Station (ESS) Interface Standard* and will continue to review all other relevant NTCIP standards when deploying new field devices.

Appendix P includes the Turbo Architecture report of the ITS standards that have been selected for the Oregon Statewide ITS Architecture. ODOT typically reviews ITS standards on a project-by-project basis as part of the systems engineering process. Once the detailed project requirements have been identified ODOT determines the applicability of available ITS standards. The architecture should be updated as additional ITS standards are selected for use or ruled out.

[50] eXtensible Markup Language (XML): a universal structured data transfer methodology that is currently widely used in e-business and e-government applications.

[51] DATa EXchange Between Systems (DATEX): a fixed message-based protocol that defines how the information is formatted and sent over a wire.

# PROJECT SEQUENCING

The sequencing of ITS projects provides a framework for implementing integrated statewide systems that support the Oregon Statewide ITS Architecture. Since infrastructure and communications networks are often shared between ITS projects it is important to implement projects in an efficient, incremental sequence that takes into account dependencies on other projects. This section includes a summary of the desired sequencing of ITS projects in Oregon over the next 10 years as well as a project sequencing matrix.

Staffing and funding play a key role in the rate at which projects may be deployed. Whether projects are developed and/or designed in house or contracted out, the ODOT ITS Unit and other ODOT departments (e.g. district maintenance offices) must have adequate staffing to manage each project and to support the ongoing maintenance and operations required upon project completion.

Funding must also be secured to support project development, construction, maintenance, and operations. Funding for statewide ITS projects is determined by the Oregon *Statewide Transportation Improvement Program* (*STIP*), which allocates federal and state funding for state and regional transportation systems over a four-year period. The *STIP* is updated every two years and is adopted by the Oregon Transportation Commission and then submitted to the Federal Highway Administration and Federal Transit Administration per federal law. Within the *STIP*, the Operations Program provides ITS funds since ITS projects typically support transportation system efficiency. Instead of assigning funding to specific ITS projects the *STIP* typically includes four general ITS funding allocations for each year of the *STIP*. This allows greater flexibility for allocating funds to projects, especially since schedules often change and ITS project budgets vary in size. The funding ranged from $900,000 to $1.5 million per year in the last *STIP*.

The ODOT ITS Unit plans project implementation on a biennium basis using the funding from the *STIP*. They are currently in the process of planning for the 2011 – 2013 Biennium. To match this process the ITS projects in this plan have been sequenced into three categories: the 2011 – 2013 Biennium, the 2013 – 2015 Biennium, and after the 2013 – 2015 Biennium as shown in Table 24. Current ongoing projects have also been listed in the table to capture the projects still under development. Projects were assigned to each biennium based on input from the Statewide Architecture Committee, current staffing levels, available *STIP* funding, relativity to other planned projects, project dependencies, technical and institutional feasibility, and equitable distribution of projects. All of the projects support the statewide ITS vision and goals described in the Operational Concept section. Project sequencing should be reevaluated prior to the 2013 – 2015 Biennium to determine if changes are needed based on staffing levels, funding allocation, schedule adherence, shifts in statewide priorities, changes in national ITS initiatives, and technical feasibility.

## Table 24. ITS Project Sequencing Matrix for Years 2011 – 2021

| Project Name | Description | Service Areas | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TOCs | Regional Traffic Control | Traveler Information | Maintenance/ Construction Ops | Road Weather Ops | Incident Mgmt | Emergency Mgmt | Archived Data Mgmt | Public Transportation |
| **Current Ongoing Projects** | | | | | | | | | | |
| TOCS: Event Management | Design TOCS to support event management at all ODOT TOCs by consolidating stand-alone systems, devices, and processes into one and by providing enhanced communication and more complete information and immediate dissemination to ODOT customers and partners (public and private). | X | | X | | | X | X | | |
| TripCheck: Cable TV Expansion | Implement the Bend area cable television application in other cities. | | | X | | | | | | |
| Advanced Transportation Controller Specification | Traffic signal control system evaluation and specification. | | X | | | | | | | |
| Portland Area Route Probes | Collect Bluetooth data from private partners to determine travel times on routes in the Portland metropolitan area. | | X | | | | | | | |
| GTFS Transit Data | Convert transit data to general transit feed specification (GTFS) so it can be disseminated by commercial ISPs (e.g. Google Transit) | | | | | | | | | X |
| Statewide Rideshare System | Implement RideShare Online (managed by King County, Washington) to provide a single web site and telephone rideshare system for use statewide to match interested travelers. This system will integrate rideshare programs currently used in different areas of Oregon. | | | | | | | | | X |
| Ongoing: Data warehousing | Continue to add data to the data warehouse to improve performance measure reporting. | X | | | | | | | X | |
| 511 - Enhancements | This project initiative will make enhancements to ODOT's traveler information systems. These enhancements will include: presenting traveler information using Twitter, ATIS support for new TOCS event impact codes; ATIS support for TLE (TripCheck Local Entry) events; feature enhancements to 511 HAT; adding Vancouver to TripCheck's maps; upgrade of 511 menus and voice quality and improving the speed and maintainability of 511 HAT, Twitter and TripCheck backend message generation engines. | | | X | | | | | | |
| Permanent Variable Speed Limits | Install permanent variable speed limits on state highways throughout Oregon where the posted speed needs to be adjusted based on real-time traffic flow conditions. | | X | | | | | | | |
| On-going - Statewide Central Traffic Signal System Expansion | Deploy additional communications infrastructure so that all traffic signals are accessible through the central signal system. | X | X | | | | | | | |
| Oregon Interoperability Server - Central Oregon 911 | Center to Center exchange of Call for Service and Incident information | X | | X | | | X | X | | |
| **Projects for 2011 - 2013 Biennium** | | | | | | | | | | |
| TOCS: Traffic Management | Integrate ATMS into TOCS to support traffic management devices and systems that collect, disseminate, and respond to traffic conditions. | X | X | X | | | | | | |
| Ramp Meter for Eugene | Implement a ramp metering system in Eugene. | X | | | | | | | | |
| Upgrade Ramp Metering in Portland | Enhance communications to the ramp meters to digital, and migrate the ATMS algorithm to ODOT Standard Platform. | X | | | | | | | | |
| Tripcheck: Local Data | Upgrade Tripcheck to display data from local agencies. | X | | X | | | | | | |
| TOCS: EOC Integration | Integrate the TOCS software with the WebEOC software used at the ECC and ODOT EOCs to enable information sharing and coordination between traffic and emergency management agencies. | X | | | | | | X | | |
| TOCS Connection to PDCC Message Broker | ODOT will develop an interface between TOCS and the OIS message broker. | X | | | | | X | X | | |
| TripCheck: Traveler Customization | Enable the TripCheck system to provide customized information to travelers based on their daily commute. This enhancement may possibly include notification features. | | | X | | | | | | |
| TripCheck Web Site: GIS-Based Mapping | Implement GIS-based mapping that enables users to zoom and pan the statewide map. | | | X | | | | | | |

| Project Name | Description | Service Areas | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TOCs | Regional Traffic Control | Traveler Information | Maintenance/ Construction Ops | Road Weather Ops | Incident Mgmt | Emergency Mgmt | Archived Data Mgmt | Public Transportation |
| TripCheck: Travel Times and Speeds | Update the Portland metropolitan area speed map on the TripCheck Web site to complete the freeway coverage, to include major arterial roadways, and to include more speed range categories. Add speed maps on the TripCheck Web site for the following metropolitan areas: Salem-Keizer, Eugene-Springfield, Bend-Redmond, and Medford/Rogue Valley. Determine travel times (based on real-time vehicle speeds and/or probe data) and disseminate this information to the TripCheck Web site, 511, and dynamic message signs. | | | X | | | | | | |
| State Incident and Weather Reporting Tool | Create a Web tool that allows the public to get historic information on weather and incident data housed at ODOT. | | | X | | | | | X | |
| 511 System Replacement | Replace 511 system/infrastructure. The system should support other TripCheck features such as travel time reporting and information customization. | | | X | | | | | | |
| TOCS: Response Plan Management | Add a response plan tool to the TOCS system that selects and helps implement the appropriate pre-planned response based on incident input. Develop event response plans for major state routes and input them into TOCS. These plans should include detailed alternate travel routes, field device locations for use as part of the plan, and clearly defined agency roles and responsibilities when multiple agencies are involved. | X | X | | | | X | | | |
| Multnomah Falls Parking Management | Implement a Parking Management system at Multnomah Falls the lets visitors to the park know if parking is available. | | X | X | | | | | | |
| TOCS: HAR Integration | Update TOCS to include an interface with HAR systems around the state. | X | | X | | | | | | |
| **Projects for 2013 - 2015 Biennium** | | | | | | | | | | |
| TripCheck: Itinerary Services | Enhance TripCheck to give travelers options and conditions for traveling between two points. | | | X | | | | | | |
| TripCheck: Bicycle Paths and | Add information to TripCheck about bicycle paths and routes. | | | X | | | | | | |
| TripCheck Web Site: Mountain Pass Pages | Add mountain pass pages on the TripCheck Web site that show a graphical profile of the pass with road temperature, current weather conditions, forecasted weather conditions, and camera images (similar to WSDOT/UW traveler information Web site). Potential mountain passes for inclusion are: I-5 Siskiyou Pass, US 20 Santiam Pass, OR 58 Willamette Pass, and US 26 Blue Box Pass. | | | X | | | | | | |
| TOCS: Traffic Signal Integration and Freeway/Arterial Integration | Enhance the TOCS system to integrate with ODOT and local traffic signal systems. TOCS will collect data from traffic signals/systems to detect events, view signal status, and to provide failure notifications when traffic signals require maintenance (e.g. failed loop detector). Based on the data TOCS will also implement predetermined event timing plans based on preset roadway condition thresholds and will also adjust ramp meter timings where ramp meters are located adjacent to traffic signals. | X | X | | | | X | X | | |
| TOCS: ForseCom Integration | Update TOCS to include an interface with ForseCom to allow TOC operators access to LEDS and NCIC. | X | | | | | X | X | | |
| TripCheck Web Site: Streaming Video | Display streaming video from CCTV cameras on the TripCheck Web site. | | | X | | | | | | |
| **Projects for After the 2013 - 2015 Biennium** | | | | | | | | | | |
| TOCS: City of Portland Tow Desk Integration | Update TOCS to include a communications interface with the City of Portland Tow Desk. | X | | | | | X | X | | |
| Variable Speed Limits - Weather | Install permanent variable speed limits on state highways throughout Oregon where the posted speed needs to be adjusted based on real-time weather conditions. | X | | X | | | | | | |
| Ramp Meter NTCIP Compliance | Update ramp meters to meet NTCIP standards. | | X | | | | | | | |
| Portable Smart Work Zone Management System | Develop and build a portable "smart work zone" system that can be deployed at work zones or special events to analyze traffic flow in real-time and provide updated information to drivers. | X | | X | X | | | | | |

| Project Name | Description | Service Areas | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TOCs | Regional Traffic Control | Traveler Information | Maintenance/ Construction Ops | Road Weather Ops | Incident Mgmt | Emergency Mgmt | Archived Data Mgmt | Public Transportation |
| Maintenance Activity Management Tools | Use AVL and other sensors to manage sanding, de-icing and other maintenance activities. | X | | | X | X | | | | |
| Public Agency Deployment for IntelliDrive | Install roadside units or wide-area wireless networking at signalized intersections and at key points on urban freeways and major rural highways so that vehicles may communicate with the roadside and activate in-vehicle warning systems as applicable to prevent roadway departure and intersection incidents. This may include in-vehicle signing. | X | X | X | | X | | | | |
| TripCheck: Travel Time Forecasts | Provide travel time forecasts based on historic data to assist with pre-trip planning. | | | X | | | | | | |
| Weather Probes | Use Intelli-drive systems to obtain weather conditions information collected by AVL or other systems installed on-board personal vehicles. Several use cases in the VII initiative describe using private vehicles as probes to gather information such as pavement temperature, friction, and the presence of rain. | | | X | | X | | | | |
| Road Weather Forecasting and Winter Maintenance Decision Support System | Upon U.S. DOT and NOAA's completion of the Clarus initiative, deploy a system that integrates weather observing, forecasting, and data management to predict road conditions. Include a tool that models various treatment options to help a maintenance manager select the right resource strategy to deal with a coming weather event. | | | | | X | | | | |
| Vehicle Probe Surveillance | Upon U.S. DOT's completion of the IntelliDrive initiative, use personal vehicles as probes to monitor traffic flow and to provide travelers with congestion related information and predicted travel times on key travel routes. This may require the deployment of roadside devices to collect probe data or an agreement with an ISP to collect the data. | | X | X | | | | | | |
| Develop Standards for ITS Applications in Work Zones | Update the Traffic Control Plans Design Manual to include standards and guidelines for using the following applications in work zones: incident detection and management, queue detection with electronic driver feedback signs, variable speed limits, lane merge controls, intrusion detectors, and over-dimension vehicle warning systems. | | | | X | | | | | |
| Mobile Incident Management Tools | Enhance incident response vehicles with camera and detection technologies that can be set up on site to help manage the incident. | | | | | | X | X | | |
| TOCS: Task Automation | Enable TOCS to automate tasks not currently automated by any of the existing systems in the handling of an event. | X | | | | | | | | |
| CCTV Camera NTCIP | Update CCTV camera systems to meet NTCIP standards. | | X | | | | | | | |
| TTIP: Heavy Rail Interface | Add functionality to allow heavy rail operators to provide train arrival information. | X | | X | | | | | | |
| Health Care System Integration | Health care agencies (e.g. hospitals) will collect information from the TOCS and TTIP systems to get advance information on crashes. | | | X | | | | | | |

# MAINTENANCE PLAN

The Statewide Architecture Committee used federal guidelines[52] to develop a maintenance plan for keeping the Oregon Statewide ITS Architecture up to date. The development and implementation of an architecture maintenance plan is one of the requirements of the FHWA Final Rule and FTA Policy. The architecture is a fluid entity that must be updated as ITS needs and services evolve in Oregon. This section answers the following questions: Who? What? When? How?

## Who Maintains the Oregon Statewide ITS Architecture?

In general the ODOT ITS Unit is responsible for maintaining the Oregon Statewide ITS Architecture and have been the keeper of it since it was first developed. The ODOT ITS Unit is well versed in the contents of the architecture and is proficient in Turbo Architecture. One staff member within the ODOT ITS Unit will be responsible for performing the actual maintenance to the Oregon Statewide ITS Architecture[53]. This staff member will be referred to as the Maintainer throughout the rest of this section. The rest of the ODOT ITS Unit will be responsible for reviewing and approving all updates.

## What is Maintained in the Oregon Statewide ITS Architecture?

The following items in the Oregon Statewide ITS Architecture will be maintained to reflect the deployment of ITS projects and changes in statewide needs:

- Statewide architecture attributes
- Project architectures and attributes
- Stakeholders
- Inventory elements
- User services/market packages
- Operational concept
- Interconnects and information flows between elements
- ITS standards
- Project sequencing

Deletions or additions to the Oregon Statewide ITS Architecture should be accompanied with descriptive comments in Turbo Architecture to document the reasons for the changes.

## When is the Oregon Statewide ITS Architecture Updated?

Approaches to architecture maintenance include periodic, exception based, or a combination of the two methods. The Committee has decided that a combination of the two methods is the best approach for the Oregon Statewide ITS Architecture as follows:

- Exception Based Architecture Maintenance: The architecture will be updated when a statewide project impacts a large portion of the architecture.
- Periodic Maintenance: Planned maintenance of the architecture will occur every two years in odd-numbered years closely following the biennium financial planning for ITS projects.

[52] *Regional ITS Architecture Maintenance White Paper*. Report FHWA-HOP-04-004. U.S. Department of Transportation, Federal Highway Administration, National ITS Architecture Team, Jan. 31, 2004.

[53] At the present time Patrick Hoke is the ODOT ITS Unit staff member responsible for architecture maintenance.

## How is the Oregon Statewide ITS Architecture Maintained?

The Maintainer will be responsible for updating the Oregon Statewide ITS Architecture based on things such as changes to existing ITS elements or operations, addition of new projects, or status changes when funding is secured. Table 25 lists the general process for maintaining the architecture for both exception based and periodic maintenance updates.

**Table 25. Oregon Statewide ITS Architecture Update Process**

| Maintenance Step | Responsibility |
|---|---|
| **Exception Based Maintenance** | |
| Work with project engineer to update the applicable portions of the Turbo Architecture database based on a project. | Maintainer* |
| Log the changes and notify the ODOT ITS Unit. | |
| Approve the changes to the Turbo Architecture database and supporting documentation. This may be done during a meeting or by e-mail. | ODOT ITS Unit |
| **Periodic Maintenance** | |
| Update the entire architecture every two years to reflect statewide changes. | Maintainer* |
| Log the changes and notify the ODOT ITS Unit. | |
| Hold a meeting to review the changes. | ODOT ITS Unit |
| Approve the changes to the Turbo Architecture database and supporting documentation. | |
| * The Maintainer is a staff member from the ODOT ITS Unit who is proficient in Turbo Architecture. | |

The Maintainer should use caution when building new flows in Turbo Architecture, which must be done when additional inventory elements are added or the subsystems and terminators for existing inventory elements are modified. Tailoring new flows within Turbo Architecture is easiest if the “conservative” setting is selected prior to running the build command.

# FUTURE CONSIDERATIONS

The following topics, which came up during the course of this project and were unable to be addressed at this time, should be revisited during future maintenance of the Oregon Statewide ITS Architecture:

- **Custom Architecture Flows:** Turbo Architecture currently allows users to create custom architecture flows but does not allow these flows to be assigned to any market packages. Iteris, who manufactures the software, is aware of this issue and is planning to add this capability to Turbo Architecture as part of their next software upgrade. Once that capability is available the custom flows currently in the Oregon Statewide ITS Architecture that interface with LEDS ("vehicle information request" and "vehicle information") should be added to the ATMS08 (Traffic Incident Management System) market package.

- **Mayday Integration:** If the Oregon Interoperability Service ends up being used to relay messages from mayday service centers to ODOT the EM03 (Mayday and Alarms Support) market package and associated flows will need to be updated.

- **Vehicle Probes:** ODOT has a project underway to collect data from Bluetooth devices to determine travel times on Portland area travel routes. The architecture was updated based on the assumption that the data will be collected by commercial ISPs and then sent to ODOT through TTIP. These interfaces should be revisited during the deployment of this project to make sure the architecture accurately reflects this process.

- **National ITS Initiatives:** Update the architecture as major national ITS initiatives mature and become ready for use in Oregon, particularly the Connected Vehicle initiative.

- **Road User Charging:** Specific stakeholders and their associated roles and responsibilities will need to be added to this plan when road user charging applications are implemented.

# APPENDIX A: GLOSSARY OF ACRONYMS

# APPENDIX A: GLOSSARY OF ACRONYMS

| | |
|---|---|
| AAA | American Automobile Association |
| AD | Archived Data Management |
| AHS | Automated Highway System |
| AOC | Agency Operations Center |
| APTS | Advanced Public Transportation System |
| ATIS | Advanced Traveler Information System |
| ATMS | Advanced Traffic Management System |
| AVI | Automated Vehicle Identification |
| AVL | Automated Vehicle Location |
| AVSS | Advanced Vehicle Safety System |
| BDS | Bureau of Disaster Services |
| BLM | Bureau of Land Management |
| BNSF | Burlington Northern Santa Fe |
| C2C | Center-to-Center |
| C2F | Center-to-Field |
| CAD | Computer Aided Dispatch |
| Caltrans | California Department of Transportation |
| CCTV | Closed-Circuit Television |
| CHP | California Highway Patrol |
| CMS | Changeable Message Sign |
| COG | Council of Governments |
| CSEPP | Chemical Stockpile Emergency Preparedness Program |
| CTS | Center for Transportation Studies |
| CV | Commercial Vehicle |
| CVO | Commercial Vehicle Operations |
| DATEX | DATa EXchange Between Systems |
| DEM | Department of Emergency Management |
| DFD | Data Flow Diagram |
| DMS | Dynamic Message Sign |
| DMV | Driver and Motor Vehicle Services Division |
| DPS | Department of Public Safety |
| DOT | Department of Transportation |
| DSRC | Dedicated Short Range Communications |
| DW/BI | Data Warehousing and Business Intelligence |
| EAS | Emergency Alert System |
| ECC | Emergency Coordination Center |
| EM | Emergency Management |
| EMD | Emergency Management Division |
| EOC | Emergency Operations Center |
| EOP | *Emergency Operations Plan* |
| FCC | Federal Communications Commission |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Administration |
| GHz | Gigahertz |
| GM | General Motors |
| GPS | Global Positioning System |
| GTFS | General Transit Feed Specification |
| HAR | Highway Advisory Radio |

| | |
|---|---|
| HazMat | Hazardous Material |
| HMIS | Highway Management Information System |
| HOT | High Occupancy Toll |
| HOV | High Occupancy Vehicle |
| HQ | Headquarters |
| HRI | Highway-Rail Intersection |
| HTCRS | Highway Traffic Conditions Reporting System |
| IBTTA | International Bridge, Tunnel and Turnpike Association |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISP (1) | Information Service Provider |
| ISP (2) | Idaho State Police |
| ISCC | Information Systems Command Center |
| ITD | Idaho Transportation Department |
| ITS | Intelligent Transportation System |
| LEDS | Law Enforcement Data System |
| LTD | Lane Transit District |
| MAX | Metropolitan Area Express |
| MC | Maintenance and Construction |
| MCTD | Motor Carrier Transportation Division |
| MDSS | Maintenance Decision Support System |
| MHz | Megahertz |
| MPO | Metropolitan Planning Organization |
| NCHRP | National Cooperative Highway Research Program |
| NCIC | National Crime Information Center |
| NDOT | Nevada Department of Transportation |
| NOAA | National Oceanic and Atmospheric Administration |
| NTCIP | National Transportation Communications for ITS Protocol |
| NWS | National Weather Service |
| NWTOC | Northwest Transportation Operations Center |
| OBU | On-Board Unit |
| ODOT | Oregon Department of Transportation |
| OEM | Office of Emergency Management |
| OERS | Oregon Emergency Response System |
| OES | Office of Emergency Services |
| OIS | Oregon Interoperability Service |
| ORS | Oregon Revised Statute |
| OSP | Oregon State Police |
| OTA | Oregon Trucking Association |
| OTC | Oregon Transportation Commission |
| PDA | Personal Digital Assistant |
| PDO | Property Damage Only |
| PIO | Public Information Officer |
| PNWR | Portland and Western Railroad |
| PORTAL | Portland Oregon Regional Transportation Archive Listing |
| PSAP | Public Safety Answering Point |
| PSpec | Process Specification |
| PSU | Portland State University |
| PTAC | Public Transportation Advisory Committee |
| PVMS | Portable Variable Message Sign |
| RITA | Research and Innovative Technology Administration |
| RMC | Resource Management Center |

| | |
|---|---|
| RSU | Roadside Unit |
| RVTD | Rogue Valley Transportation District |
| RWIS | Roadway Weather Information System |
| SAE | Society of Automobile Engineers |
| SDO | Standards Development Organization |
| SR | State Route |
| STIP | Statewide Transportation Improvement Program |
| TAC | Technical Advisory Committee |
| TDM | Travel Demand Management |
| TIC | Travel Information Council |
| TLE | TripCheck Local Entry |
| TMC | Traffic Management Center |
| TMOC | Traffic Management Operation Center |
| TMP | Traffic Management Plan |
| TOC | Transportation (or Traffic) Operations Center |
| TOCS | Transportation Operations Center Software |
| TPAC | Transportation Policy Alternatives Committee |
| TransPort | Transportation Portland |
| TSP | Transit Signal Priority |
| TTIP | TripCheck Traveler Information Portal |
| TTSP | Trusted Third Party Service Provider |
| UP | Union Pacific |
| U.S. DOT | United States Department of Transportation |
| VASP | Value Added Service Provider |
| VII | Vehicle Infrastructure Integration |
| VIN | Vehicle Identification Number |
| VMS | Variable Message Sign |
| VMT | Vehicle Miles Traveled |
| WSDOT | Washington State Department of Transportation |
| WSP | Washington State Patrol |
| XML | eXtensible Markup Language |

# APPENDIX B: SUMMARY OF CHANGES TO NATIONAL ITS ARCHITECTURE AND TURBO ARCHITECTURE

DKS Associates
TRANSPORTATION SOLUTIONS

# MEMORANDUM

| | | |
|---|---|---|
| TO: | Galen McGill, ODOT ITS Unit | |
| | Adam Bradford, ODOT ITS Unit | |
| FROM: | Jim Peters, P.E., P.T.O.E. | |
| DATE: | August 18, 2010 | |
| SUBJECT: | Turbo Architecture Update to Newest Version | P06287-011-001 |

The last update to the Oregon Statewide ITS Architecture was completed in 2005 using Turbo Architecture Version 3.1, with National ITS Architecture Version 5.1. As part of the update process, the Oregon Statewide ITS Architecture was upgraded to the newest versions of Turbo Architecture (Version 5.0) and National ITS Architecture (Version 6.1)

As the National ITS Architecture is updated, the Turbo software updates reflect those changes. By converting the Oregon ITS Architecture to the newest Turbo software, the conversion process automatically updates the Architecture to reflect changes made in the National ITS Architecture.

Attached to this memorandum are the reports generated by the conversion process. The first five reports document changes to the National ITS Architecture from Version 5.1 to 6.1. The last four reports document specific changes to the Oregon Statewide ITS Architecture.

These changes will be further reviewed during task 12.3 (Update Oregon Statewide ITS Architecture and Operational Concept Plan). During task 12.3 decisions will be made regarding whether the automatic changes made during the conversion process should be maintained or further addressed.

*9 attachments*

*x:\projects\2006\p06287-011 (odot statewide its architecture update)\task 12.1 update turbo arch to 5.0\turbo arch update memo.doc*

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# Version 6.1 Architecture Flow Changes

8/10/2010 3:26:36PM

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| **New** | | | | |
| | Alerting and Advisory Systems | Commercial Vehicle Administration | alerts and advisories | |
| | Alerting and Advisory Systems | Commercial Vehicle Check | alerts and advisories | |
| | Archived Data Management Subsystem | Border Inspection Administration | archive requests | |
| | Archived Data Management Subsystem | Border Inspection Administration | archive status | |
| | Archived Data Management Subsystem | Traffic Management | archived data products | |
| | Archived Data Management Subsystem | Transit Management | archived data products | |
| | Border Inspection Administration | Archived Data Management Subsystem | border information archive data | |
| | Border Inspection Administration | Commercial Vehicle Administration | client verification request | |
| | Border Inspection Administration | Commercial Vehicle Administration | pre-arrival notification | |
| | Border Inspection Administration | Fleet and Freight Management | clearance notification | |
| | Border Inspection Administration | Fleet and Freight Management | client id | |
| | Border Inspection Administration | Fleet and Freight Management | expedited clearance information | |
| | Border Inspection Administration | Fleet and Freight Management | expedited clearance status | |
| | Border Inspection Administration | Fleet and Freight Management | manifest receipt confirmation | |
| | Border Inspection Systems | Commercial Vehicle Administration | arrival notification | |
| | Border Inspection Systems | Commercial Vehicle Check | inspection results | |
| | Border Inspection Systems | Commercial Vehicle Subsystem | border pass/pull-in | |
| | Border Inspection Systems | Commercial Vehicle Subsystem | clearance notification | |
| | Border Inspection Systems | Emergency Management | border incident information | |
| | Border Inspection Systems | Information Service Provider | border crossing status information | |
| | Border Inspection Systems | Traffic Management | border incident information | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Border Inspection Systems | Traffic Management | lane management inputs | |
| | Border Inspection Systems | Traffic Management | remote surveillance control | |
| | Commercial Vehicle Administration | Border Inspection Administration | client verification information | |
| | Commercial Vehicle Administration | Border Inspection Administration | screening results | |
| | Commercial Vehicle Administration | Commercial Vehicle Check | accident report | |
| | Commercial Vehicle Administration | Commercial Vehicle Check | citation | |
| | Commercial Vehicle Administration | Commercial Vehicle Check | cv driver record | |
| | Commercial Vehicle Administration | CVO Information Requestor | cv driver record | |
| | Commercial Vehicle Administration | Fleet and Freight Management | cv driver record | |
| | Commercial Vehicle Administration | Other CVAS | accident report | |
| | Commercial Vehicle Administration | Other CVAS | citation | |
| | Commercial Vehicle Administration | Other CVAS | cv driver record | |
| | Commercial Vehicle Administration | Other CVAS | cv driver record request | |
| | Commercial Vehicle Check | Commercial Vehicle Administration | cv driver record request | |
| | Commercial Vehicle Subsystem | Border Inspection Systems | tag data | |
| | Commercial Vehicle Subsystem | Commercial Vehicle Check | commercial vehicle disable status | |
| | Commercial Vehicle Subsystem | Commercial Vehicle Check | expected driver identity characteristics | |
| | CVO Information Requestor | Commercial Vehicle Administration | cv driver record request | |
| | Driver Identification Card | Commercial Vehicle Check | cv driver credential | |
| | Driver Identification Card | Commercial Vehicle Subsystem | cv driver credential | |
| | Driver Identification Card | Fleet and Freight Management | cv driver credential | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Emergency Management | Border Inspection Systems | border incident response status | |
| | Emergency Management | Emergency Telecommunications System | incident information for public | |
| | Emergency Management | Public Health System | public health request | |
| | Emergency Management | Traffic Management | resource deployment status | |
| | Emergency Vehicle Subsystem | Vehicle | emergency vehicle alert | |
| | Emergency Vehicle Subsystem | Vehicle | vehicle signage data | |
| | Event Promoters | Transit Management | event plans | |
| | Fleet and Freight Management | Border Inspection Administration | expedited clearance registration | |
| | Fleet and Freight Management | Border Inspection Administration | manifest data | |
| | Fleet and Freight Management | Commercial Vehicle Administration | cv driver record request | |
| | Fleet and Freight Management | Commercial Vehicle Administration | cv repair status | |
| | Information Service Provider | Emergency Management | transportation information for operations | |
| | Information Service Provider | Fleet and Freight Management | incident information | |
| | Information Service Provider | Maintenance and Construction Management | field equipment status | |
| | Information Service Provider | Maintenance and Construction Management | road network environmental probe data | |
| | Information Service Provider | Maintenance and Construction Management | transportation information for operations | |
| | Information Service Provider | Personal Information Access | traveler alerts | |
| | Information Service Provider | Roadway Subsystem | broadcast traveler information | |
| | Information Service Provider | Roadway Subsystem | emergency traveler information | |
| | Information Service Provider | Surface Transportation Weather Service | road network environmental probe data | |
| | Information Service Provider | Traffic Management | transportation information for operations | |
| | Information Service Provider | Transit Management | transportation information for operations | |
| | Information Service Provider | Vehicle | traveler alerts | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Information Service Provider | Weather Service | road network environmental probe data | |
| | Location Data Source | Commercial Vehicle Subsystem | position fix | |
| | Location Data Source | Emergency Vehicle Subsystem | position fix | |
| | Location Data Source | Maintenance and Construction Vehicle | position fix | |
| | Location Data Source | Transit Vehicle Subsystem | position fix | |
| | Maintenance and Construction Management | Emergency Management | security equipment maintenance status | |
| | Maintenance and Construction Management | Information Service Provider | equipment maintenance status | |
| | Maintenance and Construction Vehicle | Maintenance and Construction Management | environmental sensor data | |
| | Maintenance and Construction Vehicle | Roadway Subsystem | environmental sensor data | |
| | Other CVAS | Commercial Vehicle Administration | accident report | |
| | Other CVAS | Commercial Vehicle Administration | citation | |
| | Other CVAS | Commercial Vehicle Administration | cv driver record | |
| | Other CVAS | Commercial Vehicle Administration | cv driver record request | |
| | Other Vehicle | Vehicle | vehicle intersection safety data | |
| | Other Vehicle | Vehicle | vehicle safety data | |
| | Parking Management | Vehicle | vehicle parking information | |
| | Parking Management | Vehicle | vehicle payment request | |
| | Public Health System | Emergency Management | public health response | |
| | Roadway Subsystem | Archived Data Management Subsystem | probe archive data | |
| | Roadway Subsystem | Information Service Provider | environmental probe data | |
| | Roadway Subsystem | Information Service Provider | short range communications status | |
| | Roadway Subsystem | Information Service Provider | traffic probe data | |
| | Roadway Subsystem | Maintenance and Construction Management | environmental probe data | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Roadway Subsystem | Maintenance and Construction Management | environmental sensor data | |
| | Roadway Subsystem | Maintenance and Construction Vehicle | environmental sensor data | |
| | Roadway Subsystem | Map Update Provider | traffic probe data | |
| | Roadway Subsystem | Surface Transportation Weather Service | environmental probe data | |
| | Roadway Subsystem | Surface Transportation Weather Service | environmental sensor data | |
| | Roadway Subsystem | Traffic Management | environmental sensor data | |
| | Roadway Subsystem | Traffic Management | lighting system status | |
| | Roadway Subsystem | Traffic Management | short range communications status | |
| | Roadway Subsystem | Vehicle | access permission | |
| | Roadway Subsystem | Vehicle | broadcast traveler information | |
| | Roadway Subsystem | Vehicle | emergency traveler information | |
| | Roadway Subsystem | Vehicle | roadway safety data | |
| | Roadway Subsystem | Weather Service | environmental probe data | |
| | Roadway Subsystem | Weather Service | environmental sensor data | |
| | Toll Collection | Vehicle | vehicle payment request | |
| | Traffic Management | Archived Data Management Subsystem | archived data product requests | |
| | Traffic Management | Border Inspection Systems | border incident information | |
| | Traffic Management | Border Inspection Systems | traffic images | |
| | Traffic Management | Emergency Management | incident response status | |
| | Traffic Management | Emergency Management | resource request | |
| | Traffic Management | Information Service Provider | incident information | |
| | Traffic Management | Media | incident information for media | |
| | Traffic Management | Roadway Subsystem | lighting system control data | |
| | Traffic Management | Roadway Subsystem | vehicle signage data | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Traffic Management | Transit Management | incident information | |
| | Transit Management | Archived Data Management Subsystem | archived data product requests | |
| | Transit Management | Event Promoters | event confirmation | |
| | Transit Management | Information Service Provider | emergency transit schedule information | |
| | Transit Management | Information Service Provider | transit probe data | |
| | Transit Management | Information Service Provider | transit schedule adherence information | |
| | Transit Management | Traffic Management | transit probe data | |
| | Transit Vehicle Subsystem | Vehicle | vehicle signage data | |
| | Traveler | Transit Vehicle Subsystem | boarding and alighting | |
| | Vehicle | Other Vehicle | vehicle intersection safety data | |
| | Vehicle | Other Vehicle | vehicle safety data | |
| | Vehicle | Parking Management | vehicle payment information | |
| | Vehicle | Roadway Subsystem | access request | |
| | Vehicle | Roadway Subsystem | probe archive data | |
| | Vehicle | Roadway Subsystem | vehicle diagnostics data | |
| | Vehicle | Roadway Subsystem | vehicle intersection safety data | |
| | Vehicle | Roadway Subsystem | vehicle occupancy | |
| | Vehicle | Roadway Subsystem | vehicle safety data | |
| | Vehicle | Toll Collection | vehicle payment information | |
| | Weather Service | Archived Data Management Subsystem | weather archive data | |
| | Weather Service | Information Service Provider | qualified environmental conditions data | |
| | Weather Service | Maintenance and Construction Management | environmental conditions data status | |
| | Weather Service | Maintenance and Construction Management | qualified environmental conditions data | |
| | Weather Service | Traffic Management | environmental conditions data status | |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Weather Service | Traffic Management | qualified environmental conditions data | |
| **Modified** | | | | |
| | Fleet and Freight Management | Intermodal Freight Depot | freight transportation status | intermod CVO coord |
| | Fleet and Freight Management | Intermodal Freight Shipper | freight transportation status | intermod CVO coord |
| | Information Service Provider | ISP Operator | ISP operations information presentation | ISP operating parameters |
| | Information Service Provider | Personal Information Access | broadcast traveler information | broadcast information |
| | Information Service Provider | Personal Information Access | interactive traveler information | traveler information |
| | Information Service Provider | Remote Traveler Support | broadcast traveler information | broadcast information |
| | Information Service Provider | Remote Traveler Support | interactive traveler information | traveler information |
| | Information Service Provider | Traffic Management | road network traffic probe data | road network probe information |
| | Information Service Provider | Vehicle | broadcast traveler information | broadcast information |
| | Information Service Provider | Vehicle | interactive traveler information | traveler information |
| | Intermodal Freight Depot | Fleet and Freight Management | freight transportation status | intermod CVO coord |
| | Intermodal Freight Shipper | Fleet and Freight Management | freight transportation status | intermod CVO coord |
| | ISP Operator | Information Service Provider | ISP operator inputs | ISP operating parameter updates |
| | Other Vehicle | Vehicle | vehicle control coordination | vehicle to vehicle coordination |
| | Parking Management | Vehicle | vehicle payment update | tag update |
| | Roadway Subsystem | Traffic Management | automated roadway status | AHS status |
| | Roadway Subsystem | Traffic Management | traffic probe data | vehicle probe data |
| | Roadway Subsystem | Vehicle | automated vehicle control data | AHS control data |
| | Toll Administration | Information Service Provider | toll probe data | probe data |
| | Toll Administration | Traffic Management | toll probe data | probe data |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Toll Collection | Vehicle | vehicle payment update | tag update |
| | Traffic Management | Roadway Subsystem | automated roadway control data | AHS control information |
| | Transit Operations Personnel | Transit Management | transit operations personnel inputs | transit system operator inputs |
| | Transit Vehicle Subsystem | Transit Management | demand response passenger and use data | transit vehicle passenger and use data |
| | Transit Vehicle Subsystem | Transit Management | fare collection data | fare and payment status |
| | Transit Vehicle Subsystem | Transit Management | transit vehicle loading data | transit vehicle passenger and use data |
| | Vehicle | Information Service Provider | traffic probe data | vehicle probe data |
| | Vehicle | Other Vehicle | vehicle control coordination | vehicle to vehicle coordination |
| | Vehicle | Roadway Subsystem | automated vehicle status | AHS vehicle data |
| | Vehicle | Roadway Subsystem | traffic probe data | vehicle probe data |
| **Discontinued** | | | | |
| | Commercial Vehicle Administration | Trade Regulatory Agencies | | border clearance status |
| | Commercial Vehicle Administration | Trade Regulatory Agencies | | domestic transportation information |
| | Commercial Vehicle Administration | Trade Regulatory Agencies | | transportation border clearance assessment |
| | Emergency Management | Maintenance and Construction Management | | road network probe information |
| | Emergency Management | Traffic Management | | road network probe information |
| | Emergency Vehicle Subsystem | Emergency Management | | environmental probe data |
| | Information Service Provider | Maintenance and Construction Management | | road network probe information |
| | Maintenance and Construction Vehicle | Maintenance and Construction Management | | environmental probe data |
| | Maintenance and Construction Vehicle | Roadway Subsystem | | environmental conditions data |
| | Media | Emergency Management | | media information request |
| | Media | Information Service Provider | | media information request |
| | Media | Traffic Management | | media information request |
| | Media | Transit Management | | media information request |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Parking Management | Vehicle | | request tag data |
| | Roadway Environment | Emergency Vehicle Subsystem | | environmental conditions |
| | Roadway Environment | Transit Vehicle Subsystem | | environmental conditions |
| | Roadway Subsystem | Maintenance and Construction Management | | environmental conditions data |
| | Roadway Subsystem | Maintenance and Construction Vehicle | | environmental conditions data |
| | Roadway Subsystem | Surface Transportation Weather Service | | environmental conditions data |
| | Roadway Subsystem | Traffic Management | | environmental conditions data |
| | Roadway Subsystem | Traffic Management | | environmental probe data |
| | Roadway Subsystem | Vehicle | | request tag data |
| | Roadway Subsystem | Weather Service | | environmental conditions data |
| | Toll Collection | Vehicle | | request tag data |
| | Trade Regulatory Agencies | Commercial Vehicle Administration | | declaration information |
| | Trade Regulatory Agencies | Commercial Vehicle Administration | | domestic transportation information |
| | Traffic Management | Information Service Provider | | request fare and price information |
| | Transit Management | Maintenance and Construction Management | | road network probe information |
| | Transit Management | Traffic Management | | road network probe information |
| | Transit Vehicle Subsystem | Transit Management | | environmental probe data |
| | Vehicle | Commercial Vehicle Subsystem | | vehicle location |
| | Vehicle | Emergency Vehicle Subsystem | | vehicle location |
| | Vehicle | Maintenance and Construction Vehicle | | vehicle location |
| | Vehicle | Parking Management | | tag data |
| | Vehicle | Toll Collection | | tag data |
| | Vehicle | Transit Vehicle Subsystem | | vehicle location |
| | Weather Service | Archived Data Management Subsystem | | weather information |

| Change | Source Entity | Destination Entity | New Flow | Old Flow |
|---|---|---|---|---|
| | Weather Service | Maintenance and Construction Management | | environmental conditions data |
| | Weather Service | Traffic Management | | environmental conditions data |

# Version 6.1 Functional Requirements Changes

8/10/2010 3:27:15PM

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Advanced Rail Crossing** | **12** | **New** |
| | | New Requirement: The field element shall provide approaching train advisories using field-vehicle communications to vehicles approaching the grade crossing. | | |
| | | **Center Secure Area Sensor Management** | **12** | **New** |
| | | New Requirement: The center shall monitor maintenance status of the security sensor field equipment. | | |
| | | **Center Secure Area Surveillance** | **13** | **New** |
| | | New Requirement: The center shall monitor maintenance status of the security sensor field equipment. | | |
| | | **Citation and Accident Electronic Recording** | **4** | **New** |
| | | New Requirement: The roadside check facility equipment shall receive driver records from the commercial vehicle administration center to support driver identification and collection of driver credentials and history information. | | |
| | | **Citation and Accident Electronic Recording** | **5** | **New** |
| | | New Requirement: The roadside check facility equipment shall collect safety data from the commercial vehicle and its freight equipment to help characterize the circumstances surrounding an accident. | | |
| | | **Citation and Accident Electronic Recording** | **6** | **New** |
| | | New Requirement: The roadside check facility equipment shall read the driver identification card provided by the commercial vehicle driver and support cross-check of the identification data with driver records. | | |
| | | **Credentials and Taxes Administration** | **10** | **New** |
| | | New Requirement: The center shall manage driver licensing for commercial vehicle drivers. | | |
| | | **CV Information Exchange** | **7** | **New** |
| | | New Requirement: The center shall provide individual drivers access to their own driver records on request. | | |
| | | **CV Safety and Security Administration** | **4** | **New** |
| | | New Requirement: The center shall monitor alerting and advisory systems for security alerts and advisories. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **CV Safety and Security Administration** | **5** | **New** |
| | | New Requirement: The center shall provide commercial vehicle accident reports to enforcement agencies. | | |
| | | **CV Safety and Security Administration** | **6** | **New** |
| | | New Requirement: The center shall receive citation records from roadside check facilities. | | |
| | | **CV Safety and Security Administration** | **7** | **New** |
| | | New Requirement: The center shall manage the citation records and provide the citations to enforcement agencies and the commercial fleet management center. | | |
| | | **CV Safety and Security Administration** | **8** | **New** |
| | | New Requirement: The center shall provide the capability for the commercial fleet management center to report required commercial vehicle repairs and other corrections of identified deficiencies. | | |
| | | **Emergency Early Warning System** | **9** | **New** |
| | | New Requirement: The center shall broadcast wide-area alerts and advisories to commercial vehicle administration centers and roadside check facilities for emergency situations such as severe weather events, civil emergencies, child abduction (AMBER alert system), military | | |
| | | **Emergency Evacuation Support** | **12** | **New** |
| | | New Requirement: The center shall retrieve information from public health systems to plan for and implement evacuations or in-place sheltering for biological, chemical, radiation, and other public health emergencies. | | |
| | | **Emergency Response Management** | **15** | **New** |
| | | New Requirement: The center shall collect information about the status of the recovery efforts for the infrastructure during disasters. | | |
| | | **Emergency Response Management** | **16** | **New** |
| | | New Requirement: The center shall provide the overall status of infrastructure recovery efforts to traveler information providers and media. | | |
| | | **Emergency Response Management** | **17** | **New** |
| | | New Requirement: The center shall provide the capability to communicate information about emergency situations to local population through the Emergency Telecommunications System. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Emergency Response Management** | **18** | **New** |
| | | New Requirement: The center shall provide the capability to identify neighborhoods and businesses that should be informed of an emergency situation based on information collected about incidents including their severity, impacted locations, and recovery schedule. | | |
| | | **Emergency Response Management** | **19** | **New** |
| | | New Requirement: The center shall retrieve information from public health systems to increase preparedness for, and implement a response to biological, chemical, radiation, and other public health emergencies. | | |
| | | **Emergency Response Management** | **20** | **New** |
| | | New Requirement: The center shall manage coordinated inter-agency responses to incidents at an international border. | | |
| | | **Emergency Transportation Operations Data Collection** | **1** | **New** |
| | | New Requirement: The center shall collect real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. | | |
| | | **Emergency Transportation Operations Data Collection** | **2** | **New** |
| | | New Requirement: The center shall support the capability for the system operator to monitor and control the information collection service. | | |
| | | **Field Barrier System Control** | **4** | **New** |
| | | New Requirement: The field element shall receive requests for access from approaching vehicles using field-vehicle communications and validate and authenticate the requests. | | |
| | | **Field Barrier System Control** | **5** | **New** |
| | | New Requirement: The field element shall grant access only to qualified vehicles. | | |
| | | **Field Barrier System Control** | **6** | **New** |
| | | New Requirement: The field element shall communicate access permission status and access instructions to approaching vehicles using field-vehicle communications. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Fleet Administration** | **6** | **New** |
| | | New Requirement: The center shall access driver records from the appropriate commercial vehicle administration center and use the records to support pre-hiring checks for potential drivers and monitor the performance of each driver who is hired. | | |
| | | **Fleet Maintenance Management** | **3** | **New** |
| | | New Requirement: The center shall report required commercial vehicle repairs and other corrections of identified deficiencies to the appropriate commercial vehicle administration center. | | |
| | | **Freight Administration and Management** | **7** | **New** |
| | | New Requirement: The center shall support the submission of cargo manifest data to the appropriate government border inspection administration system. | | |
| | | **Freight Administration and Management** | **8** | **New** |
| | | New Requirement: The center shall support the registration of its vehicles, drivers, and cargo for expedited border crossings with the appropriate government border inspection administration system. | | |
| | | **Freight Administration and Management** | **9** | **New** |
| | | New Requirement: The center shall coordinate the response to security incidents and the sharing of security threat information involving freight equipment with other agencies including emergency management centers, intermodal freight shippers, and alerting/advisory system | | |
| | | **Interactive Vehicle Reception** | **2** | **New** |
| | | New Requirement: The vehicle shall receive travel alerts from a center and present them to the driver. Relevant alerts are provided based on pre-supplied trip characteristics and preferences. | | |
| | | **International Border Crossing** | **2** | **New** |
| | | New Requirement: The roadside check facility equipment at a border crossing shall receive the inspection results from the border inspection system to be used to screen the incoming commercial vehicles once they have cleared the border agency's inspection area. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **ISP Operational Data Repository** | **1** | **New** |
| | | New Requirement: The center shall select real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, transit information, parking information, special event and incident information. | | |
| | | **ISP Operational Data Repository** | **2** | **New** |
| | | New Requirement: The center shall distribute real-time transportation operations data to centers in the region. The data may be broadcast or customized based on the receiving center's specified requests or subscriptions. | | |
| | | **ISP Operational Data Repository** | **3** | **New** |
| | | New Requirement: The center shall support the capability for the system operator to monitor and control the operational data repository and information distribution service. | | |
| | | **ISP Operational Data Repository** | **4** | **New** |
| | | New Requirement: The center shall provide a web site that provides real-time transportation data to transportation system operators in the region. | | |
| | | **ISP Probe Information Collection** | **5** | **New** |
| | | New Requirement: The center shall receive traffic probe data collected by transit fleet operators and include this data in aggregated probe data provided to other centers. | | |
| | | **ISP Probe Information Collection** | **6** | **New** |
| | | New Requirement: The center shall receive traffic probe data derived from electronic toll collection operations and include this data in aggregated probe data provided to other centers. | | |
| | | **ISP Traveler Data Collection** | **9** | **New** |
| | | New Requirement: The center shall collect, process, and store border crossing information. | | |
| | | **ISP Traveler Information Alerts** | **1** | **New** |
| | | New Requirement: The center shall accept traveler profiles that establish recurring trip characteristics including route, mode, and timeframe information. | | |
| | | **ISP Traveler Information Alerts** | **2** | **New** |
| | | New Requirement: The center shall accept traveler profiles that define alert thresholds that establish the severity and types of alerts that are provided to each traveler. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **ISP Traveler Information Alerts** | **3** | **New** |
| | | New Requirement: The center shall disseminate personalized traffic alerts reporting congestion, incidents, delays, detours and road closures that may impact a current or planned trip. | | |
| | | **ISP Traveler Information Alerts** | **4** | **New** |
| | | New Requirement: The center shall disseminate personalized transit alerts reporting transit delays and service interruptions. | | |
| | | **ISP Traveler Information Alerts** | **5** | **New** |
| | | New Requirement: The center shall disseminate personalized parking alerts reporting parking availability and closures. | | |
| | | **ISP Traveler Information Alerts** | **6** | **New** |
| | | New Requirement: The center shall disseminate personalized road weather alerts reporting adverse road and weather conditions. | | |
| | | **ISP Traveler Information Alerts** | **7** | **New** |
| | | New Requirement: The center shall disseminate personalized multimodal transportation service alerts including ferry and air travel delays, port closures, and service interruptions. | | |
| | | **ISP Traveler Information Alerts** | **8** | **New** |
| | | New Requirement: The center shall disseminate personalized event alerts reporting special event impacts on the transportation system. | | |
| | | **ISP Traveler Information Alerts** | **9** | **New** |
| | | New Requirement: The center shall provide an operator interface that supports monitoring and management of subscribers and the content and format of alert messages. | | |
| | | **ISP VII Traveler Information Distribution** | **1** | **New** |
| | | New Requirement: The center shall select traveler information for distribution including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. | | |
| | | **ISP VII Traveler Information Distribution** | **2** | **New** |
| | | New Requirement: The center shall distribute location relevant traveler information to short range communications equipment at the roadside. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **ISP VII Traveler Information Distribution** | **3** | **New** |
| | | New Requirement: The center shall provide the capability for a system operator to monitor VII system operation and control the type and update frequency of traveler information that is distributed. | | |
| | | **ISP VII Traveler Information Distribution** | **4** | **New** |
| | | New Requirement: The center shall monitor the operational status of the VII roadside equipment. | | |
| | | **ISP VII Traveler Information Distribution** | **5** | **New** |
| | | New Requirement: The center shall collect fault data from the roadside equipment and send to the maintenance center for repair. | | |
| | | **ISP VII Traveler Information Distribution** | **6** | **New** |
| | | New Requirement: The center shall monitor maintenance status of the roadside equipment. | | |
| | | **MCM Environmental Information Collection** | **4** | **New** |
| | | New Requirement: The center shall collect environmental probe data (air temperature, exterior light status, wiper status, traction control status, etc.) from short range communications equipment that communicates with appropriately equipped probe vehicles. | | |
| | | **MCM Infrastructure Monitoring** | **2** | **New** |
| | | New Requirement: The center shall monitor maintenance vehicle-based mobile sensors and data logging devices that collect information on current infrastructure condition. | | |
| | | **MCM Infrastructure Monitoring** | **3** | **New** |
| | | New Requirement: The center shall remotely collect data from vehicle probes using short range communications equipment and process this data to identify potential pavement degradation, potholes, and other rough or adverse road surface conditions. | | |
| | | **MCM Infrastructure Monitoring** | **4** | **New** |
| | | New Requirement: The center shall process the collected information and use it to monitor the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **MCM Infrastructure Monitoring** | **5** | **New** |
| | | New Requirement: The center shall collect current maintenance and repair needs from the asset management system and correlate this data with data collected through infrastructure monitoring systems. | | |
| | | **MCM Infrastructure Monitoring** | **6** | **New** |
| | | New Requirement: The center shall provide current infrastructure conditions information to the asset management system. | | |
| | | **MCM Infrastructure Monitoring** | **7** | **New** |
| | | New Requirement: The center shall report infrastructure repair needs to the maintenance management system. | | |
| | | **MCM Roadway Maintenance and Construction** | **13** | **New** |
| | | New Requirement: The center shall report the status of field equipment maintenance activities to the centers that operate the equipment. | | |
| | | **MCM Transportation Operations Data Collection** | **1** | **New** |
| | | New Requirement: The center shall collect real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. | | |
| | | **MCM Transportation Operations Data Collection** | **2** | **New** |
| | | New Requirement: The center shall support the capability for the system operator to monitor and control the information collection service. | | |
| | | **MCM Work Zone Management** | **6** | **New** |
| | | New Requirement: The center shall collect real-time information on the state of the road network including current traffic and road conditions to support work zone scheduling and management. | | |
| | | **MCV Infrastructure Monitoring** | **5** | **New** |
| | | New Requirement: The maintenance and construction vehicle shall respond to control information from the center to allow remote operation of the on-board vehicle systems. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **On-board CV Safety and Security** | **6** | **New** |
| | | New Requirement: The commercial vehicle shall provide expected driver identity characteristics (e.g., PIN codes and biometric data) to roadside check facilities to support safety and security checking. | | |
| | | **On-board CV Safety and Security** | **7** | **New** |
| | | New Requirement: The commercial vehicle shall provide information about previous attempts to disable the commercial vehicle to roadside check facilities. | | |
| | | **On-board EV En Route Support** | **9** | **New** |
| | | New Requirement: The emergency vehicle shall send the vehicle's location, speed and direction to other vehicles in the area. | | |
| | | **On-board EV Incident Management Communication** | **4** | **New** |
| | | New Requirement: The emergency vehicle shall provide traffic incident information to approaching vehicles using short range communications.. | | |
| | | **On-board Paratransit Operations** | **4** | **New** |
| | | New Requirement: The transit vehicle shall provide the capability to log passenger boardings and alightings and make passenger use data available to the transit center. | | |
| | | **On-board Passenger Counting** | **1** | **New** |
| | | New Requirement: The transit vehicle shall count passengers boarding and alighting. | | |
| | | **On-board Passenger Counting** | **2** | **New** |
| | | New Requirement: The passenger counts shall be related to location to support association of passenger counts with routes, route segments, or bus stops. | | |
| | | **On-board Passenger Counting** | **3** | **New** |
| | | New Requirement: The passenger counts shall be timestamped so that ridership can be measured by time of day and day of week. | | |
| | | **On-board Passenger Counting** | **4** | **New** |
| | | New Requirement: The transit vehicle shall send the collected passenger count information to the transit center. | | |
| | | **On-board Schedule Management** | **8** | **New** |
| | | New Requirement: The transit vehicle shall notify the transit center of vehicle location and operational status as the vehicle exits and returns to the transit facility to support future vehicle assignments. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **On-board Transit In Vehicle Signing Communications**<br>New Requirement: The transit vehicle shall notify nearby vehicles using short range communications when making a passenger stop, merging, and performing other operations that require cooperation from surrounding traffic. | **1** | **New** |
| | | **On-board Transit In Vehicle Signing Communications**<br>New Requirement: The transit vehicle shall provide the capability for the transit vehicle operator to monitor and control the operation of the short range communication system. | **2** | **New** |
| | | **On-board Transit Signal Priority**<br>New Requirement: The transit vehicle shall prevent a priority request from being sent when the transit vehicle cannot use the priority (e.g., when the transit vehicle makes a passenger stop on the approach to an intersection). | **4** | **New** |
| | | **Parking Short Range Traveler Information Communications**<br>New Requirement: The parking element shall distribute static parking information (e.g., guide signs, directional signs, rates, and restrictions) to equipment on-board vehicles. | **1** | **New** |
| | | **Parking Short Range Traveler Information Communications**<br>New Requirement: The parking element shall distribute dynamic parking information (e.g., parking availability and locations) to equipment on-board vehicles. | **2** | **New** |
| | | **Personal Interactive Information Reception**<br>New Requirement: The personal traveler interface shall receive travel alerts and present them to the traveler. Relevant alerts are provided based on pre-supplied trip characteristics and preferences. | **15** | **New** |
| | | **Personal Interactive Information Reception**<br>New Requirement: The personal traveler interface shall accept personal preferences, recurring trip characteristics, and traveler alert subscription information from the traveler and send this information to a center to support customized traveler information services. | **16** | **New** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Roadside Electronic Screening** | **6** | **New** |
| | | New Requirement: The roadside check facility equipment shall collect safety data from the commercial vehicle and its freight equipment. | | |
| | | **Roadside Electronic Screening** | **8** | **New** |
| | | New Requirement: The roadside check facility equipment shall verify that pull-in requests are heeded by drivers, notifying the facility operator if a vehicle fails to pull in as requested. | | |
| | | **Roadside Electronic Screening** | **9** | **New** |
| | | New Requirement: The roadside check facility equipment shall monitor alerting and advisory systems for security alerts and advisories. | | |
| | | **Roadside Lighting System Control** | **1** | **New** |
| | | New Requirement: The field element shall control lighting systems along the roadside under center control. | | |
| | | **Roadside Lighting System Control** | **2** | **New** |
| | | New Requirement: The field element shall return operational status for the lighting system equipment to the center. | | |
| | | **Roadside Lighting System Control** | **3** | **New** |
| | | New Requirement: The field element shall return lighting system equipment fault data to the center for repair. | | |
| | | **Roadside Safety and Security Inspection** | **7** | **New** |
| | | New Requirement: The roadside check facility equipment shall receive driver records, accident reports, and citation records from the commercial vehicle administration center to support driver identification and access to driver credentials and history information. | | |
| | | **Roadside Safety and Security Inspection** | **8** | **New** |
| | | New Requirement: The roadside check facility equipment shall read expected driver identity characteristics (e.g., PIN codes and biometric data) from the commercial vehicle equipment to support safety and security checking. | | |
| | | **Roadside Safety and Security Inspection** | **9** | **New** |
| | | New Requirement: The roadside check facility equipment shall read the driver identification card provided by the commercial vehicle driver and support cross-check of the identification data with driver records. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Roadway HOV Control** | **4** | **New** |
| | | New Requirement: The field element shall collect a count of vehicle occupants from passing vehicles using field-vehicle communications. | | |
| | | **Roadway Intersection Safety Warning** | **3** | **New** |
| | | New Requirement: The field element shall monitor road conditions on approaches to, and within, the intersection. | | |
| | | **Roadway Intersection Safety Warning** | **4** | **New** |
| | | New Requirement: The field element shall communicate with approaching vehicles to determine vehicle position, velocity, acceleration, direction, and intended turning movement. | | |
| | | **Roadway Intersection Safety Warning** | **5** | **New** |
| | | New Requirement: The field element shall detect potentially hazardous conditions including impending red-light or stop sign violations and potential conflicts between approaching vehicles. | | |
| | | **Roadway Intersection Safety Warning** | **7** | **New** |
| | | New Requirement: The field element shall update signs or signals to warn the driver of potentially hazardous situations. | | |
| | | **Roadway Probe Data Communications** | **4** | **New** |
| | | New Requirement: The field element shall communicate with on-board equipment on passing vehicles to collect vehicle trip information (e.g., origin and destination information, travel times) that can be used to support transportation planning. | | |
| | | **Roadway Probe Data Communications** | **5** | **New** |
| | | New Requirement: The field element shall communicate with on-board equipment on passing vehicles to collect a history of precise positioning information that can be used to derive or verify accurate roadway geometry and lane features for use by map update providers. | | |
| | | **Roadway Safety Warning System** | **1** | **New** |
| | | New Requirement: The field element shall collect safety data from passing vehicles including location, vehicle motion (speed, heading, acceleration), vehicle control (brakes, steering, throttle, exterior lights), and additional vehicle status (anti-lock brake activation, | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Roadway Safety Warning System**<br>New Requirement: The field element shall collect data from sensors and surveillance equipment to monitor environmental conditions, stopped or wrong way vehicles, roadway debris, or other potentially hazardous conditions. | **2** | **New** |
| | | **Roadway Safety Warning System**<br>New Requirement: The field element shall process the collected data to identify potential hazards. | **3** | **New** |
| | | **Roadway Safety Warning System**<br>New Requirement: The field element shall provide warnings to passing vehicles using field-vehicle communications. | **4** | **New** |
| | | **Roadway Safety Warning System**<br>New Requirement: The field element shall support remote monitoring and control by an authenticated center. | **5** | **New** |
| | | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall respond to requests from border agencies to implement special traffic control measures (e.g. lane assignments by vehicle type) on the approaches to a border crossing. | **13** | **New** |
| | | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall monitor incident response performance and calculate incident response and clearance times. | **8** | **New** |
| | | **TMC Lighting System Control**<br>New Requirement: The center shall remotely control electrical lighting systems. | **1** | **New** |
| | | **TMC Lighting System Control**<br>New Requirement: The center shall collect lighting system operational status and compare against the control information sent by the center. | **2** | **New** |
| | | **TMC Lighting System Control**<br>New Requirement: The center shall collect lighting system fault data from the field and send to the maintenance center for repair. | **3** | **New** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **TMC Traffic Management Decision Support** | **1** | **New** |
| | | New Requirement: The center shall provide center personnel with an integrated regional view of current and forecast road and traffic conditions including traffic incidents, special events, maintenance activities and other events or conditions that impact capacity or deman | | |
| | | **TMC Traffic Management Decision Support** | **2** | **New** |
| | | New Requirement: The center shall identify network imbalances and potential courses of action. | | |
| | | **TMC Traffic Management Decision Support** | **3** | **New** |
| | | New Requirement: The center shall compare the impact of potential courses of action and make recommendations to the operator. | | |
| | | **TMC Traffic Management Decision Support** | **4** | **New** |
| | | New Requirement: The recommended actions shall include predefined incident response plans, signal timing plan changes, DMS/HAR messages, and freeway control strategies including ramp metering, interchange control, and lane controls. | | |
| | | **TMC Traffic Management Decision Support** | **5** | **New** |
| | | New Requirement: The recommended actions shall include multimodal strategies that include suggested transit strategies and suggested route and mode choices for travelers. | | |
| | | **TMC Traffic Management Decision Support** | **6** | **New** |
| | | New Requirement: The center shall provide an interface to center personnel to input control parameters for the decision support process and receive recommended actions and supporting information presentation. | | |
| | | **TMC Traffic Network Performance Evaluation** | **8** | **New** |
| | | New Requirement: The center shall provide an interface to the archive data repository to enable the operator to retrieve historical operating data for use in planning to predict future traffic patterns and conditions. | | |
| | | **TMC Traffic Network Performance Evaluation** | **9** | **New** |
| | | New Requirement: This center shall use the collected information to measure overall current and forecast network performance and predict travel demand patterns. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **TMC Transportation Operations Data Collection** | **1** | **New** |
| | | New Requirement: The center shall collect real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. | | |
| | | **TMC Transportation Operations Data Collection** | **2** | **New** |
| | | New Requirement: The center shall support the capability for the system operator to monitor and control the information collection service. | | |
| | | **Transit Center Fixed-Route Operations** | **11** | **New** |
| | | New Requirement: The center shall provide an interface to the archive data repository to enable the operator to retrieve historical operating data for use in planning transit routes and schedules. | | |
| | | **Transit Center Multi-Modal Coordination** | **4** | **New** |
| | | New Requirement: The center shall coordinate transit services for special events, planning services for the event and managing transit services on the day of the event. | | |
| | | **Transit Center Multi-Modal Coordination** | **5** | **New** |
| | | New Requirement: The center shall provide transit operations personnel with the capability to control and monitor transit service coordination activities. | | |
| | | **Transit Center Paratransit Operations** | **7** | **New** |
| | | New Requirement: The center shall collect the log of passenger boardings and alightings from the paratransit vehicles. | | |
| | | **Transit Center Passenger Counting** | **1** | **New** |
| | | New Requirement: The center shall collect passenger count information from each transit vehicle. | | |
| | | **Transit Center Passenger Counting** | **2** | **New** |
| | | New Requirement: The center shall calculate transit ridership data by route, route segment, transit stop, time of day, and day of week based on the collected passenger count information. | | |
| | | **Transit Center Passenger Counting** | **3** | **New** |
| | | New Requirement: The center shall make the compiled ridership data available to the system operator and other applications. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Transit Center Signal Priority** | **3** | **New** |
| | | New Requirement: The center shall define business rules that govern use of transit vehicle signal priority, communicate these rules to the transit vehicle, and monitor transit vehicle requests for priority at signalized intersections. | | |
| | | **Transit Center Signal Priority** | **4** | **New** |
| | | New Requirement: The center shall provide transit operations personnel with the capability to control and monitor transit signal priority operations. | | |
| | | **Transit Center Vehicle Tracking** | **5** | **New** |
| | | New Requirement: The center shall provide collected transit probe data to traffic management centers and traveler information service providers for use in measuring current traffic conditions. | | |
| | | **Transit Transportation Operations Data Collection** | **1** | **New** |
| | | New Requirement: The center shall collect real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. | | |
| | | **Transit Transportation Operations Data Collection** | **2** | **New** |
| | | New Requirement: The center shall support the capability for the system operator to monitor and control the information collection service. | | |
| | | **Transit Vehicle Assignment** | **1** | **New** |
| | | New Requirement: The center shall assign individual transit vehicles to transit blocks. | | |
| | | **Transit Vehicle Assignment** | **2** | **New** |
| | | New Requirement: The center shall download vehicle assignments to the transit vehicle prior to the start of the day's operations. | | |
| | | **Transit Vehicle Assignment** | **3** | **New** |
| | | New Requirement: The center shall provide an exception handling process for the vehicle assignment function. This process shall generate new supplemental vehicle assignments as required due to change events which occur during the operating day. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Transit Vehicle Assignment** | **4** | **New** |
| | | New Requirement: The center shall provide an inventory management function for the transit facility that stores functional attributes about each vehicle owned by the transit operator. The functional attributes permit the planning and assignment functions to match vehicle | | |
| | | **Transit Vehicle Assignment** | **5** | **New** |
| | | New Requirement: The center shall generate transit vehicle availability listings, current and forecast, to support transit vehicle assignment planning. | | |
| | | **Transit Vehicle Assignment** | **6** | **New** |
| | | New Requirement: The center shall provide transit operations personnel with the capability to update transit vehicle assignments and receive reports on transit vehicle inventory status. | | |
| | | **Transit Vehicle Operator Assignment** | **5** | **New** |
| | | New Requirement: The center shall generate supplemental vehicle operator assignments as required due to change events that occur during the operating day. | | |
| | | **Vehicle Environmental Probe Support** | **2** | **New** |
| | | New Requirement: The vehicle shall monitor the status of vehicle convenience and safety systems (wiper status, headlight status, traction control system status) that can be used to measure environmental conditions and record snapshots of significant events in these system | | |
| | | **Vehicle Intersection Control** | **3** | **New** |
| | | New Requirement: The vehicle shall monitor its approach to the intersection and determine if it is approaching the intersection with excessive speed or in an unsafe manner. | | |
| | | **Vehicle Intersection Control** | **4** | **New** |
| | | New Requirement: The vehicle shall send its current position, velocity, acceleration, direction, and intended turning movement to the roadway field equipment. | | |
| | | **Vehicle Intersection Safety Warning** | **3** | **New** |
| | | New Requirement: The vehicle shall monitor its approach to the intersection and determine if it is approaching the intersection with excessive speed or in an unsafe manner. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Vehicle Intersection Safety Warning** | **4** | **New** |
| | | New Requirement: The vehicle shall send its current position, velocity, acceleration, direction, and intended turning movement to the roadway field equipment. | | |
| | | **Vehicle On-board Diagnostics System** | **1** | **New** |
| | | New Requirement: The vehicle shall monitor engine-related components including the emissions control system. | | |
| | | **Vehicle On-board Diagnostics System** | **2** | **New** |
| | | New Requirement: The vehicle shall report detected problems to the driver and store additional diagnostics data for the service technician. | | |
| | | **Vehicle On-board Diagnostics System** | **3** | **New** |
| | | New Requirement: The vehicle shall provide diagnostics data to field elements using field-vehicle communications to support vehicle performance monitoring. | | |
| | | **Vehicle On-board Diagnostics System** | **4** | **New** |
| | | New Requirement: The vehicle shall receive diagnostics messages and advisories from field elements, present the provided information to the driver, and store the received information for use by service technicians. | | |
| | | **Vehicle Pre-Crash Safety Systems** | **2** | **New** |
| | | New Requirement: The vehicle shall send and receive current vehicle location and trajectory information and use this information to determine the proximity of other vehicles and closing rates. | | |
| | | **Vehicle Secure Area Access System** | **1** | **New** |
| | | New Requirement: This vehicle shall accept inputs from the vehicle driver that include the necessary identity and access information. | | |
| | | **Vehicle Secure Area Access System** | **2** | **New** |
| | | New Requirement: The vehicle shall generate the request to activate the access control system to gain access to the secure area. | | |
| | | **Vehicle Secure Area Access System** | **3** | **New** |
| | | New Requirement: The vehicle shall receive status from access control system and provide status to the driver. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| | | **Vehicle Traffic Probe Support** | **1** | **New** |
| | | New Requirement: The vehicle shall respond to requests from short range communications equipment for identification information that can be used to collect basic probe information; the field equipment will remove identification information to ensure anonymity. | | |
| | | **Vehicle Traffic Probe Support** | **3** | **New** |
| | | New Requirement: The vehicle shall record vehicle trip information (e.g., travel times, origin and destination information for vehicles that opt in) that can be used to support transportation planning. | | |
| | | **Vehicle Traffic Probe Support** | **6** | **New** |
| | | New Requirement: The vehicle shall report the number of vehicle occupants to field equipment located along the roadway. | | |
| | | **Vehicle Warning System** | **1** | **New** |
| | | New Requirement: The vehicle shall receive vehicle location, speed, and direction information from surrounding vehicles. | | |
| | | **Vehicle Warning System** | **2** | **New** |
| | | New Requirement: The vehicle shall determine vehicle proximity and closing rates and determine the likelihood of a collision. | | |
| | | **Vehicle Warning System** | **3** | **New** |
| | | New Requirement: The vehicle shall warn the driver if the driver should take action to avoid a collision. | | |
| | | **Vehicle Warning System** | **4** | **New** |
| | | New Requirement: The vehicle shall warn the driver of approaching emergency vehicles. | | |
| | | **Vehicle Warning System** | **5** | **New** |
| | | New Requirement: The vehicle shall provide its location, speed, direction, and other information to surrounding vehicles. | | |
| | | **Vehicle Warning System** | **6** | **New** |
| | | New Requirement: The vehicle shall provide its location, speed, direction, and other information to field elements. | | |
| | | **Vehicle Warning System** | **7** | **New** |
| | | New Requirement: The vehicle shall receive warnings from field elements. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Automated Road Signing** | **1** | **Roadway Short Range Traveler Information Communications** | **1** | **Replaced** |
| Old Requirement: The field element shall distribute road condition and environmental information to signage equipment on-board vehicles, in an autonomous manner more suitable for rural applications. | | New Requirement: The field element shall distribute traveler information including traffic and road conditions to passing vehicles using short range communications, under center control. | | |
| **Automated Road Signing** | **2** | **Roadway Short Range Traveler Information Communications** | **2** | **Replaced** |
| Old Requirement: The field element shall distribute advisory information, such as evacuation information, wide-area alerts, incident information, work zone intrusion information, and other special information to signage equipment on-board vehicles, in a manner suitable fo | | New Requirement: The field element shall distribute advisory information, such as evacuation information, wide-area alerts, incident information, work zone intrusion information, and other special information to passing vehicles using short range communications, under ce | | |
| **Automated Road Signing** | **3** | **Roadway Short Range Traveler Information Communications** | **3** | **Replaced** |
| Old Requirement: The field element shall distribute indicator and fixed sign information, such as actual intersection traffic signal states, stop, or yield signs to signage equipment on-board vehicles, in a manner suitable for rural applications. | | New Requirement: The field element shall distribute indicator and fixed sign information, including static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states and local condit | | |
| **Automated Road Signing** | **4** | **Roadway Short Range Traveler Information Communications** | **4** | **Replaced** |
| Old Requirement: The field element, typically a roadside beacon, shall return system operational status to the controlling center. | | New Requirement: The field element shall return system operational status to the controlling center. | | |
| **Automated Road Signing** | **5** | **Roadway Short Range Traveler Information Communications** | **5** | **Replaced** |
| Old Requirement: The field element, typically a roadside beacon, shall return system fault data to the maintenance center for repair. | | New Requirement: The field element shall return system fault data to the maintenance center for repair. | | |
| **Basic Information Broadcast** | **1** | **Basic Information Broadcast** | **1** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate traffic and highway condition information to travelers, including incident information, detours and road closures, event information, recommended routes, and current speeds on specific routes. | | New Requirement: The center shall disseminate traffic and highway condition information to travelers, including incident information, detours and road closures, event information, recommended routes, and current speeds on specific routes. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Basic Information Broadcast** | **2** | **Basic Information Broadcast** | **2** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate maintenance and construction information to travelers, including scheduled maintenance and construction work activities and work zone activities. | | New Requirement: The center shall disseminate maintenance and construction information to travelers, including scheduled maintenance and construction work activities and work zone activities. | | |
| **Basic Information Broadcast** | **3** | **Basic Information Broadcast** | **3** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information to travelers. | | New Requirement: The center shall disseminate transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information to travelers. | | |
| **Basic Information Broadcast** | **4** | **Basic Information Broadcast** | **4** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate parking information to travelers, including location, availability, and fees. | | New Requirement: The center shall disseminate parking information to travelers, including location, availability, and fees. | | |
| **Basic Information Broadcast** | **5** | **Basic Information Broadcast** | **5** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate toll fee information to travelers. | | New Requirement: The center shall disseminate toll fee information to travelers. | | |
| **Basic Information Broadcast** | **6** | **Basic Information Broadcast** | **6** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate weather information to travelers. | | New Requirement: The center shall disseminate weather information to travelers. | | |
| **Basic Information Broadcast** | **7** | **Basic Information Broadcast** | **7** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate event information to travelers. | | New Requirement: The center shall disseminate event information to travelers. | | |
| **Basic Information Broadcast** | **8** | **Basic Information Broadcast** | **8** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate air quality information to travelers. | | New Requirement: The center shall disseminate air quality information to travelers. | | |
| **Center Secure Area Surveillance** | **11** | **Center Secure Area Surveillance** | **11** | **Edited** |
| Old Requirement: The center shall exchange traveler images with other emergency management centers to support traveler image matching. | | New Requirement: The center shall exchange traveler images with other emergency management centers to support traveler image matching. | | |
| **Citation and Accident Electronic Recording** | **3** | **Citation and Accident Electronic Recording** | **3** | **Edited** |
| Old Requirement: The roadside check facility equipment shall forward results of the roadside inspections to the commercial vehicle administration center either as needed or on a periodic (e.g. basis). These reports include accident reports, violation notifications, citat | | New Requirement: The roadside check facility equipment shall forward results of the roadside inspections to the commercial vehicle administration center either as needed or on a periodic basis. These reports include accident reports, violation notifications, citations, a | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Collect Traffic Surveillance** | **5** | **Collect Traffic Surveillance** | **5** | **Edited** |
| Old Requirement: The center shall respond to control data from center personnel regarding sensor and surveillance data collection, analysis, storage, and distribution. | | New Requirement: The center shall respond to control data from center personnel regarding sensor and surveillance data collection, analysis, storage, and distribution. | | |
| **CV Information Exchange** | **1** | **CV Information Exchange** | **1** | **Edited** |
| Old Requirement: The center shall exchange information with roadside check facilities, including credentials and credentials status information, safety status information, daily site activity data, and citations. | | New Requirement: The center shall exchange information with roadside check facilities, including credentials and credentials status information, safety status information, daily site activity data, driver records, and citations. | | |
| **CV Information Exchange** | **2** | **CV Information Exchange** | **2** | **Edited** |
| Old Requirement: The center shall exchange safety and credentials data among other commercial vehicle administration centers; includes border clearance status, credentials information, credentials status information, and safety status information. | | New Requirement: The center shall exchange safety and credentials data among other commercial vehicle administration centers; includes border clearance status, credentials information, credentials status information, driver records, accident reports, and safety status inf | | |
| **CV Information Exchange** | **5** | **CV Safety and Security Administration** | **5** | **Replaced** |
| Old Requirement: The center shall provide commercial vehicle accident reports and citations to enforcement agencies. | | New Requirement: The center shall provide commercial vehicle accident reports to enforcement agencies. | | |
| **CV Information Exchange** | **6** | **CV Information Exchange** | **5** | **Renumbered** |
| Old Requirement: The center shall provide commercial vehicle credentials and safety status information to authorized requestors such as insurance agencies. | | New Requirement: The center shall provide commercial vehicle credentials and safety status information to authorized requestors such as insurance agencies. | | |
| **CV Information Exchange** | **7** | **CV Information Exchange** | **6** | **Renumbered** |
| Old Requirement: The center shall provide reports to the commercial vehicle fleet manager regarding fleet activity through roadside facilities including accident reports, citations, credentials status information, and safety status information. | | New Requirement: The center shall provide reports to the commercial vehicle fleet manager regarding fleet activity through roadside facilities including accident reports, citations, credentials status information, driver records, and safety status information. | | |
| **CV Safety Administration** | **1** | **CV Safety and Security Administration** | **1** | **Replaced** |
| Old Requirement: The center shall provide commercial vehicle safety data to roadside check facilities. | | New Requirement: The center shall provide commercial vehicle safety and security data to roadside check facilities. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **CV Safety Administration** | **2** | **CV Safety and Security Administration** | **2** | **Replaced** |
| Old Requirement: The center shall collect and review safety inspection reports and violations from the roadside check facilities and pass on appropriate portions to other commercial vehicle administrative centers and commercial vehicle fleet operators. | | New Requirement: The center shall collect and review safety inspection reports and violations from the roadside check facilities and pass on appropriate portions to other commercial vehicle administrative centers and commercial vehicle fleet operators. | | |
| **CV Safety Administration** | **3** | **CV Safety and Security Administration** | **3** | **Replaced** |
| Old Requirement: The center shall notify enforcement agencies of commercial vehicle safety violations by individual commercial vehicles, drivers, or carriers. | | New Requirement: The center shall notify enforcement agencies of commercial vehicle safety violations by individual commercial vehicles, drivers, or carriers. | | |
| **Emergency Early Warning System** | **10** | **Emergency Early Warning System** | **11** | **Renumbered** |
| Old Requirement: The center shall coordinate the broadcast of wide-area alerts and advisories with other emergency management centers. | | New Requirement: The center shall coordinate the broadcast of wide-area alerts and advisories with other emergency management centers. | | |
| **Emergency Early Warning System** | **11** | **Emergency Early Warning System** | **12** | **Renumbered** |
| Old Requirement: The center shall receive incident information from other transportation management centers to support the early warning system. | | New Requirement: The center shall receive incident information from other transportation management centers to support the early warning system. | | |
| **Emergency Early Warning System** | **12** | **Emergency Early Warning System** | **13** | **Renumbered** |
| Old Requirement: The center shall present the alert and advisory information and the status of the actions taken in response to the alert by the other centers to the emergency system operator as received from other system inputs. | | New Requirement: The center shall present the alert and advisory information and the status of the actions taken in response to the alert by the other centers to the emergency system operator as received from other system inputs. | | |
| **Emergency Early Warning System** | **13** | **Emergency Early Warning System** | **14** | **Renumbered** |
| Old Requirement: The center shall support the entry of alert and advisory information directly from the emergency system operator. | | New Requirement: The center shall support the entry of alert and advisory information directly from the emergency system operator. | | |
| **Emergency Early Warning System** | **9** | **Emergency Early Warning System** | **10** | **Renumbered** |
| Old Requirement: The center shall process status information from each of the centers that have been sent the wide-area alert. | | New Requirement: The center shall process status information from each of the centers that have been sent the wide-area alert. | | |
| **Emergency Environmental Monitoring** | **2** | | | **Discontinued** |
| Old Requirement: The center shall receive environmental probe information from its fleet of emergency vehicles. | | | | |
| **Emergency Environmental Monitoring** | **3** | **Emergency Environmental Monitoring** | **2** | **Renumbered** |
| Old Requirement: The center shall collect current road and weather information from roadway maintenance operations. | | New Requirement: The center shall collect current road and weather information from roadway maintenance operations. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Emergency Environmental Monitoring** | **4** | **Emergency Environmental Monitoring** | **3** | **Renumbered** |
| Old Requirement: The center shall assimilate current and forecast road conditions and surface weather information to support incident management. | | New Requirement: The center shall assimilate current and forecast road conditions and surface weather information to support incident management. | | |
| **Emergency Environmental Monitoring** | **5** | **Emergency Environmental Monitoring** | **4** | **Renumbered** |
| Old Requirement: The center shall present the current and forecast road and weather information to the emergency system operator. | | New Requirement: The center shall present the current and forecast road and weather information to the emergency system operator. | | |
| **Emergency Environmental Monitoring** | **6** | | | **Discontinued** |
| Old Requirement: The center shall provide aggregated or processed environmental probe information from its fleet of emergency vehicles to traffic management and maintenance centers. | | | | |
| **Emergency Response Management** | **1** | **Emergency Response Management** | **1** | **Edited** |
| Old Requirement: The center shall provide strategic emergency response capabilities such as that of an Emergency Operations Center for large-scale incidents and disasters. | | New Requirement: The center shall provide strategic emergency response capabilities provided by an Emergency Operations Center for large-scale incidents and disasters. | | |
| **Emergency Response Management** | **11** | **Emergency Response Management** | **11** | **Edited** |
| Old Requirement: The center shall assimilate the status of the transit, traffic, rail, maintenance, and other emergency center services and systems to create an overall transportation system status, and disseminate to each of these centers and the traveling public via tra | | New Requirement: The center shall assimilate the damage assessment of the transit, traffic, rail, maintenance, and other emergency center services and systems to create an overall transportation system status, and disseminate to each of these centers and the traveling pub | | |
| **Emergency Response Management** | **3** | **Emergency Response Management** | **3** | **Edited** |
| Old Requirement: The center shall provide the capability to implement response plans and track progress through the incident by exchanging incident information and distributing response status to allied agencies. | | New Requirement: The center shall provide the capability to implement response plans and track progress through the incident by exchanging incident information and response status with allied agencies. | | |
| **Emergency Response Management** | **5** | **Emergency Response Management** | **5** | **Edited** |
| Old Requirement: The center shall track the availability of resources (including vehicles, roadway cleanup, etc.), request additional resources from traffic, maintenance, or other emergency centers if needed. | | New Requirement: The center shall track the availability of resources and coordinate resource sharing with allied agency centers including traffic, maintenance, or other emergency centers. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Emergency Response Management** | **6** | **Emergency Response Management** | **6** | **Edited** |
| Old Requirement: The center shall allocate the appropriate emergency services, resources, and vehicle (s) to respond to incidents, and shall provide the capability to override the current allocation to suit the special needs of a current incident. | | New Requirement: The center shall allocate the appropriate emergency services, resources, and vehicle (s) to respond to incidents, and shall provide the capability to override the current allocation to suit the special needs of a current incident. | | |
| **Emergency Routing** | **1** | **Emergency Routing** | **1** | **Edited** |
| Old Requirement: The center shall collect current traffic and road condition information from traffic management centers for emergency vehicle route calculation. | | New Requirement: The center shall collect current traffic and road condition information for emergency vehicle route calculation. | | |
| **Emergency Routing** | **2** | **Emergency Routing** | **2** | **Edited** |
| Old Requirement: The center shall receive inputs from traffic management and maintenance centers on the location and status of traffic control equipment and work zones along potential emergency routes. | | New Requirement: The center shall receive information on the location and status of traffic control equipment and work zones along potential emergency routes. | | |
| **Emergency Routing** | **4** | **Emergency Routing** | **4** | **Edited** |
| Old Requirement: The center shall receive asset restriction information from maintenance centers to support the dispatching of appropriate emergency resources. | | New Requirement: The center shall receive asset restriction information to support the dispatching of appropriate emergency resources. | | |
| **Emergency Routing** | **5** | **Emergency Routing** | **5** | **Edited** |
| Old Requirement: The center shall calculate emergency vehicle routes, under center personnel control, based on information from traffic management and maintenance centers. | | New Requirement: The center shall calculate emergency vehicle routes, under center personnel control, based on the collected traffic and road conditions information.. | | |
| **Fleet Administration** | **2** | **Fleet Administration** | **2** | **Edited** |
| Old Requirement: The center shall obtain and manage commercial vehicle routes for its fleet of vehicles, taking into account route restrictions, advance payment of tolls, HAZMAT restrictions, and current traffic and road conditions provided by traveler information systems | | New Requirement: The center shall obtain and manage commercial vehicle routes for its fleet of vehicles, taking into account route restrictions, advance payment of tolls, HAZMAT restrictions, current traffic and road conditions, and incident information provided by travel | | |
| **Infrastructure Provided Yellow Pages and Reservation** | **1** | **Infrastructure Provided Yellow Pages and Reservation** | **1** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate yellow pages information (such as lodging, restaurants, theaters, bicycle facilities, and other tourist activities) to travelers upon request. | | New Requirement: The center shall disseminate yellow pages information (such as lodging, restaurants, theaters, bicycle facilities, and other tourist activities) to travelers upon request. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Interactive Infrastructure Information** | **1** | **Interactive Infrastructure Information** | **1** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized traffic and highway condition information to travelers, including incident information, detours and road closures, recommended routes, and current speeds on specific routes upon request. | | New Requirement: The center shall disseminate customized traffic and highway condition information to travelers, including incident information, detours and road closures, recommended routes, and current speeds on specific routes upon request. | | |
| **Interactive Infrastructure Information** | **2** | **Interactive Infrastructure Information** | **2** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized maintenance and construction information to travelers, including scheduled maintenance and construction work activities and work zone activities upon request. | | New Requirement: The center shall disseminate customized maintenance and construction information to travelers, including scheduled maintenance and construction work activities and work zone activities upon request. | | |
| **Interactive Infrastructure Information** | **3** | **Interactive Infrastructure Information** | **3** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information to travelers upon request. | | New Requirement: The center shall disseminate customized transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information to travelers upon request. | | |
| **Interactive Infrastructure Information** | **4** | **Interactive Infrastructure Information** | **4** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized parking information to travelers, including location, availability, and fees upon request. | | New Requirement: The center shall disseminate customized parking information to travelers, including location, availability, and fees upon request. | | |
| **Interactive Infrastructure Information** | **5** | **Interactive Infrastructure Information** | **5** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized toll fee information to travelers upon request. | | New Requirement: The center shall disseminate customized toll fee information to travelers upon request. | | |
| **Interactive Infrastructure Information** | **6** | **Interactive Infrastructure Information** | **6** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized weather information to travelers upon request. | | New Requirement: The center shall disseminate customized weather information to travelers upon request. | | |
| **Interactive Infrastructure Information** | **7** | **Interactive Infrastructure Information** | **7** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized multimodal transportation service information (for example, from ferry and airline operators), including transfer points and other information, to travelers upon request. | | New Requirement: The center shall disseminate customized multimodal transportation service information (for example, from ferry and airline operators), including transfer points and other information, to travelers upon request. | | |
| **Interactive Infrastructure Information** | **8** | **Interactive Infrastructure Information** | **8** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized event information to travelers upon request. | | New Requirement: The center shall disseminate customized event information to travelers upon request. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Interactive Infrastructure Information** | **9** | **Interactive Infrastructure Information** | **9** | **Edited** |
| Old Requirement: The center shall collect, process, store, and disseminate customized air quality information to travelers upon request. | | New Requirement: The center shall disseminate customized air quality information to travelers upon request. | | |
| **Interactive Vehicle Reception** | **10** | **Interactive Vehicle Reception** | **10** | **Edited** |
| Old Requirement: The vehicle shall support driver input to invoke and cancel automatic control of the vehicle including the use of the automated highway system (AHS) lanes. | | New Requirement: The vehicle shall accept personal preferences, recurring trip characteristics, and traveler alert subscription information from the driver and send this information to a center to support customized traveler information services. | | |
| **Interactive Vehicle Reception** | **2** | | | **Discontinued** |
| Old Requirement: The transit vehicle shall receive formatted traffic and travel advisories from a center and present them to the transit vehicle traveler upon request. | | | | |
| **Interactive Vehicle Reception** | **5** | **Interactive Vehicle Reception** | **5** | **Edited** |
| Old Requirement: The vehicle shall collect vehicle data and present it to the driver (including vehicle conditions, smart probe data, safety and position warnings, and enhanced vision images) upon request . | | New Requirement: The vehicle shall collect vehicle data and present it to the driver (including vehicle conditions, environmental conditions, safety and position warnings, and enhanced vision images) upon request. | | |
| **International Border Crossing** | **2** | **International Border Crossing** | **3** | **Renumbered** |
| Old Requirement: The roadside check facility equipment at a border crossing shall request and input the tag data from approaching commercial vehicles to determine the identity of the vehicle along with its carrier, driver, and a trip identity. | | New Requirement: The roadside check facility equipment at a border crossing shall request and input the tag data from approaching commercial vehicles to determine the identity of the vehicle along with its carrier, driver, and a trip identity. | | |
| **International Border Crossing** | **3** | **International Border Crossing** | **4** | **Renumbered** |
| Old Requirement: The roadside check facility equipment at a border crossing shall request and input the border clearance data from approaching commercial vehicles to compare against the data received from the center concerning compliance with import/export and immigration | | New Requirement: The roadside check facility equipment at a border crossing shall request and input the border clearance data from approaching commercial vehicles to compare against the data received from the center concerning compliance with import/export and immigration | | |
| **International Border Crossing** | **4** | **International Border Crossing** | **5** | **Renumbered** |
| Old Requirement: The roadside check facility equipment at a border crossing shall request and input the electronic cargo lock data from approaching commercial vehicles to compare against the data received from the center. | | New Requirement: The roadside check facility equipment at a border crossing shall request and input the electronic cargo lock data from approaching commercial vehicles to compare against the data received from the center. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **International Border Crossing** | **5** | **International Border Crossing** | **6** | **Renumbered** |
| Old Requirement: The roadside check facility equipment at a border crossing shall send clearance event data regarding action taken at border to the commercial vehicle administration center and to the commercial vehicle. This may include a date/time stamped acceptance or | | New Requirement: The roadside check facility equipment at a border crossing shall send clearance event data regarding action taken at border to the commercial vehicle administration center and to the commercial vehicle. This may include a date/time stamped acceptance or | | |
| **International CV Administration** | **1** | **International CV Administration** | **1** | **Edited** |
| Old Requirement: The center shall receive domestic transportation and declaration information from Trade Regulatory Agencies such as U.S. Bureau of Immigration and Customs Enforcement(ICE), the U.S. Bureau of Customs and Border Protection (CBP), and their counterparts in | | New Requirement: The center shall receive domestic transportation and declaration information from Border Inspection Administration Agencies such as U.S. Bureau of Immigration and Customs Enforcement (ICE), the U.S. Bureau of Customs and Border Protection (CBP), and their | | |
| **International CV Administration** | **3** | **International CV Administration** | **3** | **Edited** |
| Old Requirement: The center shall provide border clearance status concerning commercial vehicles and their shipments to the roadside check facilities, the commercial vehicle fleet and freight management centers, intermodal freight shippers, other commercial vehicle admini | | New Requirement: The center shall provide border clearance status concerning commercial vehicles and their shipments to the roadside check facilities, the commercial vehicle fleet and freight management centers, intermodal freight shippers, other commercial vehicle admini | | |
| **In-Vehicle Signing System** | **1** | **Vehicle Short Range Traveler Information Reception** | **1** | **Replaced** |
| Old Requirement: The vehicle shall receive road condition and environmental information and present it to the driver via on-board signage equipment. | | New Requirement: The vehicle shall receive traveler information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. | | |
| **In-Vehicle Signing System** | **2** | **Vehicle Short Range Traveler Information Reception** | **2** | **Replaced** |
| Old Requirement: The vehicle shall receive advisory information, such as evacuation information, proximity to a maintenance and construction vehicle, wide-area alerts, incident information, work zone intrusion information, and other special information and present it to t | | New Requirement: The vehicle shall receive advisory information, such as evacuation information, proximity to a maintenance and construction vehicle, wide-area alerts, work zone intrusion information, and other special information. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **In-Vehicle Signing System** | **3** | **Vehicle Short Range Traveler Information Reception** | **3** | **Replaced** |
| Old Requirement: The vehicle shall receive indicator and fixed sign information, such as actual intersection traffic signal states, stop, or yield signs and present it to the driver via on-board signage equipment. | | New Requirement: The vehicle shall receive indicator and fixed sign information including static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states and local conditions warni | | |
| **In-Vehicle Signing System** | **4** | **Vehicle Short Range Traveler Information Reception** | **4** | **Replaced** |
| Old Requirement: The vehicle shall store a translation table for road sign and message templates used for in-vehicle display. | | New Requirement: The vehicle shall store a translation table for road sign and message templates used for in-vehicle display. | | |
| **In-Vehicle Signing System** | **5** | **Vehicle Short Range Traveler Information Reception** | **5** | **Replaced** |
| Old Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | New Requirement: The vehicle shall present the received information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | |
| **ISP Advanced Integrated Control Support** | **1** | **Infrastructure Provided Trip Planning** | **1** | **Replaced** |
| Old Requirement: The center shall provide the capability to provide specific pre-trip and enroute guidance to travelers using personal devices (such as PDAs) and drivers based on current and/or predicted conditions of the road network. | | New Requirement: The center shall provide the capability to provide specific pre-trip and enroute directions to travelers (and drivers), including costs, arrival times, and transfer points. | | |
| **ISP Advanced Integrated Control Support** | **2** | **Infrastructure Provided Trip Planning** | **11** | **Replaced** |
| Old Requirement: The center shall exchange route segment information with other centers outside the area served by the local center. | | New Requirement: The center shall exchange route segment information with other centers outside the area served by the local center. | | |
| **ISP Advanced Integrated Control Support** | **3** | **Infrastructure Provided Trip Planning** | **13** | **Replaced** |
| Old Requirement: The center shall use the preferences and constraints specified by the traveler in the trip request to select the most appropriate route. | | New Requirement: The center shall use the preferences and constraints specified by the traveler in the trip request to select the most appropriate mode of transport. | | |
| **ISP Advanced Integrated Control Support** | **4** | **Infrastructure Provided Trip Planning** | **14** | **Replaced** |
| Old Requirement: The center shall provide the capability for the traveler to confirm the proposed trip plan. | | New Requirement: The center shall provide the capability for the traveler to confirm the proposed trip plan. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **ISP Advanced Integrated Control Support** | **5** | **Infrastructure Provided Trip Planning** | **16** | **Replaced** |
| Old Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used to determine vehicle routes, trip planning, and on-line vehicle guidance. | | New Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used to determine vehicle and non-vehicle routes, trip planning, and on-line vehicle guida | | |
| **ISP Advanced Integrated Control Support** | **6** | **Infrastructure Provided Trip Planning** | **15** | **Replaced** |
| Old Requirement: The center shall provide route guidance plans and status information to traffic centers and other traveler information centers for the vehicles it is guiding. | | New Requirement: The center shall log route plans, particularly for special vehicles such as those containing hazardous materials, over-sized vehicles, or motorcades, with a traffic center. | | |
| **ISP Advanced Integrated Control Support** | **7** | **Infrastructure Provided Trip Planning** | **17** | **Replaced** |
| Old Requirement: The center shall provide the capability for center personnel to control route calculation parameters. | | New Requirement: The center shall provide the capability for center personnel to control route calculation parameters. | | |
| **ISP Emergency Traveler Information** | **1** | **ISP Emergency Traveler Information** | **1** | **Edited** |
| Old Requirement: The center shall collect and provide to the traveler interface systems emergency evacuation information, including evacuation zones, shelter information, available transportation modes, road closures and detours, changes to transit services, and traffic a | | New Requirement: The center shall disseminate emergency evacuation information to the traveler interface systems, including evacuation zones, shelter information, available transportation modes, road closures and detours, changes to transit services, and traffic and road | | |
| **ISP Emergency Traveler Information** | **3** | **ISP Emergency Traveler Information** | **3** | **Edited** |
| Old Requirement: The center shall collect and provide wide-area alert information to the traveler interface system with region-specific data, including major emergencies such as a natural or man-made disaster, civil emergency, child abductions, severe weather watches and | | New Requirement: The center shall disseminate wide-area alert information to the traveler interface systems, including major emergencies such as a natural or man-made disaster, civil emergency, child abductions, severe weather watches and warnings, military activities, an | | |
| **ISP Probe Information Collection** | **1** | **ISP Probe Information Collection** | **1** | **Edited** |
| Old Requirement: The center shall collect vehicle probe data from various sources, including vehicles under infrastructure-based route guidance and electronic toll collection points. | | New Requirement: The center shall collect traffic probe data (speeds, travel times, etc.) from appropriately equipped vehicles and short range communications equipment. | | |
| **ISP Probe Information Collection** | **2** | **ISP Probe Information Collection** | **2** | **Edited** |
| Old Requirement: The center shall aggregate collected vehicle probe data (route segment identity and the time), calculate route segment travel times, route segment speeds, and route usage, and disseminate to other centers. | | New Requirement: The center shall aggregate collected traffic probe data, calculate route segment travel times, route segment speeds, and route usage, and disseminate to other centers. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **ISP Probe Information Collection** | **3** | **ISP Probe Information Collection** | **3** | **Edited** |
| Old Requirement: The center shall collect environmental probe data (air temperature, wind speed, surface temperature, etc.) from appropriately equipped vehicles. | | New Requirement: The center shall collect environmental probe data (air temperature, exterior light status, wiper status, traction control status, etc.) from appropriately equipped vehicles and short range communications equipment. | | |
| **ISP Probe Information Collection** | **4** | **ISP Probe Information Collection** | **4** | **Edited** |
| Old Requirement: The center shall aggregate collected environmental probe data, and disseminate environmental conditions to other centers. | | New Requirement: The center shall aggregate collected environmental probe data and disseminate the aggregated environmental probe data to other centers. | | |
| **ISP Traveler Data Collection** | **6** | **ISP Traveler Data Collection** | **6** | **Edited** |
| Old Requirement: The center shall collect, process, and store weather information. | | New Requirement: The center shall collect, process, and store current and forecast road conditions and surface weather conditions. | | |
| **MCM Environmental Information Collection** | **4** | **MCM Environmental Information Collection** | **5** | **Renumbered** |
| Old Requirement: The center shall assimilate current and forecast road conditions and surface weather information using a combination of weather service provider information (such as the National Weather Service and value-added sector specific meteorological services), da | | New Requirement: The center shall assimilate current and forecast road conditions and surface weather information using a combination of weather service provider information (such as the National Weather Service and value-added sector specific meteorological services), da | | |
| **MCM Environmental Information Collection** | **5** | **MCM Environmental Information Collection** | **6** | **Renumbered** |
| Old Requirement: The center shall provide weather and road condition information to weather service providers and center personnel. | | New Requirement: The center shall provide weather and road condition information to weather service providers and center personnel. | | |
| **MCM Environmental Information Collection** | **6** | **MCM Environmental Information Collection** | **7** | **Renumbered** |
| Old Requirement: The center shall respond to control data from center personnel regarding environmental sensor control and weather data collection and processing. | | New Requirement: The center shall respond to control data from center personnel regarding environmental sensor control and weather data collection and processing. | | |
| **MCM Environmental Information Collection** | **7** | **MCM Environmental Information Collection** | **8** | **Renumbered** |
| Old Requirement: The center shall collect operational status for the roadside and vehicle-based environmental sensor equipment. | | New Requirement: The center shall collect operational status for the roadside and vehicle-based environmental sensor equipment. | | |
| **MCM Environmental Information Collection** | **8** | **MCM Environmental Information Collection** | **9** | **Renumbered** |
| Old Requirement: The center shall collect fault data for the roadside and vehicle-based environmental sensor equipment for repair. | | New Requirement: The center shall collect fault data for the roadside and vehicle-based environmental sensor equipment for repair. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **MCM Roadway Maintenance and Construction** | **10** | **MCM Roadway Maintenance and Construction** | **9** | **Renumbered** |
| Old Requirement: The center shall collect current and forecast traffic and weather information from traffic management centers and weather service providers (such as the National Weather Service and value-added sector specific meteorological services). | | New Requirement: The center shall collect current and forecast traffic and weather information from traffic management centers and weather service providers (such as the National Weather Service and value-added sector specific meteorological services). | | |
| **MCM Roadway Maintenance and Construction** | **11** | **MCM Roadway Maintenance and Construction** | **10** | **Renumbered** |
| Old Requirement: The center shall dispatch and route maintenance and construction vehicle drivers and support them with route-specific environmental, incident, advisory, threat, alert, and traffic congestion information. | | New Requirement: The center shall dispatch and route maintenance and construction vehicle drivers and support them with route-specific environmental, incident, advisory, threat, alert, and traffic congestion information. | | |
| **MCM Roadway Maintenance and Construction** | **12** | **MCM Roadway Maintenance and Construction** | **11** | **Renumbered** |
| Old Requirement: The center shall manage an interface with center personnel to accept vehicle systems control information and remotely control maintenance and construction vehicle on-board equipment. | | New Requirement: The center shall manage an interface with center personnel to accept vehicle systems control information and remotely control maintenance and construction vehicle on-board equipment. | | |
| **MCM Roadway Maintenance and Construction** | **13** | **MCM Roadway Maintenance and Construction** | **12** | **Renumbered** |
| Old Requirement: The center shall track the status of roadway maintenance and construction activities by monitoring collected data from the dispatched vehicles and equipment. | | New Requirement: The center shall track the status of roadway maintenance and construction activities by monitoring collected data from the dispatched vehicles and equipment. | | |
| **MCM Roadway Maintenance and Construction** | **5** | **MCM Roadway Maintenance and Construction** | **5** | **Edited** |
| Old Requirement: The center shall collect the status and fault data from roadside equipment, such as traffic, infrastructure, and environmental sensors, highway advisory radio and dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, c | | New Requirement: The center shall collect the status and fault data from roadside equipment, such as traffic, infrastructure, and environmental sensors, highway advisory radio and dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, c | | |
| **MCM Roadway Maintenance and Construction** | **6** | **MCM Roadway Maintenance and Construction** | **6** | **Edited** |
| Old Requirement: The center shall collect the status and fault data from traffic management centers, including data for traffic, infrastructure, and environmental sensors, highway advisory radio and dynamic message signs, automated roadway treatment systems, barrier and s | | New Requirement: The center shall collect the status and fault data from the centers that operate the equipment, including data for traffic, infrastructure, and environmental sensors, highway advisory radio and dynamic message signs, automated roadway treatment systems, b | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **MCM Roadway Maintenance and Construction**<br>Old Requirement: The center shall remotely control and collect data from infrastructure monitoring sensors located along the roadway infrastructure or on maintenance and construction vehicles. | **7** | **MCM Infrastructure Monitoring**<br>New Requirement: The center shall remotely control and collect data from fixed infrastructure monitoring sensors that monitor vibration, stress, temperature, surface continuity, and other condition measures. | **1** | **Replaced** |
| **MCM Roadway Maintenance and Construction**<br>Old Requirement: The center shall receive equipment availability and materials storage status information from storage facilities to support the scheduling of roadway maintenance and construction activities. | **8** | **MCM Roadway Maintenance and Construction**<br>New Requirement: The center shall receive equipment availability and materials storage status information from storage facilities to support the scheduling of roadway maintenance and construction activities. | **7** | **Renumbered** |
| **MCM Roadway Maintenance and Construction**<br>Old Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used as a background for the scheduling of roadway maintenance and construction activities | **9** | **MCM Roadway Maintenance and Construction**<br>New Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used as a background for the scheduling of roadway maintenance and construction activities | **8** | **Renumbered** |
| **MCM Winter Maintenance Management**<br>Old Requirement: The center shall collect current and forecast traffic and weather information from traffic management centers and weather service providers (such as the National Weather Service and value-added sector specific meteorological services). | **6** | **MCM Winter Maintenance Management**<br>New Requirement: The center shall collect real-time information on the state of the regional transportation system from other centers including current traffic and road conditions, weather conditions, special event and incident information and use the collected informatio | **6** | **Edited** |
| **MCV Environmental Monitoring**<br>Old Requirement: The maintenance and construction vehicle shall transmit environmental sensor data to fixed sensors located along the roadside. The sensor data includes location and timestamp information. | **8** | **MCV Environmental Monitoring**<br>New Requirement: The maintenance and construction vehicle shall transmit environmental sensor data to roadside equipment. The sensor data includes location and timestamp information. | **8** | **Edited** |
| **MCV Infrastructure Monitoring**<br>Old Requirement: The maintenance and construction vehicle shall provide infrastructure sensor equipment operational status to the center. | **5** | **MCV Infrastructure Monitoring**<br>New Requirement: The maintenance and construction vehicle shall provide infrastructure sensor equipment operational status to the center. | **6** | **Renumbered** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **MCV Vehicle Location Tracking**<br>Old Requirement: The maintenance and construction vehicle shall compute the location of the vehicle based on inputs from a vehicle location determination function. | **1** | **MCV Vehicle Location Tracking**<br>New Requirement: The maintenance and construction vehicle shall track its current location. | **1** | **Edited** |
| **MCV Vehicle Location Tracking**<br>Old Requirement: The maintenance and construction vehicle shall send the timestamped vehicle location to the controlling center. | **2** | **MCV Vehicle Location Tracking**<br>New Requirement: The maintenance and construction vehicle shall send the time stamped vehicle location to the controlling center. | **2** | **Edited** |
| **MCV Vehicle System Monitoring and Diagnostics**<br>Old Requirement: The maintenance and construction vehicle shall the vehicle diagnostic and safety information to an equipment repair facility. | **3** | **MCV Vehicle System Monitoring and Diagnostics**<br>New Requirement: The maintenance and construction vehicle shall send the vehicle diagnostic and safety information to an equipment repair facility. | **3** | **Edited** |
| **On-board Cargo Monitoring**<br>Old Requirement: The commercial vehicle shall compute the location of the commercial vehicle and its freight equipment based on inputs from a vehicle location determination function. | **1** | **On-board Cargo Monitoring**<br>New Requirement: The commercial vehicle shall compute the location of the commercial vehicle and its freight equipment. | **1** | **Edited** |
| **On-board CV Safety and Security**<br>Old Requirement: The commercial vehicle shall respond to requests to provide on-board safety inspection data to roadside check facilities including vehicle identification, driver logs, and characteristics data for initiating safety checking. Results of the inspection are | **2** | **On-board CV Safety and Security**<br>New Requirement: The commercial vehicle shall respond to requests to provide on-board safety inspection data to roadside check facilities including vehicle identification, driver logs, and characteristics data for initiating safety and security checking. Results of the i | **2** | **Edited** |
| **On-Board Environmental Monitoring**<br>Old Requirement: The transit vehicle shall collect environmental data from on-board sensors, including air temperature, wind speed, surface temperature, traction conditions, etc. | **1** | | | **Discontinued** |
| **On-Board Environmental Monitoring**<br>Old Requirement: The transit vehicle shall transmit environmental sensor data to the center along with location and timestamp information. | **2** | | | **Discontinued** |
| **On-Board Environmental Monitoring**<br>Old Requirement: The transit vehicle shall provide environmental sensor equipment operational status to the center. | **3** | | | **Discontinued** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **On-Board Environmental Monitoring**<br>Old Requirement: The transit vehicle shall provide environmental sensor equipment fault indication to the center for repair. | **4** | | | **Discontinued** |
| **On-board EV En Route Support**<br>Old Requirement: The emergency vehicle, including roadway service patrols, shall compute the location of the emergency vehicle based on inputs from a vehicle location determination function. | **1** | **On-board EV En Route Support**<br>New Requirement: The emergency vehicle, including roadway service patrols, shall track its current location. | **1** | **Edited** |
| **On-Board EV Environmental Monitoring**<br>Old Requirement: The emergency vehicle shall collect environmental data from on-board sensors, including air temperature, wind speed, surface temperature, traction conditions, etc. | **1** | | | **Discontinued** |
| **On-Board EV Environmental Monitoring**<br>Old Requirement: The emergency vehicle shall transmit environmental sensor data to the center along with location and timestamp information. | **2** | | | **Discontinued** |
| **On-Board EV Environmental Monitoring**<br>Old Requirement: The emergency vehicle shall provide environmental sensor equipment operational status to the center. | **3** | | | **Discontinued** |
| **On-Board EV Environmental Monitoring**<br>Old Requirement: The emergency vehicle shall provide environmental sensor equipment fault indication to the center for repair. | **4** | | | **Discontinued** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall receive transit route information for its assigned route including transit service instructions, traffic information, road conditions, and other information for the operator. | **1** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall receive a vehicle assignment including transit route information, transit service instructions, traffic information, road conditions, and other information for the operator. | **1** | **Replaced** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall use the route information and its current location to determine the deviation from the predetermined schedule. | **2** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall use the route information and its current location to determine the deviation from the predetermined schedule. | **2** | **Replaced** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall calculate the estimated times of arrival (ETA) at transit stops. | **3** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall calculate the estimated times of arrival (ETA) at transit stops. | **3** | **Replaced** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall determine scenarios to correct the schedule deviation. | **4** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall determine scenarios to correct the schedule deviation. | **4** | **Replaced** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall provide the schedule deviations and instructions for schedule corrections to the transit vehicle operator if the deviation is small, or the transit vehicle is operating in an urban area. | **5** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall provide the schedule deviations and instructions for schedule corrections to the transit vehicle operator if the deviation is small, or the transit vehicle is operating in an urban area. | **5** | **Replaced** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall send the schedule deviation and estimated arrival time information to the center. | **6** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall send the schedule deviation and estimated arrival time information to the center. | **6** | **Replaced** |
| **On-board Fixed Route Schedule Management**<br>Old Requirement: The transit vehicle shall support the operations of a flexible route service. This may include requests for route deviations that would then lead to schedule corrective actions. | **7** | **On-board Schedule Management**<br>New Requirement: The transit vehicle shall support the operations of a flexible route service. This may include requests for route deviations that would then lead to schedule corrective actions. | **7** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall detect embarking travelers on-board a transit vehicle and read data from the traveler card / payment instrument that they are carrying. | **1** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall read data from the traveler card / payment instrument presented by boarding passengers. | **1** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall provide passenger loading and fare statistics data to the center. | **10** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall provide fare statistics data to the center. | **10** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall provide an image of all travelers which shall be used for violation processing of those who do not have a traveler card / payment instrument or whose transit fare transaction fails. | **2** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall provide an image of all travelers which shall be used for violation processing of those who do not have a traveler card / payment instrument or whose transit fare transaction fails. | **2** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall determine the traveler's travel routing based on the transit vehicle's current location and the traveler's destination. | **3** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall determine the traveler's travel routing based on the transit vehicle's current location and the traveler's destination. | **3** | **Replaced** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall calculate the traveler's fare based on the origin and destination provided by the traveler as well as factors such as the transit routing, transit fare category, traveler history, and route-specific information. | **4** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall calculate the traveler's fare based on the origin and destination provided by the traveler as well as factors such as the transit routing, transit fare category, traveler history, and route-specific information. | **4** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall have access to the complete range of transit services (routes and schedules) that are available to the traveler. | **5** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall have access to the complete range of transit services (routes and schedules) that are available to the traveler. | **5** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall provide a transit fare payment interface that is suitable for travelers with physical disabilities. | **6** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall provide a transit fare payment interface that is suitable for travelers with physical disabilities. | **6** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall include a database on-board the transit vehicle for use in fare processing from which the fares for all possible trips within the transit operational network can be determined. | **7** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall include a database on-board the transit vehicle for use in fare processing from which the fares for all possible trips within the transit operational network can be determined. | **7** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall support an emergency fare structure overriding all other fares that can be activated during disasters, states of emergency or evacuations. | **8** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall support an emergency fare structure overriding all other fares that can be activated during disasters, states of emergency or evacuations. | **8** | **Replaced** |
| **On-board Transit Fare and Load Management**<br>Old Requirement: The transit vehicle shall support the support advanced payments for tolls, and/or parking lot charges, and/or transit fares via the traveler card / payment instrument. | **9** | **On-board Transit Fare Management**<br>New Requirement: The transit vehicle shall support the support advanced payments for tolls, and/or parking lot charges, and/or transit fares via the traveler card / payment instrument. | **9** | **Replaced** |
| **On-board Transit Signal Priority**<br>Old Requirement: The transit vehicle shall send the schedule deviation data and status of priority requests to the transit vehicle operator. | **3** | **On-board Transit Signal Priority**<br>New Requirement: The transit vehicle shall send the schedule deviation data and status of priority requests to the transit vehicle operator and provide the capability for the transit vehicle operator to control the priority system. | **3** | **Edited** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **On-board Transit Trip Monitoring** | **1** | **On-board Transit Trip Monitoring** | **1** | **Edited** |
| Old Requirement: The transit vehicle shall compute the location of the transit vehicle based on inputs from a vehicle location determination function. | | New Requirement: The transit vehicle shall track the current location of the transit vehicle. | | |
| **On-board Transit Trip Monitoring** | **4** | **On-board Transit Trip Monitoring** | **4** | **Edited** |
| Old Requirement: The transit vehicle shall record transit trip monitoring data including operational status information such as doors open/closed, passenger loading, running times, etc. | | New Requirement: The transit vehicle shall record transit trip monitoring data including operational status information such as doors open/closed, running times, etc. | | |
| **On-board Trip Monitoring** | **1** | **On-board Trip Monitoring** | **1** | **Edited** |
| Old Requirement: The commercial vehicle shall compute the location of the commercial vehicle and its freight equipment based on inputs from commercial vehicle measures (e.g. identity, distance traveled, etc.) and a vehicle location determination function. | | New Requirement: The commercial vehicle shall compute the location of the commercial vehicle and its freight equipment based on inputs from commercial vehicle measures (e.g. identity, distance traveled, etc.) and a positioning system. | | |
| **Parking Electronic Payment** | **10** | **Parking Electronic Payment** | **10** | **Edited** |
| Old Requirement: The parking element shall maintain a list of invalid traveler credit identities, or bad tag lists. | | New Requirement: The parking element shall maintain a list of invalid traveler credit identities. | | |
| **Parking Electronic Payment** | **2** | **Parking Electronic Payment** | **2** | **Edited** |
| Old Requirement: The parking element shall read data from the traveler card / payment instrument carried on-board the vehicle (tag) or by the traveler. | | New Requirement: The parking element shall read data from the traveler card / payment instrument carried on-board the vehicle or by the traveler. | | |
| **Personal Location Determination** | **2** | | | **Discontinued** |
| Old Requirement: The personal traveler interface shall calculate the location from one or more sources of position data such as GPS or DGPS. | | | | |
| **Personal Location Determination** | **3** | | | **Discontinued** |
| Old Requirement: The personal traveler interface shall refine its calculations as required by other functions such as navigation, guidance, and emergency notification. | | | | |
| **Remote Transit Fare Management** | **7** | **Remote Transit Fare Management** | **7** | **Edited** |
| Old Requirement: The public interface for travelers shall create passenger loading and fare statistics data based upon data collected at a transit stop. | | New Requirement: The public interface for travelers shall create fare statistics data based upon data collected at a transit stop. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Roadside Electronic Screening** | **6** | **Roadside Electronic Screening** | **7** | **Renumbered** |
| Old Requirement: The roadside check facility equipment shall send a pass/pull-in notification to the commercial vehicle and its driver based on the information received from the vehicle, the administration center, enforcement agencies, and the inspector. The message may | | New Requirement: The roadside check facility equipment shall send a pass/pull-in notification to the commercial vehicle and its driver based on the information received from the vehicle, the administration center, enforcement agencies, and the inspector. The message may | | |
| **Roadside Electronic Screening** | **7** | **Roadside Electronic Screening** | **10** | **Renumbered** |
| Old Requirement: The roadside check facility equipment shall send a record of daily activities at the facility including summaries of screening events and inspections to the commercial vehicle administration center. | | New Requirement: The roadside check facility equipment shall send a record of daily activities at the facility including summaries of screening events and inspections to the commercial vehicle administration center. | | |
| **Roadside HAZMAT Detection** | **2** | **Roadside HAZMAT Detection** | **2** | **Edited** |
| Old Requirement: The roadside check facility equipment shall detect the presence of security sensitive substance, e.g. detection of radiation or ammonia compounds, carried on-boar commercial vehicles and freight equipment approaching a facility. This data is acquired by | | New Requirement: The roadside check facility equipment shall detect the presence of security sensitive substance, e.g. detection of radiation or ammonia compounds, carried on-board commercial vehicles and freight equipment approaching a facility. This data is acquired by | | |
| **Roadside Safety and Security Inspection** | **1** | **Roadside Safety and Security Inspection** | **1** | **Edited** |
| Old Requirement: The roadside check facility equipment shall receive information concerning commercial vehicles and freight equipment approaching a facility that are being pulled in for safety inspections. | | New Requirement: The roadside check facility equipment shall receive information concerning commercial vehicles and freight equipment approaching a facility that are being pulled in for safety and security inspections. | | |
| **Roadside Safety and Security Inspection** | **2** | **Roadside Safety and Security Inspection** | **2** | **Edited** |
| Old Requirement: The roadside check facility equipment shall receive the safety inspection and status information from the commercial vehicle administration center to include information such as safety ratings, inspection summaries, and violation summaries. Corresponds to | | New Requirement: The roadside check facility equipment shall receive the safety and security inspection and status information from the commercial vehicle administration center to include information such as safety ratings, inspection summaries, and violation summaries. C | | |
| **Roadside Safety and Security Inspection** | **7** | **Roadside Safety and Security Inspection** | **10** | **Renumbered** |
| Old Requirement: The roadside check facility equipment shall forward results of the roadside safety inspections to the commercial vehicle administration center. | | New Requirement: The roadside check facility equipment shall forward results of the roadside safety inspections to the commercial vehicle administration center. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Roadway Emissions Monitoring** | **4** | **Roadway Emissions Monitoring** | **4** | **Edited** |
| Old Requirement: If the emissions level detected by the emissions sensor indicates a vehicle is violating the acceptable levels of emissions, the field element shall provide the capability to display summary emissions information or warnings to passing drivers via a drive | | New Requirement: If the emissions level detected by the emissions sensor indicates a vehicle is violating the acceptable levels of emissions, the field element shall provide the capability to display summary emissions information or warnings to passing drivers via a drive | | |
| **Roadway Field Device Monitoring** | **1** | **Roadway Field Device Monitoring** | **1** | **Edited** |
| Old Requirement: The field element shall monitor the operational status (state of the device, configuration, and fault data) of connected sensors (such as traffic, infrastructure, environmental, security, speed) and devices (such as highway advisory radio, dynamic message | | New Requirement: The field element shall monitor the operational status (state of the device, configuration, and fault data) of connected sensors (such as traffic, infrastructure, environmental, security, speed) and devices (such as highway advisory radio, dynamic message | | |
| **Roadway HOV Control** | **4** | **Roadway HOV Control** | **5** | **Renumbered** |
| Old Requirement: The field element shall provide traffic flow measures and information regarding vehicle occupancy (i.e., lane usage) in HOV lanes to the center. | | New Requirement: The field element shall provide traffic flow measures and information regarding vehicle occupancy (i.e., lane usage) in HOV lanes to the center. | | |
| **Roadway HOV Control** | **5** | **Roadway HOV Control** | **6** | **Renumbered** |
| Old Requirement: The field element shall return operational status for the HOV lane sensors to the controlling center. | | New Requirement: The field element shall return operational status for the HOV lane sensors to the controlling center. | | |
| **Roadway HOV Control** | **6** | **Roadway HOV Control** | **7** | **Renumbered** |
| Old Requirement: The field element shall return fault data for the HOV lane sensors to the center for repair. | | New Requirement: The field element shall return fault data for the HOV lane sensors to the center for repair. | | |
| **Roadway Intersection Collision Warning** | **1** | **Roadway Intersection Safety Warning** | **1** | **Replaced** |
| Old Requirement: The field element shall utilize traffic sensor data to determine the probability that a vehicle collision will occur if no action is taken by the vehicle. | | New Requirement: The field element shall utilize traffic sensors to monitor vehicles approaching and occupying an intersection. | | |
| **Roadway Intersection Collision Warning** | **2** | **Roadway Intersection Safety Warning** | **2** | **Replaced** |
| Old Requirement: The field element shall utilize traffic signal state data to determine the probability that a vehicle collision will occur if no action is taken by the vehicle. | | New Requirement: The field element shall monitor the operational state, signal timing, and current phase of the traffic signal. | | |
| **Roadway Intersection Collision Warning** | **3** | **Roadway Intersection Safety Warning** | **6** | **Replaced** |
| Old Requirement: The field element shall provide collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) to vehicle(s) approaching an intersection or railroad grade crossing. | | New Requirement: The field element shall provide intersection status and warnings to approaching vehicles using field-vehicle communications. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Roadway In-Vehicle Signing** | **1** | **Roadway Short Range Traveler Information Communications** | **1** | **Replaced** |
| Old Requirement: The field element shall distribute road condition and environmental information to signage equipment on-board vehicles under center control. | | New Requirement: The field element shall distribute traveler information including traffic and road conditions to passing vehicles using short range communications, under center control. | | |
| **Roadway In-Vehicle Signing** | **2** | **Roadway Short Range Traveler Information Communications** | **2** | **Replaced** |
| Old Requirement: The field element shall distribute advisory information, such as evacuation information, wide-area alerts, incident information, work zone intrusion information, and other special information to signage equipment on-board vehicles under center control. | | New Requirement: The field element shall distribute advisory information, such as evacuation information, wide-area alerts, incident information, work zone intrusion information, and other special information to passing vehicles using short range communications, under ce | | |
| **Roadway In-Vehicle Signing** | **3** | **Roadway Short Range Traveler Information Communications** | **3** | **Replaced** |
| Old Requirement: The field element shall distribute indicator and fixed sign information, such as actual intersection traffic signal states, stop, or yield signs to signage equipment on-board vehicles under center control. | | New Requirement: The field element shall distribute indicator and fixed sign information, including static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states and local condit | | |
| **Roadway In-Vehicle Signing** | **4** | **Roadway Short Range Traveler Information Communications** | **4** | **Replaced** |
| Old Requirement: The field element, typically a roadside beacon, shall return system operational status to the controlling center. | | New Requirement: The field element shall return system operational status to the controlling center. | | |
| **Roadway In-Vehicle Signing** | **5** | **Roadway Short Range Traveler Information Communications** | **5** | **Replaced** |
| Old Requirement: The field element, typically a roadside beacon, shall return system fault data to the maintenance center for repair. | | New Requirement: The field element shall return system fault data to the maintenance center for repair. | | |
| **Roadway Probe Beacons** | **1** | **Roadway Probe Data Communications** | **1** | **Replaced** |
| Old Requirement: The field element shall use toll and parking tags on passing vehicles for traffic data link time calculations and send to the controlling center; tag identities will be removed to ensure anonymity. | | New Requirement: The field element shall communicate with passing vehicles for traffic data link time calculations and send collected data to the controlling center; identification will be removed to ensure anonymity. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Roadway Probe Beacons** | **2** | **Roadway Probe Data Communications** | **2** | **Replaced** |
| Old Requirement: The field element shall include equipment that monitors traffic conditions (e.g., average speed) by communicating with passing vehicles equipped with a transponder or other short range communications device; also called smart probes. | | New Requirement: The field element shall communicate with on-board equipment on passing vehicles to collect current vehicle position, speed, and heading and a record of previous events (e.g., starts and stops, link travel times) that can be used to determine current traff | | |
| **Roadway Probe Beacons** | **3** | **Roadway Probe Data Communications** | **3** | **Replaced** |
| Old Requirement: The field element shall include equipment that monitors road conditions by communicating with passing vehicles equipped with a transponder or other short range communications device; also called smart probes. | | New Requirement: The field element shall communicate with on-board equipment on passing vehicles to collect current status information and a record of previous events (e.g., temperature, wiper status, headlight status, traction control system status) that can be used to d | | |
| **Roadway Probe Beacons** | **4** | **Roadway Probe Data Communications** | **6** | **Replaced** |
| Old Requirement: The field element shall aggregate, format, and store collected vehicle smart probe data (traffic and road conditions data), calculate link travel times and processed road condition data, and send to future passing vehicles. | | New Requirement: The field element shall aggregate and forward collected probe information to the center. | | |
| **Roadway Probe Beacons** | **5** | **Roadway Probe Data Communications** | **7** | **Replaced** |
| Old Requirement: The field element shall provide roadside beacon equipment operational status to the center. | | New Requirement: The field element shall provide roadside equipment operational status to the center. | | |
| **Roadway Probe Beacons** | **6** | **Roadway Probe Data Communications** | **8** | **Replaced** |
| Old Requirement: The field element shall provide roadside beacon equipment fault indication to the center for repair. | | New Requirement: The field element shall provide roadside equipment fault indication to the center for repair. | | |
| **Roadway Speed Monitoring** | **3** | **Roadway Speed Monitoring** | **3** | **Edited** |
| Old Requirement: If the speed detected by vehicle speed sensors is determined to be excessive, the field element shall provide a safe speed advisory to passing drivers via a driver information system (such as portable messages signs, etc.). | | New Requirement: If the speed detected by vehicle speed sensors is determined to be excessive, the field element shall provide a safe speed advisory to passing drivers via a driver information system (such as portable messages signs, field to vehicle communications to in- | | |
| **Roadway Systems for AHS** | **1** | **Roadway Automated Vehicle Operations** | **1** | **Replaced** |
| Old Requirement: The field element shall check the vehicle's condition to see if it is suitable for operating on automatic highway system (AHS) lanes based on vehicle control parameters (speed, headway, etc.) used by vehicles in those lanes, and once confirmed, shall send | | New Requirement: The field element shall check the vehicle's condition to see if it is suitable for operating on automated lanes based on vehicle control parameters (speed, headway, etc.) used by vehicles in those lanes, and once confirmed, shall send control parameters t | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Roadway Systems for AHS** | **2** | **Roadway Automated Vehicle Operations** | **2** | **Replaced** |
| Old Requirement: The field element shall provide to the vehicle automated lane changing data based on a lane changing strategy and detailed lane changing parameters (e.g. exactly where, and at what speed the lane change will take place), under center control. | | New Requirement: The field element shall provide to the vehicle automated lane changing data based on a lane changing strategy and detailed lane changing parameters (e.g. exactly where, and at what speed the lane change will take place), under center control. | | |
| **Roadway Systems for AHS** | **3** | **Roadway Automated Vehicle Operations** | **3** | **Replaced** |
| Old Requirement: The field element shall manage the checking in and checking out of suitably equipped vehicles requesting use of AHS lanes, and send a record of all requests to the center responsible for AHS management. | | New Requirement: The field element shall manage the checking in and checking out of suitably equipped vehicles requesting use of automated lanes, and send a record of all requests to the responsible center. | | |
| **Smart Probe** | **1** | **Vehicle Environmental Probe Support** | **1** | **Replaced** |
| Old Requirement: The vehicle shall collect and process environmental sensor data, including air temperature, wind speed, surface temperature, traction conditions, etc. | | New Requirement: The vehicle shall collect and process environmental sensor data, including air temperature and rain sensors. | | |
| **Smart Probe** | **2** | **Vehicle Environmental Probe Support** | **3** | **Replaced** |
| Old Requirement: The vehicle shall transmit environmental sensor data to the center along with location and timestamp information. | | New Requirement: The vehicle shall transmit environmental probe data to the center along with location and timestamp information. | | |
| **Smart Probe** | **3** | **Vehicle Environmental Probe Support** | **4** | **Replaced** |
| Old Requirement: The vehicle shall transmit environmental sensor data and road conditions data to field equipment located along the roadway for autonomous traffic operations, such as automated road signing. | | New Requirement: The vehicle shall transmit environmental probe data to field equipment located along the roadway using short range communications. | | |
| **TMC for AHS** | **1** | **TMC Automated Vehicle Operations** | **1** | **Replaced** |
| Old Requirement: The center shall remotely control AHS system field elements, by providing lane changing parameters, parameters for determination of vehicle suitability for particular AHS lanes, and other control information required for AHS operation. | | New Requirement: The center shall remotely control automated vehicle system field elements, by providing lane changing parameters, parameters for determination of vehicle suitability for particular automated lanes, and other control information required for automated high | | |
| **TMC for AHS** | **2** | **TMC Automated Vehicle Operations** | **2** | **Replaced** |
| Old Requirement: The center shall maintain a log of all AHS check-in and check-out transactions received from the field AHS system regardless of whether they are successful or not. | | New Requirement: The center shall maintain a log of all automated vehicle check-in and check-out transactions received from the field elements regardless of whether they are successful or not. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **TMC Incident Detection**<br>Old Requirement: The center shall receive inputs concerning upcoming events that would effect the traffic network from event promoters, traveler information service providers, and intermodal freight depots. | **3** | **TMC Incident Detection**<br>New Requirement: The center shall receive inputs concerning upcoming events that would effect the traffic network from event promoters, traveler information service providers, border crossings, and intermodal freight depots. | **3** | **Edited** |
| **TMC Incident Detection**<br>Old Requirement: The center shall support requests from emergency management centers to remotely control sensor and surveillance equipment located in the field. | **5** | **TMC Incident Detection**<br>New Requirement: The center shall support requests from emergency management centers and border inspection systems to remotely control sensor and surveillance equipment located in the field. | **5** | **Edited** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall receive inputs from emergency management and transit management centers to develop an overall status of the transportation system including emergency transit schedules in effect and current status and condition of the transportation infra | **10** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall receive inputs from emergency management and transit management centers to develop an overall status of the transportation system including emergency transit schedules in effect and current status and condition of the transportation infra | **11** | **Renumbered** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used as a background for traffic incident management. | **11** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used as a background for traffic incident management. | **12** | **Renumbered** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall exchange incident and threat information with emergency management centers as well as maintenance and construction centers; including notification of existence of incident and expected severity, location, time and nature of incident. | **4** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall exchange incident information with emergency management centers, maintenance and construction centers, transit centers, information service providers, and the media including description, location, traffic impact, status, expected duratio | **4** | **Edited** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall respond to requests from emergency management to provide traffic management resources to implement special traffic control measures, assist in clean up, verify an incident, etc. This may also involve coordination with maintenance centers | **5** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall share resources with allied agency centers to implement special traffic control measures, assist in clean up, verify an incident, etc. This may also involve coordination with maintenance centers. | **5** | **Edited** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall receive inputs concerning upcoming events that would effect the traffic network from event promoters, traveler information service providers, media, and rail operations centers. | **6** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall receive inputs concerning upcoming events that would effect the traffic network from event promoters, traveler information service providers, media, border crossings, and rail operations centers. | **6** | **Edited** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall exchange road network status assessment information with emergency management and maintenance centers including an assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capac | **8** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall exchange road network status assessment information with emergency management and maintenance centers including an assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capac | **9** | **Renumbered** |
| **TMC Incident Dispatch Coordination/Communication**<br>Old Requirement: The center shall coordinate information and controls with other traffic management centers. | **9** | **TMC Incident Dispatch Coordination/Communication**<br>New Requirement: The center shall coordinate information and controls with other traffic management centers. | **10** | **Renumbered** |
| **TMC Input to In-Vehicle Signing**<br>Old Requirement: The center shall format and output road condition and environmental information to field equipment that supports in-vehicle signage communications. | **1** | **TMC In-Vehicle Signing Management**<br>New Requirement: The center shall format and output variable sign information such as traffic and road conditions to field equipment that supports in-vehicle signage communications. | **1** | **Replaced** |
| **TMC Input to In-Vehicle Signing**<br>Old Requirement: The center shall format and output advisory information, such as evacuation information, wide-area alerts, incident information, work zone intrusion information, and other special information to field equipment that supports in-vehicle signage communicati | **2** | **TMC In-Vehicle Signing Management**<br>New Requirement: The center shall format and output advisory information, such as detour information, wide-area alerts, work zone intrusion information, and other special information to field equipment that supports in-vehicle signage communications. | **2** | **Replaced** |
| **TMC Input to In-Vehicle Signing**<br>Old Requirement: The center shall format and output indicator and fixed sign information, such as actual intersection traffic signal states, stop, or yield signs to field equipment that supports in-vehicle signage communications. | **3** | **TMC In-Vehicle Signing Management**<br>New Requirement: The center shall monitor and manage output of indicator and fixed sign information, including static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states and l | **3** | **Replaced** |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **TMC Input to In-Vehicle Signing** | **4** | **TMC In-Vehicle Signing Management** | **4** | **Replaced** |
| Old Requirement: The center shall receive system operational status from field equipment that supports in-vehicle signage communications. | | New Requirement: The center shall receive system operational status from field equipment that supports in-vehicle signage communications. | | |
| **TMC Input to In-Vehicle Signing** | **5** | **TMC In-Vehicle Signing Management** | **5** | **Replaced** |
| Old Requirement: The center shall receive system fault data from field equipment that supports in-vehicle signage communications. | | New Requirement: The center shall receive system fault data from field equipment that supports in-vehicle signage communications. | | |
| **TMC Probe Information Collection** | **1** | **TMC Probe Information Collection** | **1** | **Edited** |
| Old Requirement: The center shall collect probe data including traffic and road conditions from vehicles via roadside beacon field elements; the data may be aggregated and initial link time calculations performed in the field. | | New Requirement: The center shall collect traffic probe data from vehicles via roadside field equipment. | | |
| **TMC Probe Information Collection** | **3** | | | **Discontinued** |
| Old Requirement: The center shall collect traffic data from probe-equipped emergency vehicles via emergency management centers; the data may be aggregated and initial link time calculations performed at the sending center. | | | | |
| **TMC Probe Information Collection** | **4** | **TMC Probe Information Collection** | **3** | **Renumbered** |
| Old Requirement: The center shall collect traffic data from traveler information centers based on data from their subscriber vehicles; the data may be aggregated and initial link time calculations performed at the sending center. | | New Requirement: The center shall collect traffic data from traveler information centers based on data from their subscriber vehicles; the data may be aggregated and initial link time calculations performed at the sending center. | | |
| **TMC Probe Information Collection** | **5** | **TMC Probe Information Collection** | **4** | **Renumbered** |
| Old Requirement: The center shall collect traffic data from toll administrative centers containing journey times between toll collection points for those vehicles equipped for electronic toll collection; the data may be aggregated and processed at the sending center. | | New Requirement: The center shall collect traffic data from toll administrative centers containing travel times between toll collection points for those vehicles equipped for electronic toll collection; the data may be aggregated and processed at the sending center. | | |
| **TMC Probe Information Collection** | **6** | **TMC Probe Information Collection** | **5** | **Renumbered** |
| Old Requirement: The center shall assimilate current and forecast traffic and road conditions based on collected probe data and distribute to other centers for dissemination to travelers. | | New Requirement: The center shall assimilate current and forecast traffic conditions based on collected probe data and distribute to other centers for dissemination to travelers. | | |
| **TMC Probe Information Collection** | **7** | **TMC Probe Information Collection** | **6** | **Renumbered** |
| Old Requirement: The center shall collect operational status for the roadside probe data collection equipment. | | New Requirement: The center shall collect operational status for the roadside probe data collection equipment. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **TMC Probe Information Collection** | **8** | **TMC Probe Information Collection** | **7** | **Renumbered** |
| Old Requirement: The center shall collect fault data for the roadside probe data collection equipment for repair. | | New Requirement: The center shall collect fault data for the roadside probe data collection equipment for repair. | | |
| **TMC Regional Traffic Control** | **1** | **TMC Regional Traffic Management** | **1** | **Replaced** |
| Old Requirement: The center shall exchange traffic information with other traffic management centers, includes incident information, congestion data, traffic data, signal timing plans, and real-time signal control information. | | New Requirement: The center shall exchange traffic information with other traffic management centers including incident information, congestion data, traffic data, signal timing plans, and real-time signal control information. | | |
| **TMC Regional Traffic Control** | **2** | **TMC Regional Traffic Management** | **2** | **Replaced** |
| Old Requirement: The center shall exchange traffic control information with other traffic management centers, includes remote monitoring and control of traffic management devices (e.g. signs, sensors, signals, cameras, etc.). | | New Requirement: The center shall exchange traffic control information with other traffic management centers to support remote monitoring and control of traffic management devices (e.g. signs, sensors, signals, cameras, etc.). | | |
| **TMC Toll/Parking Coordination** | **1** | **TMC Demand Management Coordination** | **1** | **Replaced** |
| Old Requirement: The center shall collect and store toll pricing data from toll administration centers, including the price for each road segment to which a toll applies, with the time and date for when it applies. | | New Requirement: The center shall collect and store toll pricing data from toll administration centers, including the price for each road segment to which a toll applies, with the time and date for when it applies. | | |
| **TMC Toll/Parking Coordination** | **2** | **TMC Demand Management Coordination** | **2** | **Replaced** |
| Old Requirement: The center shall collect and store parking information from parking management providers including lot locations, features (e.g. ability to handle oversized vehicles), capacity, type, hours of operation and rates. | | New Requirement: The center shall collect and store parking information from parking management providers including lot locations, features (e.g. ability to handle oversized vehicles), capacity, type, hours of operation and rates. | | |
| **TMC Toll/Parking Coordination** | **3** | **TMC Demand Management Coordination** | **3** | **Replaced** |
| Old Requirement: The center shall collect and store transit fare and schedule information from transit management centers. | | New Requirement: The center shall collect and store transit fare and schedule information from transit management centers. | | |
| **TMC Toll/Parking Coordination** | **4** | **TMC Demand Management Coordination** | **4** | **Replaced** |
| Old Requirement: The center shall collect and store current transit, parking, and toll fee schedule information provided by regional traveler information systems. | | New Requirement: The center shall collect and store current transit, parking, and toll fee schedule information provided by regional traveler information systems. | | |
| **TMC Toll/Parking Coordination** | **5** | **TMC Demand Management Coordination** | **5** | **Replaced** |
| Old Requirement: The center shall send requests to toll administration centers to change pricing, modify restrictions, or modify operations of a toll road facility. | | New Requirement: The center shall send requests to toll administration centers to change pricing, modify restrictions, or modify operations of a toll road facility. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **TMC Toll/Parking Coordination** | **6** | **TMC Demand Management Coordination** | **6** | **Replaced** |
| Old Requirement: The center shall send requests to parking management providers to change the current parking lot charging structure. | | New Requirement: The center shall send requests to parking management providers to change the current parking lot charging structure. | | |
| **TMC Toll/Parking Coordination** | **7** | **TMC Demand Management Coordination** | **7** | **Replaced** |
| Old Requirement: The center shall send requests to transit management centers to change the current transit services - schedules or fares of the transit services including park-and-ride lots. | | New Requirement: The center shall send requests to transit management centers to change the current transit services - schedules or fares of the transit services including park-and-ride lots. | | |
| **TMC Traffic Information Dissemination** | **5** | **TMC Traffic Information Dissemination** | **5** | **Edited** |
| Old Requirement: The center shall retrieve locally stored traffic information, including current and forecasted traffic information, road and weather conditions, traffic incident information, information on diversions and alternate routes, closures, and special traffic re | | New Requirement: The center shall retrieve locally stored traffic information, including current and forecasted traffic information, road and weather conditions, traffic incident information, information on diversions and alternate routes, closures, and special traffic re | | |
| **TMC Traffic Information Dissemination** | **7** | **TMC Traffic Information Dissemination** | **7** | **Edited** |
| Old Requirement: The center shall distribute traffic data to the media upon request; the capability to provide the information in both data stream and graphical display shall be supported. | | New Requirement: The center shall distribute traffic data to the media; the capability to provide the information in both data stream and graphical display shall be supported. | | |
| **Toll Administration** | **5** | **Toll Administration** | **5** | **Edited** |
| Old Requirement: The center shall manage the details of toll payment violations based on tag information from the toll plaza, vehicle registration information from the Department of Motor Vehicles, invalid tag information from a Financial Institution, and previous violati | | New Requirement: The center shall manage the details of toll payment violations based on vehicle information from the toll plaza, registration information from the Department of Motor Vehicles, invalid payment information from a Financial Institution, and previous violati | | |
| **Toll Plaza Toll Collection** | **1** | **Toll Plaza Toll Collection** | **1** | **Edited** |
| Old Requirement: The field element shall read data from vehicle toll tags to support toll payment transactions. | | New Requirement: The field element shall read data from passing vehicles to support toll payment transactions. | | |
| **Toll Plaza Toll Collection** | **2** | **Toll Plaza Toll Collection** | **2** | **Edited** |
| Old Requirement: The field element shall calculate the toll due based on the vehicle characteristics (vehicle size, weight, axle count, etc.), tag data, and stored toll prices. | | New Requirement: The field element shall calculate the toll due based on the vehicle characteristics (vehicle size, weight, axle count, etc.) and stored toll prices. | | |
| **Toll Plaza Toll Collection** | **3** | **Toll Plaza Toll Collection** | **3** | **Edited** |
| Old Requirement: The field element shall update the toll tag value after debiting the toll amount and send a record of the transaction to a center. | | New Requirement: The field element shall update the stored value after debiting the toll amount and send a record of the transaction to a center. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Toll Plaza Toll Collection** | **4** | **Toll Plaza Toll Collection** | **4** | **Edited** |
| Old Requirement: The field element shall read the credit identity on the toll tag and send that identity and the amount to be debited to a center. | | New Requirement: The field element shall read the credit identity from the passing vehicle and send that identity and the amount to be debited to a center. | | |
| **Toll Plaza Toll Collection** | **5** | **Toll Plaza Toll Collection** | **5** | **Edited** |
| Old Requirement: The field element shall support advanced toll payment by checking the vehicle's toll tag information against a stored list of advanced payments, and debiting the toll from the list in the case of a match. | | New Requirement: The field element shall support advanced toll payment by checking the vehicle's toll information against a stored list of advanced payments, and debiting the toll from the list in the case of a match. | | |
| **Toll Plaza Toll Collection** | **6** | **Toll Plaza Toll Collection** | **6** | **Edited** |
| Old Requirement: In the case of closed toll systems, the field element shall update the toll tag with the system entry point, and upon toll system exit, used in the calculation of the toll. | | New Requirement: In the case of closed toll systems, the field element shall update the vehicle on-board data with the system entry point, and upon toll system exit, use the stored data in the calculation of the toll. | | |
| **Transit Center Fare and Load Management** | **1** | **Transit Center Fare Management** | **1** | **Replaced** |
| Old Requirement: The center shall manage the actual value of transit fares for each segment of each regular transit route, including the transmission of the information to transit vehicles and transit stops or stations. | | New Requirement: The center shall manage the actual value of transit fares for each segment of each regular transit route, including the transmission of the information to transit vehicles and transit stops or stations. | | |
| **Transit Center Fare and Load Management** | **10** | **Transit Center Fare Management** | **10** | **Replaced** |
| Old Requirement: The center shall collect passenger loading and fare statistics data to implement variable and flexible fare structures. | | New Requirement: The center shall collect fare statistics data to implement variable and flexible fare structures. | | |
| **Transit Center Fare and Load Management** | **11** | **Transit Center Fare Management** | **11** | **Replaced** |
| Old Requirement: The center shall exchange fare and load information with other transit management centers, including potential Centralized Payments facilities. | | New Requirement: The center shall exchange fare and load information with other transit management centers, including potential Centralized Payments facilities. | | |
| **Transit Center Fare and Load Management** | **12** | **Transit Center Fare Management** | **12** | **Replaced** |
| Old Requirement: The center shall provide transit fare information to other centers, including traveler information providers upon request. | | New Requirement: The center shall provide transit fare information to other centers, including traveler information providers upon request. | | |
| **Transit Center Fare and Load Management** | **2** | **Transit Center Fare Management** | **2** | **Replaced** |
| Old Requirement: The center shall provide the capability for a system operator to manage the transit fares and control the exchange of transit fare information. | | New Requirement: The center shall provide the capability for a system operator to manage the transit fares and control the exchange of transit fare information. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Transit Center Fare and Load Management** | **3** | **Transit Center Fare Management** | **3** | **Replaced** |
| Old Requirement: The center shall process the financial requests from the transit vehicles or roadside and manage an interface to a Financial Institution. | | New Requirement: The center shall process the financial requests from the transit vehicles or roadside and manage an interface to a Financial Institution. | | |
| **Transit Center Fare and Load Management** | **4** | **Transit Center Fare Management** | **4** | **Replaced** |
| Old Requirement: The center shall support the payment of transit fare transactions using data provided by the traveler cards / payment instruments. | | New Requirement: The center shall support the payment of transit fare transactions using data provided by the traveler cards / payment instruments. | | |
| **Transit Center Fare and Load Management** | **5** | **Transit Center Fare Management** | **5** | **Replaced** |
| Old Requirement: The center shall collect data on fare payment violations and send the data, including images of the violator, to the appropriate enforcement agency. | | New Requirement: The center shall collect data on fare payment violations and send the data, including images of the violator, to the appropriate enforcement agency. | | |
| **Transit Center Fare and Load Management** | **6** | **Transit Center Fare Management** | **6** | **Replaced** |
| Old Requirement: The center shall process requests for transit fares to be paid in advance. | | New Requirement: The center shall process requests for transit fares to be paid in advance. | | |
| **Transit Center Fare and Load Management** | **7** | **Transit Center Fare Management** | **7** | **Replaced** |
| Old Requirement: The center shall process requests for the advanced payment of tolls and parking lot charges as well as other non-transportation services, e.g. yellow-pages services. | | New Requirement: The center shall process requests for the advanced payment of tolls and parking lot charges as well as other non-transportation services, e.g. yellow-pages services. | | |
| **Transit Center Fare and Load Management** | **8** | **Transit Center Fare Management** | **8** | **Replaced** |
| Old Requirement: The center shall be capable of establishing emergency fare structures to override all other fares during disasters, states of emergency, or evacuations. | | New Requirement: The center shall be capable of establishing emergency fare structures to override all other fares during disasters, states of emergency, or evacuations. | | |
| **Transit Center Fare and Load Management** | **9** | **Transit Center Fare Management** | **9** | **Replaced** |
| Old Requirement: The center shall maintain a list of invalid traveler credit identities, or bad tag lists that can be forwarded to transit vehicles and transit stops or stations. | | New Requirement: The center shall maintain a list of invalid traveler credit identities or bad tag lists that can be forwarded to transit vehicles and transit stops or stations. | | |
| **Transit Center Fixed-Route Operations** | **1** | **Transit Center Fixed-Route Operations** | **1** | **Edited** |
| Old Requirement: The center shall generate transit routes and schedules based on such factors as parameters input by the system operator, road network conditions, operational data on current routes and schedules, and digitized map data. | | New Requirement: The center shall generate transit routes and schedules based on such factors as parameters input by the system operator, road network conditions, incident information, operational data on current routes and schedules, and digitized map data. | | |
| **Transit Center Multi-Modal Coordination** | **1** | **Transit Center Signal Priority** | **1** | **Replaced** |
| Old Requirement: The center shall analyze transit vehicle schedule performance to determine the need for priority along certain routes or at certain intersections. | | New Requirement: The center shall analyze transit vehicle schedule performance to determine the need for priority along certain routes or at certain intersections. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Transit Center Multi-Modal Coordination** | **2** | **Transit Center Signal Priority** | **2** | **Replaced** |
| Old Requirement: The center shall send requests for priority along routes or at intersections to traffic management. | | New Requirement: The center shall send requests for priority along routes or at intersections to traffic management. | | |
| **Transit Center Multi-Modal Coordination** | **3** | **Transit Center Multi-Modal Coordination** | **1** | **Renumbered** |
| Old Requirement: The center shall coordinate schedules and services between transit agencies, traffic management, maintenance and construction operations, parking management, and other surface or air transportation modes. | | New Requirement: The center shall coordinate schedules and services between transit agencies, traffic management, maintenance and construction operations, parking management, and other surface or air transportation modes. | | |
| **Transit Center Multi-Modal Coordination** | **4** | **Transit Center Multi-Modal Coordination** | **2** | **Renumbered** |
| Old Requirement: The center shall share transfer cluster and transfer point information with multimodal transportation service providers, other transit agencies, and traveler information service providers. A transfer cluster is a collection of stops, stations, or termina | | New Requirement: The center shall share transfer cluster and transfer point information with multimodal transportation service providers, other transit agencies, and traveler information service providers. A transfer cluster is a collection of stop points, stations, or t | | |
| **Transit Center Multi-Modal Coordination** | **5** | **Transit Center Multi-Modal Coordination** | **3** | **Renumbered** |
| Old Requirement: The center shall accept requests from traffic management to change routes and schedules as part of the implementation of demand management strategies. | | New Requirement: The center shall accept requests from traffic management to change routes and schedules as part of the implementation of demand management strategies. | | |
| **Transit Center Paratransit Operations** | **3** | **Transit Center Paratransit Operations** | **3** | **Edited** |
| Old Requirement: The center shall generate demand response transit (including paratransit) routes and schedules based on such factors as parameters input by the system operator, what other demand responsive transit schedules have been planned, the availability and locatio | | New Requirement: The center shall generate demand response transit (including paratransit) routes and schedules based on such factors as parameters input by the system operator, what other demand responsive transit schedules have been planned, the availability and locatio | | |
| **Transit Environmental Monitoring** | **2** | **Transit Environmental Monitoring** | **2** | **Edited** |
| Old Requirement: The center shall collect current and forecast road and weather information from weather service providers and vehicle probes. | | New Requirement: The center shall collect current and forecast road and weather information from weather service providers and roadway maintenance centers. | | |
| **Transit Environmental Monitoring** | **3** | | | **Discontinued** |
| Old Requirement: The center shall receive road network probe information from its fleet of transit vehicles. | | | | |
| **Transit Environmental Monitoring** | **4** | | | **Discontinued** |
| Old Requirement: The center shall provide road network probe information from its fleet of transit vehicles to traffic management as well as maintenance and construction management. | | | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Transit Garage Maintenance** | **3** | **Transit Garage Maintenance** | **3** | **Edited** |
| Old Requirement: The center shall generate transit vehicle maintenance schedules, includes what and when the maintenance or repair is to be performed. | | New Requirement: The center shall generate transit vehicle maintenance schedules that identify the maintenance or repair to be performed and when the work is to be done. | | |
| **Transit Garage Maintenance** | **8** | **Transit Garage Maintenance** | **8** | **Edited** |
| Old Requirement: The center shall provide the transit system operator with the capability to update transit vehicle maintenance information and receive reports on all transit vehicle operations data. | | New Requirement: The center shall provide transit operations personnel with the capability to update transit vehicle maintenance information and receive reports on all transit vehicle operations data. | | |
| **Transit Vehicle Operator Scheduling** | **1** | **Transit Vehicle Operator Assignment** | **1** | **Replaced** |
| Old Requirement: The center shall maintain records of a transit vehicle operator's performance. This may be done utilizing standardized performance evaluation criteria set forth by governmental regulations and transit operating company policies, assessing the transit veh | | New Requirement: The center shall maintain records of a transit vehicle operator's performance. This may be done utilizing standardized performance evaluation criteria set forth by governmental regulations and transit operating company policies, assessing the transit veh | | |
| **Transit Vehicle Operator Scheduling** | **2** | **Transit Vehicle Operator Assignment** | **2** | **Replaced** |
| Old Requirement: The center shall assess the transit vehicle operator's availability based on previous work assignments, accumulated hours, plus health and vacation commitments. | | New Requirement: The center shall assess the transit vehicle operator's availability based on previous work assignments, accumulated hours, plus health and vacation commitments. | | |
| **Transit Vehicle Operator Scheduling** | **3** | **Transit Vehicle Operator Assignment** | **3** | **Replaced** |
| Old Requirement: The center shall assign transit vehicle operators to transit schedules based on their eligibility, route preferences, seniority, and transit vehicle availability. | | New Requirement: The center shall assign transit vehicle operators to transit schedules based on their eligibility, route preferences, seniority, and transit vehicle availability. | | |
| **Transit Vehicle Operator Scheduling** | **4** | **Transit Vehicle Operator Assignment** | **4** | **Replaced** |
| Old Requirement: The center shall provide an interface through which the transit vehicle operator information can be maintained - either from the transit vehicle operator, a transit system operator (i.e. center personnel), or other functions. | | New Requirement: The center shall provide an interface through which the transit vehicle operator information can be maintained - either from the transit vehicle operator, center personnel, or other functions. | | |
| **Traveler Telephone Information** | **10** | **Traveler Telephone Information** | **10** | **Edited** |
| Old Requirement: The center shall collect and provide current ferry and rail schedule and airport status information in the requested voice format and for the requested location. | | New Requirement: The center shall provide current ferry and rail schedule and airport status information in the requested voice format and for the requested location. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Traveler Telephone Information** | **4** | **Traveler Telephone Information** | **4** | **Edited** |
| Old Requirement: The center shall collect and provide information on traffic conditions in the requested voice format and for the requested location. | | New Requirement: The center shall provide information on traffic conditions in the requested voice format and for the requested location. | | |
| **Traveler Telephone Information** | **5** | **Traveler Telephone Information** | **5** | **Edited** |
| Old Requirement: The center shall collect and provide work zone and roadway maintenance information in the requested voice format and for the requested location. | | New Requirement: The center shall provide work zone and roadway maintenance information in the requested voice format and for the requested location. | | |
| **Traveler Telephone Information** | **6** | **Traveler Telephone Information** | **6** | **Edited** |
| Old Requirement: The center shall collect and provide roadway environment conditions information in the requested voice format and for the requested location. | | New Requirement: The center shall provide roadway environment conditions information in the requested voice format and for the requested location. | | |
| **Traveler Telephone Information** | **7** | **Traveler Telephone Information** | **7** | **Edited** |
| Old Requirement: The center shall collect and provide weather and event information in the requested voice format and for the requested location. | | New Requirement: The center shall provide weather and event information in the requested voice format and for the requested location. | | |
| **Traveler Telephone Information** | **8** | **Traveler Telephone Information** | **8** | **Edited** |
| Old Requirement: The center shall collect and provide transit service information in the requested voice format and for the requested location. | | New Requirement: The center shall provide transit service information in the requested voice format and for the requested location. | | |
| **Traveler Telephone Information** | **9** | **Traveler Telephone Information** | **9** | **Edited** |
| Old Requirement: The center shall collect and provide yellow pages services information in the requested voice format and for the requested location. | | New Requirement: The center shall provide yellow pages services information in the requested voice format and for the requested location. | | |
| **Vehicle Intersection Collision Warning** | **1** | **Vehicle Intersection Safety Warning** | **1** | **Replaced** |
| Old Requirement: The vehicle shall monitor the area surrounding vehicle as it approaches an intersection to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, rocks in roadway etc. | | New Requirement: The vehicle shall monitor the area surrounding the vehicle as it approaches an intersection to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, debris in roadway etc. | | |
| **Vehicle Intersection Collision Warning** | **2** | **Vehicle Intersection Safety Warning** | **2** | **Replaced** |
| Old Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle and the current speed and direction of the vehicle. | | New Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle and the current speed and direction of the vehicle. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Vehicle Intersection Collision Warning** | **3** | **Vehicle Intersection Safety Warning** | **5** | **Replaced** |
| Old Requirement: The vehicle shall receive warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | New Requirement: The vehicle shall receive warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | |
| **Vehicle Intersection Collision Warning** | **4** | **Vehicle Intersection Safety Warning** | **6** | **Replaced** |
| Old Requirement: The vehicle shall provide intersection collision warnings to the driver about the presence of potentially hazardous situations and need for immediate collision avoidance action. | | New Requirement: The vehicle shall provide warnings to the driver about the presence of potentially hazardous situations and need for immediate action. | | |
| **Vehicle Intersection Collision Warning** | **5** | **Vehicle Intersection Safety Warning** | **7** | **Replaced** |
| Old Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | New Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | |
| **Vehicle Intersection Control** | **1** | **Vehicle Intersection Control** | **1** | **Edited** |
| Old Requirement: The vehicle shall monitor the area surrounding vehicle as it approaches an intersection to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, rocks in roadway etc. | | New Requirement: The vehicle shall monitor the area surrounding the vehicle as it approaches an intersection to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, debris in roadway etc. | | |
| **Vehicle Intersection Control** | **3** | **Vehicle Intersection Control** | **5** | **Renumbered** |
| Old Requirement: The vehicle shall receive warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | New Requirement: The vehicle shall receive warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | |
| **Vehicle Intersection Control** | **4** | **Vehicle Intersection Control** | **6** | **Renumbered** |
| Old Requirement: The vehicle shall provide intersection collision warnings to the driver about the presence of potentially hazardous situations and need for immediate collision avoidance action. | | New Requirement: The vehicle shall provide warnings to the driver about the presence of potentially hazardous situations and need for immediate action. | | |
| **Vehicle Intersection Control** | **5** | **Vehicle Intersection Control** | **7** | **Renumbered** |
| Old Requirement: The vehicle shall send appropriate control actions to the vehicle's braking and steering actuators. | | New Requirement: The vehicle shall send appropriate control actions to the vehicle's braking and steering actuators. | | |
| **Vehicle Intersection Control** | **6** | **Vehicle Intersection Control** | **8** | **Renumbered** |
| Old Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision with the other vehicle or obstacle to be high. | | New Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision to be high. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Vehicle Intersection Control** | **7** | **Vehicle Intersection Control** | **9** | **Renumbered** |
| Old Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | New Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | |
| **Vehicle Location Determination** | **2** | **Vehicle Location Determination** | **2** | **Edited** |
| Old Requirement: The vehicle shall calculate the location from one or more sources of position data. These location referencing systems include position systems such as GPS, DGPS, odometer and differential odometers. | | New Requirement: The vehicle shall calculate the location from one or more data sources including positioning systems such as GPS, sensors that track vehicle movement, and maps used to determine the likely vehicle route. | | |
| **Vehicle Location Determination** | **3** | | | **Discontinued** |
| Old Requirement: The vehicle shall refine its calculations as required by other in-vehicle functions. | | | | |
| **Vehicle Pre-Crash Safety Systems** | **2** | **Vehicle Pre-Crash Safety Systems** | **3** | **Renumbered** |
| Old Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle, conditions of the roadway and environment, and the current speed and direction of t | | New Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle, conditions of the roadway and environment, and the current speed and direction of t | | |
| **Vehicle Pre-Crash Safety Systems** | **3** | **Vehicle Pre-Crash Safety Systems** | **4** | **Renumbered** |
| Old Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision with the other vehicle or obstacle to be high. | | New Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision with the other vehicle or obstacle to be high. | | |
| **Vehicle Probe Support** | **1** | **Vehicle Traffic Probe Support** | **2** | **Replaced** |
| Old Requirement: The vehicle shall collect and process traffic conditions data, including location, speed, and link travel times. | | New Requirement: The vehicle shall track its current vehicle position, speed, and heading and record snapshots of events (e.g., starts and stops, link travel times) that can be used to determine current traffic conditions. | | |
| **Vehicle Probe Support** | **2** | **Vehicle Traffic Probe Support** | **4** | **Replaced** |
| Old Requirement: The vehicle shall transmit data to the center upon request including speed, link travel times, location and timestamp information. | | New Requirement: The vehicle shall transmit collected probe data to the center. | | |
| **Vehicle Probe Support** | **3** | **Vehicle Traffic Probe Support** | **5** | **Replaced** |
| Old Requirement: The vehicle shall transmit data to field equipment located along the roadway upon request including speed, link travel times, location and timestamp information. | | New Requirement: The vehicle shall transmit collected probe data to field equipment located along the roadway. | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Vehicle Systems for AHS** | **1** | **Vehicle Automated Operations** | **1** | **Replaced** |
| Old Requirement: The vehicle shall provide the capability for a driver to request using automated highway system (AHS) lanes. | | New Requirement: The vehicle shall provide the capability for a driver to request access to automated vehicle lanes. | | |
| **Vehicle Systems for AHS** | **10** | **Vehicle Automated Operations** | **10** | **Replaced** |
| Old Requirement: The vehicle shall provide warnings to the driver of potential dangers based on sensor input and analysis concerning the safety of the vehicle operating in an automated highway system (AHS) lane. | | New Requirement: The vehicle shall provide warnings to the driver of potential dangers based on sensor input and analysis concerning the safety of the vehicle operating in an automated lane. | | |
| **Vehicle Systems for AHS** | **11** | **Vehicle Automated Operations** | **11** | **Replaced** |
| Old Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | New Requirement: The vehicle shall present information to the driver in audible or visual forms without impairing the driver's ability to control the vehicle in a safe manner. | | |
| **Vehicle Systems for AHS** | **2** | **Vehicle Automated Operations** | **2** | **Replaced** |
| Old Requirement: The vehicle shall request usage of automated highway system (AHS) lanes for all or part of an overall route; including sending vehicle conditions to the roadside to determine eligibility. | | New Requirement: The vehicle shall request usage of automated lanes for all or part of an overall route; including sending vehicle conditions to the roadside to determine eligibility. | | |
| **Vehicle Systems for AHS** | **3** | **Vehicle Automated Operations** | **3** | **Replaced** |
| Old Requirement: The vehicle shall collect and monitor data concerning the safety of the vehicle while on AHS lanes including conditions of the brakes, drive train, forward/rear/side sensors, steering condition, fuel level, tire wear and pressure, and the status of vehicl | | New Requirement: The vehicle shall collect and monitor data concerning the safety of the vehicle while on automated lanes including conditions of the brakes, drive train, forward/rear/side sensors, steering condition, fuel level, tire wear and pressure, and the status of | | |
| **Vehicle Systems for AHS** | **4** | **Vehicle Automated Operations** | **4** | **Replaced** |
| Old Requirement: The vehicle shall monitor the area surrounding vehicle in an AHS lane to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, rocks in roadway etc. | | New Requirement: The vehicle shall monitor the area surrounding vehicle in an automated lane to determine the proximity of other objects to the vehicle. Obstacles could include animals, other vehicles, pedestrians, debris in roadway etc. | | |
| **Vehicle Systems for AHS** | **5** | **Vehicle Automated Operations** | **5** | **Replaced** |
| Old Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle, conditions of the roadway and environment, and the current speed and direction of t | | New Requirement: The vehicle shall evaluate the likelihood of a collision between two vehicles or a vehicle and a stationary object, based on the proximity of other objects to the vehicle, conditions of the roadway and environment, and the current speed and direction of t | | |

| Old Functional Area | Old # | New Functional Area | New # | Change |
|---|---|---|---|---|
| **Vehicle Systems for AHS** | **6** | **Vehicle Automated Operations** | **6** | **Replaced** |
| Old Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision with the other vehicle or obstacle to be high. | | New Requirement: The vehicle shall deploy a pre-crash safety system either to avoid the accident or to reduce the accident severity, once it has determined the probability of a collision with the other vehicle or obstacle to be high. | | |
| **Vehicle Systems for AHS** | **7** | **Vehicle Automated Operations** | **7** | **Replaced** |
| Old Requirement: The vehicle shall receive automated highway system status, warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | New Requirement: The vehicle shall receive automated highway system status, warnings and collision avoidance data (intersection congestion, approaching vehicles, potential collision hazards, etc.) from the roadway field equipment. | | |
| **Vehicle Systems for AHS** | **8** | **Vehicle Automated Operations** | **8** | **Replaced** |
| Old Requirement: The vehicle shall send appropriate control actions to the vehicle's accelerator, braking and steering actuators when operating in an automated highway system (AHS) lane. | | New Requirement: The vehicle shall send appropriate control actions to the vehicle's accelerator, braking and steering actuators when operating in an automated lane. | | |
| **Vehicle Systems for AHS** | **9** | **Vehicle Automated Operations** | **9** | **Replaced** |
| Old Requirement: The vehicle shall exchange data with other vehicles in the platoon of an automated highway system (AHS) to share vehicle status information, roadway condition data, and initiate vehicle actuator controls to maintain safe following distances. | | New Requirement: The vehicle shall exchange data with other vehicles in the platoon to share vehicle status information, roadway condition data, and initiate vehicle actuator controls to maintain safe following distances. | | |
| **Vehicle Toll/Parking Interface** | **1** | **Vehicle Toll/Parking Interface** | **1** | **Edited** |
| Old Requirement: The vehicle shall respond to requests from toll collection equipment for tag information including credit identity, stored value card cash, etc. | | New Requirement: The vehicle shall respond to requests from toll collection equipment for credit identity, stored value card cash, etc. | | |
| **Vehicle Toll/Parking Interface** | **2** | **Vehicle Toll/Parking Interface** | **2** | **Edited** |
| Old Requirement: The vehicle shall respond to request from parking field equipment for tag information including credit identity, stored value card cash, etc. | | New Requirement: The vehicle shall respond to request from parking field equipment for credit identity, stored value card cash, etc. | | |
| **Vehicle Toll/Parking Interface** | **4** | **Vehicle Toll/Parking Interface** | **4** | **Edited** |
| Old Requirement: The vehicle shall provide an interface with the traveler card / payment instrument carried on-board the vehicle (tag) - to exchange identity information and payment transactions. | | New Requirement: The vehicle shall provide an interface with the traveler card / payment instrument carried on-board the vehicle - to exchange identity information and payment transactions. | | |

# Version 6.1 Market Package Changes

8/10/2010 3:25:45PM

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| APTS09 | Transit Signal Priority | New | | |

**Description:** This market package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.

APTS10 Transit Passenger Counting New

**Description:** This market package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.

ATIS06 Transportation Operations Data Sharing New

**Description:** This market package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.

ATIS10 VII Traveler Information New

**Description:** This market package provides location-specific information to travelers in vehicles using Vehicle Infrastructure Integration (VII). Dedicated short range communications is used to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass VII roadside equipment along their route. This market package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.

ATMS12 Roadside Lighting System Control New

**Description:** This market package includes systems that manage electrical lighting systems by monitoring operational conditions and using the lighting controls to vary the amount of light provided along the roadside. These systems allow a center to control lights based on traffic conditions, time-of-day, and the occurrence of incidents. Such systems can increase the safety of a roadway segment by increasing lighting and conserve energy at times when conditions warrant a reduction in the amount of lighting.

AVSS12 Cooperative Vehicle Safety Systems New

**Description:** This market package enhances the on-board longitudinal and lateral warning stand-alone systems by exchanging messages with other surrounding vehicles and roadside equipment. Vehicles send out information concerning their location, speed, and direction to surrounding vehicles. The roadside equipment provides information about potential safety hazards in the vehicle path such as stalled (unequipped) vehicles, wrong-way drivers, debris, or water hazards. The on-board systems can then process this information and present warnings to the driver including headway warnings, merge warnings, unsafe passing warnings, and warnings about hazards detected in the vehicle path. Special messages from approaching emergency vehicles may also be received and processed.

MC11 Environmental Probe Surveillance New

**Description:** This market package collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. It leverages vehicle on-board systems that measure temperature, sense current weather conditions (rain and sun sensors) and also can monitor aspects of the vehicle operational status (e.g., use of headlights, wipers, and traction control system) to gather information about local environmental conditions. It includes the on-board vehicle systems that collect and report environmental probe data, the infrastructure equipment that collects the probe data and the centers that aggregate and share the collected probe data.

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| MC12 | Infrastructure Monitoring | New | | |

**Description:** This market package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This market package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.

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|---|---|---|---|---|
| APTS01 | Transit Vehicle Tracking | Modified | APTS1 | Transit Vehicle Tracking |

**Description:** This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

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|---|---|---|---|---|
| APTS02 | Transit Fixed-Route Operations | Modified | APTS2 | Transit Fixed-Route Operations |

**Description:** This market package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

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|---|---|---|---|---|
| APTS03 | Demand Response Transit Operations | Modified | APTS3 | Demand Response Transit Operations |

**Description:** This market package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this market package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

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|---|---|---|---|---|
| APTS04 | Transit Fare Collection Management | Modified | APTS4 | Transit Passenger and Fare Management |

**Description:** This market package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other market packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| APTS05 | Transit Security | Modified | APTS5 | Transit Security |

**Description:** This market package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this market package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).

The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this market package.

In addition the market package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.

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| APTS06 | Transit Fleet Management | Modified | APTS6 | Transit Maintenance |

**Description:** This market package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Managemen Subsystem processes this data and schedules preventative and corrective maintenance. The market package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.

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| APTS07 | Multi-modal Coordination | Modified | APTS7 | Multi-modal Coordination |

**Description:** This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.

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| APTS08 | Transit Traveler Information | Modified | APTS8 | Transit Traveler Information |

**Description:** This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

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|---|---|---|---|---|
| ATIS01 | Broadcast Traveler Information | Modified | ATIS1 | Broadcast Traveler Information |

**Description:** This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| ATIS02 | Interactive Traveler Information | Modified | ATIS2 | Interactive Traveler Information |

**Description:** This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a “traveler card” that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.

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| ATIS03 | Autonomous Route Guidance | Modified | ATIS3 | Autonomous Route Guidance |

**Description:** This market package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.

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| ATIS04 | Dynamic Route Guidance | Modified | ATIS4 | Dynamic Route Guidance |

**Description:** This market package offers advanced route planning and guidance that is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is considered by the user equipment in provision of route guidance.

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| ATIS05 | ISP Based Trip Planning and Route Guidance | Modified | ATIS5 | ISP Based Trip Planning and Route Guidance |

**Description:** This market package offers the user trip planning and en-route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this market package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services (e.g., parking reservations) are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.

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|---|---|---|---|---|
| ATIS07 | Yellow Pages and Reservation | Modified | ATIS7 | Yellow Pages and Reservation |

**Description:** This market package provides yellow pages and reservation services to the user. These additional traveler services may be provided using the same basic user equipment used for Interactive Traveler Information. This market package provides multiple ways for accessing information either while en route in a vehicle using wide-area wireless communications or pre-trip via fixed-point to fixed-point connections.

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| ATIS08 | Dynamic Ridesharing | Modified | ATIS8 | Dynamic Ridesharing |

**Description:** This market package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.

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|---|---|---|---|---|
| ATIS09 | In Vehicle Signing | Modified | ATIS9 | In Vehicle Signing |

**Description:** This market package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). It includes short range communications between field equipment and the vehicle and connections to the Traffic Management Subsystem for monitoring and control. This market package also includes the capability for maintenance and construction, transit, and emergency vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in work zones, around incidents, and in areas where transit operations impacts traffic.

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| ATMS02 | Traffic Probe Surveillance | Modified | ATMS02 | Probe Surveillance |

**Description:** This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status directly to the center, and 2) dedicated short range communications between passing vehicles and the roadside is used to provide equivalent information to the center. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture The market package enables transportation operators and traveler information providers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, on-board equipment, data reduction software, and fixed-point to fixed-point links between centers to share the collected information. Both “Opt out” and “Opt in” strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.

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| ATMS07 | Regional Traffic Management | Modified | ATMS07 | Regional Traffic Control |

**Description:** This market package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

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| ATMS09 | Traffic Decision Support and Demand Management | Modified | ATMS09 | Traffic Forecast and Demand Management |

**Description:** This market package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this market package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment. TDM recommendations are coordinated with transit, parking, and toll administration centers to support regional implementation of TDM strategies. Incident response and congestion management recommendations are implemented by the local traffic management center and coordinated with other regional centers by other market packages (see ATMS07-Regional Traffic Management and ATMS08-Traffic Incident Management). All recommendations are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. Traffic data is collected from sensors and surveillance equipment, other traffic management centers. Forecasted traffic loads are derived from historical data and route plans supplied by the Information Service Provider Subsystem. This market package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support TDM, where applicable.

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| AVSS11 | Automated Vehicle Operations | Modified | AVSS11 | Automated Highway System |

**Description:** This market package enables “hands-off” operation of the vehicle on automated portions of the highway system. Implementation requires lateral lane holding, vehicle speed and steering control. Communications between vehicles and between the vehicles and supporting infrastructure equipment supports cooperative checkin to the automated portion of the system and transition to automated mode, coordination of maneuvers between vehicles in automated mode, and checkout from the automated system as the driver resumes control of the vehicle.

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| CVO08 | On-board CVO and Freight Safety and Security | Modified | CVO08 | On-board CVO and Freight Safety & Security |

**Description:** This market package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Market Package and includes roadside support for reading on-board safety data via tags. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Commercial Vehicle Check roadside elements. This market package allows for the Fleet and Freight Management subsystem to have access to the on-board safety data. In addition to safety data, this market package provides a means for monitoring the security of the Commercial Vehicle along with the cargo, containers, trailers, and other equipment that are being hauled. Commercial Vehicle on-board tamper and breach sensors provide an indication of any security irregularities and the sensor data is provided to the Fleet and Freight Management subsystem along with particular notification of any breach alerts. Commercial Vehicle Drivers may be aware of the sensor readings and can provide an explanation back to the Fleet and Freight Management subsystem via the Commercial Vehicle. Commercial vehicle and freight security breaches are also sent to the commercial vehicle check.

| MP | MP Name | Change | Old MP | Old MP Name |
|---|---|---|---|---|
| ATIS6 | Integrated Transportation Management/Route Guidance | Discontinued | | |

**Description:** This market package provides advanced route planning and guidance which is responsive to current conditions, and supports collection of near-real time information on intended routes for a proportion of the vehicles in the network. This comprehensive road network probe information can be used by the Traffic Management Subsystem to optimize the traffic control strategy based on anticipated vehicle routes. The Traffic Management Subsystem would utilize the individual and ISP route planning information to optimize signal timing while at the same time providing updated signal timing information to allow optimized route plans. The predictive link times used by this market package are provided by the market package ATMS9--Traffic Forecast and Demand Management--at the traffic management center.

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|---|---|---|---|---|
| ATMS12 | Virtual TMC and Smart Probe Data | Discontinued | | |

**Description:** This market package provides for special requirements of rural road systems. Instead of a central TMC, the traffic management is distributed over a very wide area (e.g., a whole state or collection of states). Each locality has the capability of accessing available information for assessment of road conditions. The package uses vehicles as smart probes that are capable of measuring road conditions and providing this information to the roadway for relay to the Traffic Management Subsystem and potentially direct relay to following vehicles (i.e., the automated road signing equipment is capable of autonomous operation). In-vehicle signing is used to inform drivers of detected road conditions.

# Version 6.1 Standard Changes

8/10/2010 3:28:09PM

| Change | | SDO | Standard Name | Document ID |
|---|---|---|---|---|
| New | | IEEE | Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification | IEEE 802.11p |
| New | | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture | IEEE P1609.0 |
| New | | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS) | IEEE P1609.11 |
| New | | AASHTO/ITE/NEMA | Object Definitions for Electrical and Lighting Management Systems (ELMS) | NTCIP 1213 |
| New | | AASHTO/ITE/NEMA | Object Definitions for Conflict Monitor Units (CMU) | NTCIP 1214 |
| Modified * | Old: | ASTM/IEEE/SAE | Dedicated Short Range Communication at 5.9 GHz Standards Group | DSRC 5GHz |
| | New: | ASTM/IEEE/SAE | Dedicated Short Range Communication at 5.9 GHz Standards Group | DSRC 5GHz |
| Modified * | Old: | SAE/IEEE | DSRC 5GHz | DSRC 5GHz |
| | New: | ASTM/IEEE/SAE | Dedicated Short Range Communication at 5.9 GHz Standards Group | DSRC 5GHz |
| Modified * | Old: | ASTM | Dedicated Short Range Communication at 915 MHz Standards Group | DSRC 915MHz |
| | New: | ASTM | Dedicated Short Range Communication at 915 MHz Standards Group | DSRC 915MHz |
| Modified * | Old: | AASHTO/ITE/NEMA | NTCIP Center-to-Center Standards Group | NTCIP C2C |
| | New: | AASHTO/ITE/NEMA | NTCIP Center-to-Center Standards Group | NTCIP C2C |
| Modified * | Old: | AASHTO/ITE/NEMA | NTCIP Center-to-Field Standards Group | NTCIP C2F |
| | New: | AASHTO/ITE/NEMA | NTCIP Center-to-Field Standards Group | NTCIP C2F |
| Modified | Old: | ASTM | Standard Specification for Metadata to Support Archived Data Management Systems | ASTM E2259-xx |
| | New: | ASTM | Standard Practice for Metadata to Support Archived Data Management Systems | ASTM E2468-05 |
| Modified | Old: | ASTM | Standard Specification for Archiving ITS Generated Travel Monitoring Data | ASTM E2259-yy |
| | New: | ASTM | Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data | ASTM E2665-08 |
| Modified | Old: | IEEE | Standard for Traffic Incident Management Message Sets for Use by EMCs | IEEE 1512.1-2003 |
| | New: | IEEE | Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.1-2006 |
| Modified | Old: | IEEE | Standard for Public Safety IMMS for use by EMCs | IEEE 1512.2-2004 |
| | New: | IEEE | Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.2-2004 |
| Modified | Old: | IEEE | Standard for Hazardous Material IMMS | IEEE 1512.3-2002 |
| | New: | IEEE | Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.3-2006 |
| Modified | Old: | IEEE | Standard for Common Incident Management Message Sets (IMMS) for use by EMCs | IEEE 1512-2000 |

| Change | | SDO | Standard Name | Document ID |
|---|---|---|---|---|
| | New: | IEEE | Standard for Common Incident Management Message Sets for use by Emergency Management Centers | IEEE 1512 -2006 |
| Modified | Old: | IEEE | Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection | IEEE 1570-2002 |
| | New: | IEEE | Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection | IEEE 1570-2002 |
| Modified | Old: | IEEE | Resource Manager for DSRC 5.9 GHz | IEEE 1609.1 |
| | New: | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager | IEEE 1609.1-2006 |
| Modified | Old: | IEEE | Application Services (Layers 6,7) for DSRC 5.9 GHz | IEEE 1609.2 |
| | New: | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages | IEEE 1609.2-2006 |
| Modified | Old: | IEEE | Communications Services (Layers 4,5) for DSRC 5.9 GHz (Future Standard) | IEEE 1609.3 |
| | New: | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services | IEEE 1609.3 |
| Modified | Old: | IEEE | Medium Access Control (MAC) Extension & the MAC Extension Management Entity for DSRC 5.9 GHz | IEEE 1609.4 |
| | New: | IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation | IEEE 1609.4-2006 |
| Modified | Old: | IEEE | Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications | IEEE 802.11 |
| | New: | ASTM | Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications | ASTM E2213-03 |
| Modified | Old: | IEEE | Standard for Message Sets for Vehicle/Roadside Communications | IEEE Std 1455-1999 |
| | New: | IEEE | Standard for Message Sets for Vehicle/Roadside Communications | IEEE 1455-1999 |
| Modified | Old: | ITE | ATC Application Program Interface (API) | ITE 9603-1 |
| | New: | NEMA/AASHTO/ITE | Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) | ITE ATC API |
| Modified | Old: | ITE | ATC Cabinet | ITE 9603-2 |
| | New: | NEMA/AASHTO/ITE | ITS Standard Specification for Roadside Cabinets | ITE ITS Cabinet |
| Modified | Old: | ITE | Advanced Transportation Controller (ATC) | ITE 9603-3 |
| | New: | NEMA/AASHTO/ITE | Advanced Transportation Controller (ATC) | ITE ATC Controller 5.2 |
| Modified | Old: | ITE | Standard for Functional Level Traffic Management Data Dictionary (TMDD) | ITE TM 1.03 |
| | New: | AASHTO/ITE | Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC) | ITE TMDD |
| Modified | Old: | ITE | Message Sets for External TMC Communication (MS/ETMCC) | ITE TM 2.01 |
| | New: | AASHTO/ITE | Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC) | ITE TMDD |

| Change | | SDO | Standard Name | Document ID |
|---|---|---|---|---|
| Modified | Old: | ITE | TMDD & MS/ETMCC Guide Standard for Functional Level Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications | ITE TMDD Guide |
| | New: | AASHTO/ITE | TMDD and MS/ETMCC Guide Standard for Functional Level Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications | ITE TMDD Guide |
| Modified | Old: | AASHTO/ITE/NEMA | Object Definitions for Actuated Traffic Signal Controller Units | NTCIP 1202 |
| | New: | AASHTO/ITE/NEMA | Object Definitions for Actuated Traffic Signal Controller (ASC) Units | NTCIP 1202 |
| Modified | Old: | AASHTO/ITE/NEMA | Environmental Sensor Station (ESS) Interface Standard | NTCIP 1204 |
| | New: | AASHTO/ITE/NEMA | Object Definitions for Environmental Sensor Stations (ESS) | NTCIP 1204 |
| Modified | Old: | AASHTO/ITE/NEMA | Field Management Stations - Part 1: Object Definitions for Signal System Masters | NTCIP 1210 |
| | New: | AASHTO/ITE/NEMA | Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters | NTCIP 1210 |
| Modified | Old: | AASHTO/ITE/NEMA | Object Definitions for Signal Control and Prioritization | NTCIP 1211 |
| | New: | AASHTO/ITE/NEMA | Object Definitions for Signal Control and Prioritization (SCP) | NTCIP 1211 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Framework Standard | NTCIP 1400 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Common Public Transportation (CPT) Objects | NTCIP 1401 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Incident Management (IM) Objects | NTCIP 1402 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Passenger Information (PI) Objects | NTCIP 1403 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Scheduling/Runcutting (SCH) Objects | NTCIP 1404 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Spatial Representation (SP) Objects | NTCIP 1405 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP On-Board (OB) Objects | NTCIP 1406 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Control Center (CC) Objects | NTCIP 1407 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |
| Modified | Old: | AASHTO/ITE/NEMA | TCIP Fare Collection (FC) Business Area Objects | NTCIP 1408 |
| | New: | APTA | Standard for Transit Communications Interface Profiles | APTA TCIP-S-001 3.0.3 |

| Change | | SDO | Standard Name | Document ID |
|---|---|---|---|---|
| Modified | Old: | AASHTO/ITE/NEMA | Application Profile for XML Message Encoding and Transport in ITS C2C Communications | NTCIP 2306 |
| | New: | AASHTO/ITE/NEMA | Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML) | NTCIP 2306 |
| Modified | Old: | SAE | RDS (Radio Data System) Phrase Lists | SAE J2540-1 |
| | New: | SAE | RDS (Radio Data System) Phrase Lists | SAE J2540/1 |
| Modified | Old: | SAE | ITIS (International Traveler Information Systems) Phrase Lists | SAE J2540-2 |
| | New: | SAE | ITIS (International Traveler Information Systems) Phrase Lists | SAE J2540/2 |
| Modified | Old: | SAE | National Names Phrase List | SAE J2540-3 |
| | New: | SAE | National Names Phrase List | SAE J2540/3 |
| Modified | Old: | SAE | Data Dictionary and Message Sets for DSRC 5.9 GHz (Future Standard) | SAE JXXXX |
| | New: | SAE | Dedicated Short Range Communications (DSRC) Message Set Dictionary | SAE J2735 |
| Discontinued | | ANSI | Commercial Vehicle Safety Reports | ANSI TS284 |
| Discontinued | | ANSI | Commercial Vehicle Safety and Credentials Information Exchange | ANSI TS285 |
| Discontinued | | ANSI | Commercial Vehicle Credentials | ANSI TS286 |
| Discontinued | | ASTM | Standard Provisional Specification for Dedicated Short Range Communication (DSRC) Data Link Layer | ASTM PS 105-99 |
| Discontinued | | IEEE | Logical Link (Layer 2) for DSRC 5.9 GHz | IEEE 802.2 |
| Discontinued | | IEEE | Trial-Use Standard for Message Set Template for Intelligent Transportation Systems | IEEE Std 1488-2000 |
| Discontinued | | IEEE | Standard for Data Dictionaries for Intelligent Transportation Systems | IEEE Std 1489-1999 |
| Discontinued | | ISO | Networking Services (Layer 3) for DSRC 5.9 GHz | ISO 21210 |
| Discontinued | | AASHTO/ITE/NEMA | Simple Transportation Management Framework (STMF) | NTCIP 1101 |
| Discontinued | | AASHTO/ITE/NEMA | CORBA Security Service Specification | NTCIP 1105 |
| Discontinued | | AASHTO/ITE/NEMA | CORBA Near-Real Time Data Service Specification | NTCIP 1106 |
| Discontinued | | AASHTO/ITE/NEMA | Weather Report Message Set for Environmental Sensor Stations (Future Standard) | NTCIP 1301 |

| Change | SDO | Standard Name | Document ID |
|---|---|---|---|
| Discontinued | AASHTO/ITE/NEMA | Application Profile for CORBA (AP-CORBA) | NTCIP 2305 |
| Discontinued | AASHTO/ITE/NEMA | Information Profile for DATEX | NTCIP 2501 |
| Discontinued | AASHTO/ITE/NEMA | Information Profile for CORBA | NTCIP 2502 |
| Discontinued | SAE | ITS Data Bus - Data Security Services | SAE J1760 |
| Discontinued | SAE | ITS Data Bus Architecture Reference Model Information Report | SAE J2355 |
| Discontinued | SAE | ITS Data Bus - lDB-C Physical Layer | SAE J2366-1 |
| Discontinued | SAE | ITS Data Bus - Link Layer | SAE J2366-2 |
| Discontinued | SAE | ITS Data Bus - Thin Transport Layer | SAE J2366-4 |
| Discontinued | SAE | ITS Data Bus - Application Message Layer | SAE J2366-7 |
| Discontinued | SAE | ITS Data Bus Vehicle Gateway Reference Design Recommended Practice | SAE J2367 |

| Change | SDO | Standard Name | Document ID |
|---|---|---|---|

*** The standards included in the group have changed as identified below:**

**Dedicated Short Range Communication at 5.9 GHz Standards Group**

| SDO | Standard Name | Document ID | Change |
|---|---|---|---|
| ISO | Networking Services (Layer 3) for DSRC 5.9 GHz | ISO 21210 | Removed |
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture | IEEE P1609.0 | Added |
| IEEE | Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification | IEEE 802.11p | Added |
| IEEE | Logical Link (Layer 2) for DSRC 5.9 GHz | IEEE 802.2 | Removed |

**Dedicated Short Range Communication at 915 MHz Standards Group**

| SDO | Standard Name | Document ID | Change |
|---|---|---|---|
| ASTM | Standard Provisional Specification for Dedicated Short Range Communication (DSRC) Data Link Layer | ASTM PS 105-99 | Removed |

**NTCIP Center-to-Center Standards Group**

| SDO | Standard Name | Document ID | Change |
|---|---|---|---|
| AASHTO/ITE/NEMA | Information Profile for DATEX | NTCIP 2501 | Removed |
| AASHTO/ITE/NEMA | Information Profile for CORBA | NTCIP 2502 | Removed |
| AASHTO/ITE/NEMA | CORBA Security Service Specification | NTCIP 1105 | Removed |
| AASHTO/ITE/NEMA | CORBA Near-Real Time Data Service Specification | NTCIP 1106 | Removed |
| AASHTO/ITE/NEMA | Application Profile for CORBA (AP-CORBA) | NTCIP 2305 | Removed |

**NTCIP Center-to-Field Standards Group**

| SDO | Standard Name | Document ID | Change |
|---|---|---|---|
| AASHTO/ITE/NEMA | Simple Transportation Management Framework (STMF) | NTCIP 1101 | Removed |

# Version 6.1 Subsystems and Terminator Changes

8/10/2010 3:24:40PM

| Entity Name | Entity Kind | Entity Class | Entity Type | Old Entity Name |
|---|---|---|---|---|
| **New** | | | | |
| Border Inspection Systems | Terminator | Field | System | |
| Driver Identification Card | Terminator | Traveler | System | |
| Public Health System | Terminator | Center | System | |
| **Modified** | | | | |
| Border Inspection Administration | Terminator | Center | System | Trade Regulatory Agencies |
| Transit Operations Personnel | Terminator | Center | Human | Transit System Operators |

# Conversion Summary

8/10/2010 3:18:56PM

## Original File Information

| | |
|---|---|
| Original File | X:\Projects\2006\P0C9F9~1\TASK12~1.0\ODOTS T~1.TBO |
| Turbo Architecture | 3.1.8 - 5/12/2005 3:55:16 PM |
| Physical Architecture | 5.1.0 - 4/7/2005 8:28:35 AM |
| Market Packages | 5.1.0 - 3/28/2005 11:15:05 AM |
| SDOMAP | 5.1.1 - 5/6/2005 11:00:24 AM |

## Converted File Information

| | |
|---|---|
| Converted File | X:\Projects\2006\P06287-011 (ODOT Statewide ITS Architecture Update)\Task 12.1 Update Turbo Arch to 5.0\ODOT Statewide Architecture_v 5.0.tbo |
| Turbo Architecture | 5.0.7 - 6/28/2010 7:47:44 AM |
| Physical Architecture | 6.1.8 - 2/8/2009 1:36:36 PM |
| Market Packages | 6.1.6 - 12/14/2008 4:24:50 PM |
| SDOMAP | 6.1.6 - 6/28/2010 9:46:18 AM |

## Architectures Converted

| | |
|---|---|
| Regional Architecture | Oregon Statewide ITS Architecture |
| Project Architecture | Road Weather Operations |
| Project Architecture | Transportation Operations Center System |
| Project Architecture | TripCheck System |
| Project Architecture | TripCheck Traveler Information Portal |

# Discontinued Flows

8/10/2010 3:22:01PM

| Source Element | Destination Element | Flow Name | Flow Kind |
|---|---|---|---|
| **Regional Architecture:** Oregon Statewide ITS Architecture | | | |
| Local Fire and Life Safety Vehicles | 911 Centers | environmental probe data* | Discontinued |
| Local Law Enforcement Vehicles | 911 Centers | environmental probe data* | Discontinued |
| Local Maintenance and Construction Vehicles | Local Traffic Operations Centers | environmental probe data* | Discontinued |
| Media | Local Traffic Operations Centers | media information request* | Discontinued |
| Media | ODOT Transportation Operations Center System | media information request* | Discontinued |
| Media | TripCheck Traveler Information Portal | media information request* | Discontinued |

The asterisk (*) indicates that this flow has been discontinued and is no longer included in the National ITS Architecture.

# Flow Conversion Details

8/10/2010 3:21:13PM

| Change | Source Element | Destination Element | Old Flow | New Flow |
|---|---|---|---|---|
| **Regional Architecture: Oregon Statewide ITS Architecture** | | | | |
| Replaced | Commercial Information Service Providers | Personal Traveler Information Devices | broadcast information | broadcast traveler information |
| Replaced | Commercial Information Service Providers | Personal Traveler Information Devices | traveler information | interactive traveler information |
| Replaced | Commercial Information Service Providers | TripCheck Traveler Information Portal | road network probe information | road network traffic probe data |
| Replaced | Commercial Information Service Providers | Vehicles | broadcast information | broadcast traveler information |
| Replaced | Commercial Information Service Providers | Vehicles | traveler information | interactive traveler information |
| Replaced | Commercial Transit Operations and Dispatch Centers | TripCheck Traveler Information Portal | road network probe information | transit probe data |
| Replaced | Local Field Devices | Local Maintenance and Construction Management | environmental conditions data | environmental sensor data |
| Replaced | Local Field Devices | Local Traffic Operations Centers | environmental conditions data | environmental sensor data |
| Replaced | Local Maintenance and Construction Vehicles | Local Maintenance and Construction Management | environmental probe data | environmental sensor data |
| Replaced | NOAA National Weather Service | ODOT Transportation Operations Center System | weather information | weather archive data |
| Replaced | NOAA National Weather Service | Portland State University PORTAL Data Warehouse | weather information | weather archive data |
| Replaced | ODOT Field Devices | ODOT Maintenance and Construction Management | environmental conditions data | environmental sensor data |
| Replaced | ODOT Field Devices | ODOT Transportation Operations Center System | environmental conditions data | environmental sensor data |
| Replaced | ODOT Incident Response Vehicles | ODOT Transportation Operations Center System | environmental probe data | environmental sensor data |
| Replaced | ODOT Maintenance and Construction Vehicles | ODOT Maintenance and Construction Management | environmental probe data | environmental sensor data |
| Replaced | ODOT Maintenance and Construction Vehicles | ODOT Transportation Operations Center System | environmental probe data | environmental sensor data |
| Replaced | Public Transit Operations and Dispatch Centers | Portland State University PORTAL Data Warehouse | road network probe information | transit probe data |
| Replaced | Public Transit Operations and Dispatch Centers | TripCheck Traveler Information Portal | road network probe information | transit probe data |
| Replaced | TripCheck System | External State Traffic Operations Centers | road network probe information | road network traffic probe data |
| Replaced | TripCheck System | Local Maintenance and Construction Management | road network probe information | road network environmental probe data |
| Replaced | TripCheck System | Local Traffic Operations Centers | road network probe information | road network traffic probe data |
| Replaced | TripCheck System | ODOT Maintenance and Construction Management | road network probe information | road network environmental probe data |

| Change | Source Element | Destination Element | Old Flow | New Flow |
|---|---|---|---|---|
| Replaced | TripCheck System | ODOT Transportation Operations Center System | road network probe information | road network environmental probe data |
| Replaced | TripCheck System | Personal Traveler Information Devices | broadcast information | broadcast traveler information |
| Replaced | TripCheck System | Personal Traveler Information Devices | traveler information | interactive traveler information |
| Replaced | TripCheck System | Welcome Centers and Wayside Travel Information Centers | broadcast information | broadcast traveler information |
| Replaced | TripCheck Traveler Information Portal | Local Maintenance and Construction Management | road network probe information | road network environmental probe data |
| Replaced | TripCheck Traveler Information Portal | Local Traffic Operations Centers | road network probe information | road network traffic probe data |
| Replaced | TripCheck Traveler Information Portal | ODOT Maintenance and Construction Management | road network probe information | road network environmental probe data |
| Replaced | TripCheck Traveler Information Portal | ODOT Transportation Operations Center System | road network probe information | road network environmental probe data |
| Replaced | Vehicles | Commercial Information Service Providers | vehicle probe data | traffic probe data |
| Status Change | Local Fire and Life Safety Vehicles | 911 Centers | environmental probe data (National) | environmental probe data* (Discontinued) |
| Status Change | Local Law Enforcement Vehicles | 911 Centers | environmental probe data (National) | environmental probe data* (Discontinued) |
| Status Change | Local Maintenance and Construction Vehicles | Local Traffic Operations Centers | environmental probe data (National) | environmental probe data* (Discontinued) |
| Status Change | Media | Local Traffic Operations Centers | media information request (National) | media information request* (Discontinued) |
| Status Change | Media | ODOT Transportation Operations Center System | media information request (National) | media information request* (Discontinued) |
| Status Change | Media | TripCheck Traveler Information Portal | media information request (National) | media information request* (Discontinued) |
| Status Change | ODOT Incident Response Vehicles | ODOT Transportation Operations Center System | environmental probe data (National) | environmental probe data* (Discontinued) |
| Status Change | ODOT Maintenance and Construction Vehicles | ODOT Transportation Operations Center System | environmental probe data (National) | environmental probe data* (Discontinued) |

# User Defined Flows/Entities in Converted Architecture

8/10/2010 3:22:59PM

| | Entity | Element | Kind | Flow Name | Flow Kind |
|---|---|---|---|---|---|
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Management | ODOT Emergency Operations Centers | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Management | Oregon State Police Dispatch Centers | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Management | Local Law Enforcement Centers | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Management | Oregon Emergency Coordination Center | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Traffic Management | ODOT Transportation Operations Center System | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Vehicle Subsystem | Oregon State Police Vehicles | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Vehicle Subsystem | Local Law Enforcement Vehicles | Subsystem | | |
| ***Source:*** | Other Emergency Management | Law Enforcement Data System | Terminator | vehicle information | UserDefined |
| ***Destination:*** | Emergency Management | ODOT Transportation Operations Center System | Subsystem | | |
| ***Source:*** | Emergency Management | Local Law Enforcement Centers | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Emergency Vehicle Subsystem | Local Law Enforcement Vehicles | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Emergency Management | ODOT Emergency Operations Centers | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Emergency Management | ODOT Transportation Operations Center System | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Traffic Management | ODOT Transportation Operations Center System | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |

| | Entity | Element | Kind | Flow Name | Flow Kind |
|---|---|---|---|---|---|
| ***Source:*** | Emergency Management | Oregon Emergency Coordination Center | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Emergency Management | Oregon State Police Dispatch Centers | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |
| ***Source:*** | Emergency Vehicle Subsystem | Oregon State Police Vehicles | Subsystem | vehicle information request | UserDefined |
| ***Destination:*** | Other Emergency Management | Law Enforcement Data System | Terminator | | |

# APPENDIX C: REGIONAL ITS ARCHITECTURE ASSESSMENT CHECKLIST

# Regional ITS Architecture Assessment Checklist

Version 3.0 - 9/27/2008

**Architecture Name**: Oregon Statewide ITS Architecture (Version 2010-1)
**Architecture Location**: Oregon
**Architecture State**: Oregon
**Type of Architecture**: Statewide
**Date Architecture Originally Developed**: 2000
**Date Architecture Last Updated**: December 2010
**Reviewer**: DKS Associates and ODOT
**Review Date**: December 6, 2010
**National Architecture Version**: 6.1
**Turbo Architecture Version**: 5.0
**Artifacts Reviewed**:

| Type | Title | File | URL |
|---|---|---|---|
| Document | Oregon Statewide ITS Architecture and Operational Concept Plan, Version 2 | Oregon Statewide ITS Architecture and Operational Concept Plan.pdf | Final Plan will be posted at: http://www.oregon.gov/ODOT/HWY/ITS/OregonStatewideArch/ |
| Turbo Architecture | Oregon Statewide ITS Architecture | OREGON.TBO | Web version of Turbo database will be posted at: http://www.oregon.gov/ODOT/HWY/ITS/OregonStatewideArch/ |

**Overall Comments:**

**Answering Questions:**
Each lettered question is essentially a yes/no question but there are places where we'll need to make a determination of how adequate or complete a certain item is covered in an architecture. With that in mind, questions can be answered Mostly if the reviewers determine that an architecture is close to being complete in a particular area or Partly if they appear to have attempted to address the criteria but still need to put additional effort before really getting credit. Unknown may be used if the reviewers cannot tell from the documentation supplied whether an architecture satisfies the criteria – this may reflect poorly on the scoring. Not Applicable would be an appropriate answer if an item truly doesn't apply to that architecture – there are no adjacent regions, for instance. Not Applicable would not be reflected in the scoring either positively or negatively.

Check Scores

**Assigning Scores:**
Each numbered criteria area is assigned an overall score of Purple (good), Orange (fair-to-middling), or Black (bad). A numerical method can be used to assign values to each Yes/Mostly/Partly/No answer and then average them out to come up with the criteria score. A more subjective method is to assign the score directly based on the reviewers' judgment – the numerical method may be used to suggest the score and then changed by the reviewers if there are extenuating circumstances. In general, to get a Purple score an architecture needs to have YES with perhaps some MOSTLYs in the individual questions.

| 1. Architecture Scope and Region Description | | ☑ Turbo Used Purple |
|---|---|---|
| General Architecture Scope and Region Description Comments Here | | |
| **Question** | **Answer** | **Comments** |
| a. Is the region defined geographically? Have boundaries been established such as counties, municipal boundaries, metropolitan areas, statewide, etc.? | Yes | State of Oregon is the boundary. |
| b. Has a timeframe for the architecture been defined? (For example, 5 or 10 years into the future, or the TIP/STIP or other Capital Plan planning period)? | Yes | 10 Years (2011 – 2021) |
| c. Has the scope of the regional architecture been defined (i.e. the range of services, institutions, or jurisdictions)? Does the scope seem appropriate given the circumstances? | Yes | Ten ITS service areas are included in the architecture. |
| d. Are adjacent/overlapping ITS architectures identified? | Yes | The statewide architecture and regional architectures use common elements where there is overlap. |

| 2. Stakeholders | | ☑ Turbo Used Purple |
|---|---|---|
| General Stakeholders Comments Here | | |
| **Question** | **Answer** | **Comments** |
| a. Are the stakeholders identified in sufficient detail to understand who the players are including agency/department name and jurisdiction? | Yes | Primary stakeholders:<br>• Transportation management agencies<br>• Public transportation agencies<br>• Public safety agencies<br><br>Expanded stakeholders:<br>• Other public agencies<br>• Private sector organizations<br>• Travelers/system users<br>• Etc. |
| b. Is the range of stakeholders commensurate with the defined scope of the regional architecture? | Yes | |
| c. Were the key stakeholders involved in the architecture development process? | Yes | |
| d. Was a champion established either individual or group, to lead the development of the architecture? | Yes | ODOT ITS Unit |

| 3. System Inventory | | ☑ Turbo Used Purple |
|---|---|---|
| General Comments: | | |
| **Question** | **Answer** | **Comments** |
| a. Has a system inventory been defined that includes a list of applicable regional system elements along with descriptions and assigned stakeholders? | Yes | |

| | | |
|---|---|---|
| b. Have the National ITS Architecture subsystems and terminators been correctly linked to regional elements? | Yes | |
| c. Does the inventory take into account adjacent regional ITS architectures such as neighboring districts or states. | Yes | External State Agencies are included as a stakeholder |
| d. (Optional) Does the inventory appropriately map regionally unique elements to user-defined entities that are described in sufficient detail to understand their function? | Not Applicable | |

## 4. Needs and Services

☐ Turbo Used **Purple**

General Needs and Services Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Are transportation needs for the region defined and described? (This could be by reference to another document, e.g. Strategic Plan.) | Yes | Needs were identified through advisory committee meetings and are documented in the Operational Concept Plan. |
| b. Are transportation services, derived from the needs, defined and described? | Yes | |
| c. Are the services adequately represented in the regional architecture? (i.e. Are services(market packages) identified and linked to inventory elements?) | Yes | |

## 5. Operational Concept

☐ Turbo Used **Purple**

General Operational Concept Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Has an architecture operational concept been described in sufficient detail to understand the roles and responsibilities of the primary stakeholders in the region in the delivery of ITS services? | Yes | |
| b. Are the roles and responsibilities of the operational concept appropriately reflected in the architecture? | Yes | |

## 6. Functional Requirements

☐ Turbo Used **Black**

No functional requirement is assigned to any of the element in the architecture.

| Question | Answer | Comments |
|---|---|---|
| a. Have high-level functions been defined for each regionally significant element in the architecture? | No | The Statewide ITS Architecture Committee maintains their decision to identify functional requirements at the project level for significant statewide systems. |

| | | |
|---|---|---|
| b. Are the requirements unambiguously stated in terms of shall statements or similar language such that the required functions of each system can be easily understood? | No | |

## 7. Interfaces/ Information Flows

☑ Turbo Used — **Purple**

General Interfaces/ Information Flows Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Are information flows defined between elements with descriptions of the information exchanged and their deployment status (existing, planned, etc)? | Yes | |
| b. Does the architecture include appropriate linkages to elements outside the region or to elements from overlapping or adjacent regional architectures? | Yes | There are links to regional architectures within Oregon through the ODOT regional TOCs and links to neighboring states through external state TOCs, EOCs, and state police. |
| c. Does the architecture address the significant integration opportunities implied by the inventory, needs/services, and the operational concept? | Yes | |
| d. (Optional) Does the architecture consider regionally unique interfaces (defined via user-defined flows) and are they described in sufficient detail to understand their purpose? | Not Applicable | |

## 8. Project Sequencing

☐ Turbo Used — **Purple**

General Project Sequencing Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Have projects been defined to include the agencies involved, timeframe, and how each is tied to the regional architecture? | Yes | Project sequencing has been identified for the 2011 – 2013 biennium and 2013 – 2015 biennium. Additional projects have been identified for implementation after 2015. The sequencing for these projects will need to be revisited as part of the maintenance process. |
| b. Have the relationships to the regional architecture and the interdependencies between projects been defined? | Yes | |
| c. Has an initial sequencing of currently defined projects been established? | Yes | |
| d. (Optional) Have opportunities to coordinate implementation schedules with other transportation improvements been investigated? | Mostly | |

## 9. Agreements

☐ Turbo Used — **Black**

General Agreements Comments Here

| Question | Answer | Comments |
|---|---|---|

| | | |
|---|---|---|
| a. Have existing interagency agreements in the region been identified/considered by the regional architecture? | Partly | Many agreements exist but are not documented in the architecture. These are typically defined at the project level. |
| b. Have future agreements been identified to implement the regional architecture and support project interoperability? | No | Agreements will need to be formalized as projects are implemented. |

## 10. Standards Identification

☐ Turbo Used **Purple**

General Standards Identification Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Has a plan been documented for how ITS standards will be considered, selected, and/or applied across the region? | Yes | |
| b. Has a listing of ITS standards been generated and tailored that are applicable to the region and projects coming out of the regional ITS architecture? | Yes | |
| c. Are these standards associated with specific interfaces (information flows or interconnects)? | Yes | |
| d. Do the important/relevant ITS standards appear to be identified? | Yes | |

## 11. Using the Regional ITS Architecture

☐ Turbo Used **Purple**

General Using the Regional ITS Architecture Comments Here

| Question | Answer | Comments |
|---|---|---|
| a. Is the architecture output presented in a way that is understandable to a variety of audiences, including the public and decision-makers? | Yes | The architecture summary report includes a description of how the architecture is used as part of ODOT's systems engineering approach to project planning and development. |
| b. Is there a detailed description for incorporating and using the regional ITS architecture in the regional and/or statewide planning process? | Yes | |
| c. Has a regional stakeholder organization or committee been identified to monitor and manage the use of the architecture in the planning process? | Yes | |
| d. Is the relationship between the regional ITS architecture and the project implementation process well defined? | Yes | |

## 12. Maintenance Plan

☐ Turbo Used **Purple**

General Maintenance Plan Comments Here

| Question | Answer | Comments |
|---|---|---|

| | | |
|---|---|---|
| a. Is there a specific documented plan for maintaining the architecture, including how changes are evaluated, who is involved, what configuration control processes are in place, and when/how often updates are made? | Yes | A maintenance plan has been included in the architecture summary report. The ODOT ITS Unit will update the architecture every two years or on an exception basis for larger projects. |
| b. Have the various reasons for updating the architecture been addressed (project updates, new requirements or initiatives, etc.)? | Yes | |
| c. Is there a plan for communicating changes in the architecture to stakeholders? | Yes | |
| d. Have the responsibilities of the various stakeholders or groups been well defined with respect to architecture maintenance? | Yes | |
| e. Is configuration control being used for the architecture outputs (e.g. version numbering schemes, naming conventions, date/time stamps, etc.)? | Yes | |

# APPENDIX D: TURBO ARCHITECTURE SUMMARY REPORT

# Architecture Summary

5/31/2012 1:56:38PM

| Architecture Name | Architecture Description | Status |
|---|---|---|

**Oregon Statewide ITS Architecture** (Region)

*Description:* This architecture includes statewide ITS initiatives in the state of Oregon led by the Oregon Department of Transportation and numerous partners such as other traffic management agencies, public transportation agencies, and emergency management agencies. Regional ITS initiatives are included in the regional architectures for the metropolitan areas of Portland, Salem-Keizer, Eugene-Springfield, Deschutes County, the Rogue Valley, and the Central Willamette Valley.

*Timeframe:* 2011-2021

*Geographic Scope:* State of Oregon

*Service Scope:*
* Regional Traffic Control
* Transportation Operations Centers
* Maintenance & Construction Operations
* Road Weather Operations
* Incident Management
* Emergency Management
* Traveler Information
* Archived Data Management
* Commercial Veh Ops
* Public Transportation
* Road User Charging

*Developer:* ODOT

*Maintainer:* ODOT ITS Unit

*Version:* 2011-1

*Revision Date:* 28-Jun-2011

**Road Weather Operations** (Project) Existing/Planned

*Description:* The Oregon vision for road weather operations is to efficiently and safely manage the transportation infrastructure during inclement weather events. This service area includes road weather information systems (RWISs), maintenance kiosks, automated roadway treatment, weather warning systems, and other systems that support transportation operations during inclement weather.

*Timeframe:* Ongoing

*Geographic Scope:* State of Oregon

*Service Scope:* Road Weather Operations

*Developer:* ODOT

*Maintainer:* ODOT ITS Unit

*Version:*

*Revision Date:*

*Associated Element:* Local Maintenance and Construction Management

*Associated Element:* Local Maintenance and Construction Vehicles

*Associated Element:* ODOT Field Devices

*Associated Element:* ODOT Maintenance and Construction Management

*Associated Element:* ODOT Maintenance and Construction Vehicles

*Associated Element:* ODOT Transportation Operations Centers

*Associated Element:* Vehicles

**Transportation Operations Center System** (Project) Existing/Planned

| Architecture Name | Architecture Description | Status |
|---|---|---|

*Description:* * TOCS Mission/Vision: "The ODOT Transportation Operations Center System provides a unified, statewide platform for around the clock coordination of transportation related services between internal and external customers."
* TOCS Goals/Objectives: "The goals and objectives of the TOCS [are] to integrate the hardware and software systems used by the TOC operators and district office personnel to provide a seamless operational platform that provides for immediate information dissemination and close operational ties between TOC's and their customers and partners both public and private."

*Timeframe:* Ongoing

*Geographic Scope:* This project is specific to ODOT's Regional Transportation Operations Centers (Portland, Salem, Central Point, Bend) and district offices located throughout Oregon.

*Service Scope:* * Transportation Operations Centers
* Regional Traffic Control (includes surface street and freeway control)
* Incident/Emergency Management
* Maintenance and Construction Operations
* Traveler Information
* Archived Data Management

*Developer:* ODOT

*Maintainer:* ODOT ITS Unit

*Version:*

*Revision Date:*

*Associated Element:* 911 Centers
*Associated Element:* Commercial HazMat Vehicles
*Associated Element:* Commercial Salvage and Towing Vehicles
*Associated Element:* External State Emergency Operations Centers
*Associated Element:* External State Traffic Operations Centers
*Associated Element:* Law Enforcement Data System
*Associated Element:* Local Emergency Operations Centers
*Associated Element:* Local Field Devices
*Associated Element:* Local Traffic Operations Centers
*Associated Element:* Media
*Associated Element:* ODOT Field Devices
*Associated Element:* ODOT Incident Response Vehicles
*Associated Element:* ODOT Maintenance and Construction Management
*Associated Element:* ODOT Maintenance and Construction Vehicles
*Associated Element:* ODOT Transportation Operations Centers
*Associated Element:* Oregon Emergency Coordination Center
*Associated Element:* Oregon Interoperability Service (OIS)
*Associated Element:* Oregon State Police Dispatch Centers
*Associated Element:* Portland State University Portal Data Warehouse
*Associated Element:* TripCheck System

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**TripCheck System** (Project) Existing/Planned

*Description:* TripCheck is the statewide public traveler information service provider for Oregon. The system provides various types of traveler information pertaining to road conditions, weather, construction, transit, traveler services, etc. Information from the TripCheck system is disseminated by ODOT through various means: the Internet (www.tripcheck.com), 511 highway advisory telephone, highway advisory radio, formatted cable television presentations, etc.

*Timeframe:* Ongoing

*Geographic Scope:* State of Oregon

*Service Scope:* Traveler Information

*Developer:* ODOT

*Maintainer:* ODOT ITS Unit

*Version:*

*Revision Date:*

*Associated Element:* Commercial Transit Operations and Dispatch Centers

| Architecture Name | Architecture Description | Status |
|---|---|---|

*Associated Element:* Local Maintenance and Construction Management
*Associated Element:* Local Traffic Operations Centers
*Associated Element:* NOAA National Weather Service
*Associated Element:* ODOT Transportation Operations Centers
*Associated Element:* Personal Traveler Information Devices
*Associated Element:* Public Transit Operations and Dispatch Centers
*Associated Element:* Travelers
*Associated Element:* TripCheck System
*Associated Element:* TripCheck Traveler Information Portal
*Associated Element:* Welcome Centers and Wayside Travel Information Centers

**TripCheck Traveler Information Portal** (Project) Existing/Planned

*Description:* The TripCheck Traveler Information Portal (TTIP) system collects, processes, stores, and disseminates transportation information to regional agencies and commercial information service providers. This system collects public agency transportation information about roadways, construction, parking, special events, road closures, etc. and allows subscribers to retrieve information from the broker. Some public agency information is not accessible to commercial information service providers for security reasons.
*Timeframe:* Ongoing
*Geographic Scope:* This project was initially deployed in the Portland metropolitan area and will be expanded to include all of Oregon.
*Service Scope:* Traveler Information
*Developer:* TransPort & ODOT
*Maintainer:*
*Version:*
*Revision Date:*

*Associated Element:* Commercial Information Service Providers
*Associated Element:* Commercial Transit Operations and Dispatch Centers
*Associated Element:* Commercial Transit Vehicles
*Associated Element:* External State Traffic Operations Centers
*Associated Element:* Heavy Rail Operations Centers
*Associated Element:* Local Maintenance and Construction Management
*Associated Element:* Local Traffic Operations Centers
*Associated Element:* Media
*Associated Element:* NOAA National Weather Service
*Associated Element:* ODOT Transportation Operations Centers
*Associated Element:* Public Transit Operations and Dispatch Centers
*Associated Element:* Public Transit Vehicles
*Associated Element:* TripCheck System
*Associated Element:* TripCheck Traveler Information Portal

## *Status Value Legend*

| Name | Description |
|---|---|
| Existing | An entity that currently exists. |
| Existing/Programmed | Some entities currently exist and others are planned and funded. |
| Existing/Planned | Some entities currently exist and others are planned but unfunded. |
| Existing/Future | Some entities currently exist and others are likely to occur in the future as technology advances or funding becomes available. |
| Programmed | Funding has been obtained for a planned entity. |
| Planned | An entity has been identified as planned within the next 10 years, but funding has not yet been obtained. |
| Future | An entity that is likely to occur in the future as technology develops or as other projects are completed but is not currently planned or funded. |
| Not Planned | |

# APPENDIX E: ATTRIBUTE CHANGE LOG

## Attribute Change Log for the Oregon Statewide ITS Architecture

| *Attribute* | *Version 2006-2 Status* | *Changes Made* |
|---|---|---|
| Service Scope | * Regional Traffic Control<br>* Transportation Operations Centers<br>* Maintenance & Construction Operations<br>* Road Weather Operations<br>* Incident Management<br>* Emergency Management<br>* Traveler Information<br>* Archived Data Management<br>* Commercial Veh Ops<br>* Public Transportation | Added "Road User Charging". |
| Version | 2010-1 | Changed to "2011-1" |
| Date/Time | 12/01/2010 02:06 PM | Changed to "06/28/2011 09:24 AM" |
| Change Log: | | Added change log entry for 2011-1 updates. |

# APPENDIX F: TURBO ARCHITECTURE STAKEHOLDER REPORT

# Stakeholders Report

5/31/2012 2:08:35PM

Stakeholders for Region Oregon Statewide ITS Architecture

**Stakeholder**

### Certification Agents

*Description:* Certification Agents are independent parties that test, manage configuration control, and certify that Trusted Third Party Service Providers' electronic road user charging collection systems meet the protocol standards set by the Charging Entities.

*Associated Element:* Road User Charging Certification

### Charging Entities

*Description:* Charging Entities are the road user charging administrators who manage user accounts, collect transaction data (e.g. road usage and payment), handle exempt accounts, help set pricing, operate roadside equipment, and work with enforcement to address non-compliant travelers. A Charging Entity may also be the road owner, a local jurisdiction, private operators, or contractors hired by road owners.

*Associated Element:* Road User Charging Administration- Charging Entities

*Associated Element:* Road User Charging Free Flow Field Devices

### Commercial HazMat Clean-Up Operators

*Description:* This stakeholder includes any commercial operators that provide hazardous material (hazmat) clean-up services.

*Associated Element:* Commercial HazMat Vehicles

### Commercial Information Service Providers

*Description:* This stakeholder includes all commercial enterprises that collect, process, store, and/or disseminate transportation information.

*Associated Element:* Commercial Information Service Providers

### Commercial Salvage and Towing Operators

*Description:* This stakeholder includes any commercial operators that provide salvage or towing operations for roadway incidents.

*Associated Element:* Commercial Salvage and Towing Vehicles

### Commercial Transportation Service Providers

*Description:* This stakeholder includes all commercial companies throughout the state of Oregon who provide transportation services. This includes buses, shuttles, taxis, limousines, etc.

*Associated Element:* Commercial Transit Operations and Dispatch Centers

*Associated Element:* Commercial Transit Vehicles

### Commercial Trucking Firms and Public Fleets

*Description:* This stakeholder includes commercial trucking firms and public fleets throughout the state of Oregon as well as the Oregon Trucking Associations (OTA), who has been serving the needs of the state's trucking industry for more than 50 years. Movement of freight is important to the economy.

*Associated Element:* Commercial Vehicles

*Associated Element:* Commercial Vehicle Management

### Emergency Medical Service Providers

*Description:* This stakeholder includes local companies that provide ambulance and medical response services throughout the state of Oregon.

*Associated Element:* Ambulances

### Enforcement Agents

*Description:* Enforcement Agents work for or with the Road Owners and Charging Entities to monitor and ensure compliance of travelers to pay their fare share of road usage. They may use all legal means available to ensure a high level of compliance. The party responsible for enforcement will vary for each different type of road charge.

*Associated Element:* Road User Charging Enforcement

### Event Promoters

**Stakeholder**

*Description:* This stakeholder includes special event promoters that have knowledge of events that may impact travel on roadways or other modal means. Examples of special events include sporting events, conventions, fairs, motorcades/parades, and public/political events. These promoters provide event information such as date, time, estimated duration, location, potential roadway impacts, event transit service, and any other information pertinent to travel in the surrounding area.

*Associated Element:* Event Promoters

### Exempt (Non-Revenue) Account Holders

*Description:* Exempt Account Holders are not required to pay some types of road user charges. Exemptions will most likely apply to emergency and public transportation vehicles. Eligibility will vary by stakeholder and by road user charge. For example, a tow truck may only be exempt from any road user charges incurred while responding to an incident at the request of ODOT.

*Stakeholders in this group:*

- Local Law Enforcement
- External State Police Agencies
- Public Transportation Service Providers
- Oregon State Police
- Local Fire and Life Safety
- Emergency Medical Service Providers
- Commercial Salvage and Towing Operators
- Commercial HazMat Clean-Up Operators

*Associated Element:* Road User Charging Exempt Accounts

### External State Departments of Transportation

*Description:* This includes the DOTs in neighboring states: Washington State Department of Transportation (WSDOT), Idaho Transportation Department (ITD), Nevada Department of Transportation (NDOT), and California Department of Transportation (Caltrans).

*Associated Element:* External State Traffic Operations Centers

### External State Offices of Emergency Management

*Description:* This includes the state offices of emergency management in neighboring states: Washington State Emergency Management Division (EMD), Idaho Bureau of Disaster Services (BDS), Nevada Department of Emergency Management (DEM), and California Governor's Office of Emergency Services (OES).

*Associated Element:* External State Emergency Operations Centers

### External State Police Agencies

*Description:* This includes the state police agencies in neighboring states: Washington State Patrol (WSP), Idaho State Police (ISP), Nevada Department of Public Safety (DPS), and California Highway Patrol (CHP).

*Associated Element:* External State Police Dispatch Centers

### Federal Land Agencies

*Description:* This stakeholder includes federal land agencies such as the Bureau of Land Management (BLM), National Forest Service, and Crater Lake National Park that manage the transportation system within their own jurisdictions.

*Associated Element:* Federal Land Traffic Management

### Heavy Rail Service Providers

*Description:* This includes heavy rail companies that operate throughout Oregon. Examples include Burlington Northern Santa Fe (BNSF) Railway, Union Pacific (UP) Railroad, and Portland and Western Railroad (PNWR).

*Associated Element:* Heavy Rail Operations Centers

### Local Fire and Life Safety

*Description:* This stakeholder includes county fire districts and city fire departments throughout the state of Oregon. Some of these agencies also provide life safety services.

*Associated Element:* Local Fire and Life Safety Vehicles

*Associated Element:* Local Fire and Life Safety Centers

### Local Law Enforcement

*Description:* This stakeholder includes county sheriff's offices and city police departments throughout the state of Oregon.

**Stakeholder**

*Associated Element:* Local Law Enforcement Centers
*Associated Element:* Local Law Enforcement Vehicles

**Local Offices of Emergency Management**

*Description:* This stakeholder includes county and city offices of emergency management throughout the state of Oregon.
*Associated Element:* Local Emergency Operations Centers

**Local Public Safety Dispatch Agencies**

*Description:* This stakeholder includes Public Safety Answering Points (PSAPs) and agencies that provide call-taking and dispatch services throughout the state of Oregon. 911 centers typically act as a primary or secondary PSAP where all 911 calls are routed. Once the PSAP takes the call they either dispatch the appropriate emergency services or transfer the call to another agency (e.g. local law enforcement or local fire and life safety) who provides their own dispatching services.
*Associated Element:* 911 Centers
*Associated Element:* Oregon Interoperability Service (OIS)

**Local Traffic Management Agencies**

*Description:* This stakeholder includes public agencies that provide traffic management services throughout the state of Oregon. This includes metropolitan planning organizations (MPOs), councils of government (COGs), area commissions on transportation (ACTs), port authority traffic departments, county traffic departments, city traffic departments, and transportation options/demand management programs.
*Associated Element:* Local Maintenance and Construction Management
*Associated Element:* Local Field Devices
*Associated Element:* Local Traffic Operations Centers
*Associated Element:* Local Maintenance and Construction Vehicles
*Associated Element:* Local Data Mart

**Map Update Provider**

*Description:* This stakeholder provides map updates for systems with map interfaces such as TripCheck, PORTAL, TOCS, and systems used at operations centers.
*Associated Element:* Map Update Provider

**Mayday Service Providers**

*Description:* Mayday service providers (e.g. GM's OnStar, ATX, AAA, RESCU) provide traveler assistance through an interface in personal vehicles.
*Associated Element:* Mayday Service Centers

**Media**

*Description:* This stakeholder includes commercial media companies who disseminate traveler information to the public.
*Associated Element:* Media

**National Oceanic and Atmospheric Administration**

*Description:* The National Oceanic and Atmospheric Administration (NOAA) plays a key role in weather reporting and forecasting events that impact surface transportation.
*Associated Element:* NOAA National Weather Service

**Oregon Department of Transportation**

*Description:* The Oregon Department of Transportation (ODOT) stakeholder includes all divisions (except Motor Carrier), regions, and districts within ODOT involved with ITS.
*Associated Element:* ODOT Field Devices
*Associated Element:* TripCheck System
*Associated Element:* ODOT Maintenance and Construction Management
*Associated Element:* ODOT Incident Response Vehicles
*Associated Element:* ODOT Maintenance and Construction Vehicles
*Associated Element:* ODOT Transportation Operations Centers
*Associated Element:* ODOT Emergency Operations Centers
*Associated Element:* TripCheck Traveler Information Portal
*Associated Element:* ODOT Traffic Signal System
*Associated Element:* ODOT Data Mart

*Associated Element:* ODOT Parking Management System
*Associated Element:* TripCheck Local Entry

**Oregon Department of Transportation Motor Carrier Transportation Division**

*Description:* The Motor Carrier Transportation Division regulates the commercial transportation industry in the state of Oregon.
*Associated Element:* ODOT Motor Carrier Inspection Facilities
*Associated Element:* ODOT Motor Carrier Administration

**Oregon Driver and Motor Vehicle (DMV) Services Division**

*Description:* The Oregon Driver and Motor Vehicle (DMV) Services Division is a branch of the Oregon Department of Transportation. It is included in the statewide architecture because it maintains the statewide vehicle registration database that may be used in the monitoring of road user charging compliance.
*Associated Element:* DMV Vehicle Registration Database

**Oregon Office of Emergency Management**

*Description:* The purpose of the Office of Emergency Management (OEM) is to execute the Governor's responsibilities to maintain an emergency services system as prescribed in ORS 401 by planning, preparing and providing for the prevention, mitigation and management of emergencies or disasters that present a threat to the lives and property of citizens of and visitors to the State of Oregon.
*Associated Element:* Oregon Emergency Coordination Center
*Associated Element:* Law Enforcement Data System

**Oregon State Police**

*Description:* State police agency
*Associated Element:* Oregon State Police Dispatch Centers
*Associated Element:* Oregon State Police Vehicles

**Oregon Travel Information Council**

*Description:* The mission of the Oregon Travel Information Council (TIC) is "to provide motorists unfamiliar to any area statewide with information of a travel related nature." The Oregon TIC is one of ODOT's TripCheck system partners.
*Associated Element:* Welcome Centers and Wayside Travel Information Centers

**Other Transportation Service Providers**

*Description:* This stakeholder includes organizations that provide specialized transportation services for seniors, people with disabilities, or people with low incomes that are not covered by public transportation service providers. These service providers include brokerages for non-emergency medical transport, client-provided transport (e.g. services offered by senior homes), and volunteer organizations (e.g. churches, charities).
*Associated Element:* Other Transportation Service Providers

**Portland State University**

*Description:* Portland State University (PSU) includes the nationally-recognized Center for Transportation Studies (CTS). Partners of CTS currently include ODOT and other transportation agencies in the Portland metropolitan area.
*Associated Element:* Portland State University Portal Data Warehouse

**Public Transportation Service Providers**

*Description:* This stakeholder includes all public agencies throughout the state of Oregon that provide transit services (e.g. TriMet, Cherriots, LTD, RVTD, Bend Dial-a-Ride services). They typically provide fixed-route service, flexible route service, or demand response service. Some providers operate multiple types of services.
*Associated Element:* Public Transit Operations and Dispatch Centers
*Associated Element:* Public Transit Vehicles
*Associated Element:* Public Transit Field Devices
*Associated Element:* Public Transit Data Mart

**Statewide Charging Standards Committee**

**Stakeholder**

*Description:* This committee, consisting of ODOT and other road user charging stakeholders, will need to work with national standards organizations to push for the development of ITS standards for an open road user charging system in Oregon.

### Travelers

*Description:* Travelers, also called customers, are the general end-user of ITS. This includes vehicular drivers, vehicular passengers, transit users, bicyclists, pedestrians, and any other forms of transportation users.

*Associated Element:* Personal Traveler Information Devices

*Associated Element:* Vehicle Drivers

*Associated Element:* Vehicles

*Associated Element:* Travelers

*Associated Element:* Traveler Card

### Trusted Third Party Service Providers

*Description:* Trusted Third Party Service Providers (TTSPs) act as a middleman between Charging Entities and travelers who wish to use an intermediary. TTSPs are typically entities such as mobile phone service or credit card providers or financial institutions that travelers already entrust with financial and private information. The TTSP may also provide other value added services of interest to travelers, which enhances the rationale of why travelers choose to use an intermediary.

*Associated Element:* Road User Charging Administration- TTSPs

### Value Added Service Providers

*Description:* Value Added Service Providers (VASPs) work either directly with travelers or as part of a package provided to travelers through Trusted Third Party Service Providers to provide value added services (e.g. traveler information) at little or no cost to entice travelers to use their services.

*Associated Element:* Road User Charging Administration- VASPs

# APPENDIX G: STAKEHOLDER CHANGE LOG

# Stakeholder Change Log for the Oregon Statewide ITS Architecture

| *Stakeholder* | *Changes Made* | *Notes* |
|---|---|---|
| Charging Entities | New stakeholder. | |
| | Included the following description: "Charging Entities are the road user charging administrators who manage user accounts, collect transaction data (e.g. road usage and payment), handle exempt accounts, help set | |
| Trusted Third Party Service Providers | New stakeholder. | |
| | Included the following description: "Trusted Third Party Service Providers (TTSPs) act as a middleman between Charging Entities and travelers who wish to use an intermediary. TTSPs are typically entities such as mobile phone service or credit card providers or financial institutions that travelers already entrust with financial and private information. The TTSP may also provide other value added services of interest to travelers, which enhances the rationale of why travelers choose to use an intermediary." | |
| Value Added Service Providers | New stakeholder. | |
| | Included the following description: "Value Added Service Providers (VASPs) work either directly with travelers or as part of a package provided to travelers through Trusted Third Party Service Providers to provide value added services (e.g. traveler information) at little or no cost to entice travelers to use their services." | |
| Oregon Driver and Motor Vehicle Services Division | New stakeholder. | |
| | Included the following description: "The Oregon Driver and Motor Vehicle (DMV) Services Division is a branch of the Oregon Department of Transportation. It is included in the statewide architecture because it maintains the statewide vehicle registration database that may be used in the monitoring of road user charging compliance." | |
| Certification Agents | New stakeholder. | |
| | Included the following description: "Certification Agents are independent parties that test, manage configuration control, and certify that Trusted Third Party Service Providers' electronic road user charging collection systems meet the protocol standards set by the Charging Entities." | |

| Stakeholder | Changes Made | Notes |
|---|---|---|
| Enforcement Agents | New stakeholder. | |
| | Included the following description: "Enforcement Agents work for or with the Road Owners and Charging Entities to monitor and ensure compliance of travelers to pay their fare share of road usage. They may use all legal means available to ensure a high level of compliance. The party responsible for enforcement will vary for each different type of road charge." | |
| Exempt (Non-Revenue) Account Holders | New stakeholder group. | |
| | Selected the following stakeholders:<br>Commercial HazMat Clean-Up Operators<br>Commercial Salvage and Towing Operators<br>Emergency Medical Service Providers<br>External State Police Agencies<br>Local Fire and Life Safety<br>Local Law Enforcement<br>Oregon State Police<br>Public Transportation Service Providers | |
| | Included the following description: "Exempt Account Holders are not required to pay some types of road user charges. Exemptions will most likely apply to emergency and public transportation vehicles. Eligibility will vary by stakeholder and by road user charge. For example, a tow truck may only be exempt from any road user charges incurred while responding to an incident at the request of ODOT." | |

# APPENDIX H: TURBO ARCHITECTURE INVENTORY REPORT

# Inventory Report

5/31/2012 2:21:21PM

## Element Inventory for Region Oregon Statewide ITS Architecture

**911 Centers** *Status:* Existing

*Description:* 911 centers throughout the state of Oregon provide call-taking services for emergencies and non-emergencies and also provide dispatching services for a number of emergency service agencies. Some emergency service agencies (e.g. Oregon State Police) provide their own dispatching once a call is transferred from a 911 center.

*Associated Stakeholder:* Local Public Safety Dispatch Agencies

*Mapped to Entity:* Emergency Management

**Ambulances** *Status:* Existing

*Description:* This element includes ambulances operated by private companies (e.g. American Medical Response).

*Associated Stakeholder:* Emergency Medical Service Providers

*Mapped to Entity:* Emergency Vehicle Subsystem

**Commercial HazMat Vehicles** *Status:* Existing

*Description:* This includes any vehicle used for commercial hazardous materials (hazmat) clean-up for roadway incident management.

*Associated Stakeholder:* Commercial HazMat Clean-Up Operators

*Mapped to Entity:* Emergency Vehicle Subsystem

**Commercial Information Service Providers** *Status:* Existing

*Description:* This element represents commercial businesses who provide transportation information such as basic advisories, traffic and road conditions, transit schedule information, yellow pages information, ridematching information, and parking information.

*Associated Stakeholder:* Commercial Information Service Providers

*Mapped to Entity:* Information Service Provider

**Commercial Salvage and Towing Vehicles** *Status:* Existing

*Description:* This includes any vehicle used for salvage or towing operations for roadway incident management.

*Associated Stakeholder:* Commercial Salvage and Towing Operators

*Mapped to Entity:* Emergency Vehicle Subsystem

**Commercial Transit Operations and Dispatch Centers** *Status:* Existing

*Description:* This element includes the centers used for operations and/or dispatch by commercial transportation service providers throughout Oregon. This element also includes traveler information systems (e.g. websites and phone systems) operated by commercial transit providers that travelers may use to access static and real-time information.

*Associated Stakeholder:* Commercial Transportation Service Providers

*Mapped to Entity:* Transit Management

**Commercial Transit Vehicles** *Status:* Existing

*Description:* This includes all transit vehicles (e.g. buses, shuttles, taxis, limousines, trains, etc.) and on-board systems used by commercial providers throughout Oregon.

*Associated Stakeholder:* Commercial Transportation Service Providers

*Mapped to Entity:* Transit Vehicle Subsystem

*Mapped to Entity:* Vehicle

**Commercial Vehicle Management** *Status:* Existing

*Description:* This stakeholder represents the companies/agencies/organizations that manage commercial vehicles and public fleets.

*Associated Stakeholder:* Commercial Trucking Firms and Public Fleets

*Mapped to Entity:* Fleet and Freight Management

**Commercial Vehicles** *Status:* Existing

**Commercial Vehicles** *Status:* Existing

*Description:* Commercial vehicles include ITS equipment that supports safe and efficient commercial vehicle operations. This equipment monitors vehicle operation, provides the driver and motor carrier real-time information, and supports mainline electronic screening.
*Associated Stakeholder:* Commercial Trucking Firms and Public Fleets
*Mapped to Entity:* Commercial Vehicle Subsystem
*Mapped to Entity:* Vehicle

**DMV Vehicle Registration Database** *Status:* Planned

*Description:* The statewide vehicle registration database may be used in the monitoring of road user charging compliance.
*Associated Stakeholder:* Oregon Driver and Motor Vehicle (DMV) Services Division
*Mapped to Entity:* DMV

**Event Promoters** *Status:* Existing/Planned

*Description:* This element is a stakeholder and a terminator. See description of the Event Promoters stakeholder.
*Associated Stakeholder:* Event Promoters
*Mapped to Entity:* Event Promoters

**External State Emergency Operations Centers** *Status:* Existing

*Description:* This element represents the centers used in neighboring states for the management and operations of major emergencies.
*Associated Stakeholder:* External State Offices of Emergency Management
*Mapped to Entity:* Emergency Management

**External State Police Dispatch Centers** *Status:* Existing

*Description:* This element represents the centers used by the state police agencies in neighboring states to manage incidents and emergencies.
*Associated Stakeholder:* External State Police Agencies
*Mapped to Entity:* Emergency Management

**External State Traffic Operations Centers** *Status:* Existing

*Description:* This element represents the centers, personnel and systems responsible for traffic operations in adjacent states.
*Associated Stakeholder:* External State Departments of Transportation
*Mapped to Entity:* Emergency Management
*Mapped to Entity:* Traffic Management

**Federal Land Traffic Management** *Status:* Existing

*Description:* This element includes the management of traffic on federal roadways not managed by ODOT. Limited, if any, ITS devices are used on these roadways. However, this element is important during major emergencies such as forest fires.
*Associated Stakeholder:* Federal Land Agencies
*Mapped to Entity:* Traffic Management

**Heavy Rail Operations Centers** *Status:* Existing

*Description:* This element is roughly the equivalent to a traffic operations center and is the source and destination of information that can be used to coordinate rail and highway traffic management and maintenance operations.
*Associated Stakeholder:* Heavy Rail Service Providers
*Mapped to Entity:* Rail Operations

**Law Enforcement Data System** *Status:* Existing

*Description:* The Law Enforcement Data System (LEDS) is a multi-agency provider of data services for law enforcement. The TOCs use the license and VIN databases.
*Associated Stakeholder:* Oregon Office of Emergency Management
*Mapped to Entity:* Other Emergency Management

**Local Data Mart** *Status:* Existing/Planned

*Description:* This element includes local traffic management systems that archive data for a variety of uses including performance measure evaluation.
*Associated Stakeholder:* Local Traffic Management Agencies
*Mapped to Entity:* Archived Data Management Subsystem

**Local Emergency Operations Centers** *Status:* Existing

*Description:* This element includes all county and city emergency operations centers (EOCs) throughout Oregon that are activated during major emergencies. This includes all primary and secondary EOCs.
*Associated Stakeholder:* Local Offices of Emergency Management
*Mapped to Entity:* Emergency Management

**Local Field Devices** *Status:* Existing/Planned

*Description:* This element includes traffic signals, traffic signal systems, video detection, system detectors, weather stations, CCTV cameras, dynamic message signs, etc. used by counties and cities throughout Oregon.
*Associated Stakeholder:* Local Traffic Management Agencies
*Mapped to Entity:* Roadway Subsystem

**Local Fire and Life Safety Centers** *Status:* Existing

*Description:* This element represents the centers used by county fire districts and city fire departments throughout Oregon to manage incidents and emergencies.
*Associated Stakeholder:* Local Fire and Life Safety
*Mapped to Entity:* Emergency Management

**Local Fire and Life Safety Vehicles** *Status:* Existing

*Description:* This includes the fire and ambulance vehicles for the county fire districts and city fire departments throughout Oregon. Most fire vehicles are equipped with emitters for traffic signal preemption and mobile data terminals.
*Associated Stakeholder:* Local Fire and Life Safety
*Mapped to Entity:* Emergency Vehicle Subsystem

**Local Law Enforcement Centers** *Status:* Existing

*Description:* This element represents the centers used by County sheriff's offices and City police agencies throughout Oregon to manage incidents and emergencies.
*Associated Stakeholder:* Local Law Enforcement
*Mapped to Entity:* Emergency Management

**Local Law Enforcement Vehicles** *Status:* Existing

*Description:* This includes the law enforcement vehicles for the County sheriff's offices and city police agencies throughout Oregon. Some vehicles are equipped with mobile data terminals that interface with a computer-aided dispatch (CAD) system used at 911/dispatch centers.
*Associated Stakeholder:* Local Law Enforcement
*Mapped to Entity:* Emergency Vehicle Subsystem

**Local Maintenance and Construction Management** *Status:* Existing

*Description:* This element includes all management of roadway maintenance and construction activities by county, city, port, transit, or other local agencies throughout the state of Oregon.
*Associated Stakeholder:* Local Traffic Management Agencies
*Mapped to Entity:* Information Service Provider
*Mapped to Entity:* Maintenance and Construction Management

**Local Maintenance and Construction Vehicles** *Status:* Existing

**Local Maintenance and Construction Vehicles** *Status:* Existing

*Description:* This element includes all maintenance and construction vehicles operated by county, city, port, transit, or other local agencies throughout the state of Oregon. Some agencies use these vehicles to respond to roadway incidents.
*Associated Stakeholder:* Local Traffic Management Agencies
*Mapped to Entity:* Emergency Vehicle Subsystem
*Mapped to Entity:* Maintenance and Construction Vehicle

**Local Traffic Operations Centers** *Status:* Existing/Planned

*Description:* This element includes all county and city traffic operations centers (TOCs). These may be physical centers or virtual TOCs that consist of a workstation that provides desktop access to an agency's traffic signals (including a central signal or adaptive signal systems and field devices.
*Associated Stakeholder:* Local Traffic Management Agencies
*Mapped to Entity:* Emergency Management
*Mapped to Entity:* Traffic Management

**Map Update Provider** *Status:* Existing/Planned

*Description:* This element is a stakeholder and a terminator. See description of the Map Update Provider stakeholder.
*Associated Stakeholder:* Map Update Provider
*Mapped to Entity:* Map Update Provider

**Mayday Service Centers** *Status:* Existing

*Description:* Mayday services (e.g. GM's OnStar, AAA, ATX, RESCU) provide traveler assistance via communications between a service center and a vehicle.
*Associated Stakeholder:* Mayday Service Providers
*Mapped to Entity:* Emergency Management

**Media** *Status:* Existing

*Description:* This element includes the systems used to disseminate traveler information (e.g. traffic reports/news, travel conditions) to the public via broadcast, cable, radio, Internet, print, or other outlets.
*Associated Stakeholder:* Media
*Mapped to Entity:* Media

**NOAA National Weather Service** *Status:* Existing

*Description:* The National Weather Service provides current weather conditions, forecasts, and warnings throughout the entire country. In Oregon they have field offices located in Medford, Pendleton, and Portland.
*Associated Stakeholder:* National Oceanic and Atmospheric Administration
*Mapped to Entity:* Weather Service

**ODOT Data Mart** *Status:* Existing

*Description:* This element includes ODOT systems that archive data for a variety of uses including performance measure evaluation.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Archived Data Management Subsystem

**ODOT Emergency Operations Centers** *Status:* Existing

*Description:* ODOT has a number of emergency operations centers (EOCs) that are activated per the ODOT Emergency Operations Plan during a major emergency or disaster. These include District EOCs, Region EOCs, the Agency Operations Center (AOC), the Resource Management Center (RMC), the Bridge Section Command Center, and the Information Systems Command Center (ISCC).
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Emergency Management

**ODOT Field Devices** *Status:* Existing/Planned

**ODOT Field Devices** *Status:* Existing/Planned

*Description:* This element includes all of ODOT's ITS existing and planned field devices. This includes, but is not limited to, traffic signals, ramp meters, CCTV cameras, dynamic message signs, road weather information systems (aka weather stations), vehicle detection (e.g. loops, radar, Bluetooth), highway advisory radio, curve warning signs, variable speed signs, downhill speed warning systems (Motor Carrier), wind warning systems, flood warning systems, remote snow zone signs (drum signs), pavement sensors that keep the road clear of snow and ice, automatic ramp closure gates, and bridge sensors. In the future this list may include permanent road user charging devices, travel time dynamic message signs, and lane control signs.

*Associated Stakeholder:* Oregon Department of Transportation

*Mapped to Entity:* Roadway Subsystem

*Mapped to Entity:* Security Monitoring Subsystem

**ODOT Incident Response Vehicles** *Status:* Existing

*Description:* ODOT's incident response vehicles are equipped with flat tire repair gear, gasoline, jumper cables, water, traffic control devices, portable dynamic message signs, and other essentials for assisting motorists and responding to incidents. They are also equipped with automated vehicle locators (OrbTrac-100 AVL System).

*Associated Stakeholder:* Oregon Department of Transportation

*Mapped to Entity:* Emergency Vehicle Subsystem

*Mapped to Entity:* Maintenance and Construction Vehicle

**ODOT Maintenance and Construction Management** *Status:* Existing

*Description:* ODOT manages the maintenance and construction of its roadways/equipment/systems through 15 district offices located throughout Oregon: 1- Astoria, 2A- Sylvan, 2B- Clackamas, 2C- Troutdale, 3- Salem, 4- Corvallis, 5- Springfield, 7- Roseburg, 8- White City, 9- The Dalles, 10- Bend, 11- Klamath Falls, 12- Pendleton, 13- La Grande, and 14- Ontario. This inventory element includes existing systems (e.g. RWIS Web database, HTCRS, InView) and future systems that support maintenance, construction, and road weather operations.

*Associated Stakeholder:* Oregon Department of Transportation

*Mapped to Entity:* Information Service Provider

*Mapped to Entity:* Maintenance and Construction Management

**ODOT Maintenance and Construction Vehicles** *Status:* Existing/Planned

*Description:* This element includes all maintenance and construction vehicles owned and operated by ODOT. These vehicles are not currently outfitted with any intelligent transportation systems but it is very likely in the next 10 years that these vehicles will be equipped with GPS or automated vehicle location tracking devices.

*Associated Stakeholder:* Oregon Department of Transportation

*Mapped to Entity:* Emergency Vehicle Subsystem

*Mapped to Entity:* Maintenance and Construction Vehicle

**ODOT Motor Carrier Administration** *Status:* Existing

*Description:* This element handles permit-processing, road-use tax reporting and payment, and other commercial vehicle transactions throughout the state of Oregon using a website.

*Associated Stakeholder:* Oregon Department of Transportation Motor Carrier Transportation Division

*Mapped to Entity:* Commercial Vehicle Administration

**ODOT Motor Carrier Inspection Facilities** *Status:* Existing

*Description:* ODOT Motor Carrier operates 6 Ports of Entry, 84 fixed weigh stations, and dozens of sites that support portable weigh scale operations. The inspection facilities includes any or all equipment which perform commercial vehicle screening and/or safety inspections. Weigh-in-motion scales, which support the Green Light Weigh Station Preclearance Program are installed at 22 of the inspection facilities.

*Associated Stakeholder:* Oregon Department of Transportation Motor Carrier Transportation Division

*Mapped to Entity:* Commercial Vehicle Check

**ODOT Parking Management System** *Status:* Planned

**ODOT Parking Management System** *Status:* Planned

*Description:* This element includes systems that provide parking information to travelers (e.g. I-84 at Multnomah Falls).
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Parking Management

**ODOT Traffic Signal System** *Status:* Existing/Planned

*Description:* This includes the TransSuite central traffic signal system and adaptive signal system servers.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Traffic Management

**ODOT Transportation Operations Centers** *Status:* Existing

*Description:* This element includes a range of systems used at ODOT TOCs and includes systems such as TOCS, ATMS, queue warning management, and variable speed management. The Transportation Operations Center System (TOCS) is a comprehensive hardware and software platform for all ODOT TOCs (Regions 1 - 5) that provides a unified, statewide platform for around the clock coordination of transportation related services between internal and external customers. TOCS will also support a field office module for use by regional managers, area offices, district offices, Salem/headquarters offices, public information officers, and the Motor Carrier Division. TOCS is being implemented in several stages with functions in the following areas: traffic/event management, incident/emergency management (including a possible link to WebEOC), maintenance operations, winter operations, device management, traveler information, and data archival/reporting.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Archived Data Management Subsystem
*Mapped to Entity:* Emergency Management
*Mapped to Entity:* Information Service Provider
*Mapped to Entity:* Maintenance and Construction Management
*Mapped to Entity:* Traffic Management

**Oregon Emergency Coordination Center** *Status:* Existing

*Description:* The Oregon Emergency Coordination Center (ECC) is the single point of contact for an integrated state response to a major emergency or disaster. The ECC is a dual-function facility in that it is the day-to-day office of the Oregon Office of Emergency Management (OEM) and becomes the ECC in a state of emergency. When activated, the ECC is considered an operational extension of the Governor's Office.
*Associated Stakeholder:* Oregon Office of Emergency Management
*Mapped to Entity:* Emergency Management

**Oregon Interoperability Service (OIS)** *Status:* Existing

*Description:* This element is a CAD-to-CAD message system that provides system interoperability between various vendors' systems. It will be owned and operated by the OIS group that includes 911 agencies in central Oregon, ODOT, and OSP. This message broker allows the agencies to perform various approved functions, such as send calls for service or get a list of active incidents. The system is currently implemented between ODOT and OSP and is being expanded to include the Central Oregon 911 centers. There are plans to expand the system to the Portland area as well as other areas of the state.
*Associated Stakeholder:* Local Public Safety Dispatch Agencies
*Mapped to Entity:* Emergency Management
*Mapped to Entity:* Other Emergency Management
*Mapped to Entity:* Traffic Management

**Oregon State Police Dispatch Centers** *Status:* Existing

*Description:* OSP operates a number of dispatch centers throughout Oregon, with the main dispatch center located in Salem. 911 and other phone calls are routed to OSP, who dispatches their own vehicles and resources using a computer-aided dispatch (CAD) system. OSP is one of the key stakeholders for incident management activities on state roadways.
*Associated Stakeholder:* Oregon State Police
*Mapped to Entity:* Emergency Management

**Oregon State Police Vehicles** *Status:* Existing

**Oregon State Police Vehicles** *Status:* Existing

*Description:* OSP vehicles are equipped with mobile data terminals that interface with the computer-aided dispatch (CAD) system used by operators at the OSP dispatch centers.
*Associated Stakeholder:* Oregon State Police
*Mapped to Entity:* Emergency Vehicle Subsystem

**Other Transportation Service Providers** *Status:* Existing/Planned

*Description:* This element is a stakeholder and a terminator. This element is intended to provide a source and destination for ITS data flows between peer (e.g. inter-regional) transit management functions. It enables transit management activities to be coordinated across geographic boundaries or different jurisdictional areas.
*Associated Stakeholder:* Other Transportation Service Providers
*Mapped to Entity:* Other Transit Management

**Personal Traveler Information Devices** *Status:* Existing

*Description:* This element includes equipment an individual owns and can use to obtain traveler information. Examples include internet-connected personal computers, phones (landline and mobile), pagers, and personal digital assistants. Technology for these types of devices continues to rapidly change and improve.
*Associated Stakeholder:* Travelers
*Mapped to Entity:* Personal Information Access

**Portland State University Portal Data Warehouse** *Status:* Existing

*Description:* Portal is the data warehouse for transportation operations and management data in the Portland-Vancouver metropolitan area. Portal currently archives freeway detector loop data, arterial volume data, weather data, and airport parking information. Portland State University is closely working with other stakeholders in the region and state to expand the system to include more archives and to develop performance measurement tools.
*Associated Stakeholder:* Portland State University
*Mapped to Entity:* Archived Data Management Subsystem
*Mapped to Entity:* Traffic Management

**Public Transit Data Mart** *Status:* Existing/Planned

*Description:* This element includes local traffic management systems that archive data for a variety of uses including performance measure evaluation.
*Associated Stakeholder:* Public Transportation Service Providers
*Mapped to Entity:* Archived Data Management Subsystem

**Public Transit Field Devices** *Status:* Existing/Planned

*Description:* This element includes the following devices in use or planned for use by public transportation agencies: dynamic message signs at stops/stations/park and rides, CCTV cameras, ticket vending machines, and customer information kiosks. Devices specific to TriMet include train sensors (these are used to request preempt at traffic signals and provide schedule adherence information).
*Associated Stakeholder:* Public Transportation Service Providers
*Mapped to Entity:* Remote Traveler Support
*Mapped to Entity:* Security Monitoring Subsystem
*Mapped to Entity:* Wayside Equipment

**Public Transit Operations and Dispatch Centers** *Status:* Existing

*Description:* This element includes the centers used for operations and/or dispatch by public transportation service providers throughout Oregon. This element also includes traveler information systems (e.g. websites and phone systems) operated by public transit agencies that travelers may use to access static and real-time information.
*Associated Stakeholder:* Public Transportation Service Providers
*Mapped to Entity:* Transit Management

**Public Transit Vehicles** *Status:* Existing

**Public Transit Vehicles** *Status:* Existing

*Description:* This includes all public transit vehicles (e.g. buses, shuttles, light rail trains, streetcars, dial-a-ride fleets, etc.) and on-board systems used throughout Oregon.
*Associated Stakeholder:* Public Transportation Service Providers
*Mapped to Entity:* Transit Vehicle Subsystem
*Mapped to Entity:* Vehicle

**Road User Charging Administration- Charging Entities** *Status:* Planned

*Description:* This includes the back office system and all processes necessary to collect each particular road user charge.
*Associated Stakeholder:* Charging Entities
*Mapped to Entity:* Toll Administration

**Road User Charging Administration- TTSPs** *Status:* Planned

*Description:* See Trusted Third Party Service Providers (TTSPs) Stakeholder description.
*Associated Stakeholder:* Trusted Third Party Service Providers
*Mapped to Entity:* Financial Institution
*Mapped to Entity:* Toll Administration

**Road User Charging Administration- VASPs** *Status:* Planned

*Description:* See Value Added Service Proviers (VASPs) Stakeholder description.
*Associated Stakeholder:* Value Added Service Providers
*Mapped to Entity:* Financial Institution

**Road User Charging Certification** *Status:* Planned

*Description:* This is the independent process that tests and certifies that the road user charging systems used by Trusted Third Party Service Providers meet the ITS standards set forth by the Charging Entities and are interoperable throughout the state of Oregon.
*Associated Stakeholder:* Certification Agents
*Mapped to Entity:* Other Toll Administration

**Road User Charging Enforcement** *Status:* Planned

*Description:* These are the processes used to enforce road user charging compliance. Stakeholders and processes will vary by road user charging application.
*Associated Stakeholder:* Enforcement Agents
*Mapped to Entity:* Enforcement Agency

**Road User Charging Exempt Accounts** *Status:* Planned

*Description:* See Stakeholder description.
*Associated Stakeholder:* mpt (Non-Revenue) Account Holders
*Mapped to Entity:* Vehicle

**Road User Charging Free Flow Field Devices** *Status:* Planned

*Description:* This includes all field devices used to support three main road user charging functions: 1) electronic road user charging, 2) image based road user charging, and 3) vehicle detection and classification. Specific field devices will vary by road user charging application.
*Associated Stakeholder:* Charging Entities
*Mapped to Entity:* Toll Collection

**Traveler Card** *Status:* Planned

*Description:* This element is used by travelers to pay for transportation services including road user charging, public transit, or parking. The traveler card may take a variety of forms such as a mobile phone, a debit card that allows the owner to allocate a specific amount of funds to a card, or an extension of an existing credit or debit card.
*Associated Stakeholder:* Travelers

**Traveler Card** *Status:* Planned

*Description:* This element is used by travelers to pay for transportation services including road user charging, public transit, or parking. The traveler card may take a variety of forms such as a mobile phone, a debit card that allows the owner to allocate a specific amount of funds to a card, or an extension of an existing credit or debit card.
*Mapped to Entity:* Traveler Card

**Travelers** *Status:* Existing

*Description:* The traveling public
*Associated Stakeholder:* Travelers
*Mapped to Entity:* Traveler

**TripCheck Local Entry** *Status:* Existing

*Description:* The TripCheck Local Entry (TLE) tool allows local agencies to input planned and real-time information about their roadway network so that it can be disseminated to travelers through the TripCheck system or to TTIP subscribers, which includes public agencies, commercial information service providers, and other interested parties.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Information Service Provider
*Mapped to Entity:* Maintenance and Construction Management
*Mapped to Entity:* Traffic Management

**TripCheck System** *Status:* Existing

*Description:* TripCheck is the statewide public traveler information service provider for Oregon. The system provides various types of traveler information pertaining to road conditions, weather, construction, transit, traveler services, etc. Information from the TripCheck system is disseminated by ODOT through various means: the Internet (www.tripcheck.com), 511 highway advisory telephone, formatted cable television presentations, TripCheck mobile, Twitter, etc.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Information Service Provider
*Mapped to Entity:* Traffic Management

**TripCheck Traveler Information Portal** *Status:* Existing

*Description:* The TripCheck Traveler Information Portal (TTIP) system collects, processes, stores, and disseminates transportation information to regional agencies and commercial information service providers. This system collects public agency transportation information about roadways, construction, parking, special events, road closures, etc. and allows subscribers to retrieve information from the broker. Some public agency information is not accessible to commercial information service providers for security reasons. TTIP has been deployed in the Portland metropolitan area and will ultimately be expanded to a statewide level. See the Traveler Information Operational Concept for detailed stakeholder roles and responsibilities.
*Associated Stakeholder:* Oregon Department of Transportation
*Mapped to Entity:* Archived Data Management Subsystem
*Mapped to Entity:* Information Service Provider
*Mapped to Entity:* Traffic Management
*Mapped to Entity:* Transit Management

**Vehicle Drivers** *Status:* Existing

*Description:*
*Associated Stakeholder:* Travelers
*Mapped to Entity:* Driver

**Vehicles** *Status:* Existing

*Description:* A general element that represents personal automobiles and fleet vehicles that include ITS safety, navigation and traveler information systems that may be applicable to any highway vehicle.
*Associated Stakeholder:* Travelers
*Mapped to Entity:* Basic Vehicle

**Vehicles** *Status:* Existing

*Description:* A general element that represents personal automobiles and fleet vehicles that include ITS safety, navigation and traveler information systems that may be applicable to any highway vehicle.

*Mapped to Entity:* Vehicle

**Welcome Centers and Wayside Travel Information Centers** *Status:* Existing

*Description:* The Oregon TIC operates staffed traveler information centers at Oregon's 8 welcome centers through a contract with the Oregon Tourism Commission. The Oregon TIC also operates 13 travel information centers, which primarily consist of backlit display kiosks, at heavily-used rest areas.

*Associated Stakeholder:* Oregon Travel Information Council

*Mapped to Entity:* Information Service Provider

*Mapped to Entity:* Remote Traveler Support

### *Status Value Legend*

| Name | Description |
|---|---|
| Existing | An entity that currently exists. |
| Existing/Programmed | Some entities currently exist and others are planned and funded. |
| Existing/Planned | Some entities currently exist and others are planned but unfunded. |
| Existing/Future | Some entities currently exist and others are likely to occur in the future as technology advances or funding becomes available. |
| Programmed | Funding has been obtained for a planned entity. |
| Planned | An entity has been identified as planned within the next 10 years, but funding has not yet been obtained. |
| Future | An entity that is likely to occur in the future as technology develops or as other projects are completed but is not currently planned or funded. |
| Not Planned | |

# APPENDIX I: INVENTORY CHANGE LOG

# Inventory Change Log for the Oregon Statewide ITS Architecture

| Stakeholder | Elements | Changes Made | Notes |
|---|---|---|---|
| Charging Entities | Road User Charging Administration-Charging Entities | New element with planned status. | |
| | | Included the following description: "This includes the back office system and all processes necessary to collect each particular road user charge." | |
| | | Selected the following:<br>Toll Administration Subsystem | |
| | Road User Charging Free Flow Field Devices | New element with planned status. | |
| | | Included the following description: "This includes all field devices used to support three main road user charging functions: 1) electronic road user charging, 2) image based road user charging, and 3) vehicle detection and classification. Specific field devices | |
| | | Selected the following:<br>Toll Collection Subsystem | |
| Trusted Third Party Service Providers | Road User Charging Administration-TTSPs | New element with planned status. | |
| | | Included the following description: "See Trusted Third Party Service Providers (TTSPs) Stakeholder description." | |
| | | Selected the following:<br>Toll Administration Subsystem<br>Financial Institution Terminator | |
| Value Added Service Providers | Road User Charging Administration-VASPs | New element with planned status. | |
| | | Included the following description: "See Value Added Service Proviers (VASPs) Stakeholder description." | |
| | | Selected the following:<br>Financial Institution Terminator | |
| Oregon Driver and Motor Vehicle Services Division | DMV Vehicle Registration Database | New element with planned status. | |
| | | Included the following description: "The statewide vehicle registration database may be used in the monitoring of road user charging compliance." | |
| | | Selected the following:<br>DMV Terminator | |
| Certification Agents | Road User Charging Certification | New element with planned status. | |
| | | Included the following description: "This is the independent process that tests and certifies that the road user charging systems used by Trusted Third Party Service Providers meet the ITS standards set forth by the Charging Entities and are interoperable throughout the state of Oregon." | |
| | | Selected the following:<br>Other Toll Administration Terminator | This was the most applicable terminator in the current national architecture. |

| Stakeholder | Elements | Changes Made | Notes |
|---|---|---|---|
| Enforcement Agents | Road User Charging Enforcement | New element with planned status. | |
| | | Included the following description: "These are the processes used to enforce road user charging compliance. Stakeholders and processes will vary by road user charging application." | |
| | | Selected the following:<br>Enforcement Agency Terminator | |
| Exempt (Non-Revenue) Account Holders | Road User Charging Certification | New element with planned status. | |
| | | Included the following description: "See Stakeholder description." | |
| | | Selected the following:<br>Vehicle Subsystem | |
| Travelers | Traveler Card | Change the description to: "This element is used by travelers to pay for transportation services including road user charging, public transit, or parking. The traveler card may take a variety of forms such as a mobile phone, a debit card that allows the owner to allocate a specific amount of funds to a card, or an extension of an existing credit or debit card." | |

# APPENDIX J: TURBO ARCHITECTURE MARKET PACKAGE REPORT

# Market Packages (Transportation Services)

5/31/2012 2:37:18PM

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

### ITS Data Mart (AD1) -- Existing/Programmed

This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

*The selected elements represent the various systems used to archive data. Some agencies archive data using multiple systems. For example, ODOT's HTCRS, CAD, and TOCS systems all archive different types of data.*

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Data Mart | |
| Local Emergency Operations Centers | -- Not Selected |
| Local Field Devices | |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Map Update Provider | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| NOAA National Weather Service | -- Not Selected |
| ODOT Data Mart | |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Field Devices | |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Motor Carrier Administration | -- Not Selected |
| ODOT Parking Management System | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Data Mart | |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Administration- Charging Entities | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### ITS Data Warehouse (AD2) -- Existing/Planned

This market package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart.

*The PORTAL data warehouse is the archived data user service for the Portland metropolitan area. This warehouse may eventually be expanded to include data for the entire state of Oregon.*

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | |
| Federal Land Traffic Management | -- Not Selected |
| Local Data Mart | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | |
| Map Update Provider | |
| Mayday Service Centers | -- Not Selected |
| NOAA National Weather Service | -- Not Selected |
| ODOT Data Mart | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Motor Carrier Administration | -- Not Selected |
| ODOT Parking Management System | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |
| Portland State University Portal Data Warehouse | |
| Public Transit Data Mart | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Administration- Charging Entities | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Administration- VASPs | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### ITS Virtual Data Warehouse (AD3) -- Not Planned

This market package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse Market Package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse Market Package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.

| | | |
|---|---|---|
| | Local Data Mart | -- Not Selected |
| | ODOT Data Mart | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Data Mart | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Transit Vehicle Tracking (APTS01) -- Existing/Planned

This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

| | | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Transit Fixed-Route Operations (APTS02) -- Existing/Planned

This market package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Data Mart | -- Not Selected |
| | Local Maintenance and Construction Management | |
| | Local Traffic Operations Centers | |
| | ODOT Data Mart | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Data Mart | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Demand Response Transit Operations (APTS03) -- Existing/Planned

This market package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this market package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

| | | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Maintenance and Construction Management | |
| | Local Traffic Operations Centers | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Transit Fare Collection Management (APTS04) -- Planned

This market package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other market packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

| | |
|---|---|
| Commercial Information Service Providers | |
| Commercial Transit Operations and Dispatch Centers | |
| Commercial Transit Vehicles | |
| Local Maintenance and Construction Management | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Other Transportation Service Providers | -- Not Selected |
| Public Transit Field Devices | |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Administration- VASPs | -- Not Selected |
| Road User Charging Enforcement | -- Not Selected |
| Traveler Card | |
| Travelers | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Transit Security (APTS05) -- Existing/Planned

This market package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this market package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit ( BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).

The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this market package.

In addition the market package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.

| | |
|---|---|
| 911 Centers | |
| Commercial Information Service Providers | |
| Commercial Transit Operations and Dispatch Centers | |
| Commercial Transit Vehicles | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Heavy Rail Operations Centers | -- Not Selected |
| | Law Enforcement Data System | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | |
| | Public Transit Field Devices | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Transit Fleet Management (APTS06) -- Existing/Planned

This market package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The market package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.

| | | |
|---|---|---|
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Multi-modal Coordination (APTS07) -- Existing/Planned

This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.

| | | |
|---|---|---|
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | Event Promoters | |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Traffic Operations Centers | |
| | ODOT Parking Management System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Other Transportation Service Providers | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |

### Transit Traveler Information (APTS08) -- Existing/Programmed

This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

*This market package addresses the Regional Trip Planner project that will be incorporated into the TripCheck system. The Regional Trip Planner will provide comprehensive transit information for travelers in Oregon and Washington.*

| | | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Media | -- Not Selected |
| | Media | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Other Transportation Service Providers | -- Not Selected |
| | Other Transportation Service Providers | -- Not Selected |
| | Personal Traveler Information Devices | |
| | Personal Traveler Information Devices | |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Travelers | -- Not Selected |
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

### Transit Signal Priority (APTS09) -- Existing/Planned

This market package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.

| | |
|---|---|
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | |
| Local Traffic Operations Centers | |
| ODOT Field Devices | |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |

### Transit Passenger Counting (APTS10) -- Planned

This market package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.

| | |
|---|---|
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | |
| Travelers | |
| TripCheck Traveler Information Portal | -- Not Selected |

### Broadcast Traveler Information (ATIS01) -- Existing

This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | |
| Commercial Information Service Providers | |
| Commercial Transit Operations and Dispatch Centers | |
| Commercial Transit Operations and Dispatch Centers | |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Commercial Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Event Promoters | -- Not Selected |
| | Event Promoters | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | |
| | External State Traffic Operations Centers | |
| | Federal Land Traffic Management | |
| | Federal Land Traffic Management | |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | |
| | Local Maintenance and Construction Management | |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | Mayday Service Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | |
| | Media | |
| | NOAA National Weather Service | |
| | NOAA National Weather Service | |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Personal Traveler Information Devices | |
| | Personal Traveler Information Devices | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Travelers | |
| | Travelers | |
| | TripCheck Local Entry | |
| | TripCheck Local Entry | |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Vehicle Drivers | |
| | Vehicle Drivers | |
| | Vehicles | |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | |
| | Welcome Centers and Wayside Travel Information Centers | |

### Interactive Traveler Information (ATIS02) -- Existing/Planned

This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a “traveler card” that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | |
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Event Promoters | -- Not Selected |
| | Event Promoters | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | |
| | Media | |
| | NOAA National Weather Service | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Personal Traveler Information Devices | |
| | Personal Traveler Information Devices | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Administration- VASPs | -- Not Selected |
| | Road User Charging Administration- VASPs | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Traveler Card | -- Not Selected |
| | Traveler Card | -- Not Selected |
| | Travelers | |
| | Travelers | |
| | TripCheck Local Entry | |
| | TripCheck Local Entry | |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Vehicle Drivers | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | |
| | Welcome Centers and Wayside Travel Information Centers | |

### Autonomous Route Guidance (ATIS03) -- Not Planned

This market package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Personal Traveler Information Devices | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Travelers | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

### Dynamic Route Guidance (ATIS04) -- Not Planned

This market package offers advanced route planning and guidance that is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is considered by the user equipment in provision of route guidance.

| | | |
|---|---|---|
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Personal Traveler Information Devices | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### ISP Based Trip Planning and Route Guidance (ATIS05) -- Not Planned

This market package offers the user trip planning and en-route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this market package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services (e.g., parking reservations) are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.

*Transit traveller route guidance is for a future phase of Regional Trip Planner*

| | | |
|---|---|---|
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Motor Carrier Administration | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Personal Traveler Information Devices | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Transportation Operations Data Sharing (ATIS06) -- Existing/Planned

This market package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Vehicle Management | -- Not Selected |
| | Event Promoters | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Mayday Service Centers | -- Not Selected |
| | Media | -- Not Selected |
| | NOAA National Weather Service | |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | TripCheck Local Entry | |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Yellow Pages and Reservation (ATIS07) -- Planned

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package provides yellow pages and reservation services to the user. These additional traveler services may be provided using the same basic user equipment used for Interactive Traveler Information. This market package provides multiple ways for accessing information either while en route in a vehicle using wide-area wireless communications or pre-trip via fixed-point to fixed-point connections.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Map Update Provider | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Personal Traveler Information Devices | |
| Public Transit Field Devices | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Administration- VASPs | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Traveler Card | -- Not Selected |
| Travelers | |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Dynamic Ridesharing (ATIS08) -- Planned

This market package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.

| | |
|---|---|
| Commercial Information Service Providers | |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Map Update Provider | |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Personal Traveler Information Devices | |
| Public Transit Field Devices | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Administration- VASPs | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Traveler Card | -- Not Selected |
| Travelers | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### In Vehicle Signing (ATIS09) -- Future

This market package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). It includes short range communications between field equipment and the vehicle and connections to the Traffic Management Subsystem for monitoring and control. This market package also includes the capability for maintenance and construction, transit, and emergency vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in work zones, around incidents, and in areas where transit operations impacts traffic.

*This market package will be added in the future when the technology is available and affordable.*

| | | |
|---|---|---|
| | Ambulances | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | |
| | Local Fire and Life Safety Vehicles | -- Not Selected |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | |

### VII Traveler Information (ATIS10) -- Not Planned

This market package provides location-specific information to travelers in vehicles using Vehicle Infrastructure Integration (VII). Dedicated short range communications is used to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass VII roadside equipment along their route. This market package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Event Promoters | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Parking Management System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Network Surveillance (ATMS01) -- Existing

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| External State Traffic Operations Centers | |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | |
| Map Update Provider | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Field Devices | |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Traffic Probe Surveillance (ATMS02) -- Existing/Planned

This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status directly to the center, and 2) dedicated short range communications between passing vehicles and the roadside is used to provide equivalent information to the center. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture. The market package enables transportation operators and traveler information providers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, on-board equipment, data reduction software, and fixed-point to fixed-point links between centers to share the collected information. Both “Opt out” and “Opt in” strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.

*TriMet and the City of Portland currently use fixed-route buses as probes. Other agencies throughout the state plan to use transit vehicles as probes.*

| | | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | Map Update Provider | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Vehicles | |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Surface Street Control (ATMS03) -- Existing

This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.

| | | |
|---|---|---|
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | |
| | Local Traffic Operations Centers | |
| | ODOT Field Devices | |
| | ODOT Traffic Signal System | |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | |

### Freeway Control (ATMS04) -- Existing

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option.

This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.
*ODOT operates a variety of field devices on the freeway system throughout the state. Ramp meters are currently only used in Region 1 (Portland) and are planned for Region 2 (Eugene-Springfield).*

| | |
|---|---|
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | |

### HOV Lane Management (ATMS05) -- Not Planned

This market package manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violations.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| DMV Vehicle Registration Database | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Enforcement | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |

### Traffic Information Dissemination (ATMS06) -- Existing

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| This market package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated. | | |
| | 911 Centers | |
| | 911 Centers | |
| | Commercial Information Service Providers | |
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | External State Emergency Operations Centers | |
| | External State Emergency Operations Centers | |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | |
| | External State Traffic Operations Centers | |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | |
| | Local Emergency Operations Centers | |
| | Local Field Devices | |
| | Local Field Devices | |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | |
| | Local Maintenance and Construction Management | |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | Mayday Service Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | |
| | Media | |
| | ODOT Emergency Operations Centers | |
| | ODOT Emergency Operations Centers | |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Oregon Emergency Coordination Center | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | |
| | Oregon State Police Dispatch Centers | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Vehicle Drivers | |
| | Vehicle Drivers | |
| | Vehicles | |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Regional Traffic Management (ATMS07) -- Existing

This market package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

| | | |
|---|---|---|
| | External State Traffic Operations Centers | |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | |
| | Local Traffic Operations Centers | |
| | ODOT Field Devices | |
| | ODOT Traffic Signal System | |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Traffic Incident Management System (ATMS08) -- Existing

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination market package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information market packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel. | | |
| | 911 Centers | |
| | 911 Centers | |
| | 911 Centers | |
| | Ambulances | -- Not Selected |
| | Ambulances | -- Not Selected |
| | Ambulances | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | Event Promoters | |
| | Event Promoters | |
| | Event Promoters | |
| | External State Emergency Operations Centers | |
| | External State Emergency Operations Centers | |
| | External State Emergency Operations Centers | |
| | External State Police Dispatch Centers | |
| | External State Police Dispatch Centers | |
| | External State Police Dispatch Centers | |
| | External State Traffic Operations Centers | |
| | External State Traffic Operations Centers | |
| | External State Traffic Operations Centers | |
| | Federal Land Traffic Management | |
| | Federal Land Traffic Management | |
| | Federal Land Traffic Management | |
| | Heavy Rail Operations Centers | -- Not Selected |
| | Heavy Rail Operations Centers | -- Not Selected |
| | Heavy Rail Operations Centers | -- Not Selected |
| | Law Enforcement Data System | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Law Enforcement Data System | |
| | Law Enforcement Data System | |
| | Local Emergency Operations Centers | |
| | Local Emergency Operations Centers | |
| | Local Emergency Operations Centers | |
| | Local Field Devices | |
| | Local Field Devices | |
| | Local Field Devices | |
| | Local Fire and Life Safety Centers | |
| | Local Fire and Life Safety Centers | |
| | Local Fire and Life Safety Centers | |
| | Local Fire and Life Safety Vehicles | -- Not Selected |
| | Local Fire and Life Safety Vehicles | -- Not Selected |
| | Local Fire and Life Safety Vehicles | -- Not Selected |
| | Local Law Enforcement Centers | |
| | Local Law Enforcement Centers | |
| | Local Law Enforcement Centers | |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | Map Update Provider | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Mayday Service Centers | |
| | Mayday Service Centers | |
| | Mayday Service Centers | |
| | Media | |
| | Media | |
| | Media | |
| | ODOT Emergency Operations Centers | |
| | ODOT Emergency Operations Centers | |
| | ODOT Emergency Operations Centers | |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | |
| | Oregon Emergency Coordination Center | |
| | Oregon Emergency Coordination Center | |
| | Oregon Interoperability Service (OIS) | |
| | Oregon Interoperability Service (OIS) | |
| | Oregon Interoperability Service (OIS) | |
| | Oregon State Police Dispatch Centers | |
| | Oregon State Police Dispatch Centers | |
| | Oregon State Police Dispatch Centers | |
| | Oregon State Police Vehicles | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Operations and Dispatch Centers | |
| | TripCheck Local Entry | |
| | TripCheck Local Entry | |
| | TripCheck Local Entry | |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Traffic Decision Support and Demand Management (ATMS09) -- Future**

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this market package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment. TDM recommendations are coordinated with transit, parking, and toll administration centers to support regional implementation of TDM strategies. Incident response and congestion management recommendations are implemented by the local traffic management center and coordinated with other regional centers by other market packages (see ATMS07-Regional Traffic Management and ATMS08-Traffic Incident Management). All recommendations are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. Traffic data is collected from sensors and surveillance equipment, other traffic management centers. Forecasted traffic loads are derived from historical data and route plans supplied by the Information Service Provider Subsystem. This market package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support TDM, where applicable.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Event Promoters | |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Data Mart | -- Not Selected |
| Local Field Devices | |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | |
| Map Update Provider | |
| ODOT Data Mart | -- Not Selected |
| ODOT Field Devices | |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Parking Management System | |
| ODOT Traffic Signal System | |
| ODOT Transportation Operations Centers | |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | |
| Public Transit Data Mart | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |
| Road User Charging Administration- Charging Entities | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| TripCheck Local Entry | |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Electronic Toll Collection (ATMS10) -- Existing/Planned

This market package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Field-Vehicle Communication between the roadway equipment and the vehicle is required as well as Fixed Point-Fixed Point interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Toll violations are identified and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national interoperability for these services. Two other market packages, APTS04: Transit Fare Collection Management and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

The vehicle equipment and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| *This market package is intended to capture all road user charging applications in Oregon. Road user charges include taxes, tolls, fees, and fares. Oregon MCTD oversees an existing weight-distance tax collection system for trucks. Additional road user charging applications are anticipated in the future. The Oregon road user charging vision is to operate a reliable, easy to use, relatively low cost, enforceable, publicly acceptable "open" system that collects road user charges using interoperable components that conform to common standards.* | | |
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | DMV Vehicle Registration Database | |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Administration- Charging Entities | |
| | Road User Charging Administration- TTSPs | |
| | Road User Charging Administration- VASPs | |
| | Road User Charging Certification | |
| | Road User Charging Enforcement | |
| | Road User Charging Exempt Accounts | |
| | Road User Charging Free Flow Field Devices | |
| | Traveler Card | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Emissions Monitoring and Management (ATMS11) -- Not Planned**

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the emissions management subsystem for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this market package. For area wide monitoring, this market package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this market package collects data from on-board diagnostic systems and measures tail pipe emissions to identify vehicles that exceed emissions standards and/or clean vehicles that could be released from standard emissions tests, depending on policy and regulations. Summary emissions information or warnings can also be displayed to drivers. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| DMV Vehicle Registration Database | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Map Update Provider | -- Not Selected |
| Media | -- Not Selected |
| NOAA National Weather Service | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Enforcement | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Roadside Lighting System Control (ATMS12) -- Not Planned

This market package includes systems that manage electrical lighting systems by monitoring operational conditions and using the lighting controls to vary the amount of light provided along the roadside. These systems allow a center to control lights based on traffic conditions, time-of-day, and the occurrence of incidents. Such systems can increase the safety of a roadway segment by increasing lighting and conserve energy at times when conditions warrant a reduction in the amount of lighting.

| | |
|---|---|
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | TripCheck Traveler Information Portal | -- Not Selected |

### Standard Railroad Grade Crossing (ATMS13) -- Not Planned

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.

| | |
|---|---|
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Field Devices | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | -- Not Selected |

### Advanced Railroad Grade Crossing (ATMS14) -- Not Planned

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems that preclude entrance into the intersection when the barriers are activated. Like the Standard Package, the HRI equipment is activated on notification by wayside interface equipment which detects, or communicates with the approaching train. In this market package, the wayside equipment provides additional information about the arriving train so that the train's direction of travel, estimated time of arrival, and estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This market package also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

**Railroad Operations Coordination (ATMS15) -- Future**

This market package provides an additional level of strategic coordination between freight rail operations and traffic management centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (HRI) closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.

| | | |
|---|---|---|
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Heavy Rail Operations Centers | |
| | Heavy Rail Operations Centers | |
| | Local Field Devices | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Local Traffic Operations Centers | |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Parking Facility Management (ATMS16) -- Planned**

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This market package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Two other market packages, APTS04: Transit Fare Collection Management and ATMS10: Electronic Toll Collection also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| DMV Vehicle Registration Database | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Parking Management System | |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |
| Road User Charging Administration- VASPs | -- Not Selected |
| Road User Charging Enforcement | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Traveler Card | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | |
| Vehicles | -- Not Selected |

### Regional Parking Management (ATMS17) -- Not Planned

This market package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This market package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Parking Management System | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Operations and Dispatch Centers | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Reversible Lane Management (ATMS18) -- Not Planned

This market package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this market package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This market package also includes the equipment used to electronically reconfigure intersections and manage right-of-way to address dynamic demand changes and special events.

| | | |
|---|---|---|
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Speed Monitoring (ATMS19) -- Existing

This market package monitors the speeds of vehicles traveling through a roadway system. If the speed is determine to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement agency to enforce the speed limit on a roadway system.

*ODOT Region 3 uses a curve warning system on I-5 in the Myrtle Creek area. ODOT Motor Carrier uses a downhill speed warning system on I-84 at Emigrant Hill. This includes variable speed systems.*

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Enforcement | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | |
| | Vehicles | -- Not Selected |

### Drawbridge Management (ATMS20) -- Not Planned

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package supports systems that manage drawbridges at rivers and canals and other multimodal crossings (other than railroad grade crossings which are specifically covered by other market packages). The equipment managed by this market package includes control devices (e.g., gates, warning lights, dynamic message signs) at the drawbridge as well as the information systems that are used to keep travelers appraised of current and forecasted drawbridge status.

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Field Devices | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| ODOT Field Devices | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Roadway Closure Management (ATMS21) -- Existing/Programmed

This market package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The market package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this market package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This market package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS market packages.

*ODOT Region 5 has a programmed project to install automated gates on freeway ramps to enhance winter operations. Emergency vehicles will be able to raise closed gates via opticom. Remote-controlled gates have also been deployed in Morrow and Umatilla Counties as part of the CSEPP program to close roads and direct traffic out of affected areas.*

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Ambulances | -- Not Selected |
| Commercial HazMat Vehicles | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Salvage and Towing Vehicles | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Field Devices | |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Fire and Life Safety Vehicles | |
| Local Law Enforcement Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Vehicle Safety Monitoring (AVSS01) -- Not Planned**

This market package will diagnose critical components of the vehicle and warn the driver of potential dangers. On-board sensors will determine the vehicle's condition, performance, on-board safety data, and display information.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

**Driver Safety Monitoring (AVSS02) -- Not Planned**

This market package will determine the driver's condition, and warn the driver of potential dangers. On-board sensors will determine the driver's condition, performance, on-board safety data, and display information.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

**Longitudinal Safety Warning (AVSS03) -- Not Planned**

This market package allows for longitudinal warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas in front of and behind the vehicle and present warnings to the driver about potential hazards.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

### Lateral Safety Warning (AVSS04) -- Not Planned

This market package allows for lateral warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas to the sides of the vehicle and present warnings to the driver about potential hazards.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |

### Intersection Safety Warning (AVSS05) -- Future

This market package monitors vehicles approaching an intersection and warns drivers when hazardous conditions are detected. The market package detects impending violations (e.g., red-light violations) and potential conflicts between vehicles occupying or approaching the intersection (e.g., situations where a left turn would be unsafe because of approaching traffic). When a potentially hazardous condition is detected, a warning is communicated to the involved vehicles using short range communications and/or signs/signals in the intersection.

*This market package may be deployed within the next 10 years and will involve public agencies installing field devices at traffic signals that can communicate to warning systems in vehicles that alert drivers of potential safety hazards.*

| | |
|---|---|
| Commercial Transit Vehicles | |
| Commercial Vehicles | |
| Local Field Devices | |
| Map Update Provider | -- Not Selected |
| ODOT Field Devices | |
| Public Transit Vehicles | |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | |
| Vehicles | |

### Pre-Crash Restraint Deployment (AVSS06) -- Not Planned

This market package provides in-vehicle sensors and on-board communications to monitor the vehicle's local environment, determine collision probability and deploy a pre-crash safety system. It will include on-board sensors to measure lateral and longitudinal gaps and together with weather and roadway conditions will determine lateral and longitudinal collision probability. It will exchange messages with other equipped vehicles to determine the precise location of surrounding vehicles. It will deploy a pre-crash safety system when a crash is imminent.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicles | -- Not Selected |

### Driver Visibility Improvement (AVSS07) -- Not Planned

This market package will enhance driver visibility using an enhanced vision system. On-board display hardware is needed

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

### Advanced Vehicle Longitudinal Control (AVSS08) -- Not Planned

This market package automates the speed and headway control functions on board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the throttle and brakes. It requires on-board sensors to measure longitudinal gaps and a processor for controlling the vehicle speed.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Map Update Provider | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |

### Advanced Vehicle Lateral Control (AVSS09) -- Not Planned

This market package automates the steering control on board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the steering. It requires on-board sensors to measure lane position and lateral deviations and a processor for controlling the vehicle steering.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| Public Transit Vehicles | -- Not Selected |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | -- Not Selected |
| Vehicles | -- Not Selected |

### Intersection Collision Avoidance (AVSS10) -- Future

This market package will determine the probability of an intersection collision and provide timely warnings to approaching vehicles so that avoidance actions can be taken. This market package builds on the Intersection Safety Warning field and in-vehicle equipment and adds equipment in the vehicle that can take control of the vehicle to avoid intersection violations and potential collisions. The same sensors and communications equipment in the roadway infrastructure are used to assess vehicle locations and speeds near an intersection. This information is determined and communicated to the approaching vehicle using a short range communications system. The vehicle uses this information to develop control actions which alter the vehicle's speed and steering control and potentially activate its pre-crash safety system.
*This market package may be deployed within the next 10 years and will involve public agencies installing field devices at traffic signals that can communicate to warning systems in vehicles that alert drivers of potential safety hazards.*

| | |
|---|---|
| Commercial Transit Vehicles | |
| Commercial Vehicles | |
| Local Field Devices | |
| Map Update Provider | -- Not Selected |
| ODOT Field Devices | |
| Public Transit Vehicles | |
| Road User Charging Exempt Accounts | -- Not Selected |
| Vehicle Drivers | |
| Vehicles | |

### Automated Vehicle Operations (AVSS11) -- Not Planned

This market package enables "hands-off" operation of the vehicle on automated portions of the highway system. Implementation requires lateral lane holding, vehicle speed and steering control. Communications between vehicles and between the vehicles and supporting infrastructure equipment supports cooperative checkin to the automated portion of the system and transition to automated mode, coordination of maneuvers between vehicles in automated mode, and checkout from the automated system as the driver resumes control of the vehicle.

| | |
|---|---|
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

**Cooperative Vehicle Safety Systems (AVSS12) -- Not Planned**

This market package enhances the on-board longitudinal and lateral warning stand-alone systems by exchanging messages with other surrounding vehicles and roadside equipment. Vehicles send out information concerning their location, speed, and direction to surrounding vehicles. The roadside equipment provides information about potential safety hazards in the vehicle path such as stalled (unequipped) vehicles, wrong-way drivers, debris, or water hazards. The on-board systems can then process this information and present warnings to the driver including headway warnings, merge warnings, unsafe passing warnings, and warnings about hazards detected in the vehicle path. Special messages from approaching emergency vehicles may also be received and processed.

| | | |
|---|---|---|
| | Ambulances | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Fire and Life Safety Vehicles | -- Not Selected |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |

**Fleet Administration (CVO01) -- Not Planned**

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package provides the capabilities to manage a fleet of commercial vehicles. The Fleet and Freight Management subsystem provides the route for a commercial vehicle by either utilizing an in-house routing software package or an Information Service Provider. Routes generated by either approach are constrained by hazardous materials and other restrictions (such as height or weight). Any such restricted areas are determined by the Commercial Vehicle Administration. A route would be electronically sent to the Commercial Vehicle with any appropriate dispatch instructions. The location of the Commercial Vehicle can be monitored by the Fleet and Freight Management subsystem and routing changes can be made depending on current road network conditions. Once a route has been assigned, changes must be coordinated between the Fleet and Freight Management subsystem and the Commercial Vehicle. Commercial Vehicle Drivers would be alerted to any changes in route from the planned route and given an opportunity to justify a rerouting. Any unauthorized or unexpected route changes by the Commercial Vehicle will register a route deviation alert with the Fleet and Freight Management subsystem. The Fleet and Freight Management subsystem can also notify local public safety agencies of the route deviation when appropriate (e.g., if there is safety sensitive HAZMAT being carried), by sending an alarm to the Emergency Management subsystem.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Map Update Provider | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Motor Carrier Administration | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Freight Administration (CVO02) -- Not Planned

This market package tracks the movement of cargo and monitors the cargo condition. Interconnections are provided to intermodal freight shippers and intermodal freight depots for tracking of cargo from source to destination. In addition to the usual cargo monitoring required to insure that cargo gets from origin to destination, the Fleet and Freight Management subsystem monitors shipments to make sure that no tampering or breach of security occurs to the cargo on commercial vehicles. Any such tampering will be reported to the Fleet and Freight Management subsystem. In addition to exceptions (e.g., alerts) that are reported, on-going indications of the state of the various freight equipment are reported to the Fleet and Freight Management subsystem. The commercial vehicle driver is also alerted of any tampering or breach of cargo security. Freight managers may decide to take further action on the alerts and/or provide responses that explain that the alerts are false alarms. If no explanation is received, the Fleet and Freight Management subsystem may notify the Emergency Management subsystem.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Vehicles | -- Not Selected |

### Electronic Clearance (CVO03) -- Existing

This market package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and Field-Vehicle Communications to the roadside. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, transponder read/write devices and computer workstations.
*This market packages includes the elements of ODOT Motor Carrier's Green Light Preclearance system.*

| | |
|---|---|
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | |
| ODOT Motor Carrier Administration | -- Not Selected |
| ODOT Motor Carrier Inspection Facilities | |
| Road User Charging Enforcement | -- Not Selected |

### CV Administrative Processes (CVO04) -- Existing

This market package provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles may be enrolled in the electronic clearance program provided by a separate market package which allows commercial vehicles to be screened at mainline speeds at roadside check facilities. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration subsystem and snapshots of this database are made available to the roadside check facilities at the roadside to support the electronic clearance process.

Commercial Vehicle Administration subsystems can share credential information with other Commercial Vehicle Administration subsystems, so that it is possible for any Commercial Vehicle Administration subsystem to have access to all credentials, credential fees, credentials status and safety status information. In addition, it is possible for one Commercial Vehicle Administration subsystem to collect HAZMAT route restrictions information from other Commercial Vehicle Administration subsystems and then act as a clearinghouse for this route restrictions information for Information Service Providers, Map Update Providers, and Fleet and Freight Management subsystems.
*ODOT Motor Carrier provides many of the components of this market package on their website.*

| | |
|---|---|
| Commercial Information Service Providers | -- Not Selected |
| Commercial Vehicle Management | |
| Local Maintenance and Construction Management | -- Not Selected |
| Map Update Provider | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Motor Carrier Administration | |
| ODOT Transportation Operations Centers | -- Not Selected |
| Road User Charging Administration- TTSPs | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Road User Charging Administration- VASPs | -- Not Selected |
| | Road User Charging Enforcement | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### International Border Electronic Clearance (CVO05) -- Not Planned

This market package provides for automated clearance at international border crossings. It augments the Electronic Clearance market package by allowing interface with border administration and border inspection related functions. This market package processes the entry documentation for vehicle, cargo, and driver, checks compliance with import/export and immigration regulations, handles duty fee processing, and reports the results of the crossing event to manage release of commercial vehicle, cargo, and driver across an international border. It interfaces with administrative systems used by customs and border protection, immigration, carriers, and service providers (e.g., brokers) and inspection systems at international border crossings to generate, process, and store entry documentation.

| | | |
|---|---|---|
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | ODOT Motor Carrier Administration | -- Not Selected |
| | ODOT Motor Carrier Inspection Facilities | -- Not Selected |

### Weigh-In-Motion (CVO06) -- Existing

This market package provides for high speed weigh-in-motion with or without Automated Vehicle Identification (AVI) capabilities. This market package provides the roadside equipment that could be used as a stand-alone system or to augment the Electronic Clearance (CVO03) market package.

| | | |
|---|---|---|
| | Commercial Vehicles | |
| | ODOT Motor Carrier Inspection Facilities | |

### Roadside CVO Safety (CVO07) -- Not Planned

This market package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the roadside check locations. The capabilities for performing the safety inspection are shared between this market package and the On-board CVO and Freight Safety & Security (CVO08) Market Package which enables a variety of implementation options. The basic option, directly supported by this market package, facilitates safety inspection of vehicles that have been pulled off the highway, perhaps as a result of the automated screening process provided by the Electronic Clearance (CVO03) Market Package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-board CVO and Freight Safety & Security (CVO08) market package, utilize additional on-board vehicle safety monitoring and reporting capabilities in the commercial vehicle to augment the roadside safety check.

| | | |
|---|---|---|
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | ODOT Motor Carrier Administration | -- Not Selected |
| | ODOT Motor Carrier Inspection Facilities | -- Not Selected |
| | Road User Charging Enforcement | -- Not Selected |

### On-board CVO and Freight Safety and Security (CVO08) -- Not Planned

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Market Package and includes roadside support for reading on-board safety data via tags. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Commercial Vehicle Check roadside elements. This market package allows for the Fleet and Freight Management subsystem to have access to the on-board safety data. In addition to safety data, this market package provides a means for monitoring the security of the Commercial Vehicle along with the cargo, containers, trailers, and other equipment that are being hauled. Commercial Vehicle on-board tamper and breach sensors provide an indication of any security irregularities and the sensor data is provided to the Fleet and Freight Management subsystem along with particular notification of any breach alerts. Commercial Vehicle Drivers may be aware of the sensor readings and can provide an explanation back to the Fleet and Freight Management subsystem via the Commercial Vehicle. Commercial vehicle and freight security breaches are also sent to the commercial vehicle check.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Motor Carrier Administration | -- Not Selected |
| ODOT Motor Carrier Inspection Facilities | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |

### CVO Fleet Maintenance (CVO09) -- Not Planned

This market package supports maintenance of CVO fleet vehicles with on-board monitoring equipment and Automated Vehicle Location (AVL) capabilities within the Fleet and Freight Management Subsystem. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

| | |
|---|---|
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| ODOT Motor Carrier Administration | -- Not Selected |

### HAZMAT Management (CVO10) -- Not Planned

This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicle Management | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Vehicles | -- Not Selected |

### Roadside HAZMAT Security Detection and Mitigation (CVO11) -- Not Planned

This market package provides the capability to detect and classify security sensitive HAZMAT on commercial vehicles using roadside sensing and imaging technology. Credentials information can be accessed to verify if the commercial driver, vehicle and carrier are permitted to transport the identified HAZMAT. If the credentials analysis and sensed HAZMAT information do not agree, the vehicle can be signaled to pull off the highway, and if required, an alarm can be sent to Emergency Management to request they monitor, traffic stop or disable the vehicle.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Motor Carrier Administration | -- Not Selected |
| | ODOT Motor Carrier Inspection Facilities | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |

### CV Driver Security Authentication (CVO12) -- Not Planned

This market package provides the ability for Fleet and Freight Management to detect when an unauthorized commercial vehicle driver attempts to drive their vehicle based on stored driver identity information. If an unauthorized driver has been detected, Fleet and Freight Management can activate commands to safely disable the commercial vehicle. Alarms can also be sent to emergency management to inform them of a potential commercial vehicle hijacking or theft and potential hazardous situation. In addition, Emergency Management can request Fleet and Freight Management to disable a specific vehicle in their fleet.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |

### Freight Assignment Tracking (CVO13) -- Not Planned

This market package provides for the planning and tracking of three aspects of commercial vehicle shipments. For each shipment, the commercial vehicle, the freight equipment, and the commercial vehicle driver are monitored for consistency with the planned assignment. Any unauthorized changes are determined by the Fleet and Freight Management subsystem and then the appropriate people and subsystems are notified. Data collected by the On-board CV and Freight Safety & Security and the On-board Driver Authentication equipment packages used in other market packages are also used to monitor the three aspects of assignment for this market package. In addition to this market package, Fleet and Freight Managers may also monitor routes and itineraries and this capability is included in Fleet Administration.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Vehicle Management | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |

### Emergency Call-Taking and Dispatch (EM01) -- Existing

This market package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.

| | | |
|---|---|---|
| | 911 Centers | |
| | Ambulances | |
| | Commercial HazMat Vehicles | |
| | Commercial Salvage and Towing Vehicles | |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Law Enforcement Data System | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | |
| | Local Fire and Life Safety Vehicles | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Law Enforcement Centers | |
| | Local Law Enforcement Vehicles | |
| | Local Maintenance and Construction Vehicles | |
| | Local Traffic Operations Centers | |
| | Map Update Provider | |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Incident Response Vehicles | |
| | ODOT Maintenance and Construction Vehicles | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | |
| | Oregon State Police Dispatch Centers | |
| | Oregon State Police Vehicles | |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Emergency Routing (EM02) -- Existing/Planned

This market package supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions, and suggested routing information are provided to enhance emergency vehicle routing. Special priority or other specific emergency traffic control strategies can be coordinated to improve the safety and time-efficiency of responding vehicle travel on the selected route(s). The Emergency Management Subsystem provides the routing for the emergency fleet based on real-time conditions and has the option of requesting a route from the Traffic Management subsystem. The Emergency Vehicle may also be equipped with dedicated short range communications for local signal preemption and the transmission of alerts to surrounding vehicles. The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Ambulances | -- Not Selected |
| | Commercial HazMat Vehicles | -- Not Selected |
| | Commercial Salvage and Towing Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Field Devices | |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Vehicles | |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Vehicles | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | |
| | Mayday Service Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Vehicles | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |

### Mayday and Alarms Support (EM03) -- Existing/Programmed

This market package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user, gather information about the incident, and determine the appropriate response. The request for assistance may be manually initiated or automated and linked to vehicle sensors. This market package also includes general surveillance capabilities that enable the Emergency Management Subsystem to remotely monitor public areas (e.g., rest stops, parking lots) to improve security in these areas. The Emergency Management Subsystem may be operated by the public sector or by a private sector telematics service provider.

*Private companies already provide mayday services to people who purchase vehicles with mayday systems and subscribe to the system. Call-takers at mayday service centers facilitate emergency response by calling 911 and passing along information (communications with driver, location of vehicle determined by GPS, etc.). ODOT is currently working on a project to integrate private mayday service systems with emergency and incident management agencies. The CAD message broker may be used as the interface between system users.*

| | | |
|---|---|---|
| | 911 Centers | |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Law Enforcement Data System | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Personal Traveler Information Devices | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Travelers | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Roadway Service Patrols (EM04) -- Existing**

This market package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The market package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Ambulances | -- Not Selected |
| Commercial HazMat Vehicles | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Salvage and Towing Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Fire and Life Safety Vehicles | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Law Enforcement Vehicles | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Maintenance and Construction Vehicles | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Incident Response Vehicles | |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Maintenance and Construction Vehicles | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |
| Oregon State Police Vehicles | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| TripCheck Local Entry | -- Not Selected |
| TripCheck System | -- Not Selected |
| TripCheck Traveler Information Portal | -- Not Selected |
| Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

**Transportation Infrastructure Protection (EM05) -- Existing/Future**

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|
| This market package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated by Traffic Management Subsystems to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust systems and other automated and remotely controlled systems that mitigate impact of an incident. | |
| | 911 Centers -- Not Selected |
| | Ambulances -- Not Selected |
| | Commercial HazMat Vehicles -- Not Selected |
| | Commercial Salvage and Towing Vehicles -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers -- Not Selected |
| | Commercial Transit Vehicles -- Not Selected |
| | Commercial Vehicles -- Not Selected |
| | External State Emergency Operations Centers -- Not Selected |
| | External State Police Dispatch Centers -- Not Selected |
| | External State Traffic Operations Centers -- Not Selected |
| | Federal Land Traffic Management -- Not Selected |
| | Heavy Rail Operations Centers -- Not Selected |
| | Law Enforcement Data System -- Not Selected |
| | Local Emergency Operations Centers -- Not Selected |
| | Local Field Devices -- Not Selected |
| | Local Fire and Life Safety Centers -- Not Selected |
| | Local Fire and Life Safety Vehicles -- Not Selected |
| | Local Law Enforcement Centers -- Not Selected |
| | Local Law Enforcement Vehicles -- Not Selected |
| | Local Maintenance and Construction Management -- Not Selected |
| | Local Maintenance and Construction Vehicles -- Not Selected |
| | Local Traffic Operations Centers -- Not Selected |
| | Mayday Service Centers -- Not Selected |
| | ODOT Emergency Operations Centers -- Not Selected |
| | ODOT Field Devices |
| | ODOT Incident Response Vehicles -- Not Selected |
| | ODOT Maintenance and Construction Management -- Not Selected |
| | ODOT Maintenance and Construction Vehicles -- Not Selected |
| | ODOT Traffic Signal System -- Not Selected |
| | ODOT Transportation Operations Centers |
| | Oregon Emergency Coordination Center -- Not Selected |
| | Oregon Interoperability Service (OIS) |
| | Oregon State Police Dispatch Centers |
| | Oregon State Police Vehicles -- Not Selected |
| | Portland State University Portal Data Warehouse -- Not Selected |
| | Public Transit Field Devices -- Not Selected |
| | Public Transit Operations and Dispatch Centers -- Not Selected |
| | Public Transit Vehicles -- Not Selected |
| | Road User Charging Exempt Accounts -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Wide-Area Alert (EM06) -- Existing

This market package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites. *ODOT posts amber alerts (issued by 911 centers) on DMSs and on the TripCheck system. Local agencies also post or plan to post amber alerts on DMSs.*

| | | |
|---|---|---|
| | 911 Centers | |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | |
| | Commercial Transit Vehicles | |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Law Enforcement Data System | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Field Devices | |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | |
| | Mayday Service Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Personal Traveler Information Devices | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | Public Transit Vehicles | |
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Road User Charging Free Flow Field Devices | -- Not Selected |
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Early Warning System (EM07) -- Not Planned

This market package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The market package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Law Enforcement Data System | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Disaster Response and Recovery (EM08) -- Not Planned

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) |
|---|---|

This market package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).

The market package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The market package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this market package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.

The market package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this market package, the Emergency Management subsystem represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Subsystem and the other center subsystems provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this market package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities.

This market package builds on the basic traffic incident response service that is provided by ATMS08, the Traffic Incident Management market package. This market package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of the National ITS Architecture will want to consider both ATMS08 and this market package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.

Disaster Response and Recovery is also supported by EM10, the "Disaster Traveler Information" market package that keeps the public informed during a disaster response. See that market package for more information.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Law Enforcement Data System | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Emergency Coordination Center | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Other Transportation Service Providers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |

### Evacuation and Reentry Management (EM09) -- Planned

This market package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The market package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.

This market package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.

Evacuations are also supported by EM10, the "Disaster Traveler Information" market package, which keeps the public informed during evacuations. See that market package for more information.

| | |
|---|---|
| 911 Centers | |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Law Enforcement Data System | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |
| Oregon Emergency Coordination Center | -- Not Selected |
| Oregon Interoperability Service (OIS) | -- Not Selected |
| Oregon State Police Dispatch Centers | -- Not Selected |
| Portland State University Portal Data Warehouse | -- Not Selected |
| Public Transit Operations and Dispatch Centers | |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Road User Charging Administration- Charging Entities | -- Not Selected |
| | Road User Charging Administration- TTSPs | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Disaster Traveler Information (EM10) -- Not Planned

This market package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This market package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.

A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This market package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.

This market package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this market package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.

This market package augments the ATIS market packages that provide traveler information on a day-to-day basis for the surface transportation system. This market package provides focus on the special requirements for traveler information dissemination in disaster situations.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Vehicles | -- Not Selected |
| Commercial Vehicles | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| Media | -- Not Selected |
| NOAA National Weather Service | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Maintenance and Construction Management | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |
| ODOT Transportation Operations Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Personal Traveler Information Devices | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Field Devices | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Travelers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Maintenance and Construction Vehicle and Equipment Tracking (MC01) -- Planned

This market package will track the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.

| | | |
|---|---|---|
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Map Update Provider | |
| | Map Update Provider | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Vehicles | |
| | ODOT Maintenance and Construction Vehicles | |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |

### Maintenance and Construction Vehicle Maintenance (MC02) -- Not Planned

This market package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | Vehicles | -- Not Selected |

### Road Weather Data Collection (MC03) -- Existing

This market package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution Market Package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The market package may also request and receive qualified data sets from meteorological systems.

| | | |
|---|---|---|
| | Commercial Information Service Providers | |
| | Commercial Information Service Providers | |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Weather Information Processing and Distribution (MC04) -- Planned

This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.
*This market package is a planned module of TOCS.*

| | |
|---|---|
| 911 Centers | -- Not Selected |
| 911 Centers | -- Not Selected |
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Heavy Rail Operations Centers | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | |
| Local Maintenance and Construction Management | |
| Local Maintenance and Construction Management | |
| Local Traffic Operations Centers | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Local Traffic Operations Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |
| Mayday Service Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Media | |
| | Media | |
| | Media | |
| | NOAA National Weather Service | |
| | NOAA National Weather Service | |
| | NOAA National Weather Service | |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Roadway Automated Treatment (MC05) -- Existing/Planned

This market package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The market package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Local Field Devices | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |
| | Vehicle Drivers | -- Not Selected |

### Winter Maintenance (MC06) -- Future

This market package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Operations and Dispatch Centers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Map Update Provider | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Media | -- Not Selected |
| | Media | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Vehicles | |
| | ODOT Maintenance and Construction Vehicles | |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Roadway Maintenance and Construction (MC07) -- Existing/Future

This market package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Local Traffic Operations Centers | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Map Update Provider | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | Mayday Service Centers | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | |
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Work Zone Management (MC08) -- Existing/Planned

This market package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This market package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.

| | |
|---|---|
| 911 Centers | -- Not Selected |
| Commercial Information Service Providers | -- Not Selected |
| Commercial Transit Operations and Dispatch Centers | |
| External State Emergency Operations Centers | -- Not Selected |
| External State Police Dispatch Centers | -- Not Selected |
| External State Traffic Operations Centers | -- Not Selected |
| Federal Land Traffic Management | -- Not Selected |
| Local Emergency Operations Centers | -- Not Selected |
| Local Field Devices | |
| Local Fire and Life Safety Centers | -- Not Selected |
| Local Law Enforcement Centers | -- Not Selected |
| Local Maintenance and Construction Management | |
| Local Maintenance and Construction Vehicles | -- Not Selected |
| Local Traffic Operations Centers | |
| Mayday Service Centers | -- Not Selected |
| Media | -- Not Selected |
| ODOT Emergency Operations Centers | -- Not Selected |
| ODOT Field Devices | |
| ODOT Incident Response Vehicles | -- Not Selected |
| ODOT Maintenance and Construction Management | |
| ODOT Maintenance and Construction Vehicles | -- Not Selected |
| ODOT Traffic Signal System | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Transportation Operations Centers | |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | Vehicle Drivers | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Work Zone Safety Monitoring (MC09) -- Existing/Future

This market package includes systems that improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. This market package detects vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment or other potential safety hazards. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. The market package supports both stationary and mobile work zones. The intrusion detection and alarm systems may be collocated or distributed, allowing systems that detect safety issues far upstream from a work zone (e.g., detection of over dimension vehicles before they enter the work zone).

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Field Devices | |
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | Vehicle Drivers | |
| | Vehicles | |

### Maintenance and Construction Activity Coordination (MC10) -- Existing/Programmed

This market package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.

| | | |
|---|---|---|
| | 911 Centers | -- Not Selected |
| | Commercial Information Service Providers | |
| | Commercial Transit Operations and Dispatch Centers | |
| | External State Emergency Operations Centers | -- Not Selected |
| | External State Police Dispatch Centers | -- Not Selected |
| | External State Traffic Operations Centers | -- Not Selected |
| | Federal Land Traffic Management | -- Not Selected |
| | Heavy Rail Operations Centers | -- Not Selected |
| | Local Emergency Operations Centers | -- Not Selected |
| | Local Fire and Life Safety Centers | -- Not Selected |
| | Local Law Enforcement Centers | -- Not Selected |
| | Local Maintenance and Construction Management | |
| | Local Traffic Operations Centers | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | Mayday Service Centers | -- Not Selected |
| | Media | -- Not Selected |
| | ODOT Emergency Operations Centers | -- Not Selected |
| | ODOT Maintenance and Construction Management | |
| | ODOT Motor Carrier Administration | -- Not Selected |
| | ODOT Traffic Signal System | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Oregon Emergency Coordination Center | -- Not Selected |
| | Oregon Interoperability Service (OIS) | -- Not Selected |
| | Oregon State Police Dispatch Centers | -- Not Selected |
| | Portland State University Portal Data Warehouse | -- Not Selected |
| | Public Transit Operations and Dispatch Centers | |
| | TripCheck Local Entry | |
| | TripCheck System | |
| | TripCheck Traveler Information Portal | |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Environmental Probe Surveillance (MC11) -- Not Planned

This market package collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. It leverages vehicle on-board systems that measure temperature, sense current weather conditions (rain and sun sensors) and also can monitor aspects of the vehicle operational status (e.g., use of headlights, wipers, and traction control system) to gather information about local environmental conditions. It includes the on-board vehicle systems that collect and report environmental probe data, the infrastructure equipment that collects the probe data and the centers that aggregate and share the collected probe data.

| | | |
|---|---|---|
| | Commercial Information Service Providers | -- Not Selected |
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | NOAA National Weather Service | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | TripCheck System | -- Not Selected |
| | TripCheck Traveler Information Portal | -- Not Selected |
| | Vehicles | -- Not Selected |
| | Welcome Centers and Wayside Travel Information Centers | -- Not Selected |

### Infrastructure Monitoring (MC12) -- Not Planned

This market package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This market package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.

| | | |
|---|---|---|
| | Commercial Transit Vehicles | -- Not Selected |
| | Commercial Vehicles | -- Not Selected |
| | Local Field Devices | -- Not Selected |
| | Local Maintenance and Construction Management | -- Not Selected |
| | Local Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Field Devices | -- Not Selected |

## Market Packages for Region Oregon Statewide ITS Architecture

| Market Package | Element(s) | |
|---|---|---|
| | ODOT Incident Response Vehicles | -- Not Selected |
| | ODOT Maintenance and Construction Management | -- Not Selected |
| | ODOT Maintenance and Construction Vehicles | -- Not Selected |
| | ODOT Transportation Operations Centers | -- Not Selected |
| | Public Transit Vehicles | -- Not Selected |
| | Road User Charging Exempt Accounts | -- Not Selected |
| | TripCheck Local Entry | -- Not Selected |
| | Vehicles | -- Not Selected |

# APPENDIX K: MARKET PACKAGE CHANGE LOG

# Market Package Change Log for the Oregon Statewide ITS Architecture

| *Market Package* | *Changes Made* | *Notes* |
|---|---|---|
| ATMS10: Electronic Toll Collection | Changed status from "Future" to "Existing/Planned". | |
| | Selected the following elements:<br>DMV Vehicle Registration Database<br>Road User Charging Administration- Charging Entities<br>Road User Charging Administration- TTSPs<br>Road User Charging Administration- VASPs<br>Road User Charging Certification<br>Road User Charging Enforcement<br>Road User Charging Exempt Accounts<br>Road User Charging Free Flow Field Devices<br>Traveler Card | |
| | Replaced the comment with: "This market package is intended to capture all road user charging applications in Oregon. Road user charges include taxes, tolls, fees, and fares. Oregon MCTD oversees an existing weight-distance tax collection system for trucks. Additional road user charging applications are anticipated in the future. The Oregon road user charging vision is to operate a reliable, easy to use, relatively low cost, enforceable, publicly acceptable “open” system that collects road user charges using interoperable components that conform to common standards." | |

# APPENDIX L: TURBO ARCHITECTURE INTERCONNECT REPORT

# Interconnected Elements

5/31/2012 2:45:14PM

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| 911 Centers | Ambulances | Existing |
| 911 Centers | Commercial Transit Operations and Dispatch Centers | Existing/Planned |
| 911 Centers | Local Fire and Life Safety Vehicles | Existing |
| 911 Centers | Local Law Enforcement Centers | Existing/Planned |
| 911 Centers | Local Law Enforcement Vehicles | Existing |
| 911 Centers | Local Maintenance and Construction Management | Existing |
| 911 Centers | Local Traffic Operations Centers | Planned |
| 911 Centers | ODOT Emergency Operations Centers | Existing |
| 911 Centers | ODOT Maintenance and Construction Management | Existing |
| 911 Centers | ODOT Transportation Operations Centers | Existing |
| 911 Centers | Oregon Emergency Coordination Center | Planned |
| 911 Centers | Oregon Interoperability Service (OIS) | Programmed |
| 911 Centers | Oregon State Police Dispatch Centers | Existing/Planned |
| 911 Centers | Public Transit Operations and Dispatch Centers | Existing/Planned |
| 911 Centers | Public Transit Vehicles | Planned |
| Ambulances | Local Fire and Life Safety Centers | Planned |
| Commercial HazMat Vehicles | Local Law Enforcement Centers | Existing |
| Commercial HazMat Vehicles | Local Traffic Operations Centers | Existing |
| Commercial HazMat Vehicles | ODOT Transportation Operations Centers | Existing |
| Commercial HazMat Vehicles | Oregon State Police Dispatch Centers | Existing |
| Commercial Information Service Providers | Commercial Transit Operations and Dispatch Centers | Existing/Planned |
| Commercial Information Service Providers | Map Update Provider | Existing/Planned |
| Commercial Information Service Providers | Personal Traveler Information Devices | Existing/Planned |
| Commercial Information Service Providers | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Commercial Information Service Providers | TripCheck Traveler Information Portal | Existing/Planned |
| Commercial Information Service Providers | Vehicles | Existing/Planned |
| Commercial Salvage and Towing Vehicles | Local Law Enforcement Centers | Existing |
| Commercial Salvage and Towing Vehicles | Local Traffic Operations Centers | Existing |
| Commercial Salvage and Towing Vehicles | ODOT Transportation Operations Centers | Existing |
| Commercial Salvage and Towing Vehicles | Oregon State Police Dispatch Centers | Existing |
| Commercial Transit Operations and Dispatch Centers | Commercial Transit Vehicles | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | Event Promoters | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | ODOT Maintenance and Construction Management | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | Other Transportation Service Providers | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | Personal Traveler Information Devices | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | TripCheck Local Entry | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | TripCheck System | Existing/Planned |
| Commercial Transit Operations and Dispatch Centers | TripCheck Traveler Information Portal | Existing/Planned |
| Commercial Transit Vehicles | Local Field Devices | Future |
| Commercial Transit Vehicles | ODOT Field Devices | Future |

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| Commercial Transit Vehicles | Traveler Card | Existing/Planned |
| Commercial Transit Vehicles | Vehicle Drivers | Existing/Future |
| Commercial Transit Vehicles | Vehicles | Future |
| Commercial Vehicle Management | ODOT Motor Carrier Administration | Existing |
| Commercial Vehicles | Local Field Devices | Future |
| Commercial Vehicles | ODOT Field Devices | Future |
| Commercial Vehicles | ODOT Motor Carrier Inspection Facilities | Existing |
| Commercial Vehicles | Vehicle Drivers | Existing/Future |
| Commercial Vehicles | Vehicles | Future |
| DMV Vehicle Registration Database | Road User Charging Administration- Charging Entities | Planned |
| DMV Vehicle Registration Database | Road User Charging Enforcement | Planned |
| Event Promoters | Local Traffic Operations Centers | Existing/Planned |
| Event Promoters | ODOT Emergency Operations Centers | Existing/Planned |
| Event Promoters | ODOT Transportation Operations Centers | Existing/Planned |
| Event Promoters | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Event Promoters | TripCheck Local Entry | Existing/Planned |
| Event Promoters | TripCheck Traveler Information Portal | Existing/Planned |
| External State Emergency Operations Centers | External State Police Dispatch Centers | Existing |
| External State Emergency Operations Centers | ODOT Emergency Operations Centers | Existing |
| External State Emergency Operations Centers | Oregon Emergency Coordination Center | Existing |
| External State Emergency Operations Centers | Oregon Interoperability Service (OIS) | Planned |
| External State Emergency Operations Centers | TripCheck Local Entry | Existing/Planned |
| External State Police Dispatch Centers | Oregon Interoperability Service (OIS) | Planned |
| External State Police Dispatch Centers | TripCheck Local Entry | Existing/Planned |
| External State Traffic Operations Centers | Map Update Provider | Existing/Planned |
| External State Traffic Operations Centers | ODOT Field Devices | Existing |
| External State Traffic Operations Centers | ODOT Transportation Operations Centers | Existing |
| External State Traffic Operations Centers | Oregon Interoperability Service (OIS) | Planned |
| External State Traffic Operations Centers | Portland State University Portal Data Warehouse | Existing/Planned |
| External State Traffic Operations Centers | TripCheck Local Entry | Existing/Planned |
| External State Traffic Operations Centers | TripCheck System | Planned |
| External State Traffic Operations Centers | TripCheck Traveler Information Portal | Existing/Planned |
| Federal Land Traffic Management | Oregon Interoperability Service (OIS) | Planned |
| Federal Land Traffic Management | TripCheck Local Entry | Existing/Planned |
| Federal Land Traffic Management | TripCheck Traveler Information Portal | Planned |
| Heavy Rail Operations Centers | TripCheck Traveler Information Portal | Future |
| Law Enforcement Data System | Local Law Enforcement Centers | Existing |
| Law Enforcement Data System | Local Law Enforcement Vehicles | Existing/Planned |
| Law Enforcement Data System | ODOT Emergency Operations Centers | Existing |
| Law Enforcement Data System | ODOT Transportation Operations Centers | Existing |
| Law Enforcement Data System | Oregon Emergency Coordination Center | Existing |
| Law Enforcement Data System | Oregon State Police Dispatch Centers | Existing |
| Law Enforcement Data System | Oregon State Police Vehicles | Existing/Planned |
| Local Data Mart | Local Field Devices | Existing/Planned |

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| Local Emergency Operations Centers | Local Maintenance and Construction Management | Existing |
| Local Emergency Operations Centers | Local Traffic Operations Centers | Existing |
| Local Emergency Operations Centers | ODOT Emergency Operations Centers | Existing |
| Local Emergency Operations Centers | ODOT Maintenance and Construction Management | Existing |
| Local Emergency Operations Centers | ODOT Transportation Operations Centers | Existing |
| Local Emergency Operations Centers | Oregon Emergency Coordination Center | Existing |
| Local Emergency Operations Centers | Oregon Interoperability Service (OIS) | Planned |
| Local Field Devices | Local Fire and Life Safety Vehicles | Existing |
| Local Field Devices | Local Maintenance and Construction Management | Existing |
| Local Field Devices | Local Traffic Operations Centers | Existing |
| Local Field Devices | ODOT Field Devices | Existing/Planned |
| Local Field Devices | ODOT Transportation Operations Centers | Existing/Planned |
| Local Field Devices | Public Transit Vehicles | Existing/Planned |
| Local Field Devices | Vehicle Drivers | Existing/Planned |
| Local Field Devices | Vehicles | Existing |
| Local Fire and Life Safety Centers | Local Fire and Life Safety Vehicles | Existing |
| Local Fire and Life Safety Centers | Oregon Interoperability Service (OIS) | Planned |
| Local Fire and Life Safety Centers | TripCheck Local Entry | Existing/Planned |
| Local Fire and Life Safety Vehicles | ODOT Field Devices | Existing |
| Local Law Enforcement Centers | Local Law Enforcement Vehicles | Existing |
| Local Law Enforcement Centers | Local Traffic Operations Centers | Existing |
| Local Law Enforcement Centers | Oregon Interoperability Service (OIS) | Planned |
| Local Maintenance and Construction Management | Local Maintenance and Construction Vehicles | Existing |
| Local Maintenance and Construction Management | Local Traffic Operations Centers | Existing |
| Local Maintenance and Construction Management | ODOT Emergency Operations Centers | Existing |
| Local Maintenance and Construction Management | ODOT Maintenance and Construction Management | Existing |
| Local Maintenance and Construction Management | ODOT Motor Carrier Administration | Existing |
| Local Maintenance and Construction Management | ODOT Transportation Operations Centers | Existing |
| Local Maintenance and Construction Management | Oregon Emergency Coordination Center | Existing |
| Local Maintenance and Construction Management | Oregon State Police Dispatch Centers | Existing |
| Local Maintenance and Construction Management | Portland State University Portal Data Warehouse | Existing/Programmed |
| Local Maintenance and Construction Management | TripCheck Local Entry | Existing/Planned |
| Local Maintenance and Construction Management | TripCheck System | Existing |
| Local Maintenance and Construction Management | TripCheck Traveler Information Portal | Existing |
| Local Maintenance and Construction Vehicles | Local Traffic Operations Centers | Existing |
| Local Traffic Operations Centers | Map Update Provider | Existing/Planned |
| Local Traffic Operations Centers | Media | Planned |
| Local Traffic Operations Centers | ODOT Emergency Operations Centers | Planned |
| Local Traffic Operations Centers | ODOT Field Devices | Existing/Planned |
| Local Traffic Operations Centers | ODOT Maintenance and Construction Management | Existing |
| Local Traffic Operations Centers | ODOT Transportation Operations Centers | Existing/Planned |
| Local Traffic Operations Centers | Oregon Emergency Coordination Center | Planned |
| Local Traffic Operations Centers | Oregon Interoperability Service (OIS) | Planned |

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| Local Traffic Operations Centers | Portland State University Portal Data Warehouse | Existing/Planned |
| Local Traffic Operations Centers | Public Transit Operations and Dispatch Centers | Future |
| Local Traffic Operations Centers | TripCheck Local Entry | Existing/Planned |
| Local Traffic Operations Centers | TripCheck System | Existing/Planned |
| Local Traffic Operations Centers | TripCheck Traveler Information Portal | Existing/Planned |
| Map Update Provider | ODOT Maintenance and Construction Management | Existing/Planned |
| Map Update Provider | ODOT Transportation Operations Centers | Existing/Planned |
| Map Update Provider | Portland State University Portal Data Warehouse | Existing/Planned |
| Mayday Service Centers | ODOT Transportation Operations Centers | Existing/Programmed |
| Mayday Service Centers | Oregon Interoperability Service (OIS) | Planned |
| Mayday Service Centers | Vehicles | Existing |
| Media | ODOT Transportation Operations Centers | Existing |
| Media | TripCheck Traveler Information Portal | Existing |
| NOAA National Weather Service | ODOT Transportation Operations Centers | Existing |
| NOAA National Weather Service | Portland State University Portal Data Warehouse | Existing |
| NOAA National Weather Service | TripCheck Local Entry | Existing/Planned |
| NOAA National Weather Service | TripCheck System | Existing |
| ODOT Data Mart | ODOT Field Devices | Existing/Planned |
| ODOT Emergency Operations Centers | ODOT Maintenance and Construction Management | Existing |
| ODOT Emergency Operations Centers | ODOT Transportation Operations Centers | Existing |
| ODOT Emergency Operations Centers | Oregon Emergency Coordination Center | Existing |
| ODOT Emergency Operations Centers | Oregon Interoperability Service (OIS) | Planned |
| ODOT Emergency Operations Centers | Oregon State Police Dispatch Centers | Existing |
| ODOT Field Devices | ODOT Maintenance and Construction Management | Existing |
| ODOT Field Devices | ODOT Traffic Signal System | Existing/Planned |
| ODOT Field Devices | ODOT Transportation Operations Centers | Existing |
| ODOT Field Devices | Public Transit Vehicles | Existing/Planned |
| ODOT Field Devices | Vehicle Drivers | Existing/Future |
| ODOT Field Devices | Vehicles | Existing/Planned |
| ODOT Incident Response Vehicles | ODOT Maintenance and Construction Management | Existing |
| ODOT Incident Response Vehicles | ODOT Transportation Operations Centers | Existing |
| ODOT Maintenance and Construction Management | ODOT Maintenance and Construction Vehicles | Existing |
| ODOT Maintenance and Construction Management | ODOT Motor Carrier Administration | Existing |
| ODOT Maintenance and Construction Management | ODOT Transportation Operations Centers | Existing |
| ODOT Maintenance and Construction Management | Oregon Emergency Coordination Center | Existing |
| ODOT Maintenance and Construction Management | Oregon State Police Dispatch Centers | Existing |
| ODOT Maintenance and Construction Management | Portland State University Portal Data Warehouse | Existing |
| ODOT Maintenance and Construction Management | Public Transit Operations and Dispatch Centers | Existing/Planned |
| ODOT Maintenance and Construction Management | TripCheck System | Existing |
| ODOT Maintenance and Construction Management | TripCheck Traveler Information Portal | Existing/Planned |
| ODOT Maintenance and Construction Vehicles | ODOT Transportation Operations Centers | Existing |
| ODOT Motor Carrier Administration | ODOT Motor Carrier Inspection Facilities | Existing |
| ODOT Motor Carrier Administration | Oregon State Police Dispatch Centers | Existing |

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| ODOT Motor Carrier Administration | Portland State University Portal Data Warehouse | Existing/Planned |
| ODOT Motor Carrier Administration | TripCheck System | Existing |
| ODOT Motor Carrier Administration | TripCheck Traveler Information Portal | Planned |
| ODOT Parking Management System | Vehicle Drivers | Existing/Planned |
| ODOT Transportation Operations Centers | Oregon Emergency Coordination Center | Existing |
| ODOT Transportation Operations Centers | Oregon Interoperability Service (OIS) | Programmed |
| ODOT Transportation Operations Centers | Portland State University Portal Data Warehouse | Existing |
| ODOT Transportation Operations Centers | Public Transit Operations and Dispatch Centers | Future |
| ODOT Transportation Operations Centers | TripCheck System | Existing |
| ODOT Transportation Operations Centers | TripCheck Traveler Information Portal | Existing |
| Oregon Emergency Coordination Center | Oregon Interoperability Service (OIS) | Planned |
| Oregon Interoperability Service (OIS) | Oregon State Police Dispatch Centers | Programmed |
| Oregon State Police Dispatch Centers | Oregon State Police Vehicles | Existing |
| Other Transportation Service Providers | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Other Transportation Service Providers | TripCheck Traveler Information Portal | Existing/Planned |
| Personal Traveler Information Devices | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Personal Traveler Information Devices | Travelers | Existing/Planned |
| Personal Traveler Information Devices | TripCheck System | Existing/Programmed |
| Personal Traveler Information Devices | TripCheck Traveler Information Portal | Existing/Planned |
| Portland State University Portal Data Warehouse | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Portland State University Portal Data Warehouse | TripCheck System | Existing |
| Portland State University Portal Data Warehouse | TripCheck Traveler Information Portal | Existing/Planned |
| Public Transit Data Mart | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Public Transit Field Devices | Public Transit Operations and Dispatch Centers | Existing/Planned |
| Public Transit Field Devices | Traveler Card | Existing/Planned |
| Public Transit Field Devices | Travelers | Existing/Planned |
| Public Transit Operations and Dispatch Centers | Public Transit Vehicles | Existing/Planned |
| Public Transit Operations and Dispatch Centers | TripCheck Local Entry | Existing/Planned |
| Public Transit Operations and Dispatch Centers | TripCheck System | Existing/Planned |
| Public Transit Operations and Dispatch Centers | TripCheck Traveler Information Portal | Existing/Planned |
| Public Transit Vehicles | Traveler Card | Existing/Planned |
| Public Transit Vehicles | Travelers | Existing/Planned |
| Public Transit Vehicles | Vehicle Drivers | Existing/Future |
| Public Transit Vehicles | Vehicles | Future |
| Road User Charging Administration- Charging Entities | Road User Charging Administration- TTSPs | Planned |
| Road User Charging Administration- Charging Entities | Road User Charging Certification | Planned |
| Road User Charging Administration- Charging Entities | Road User Charging Enforcement | Planned |
| Road User Charging Administration- Charging Entities | Road User Charging Free Flow Field Devices | Planned |
| Road User Charging Administration- TTSPs | Road User Charging Administration- VASPs | Planned |
| Road User Charging Administration- TTSPs | Road User Charging Certification | Planned |
| Road User Charging Administration- VASPs | Travelers | Planned |
| Road User Charging Free Flow Field Devices | Traveler Card | Planned |

## Oregon Statewide ITS Architecture (Region)

| Element | Element | Status |
|---|---|---|
| Travelers | Welcome Centers and Wayside Travel Information Centers | Existing |
| TripCheck Local Entry | TripCheck Traveler Information Portal | Existing/Planned |
| TripCheck System | TripCheck Traveler Information Portal | Existing |
| TripCheck System | Welcome Centers and Wayside Travel Information Centers | Existing |
| TripCheck Traveler Information Portal | Vehicles | Existing/Planned |
| Vehicle Drivers | Vehicles | Existing/Future |

## Oregon Statewide ITS Architecture (Region)

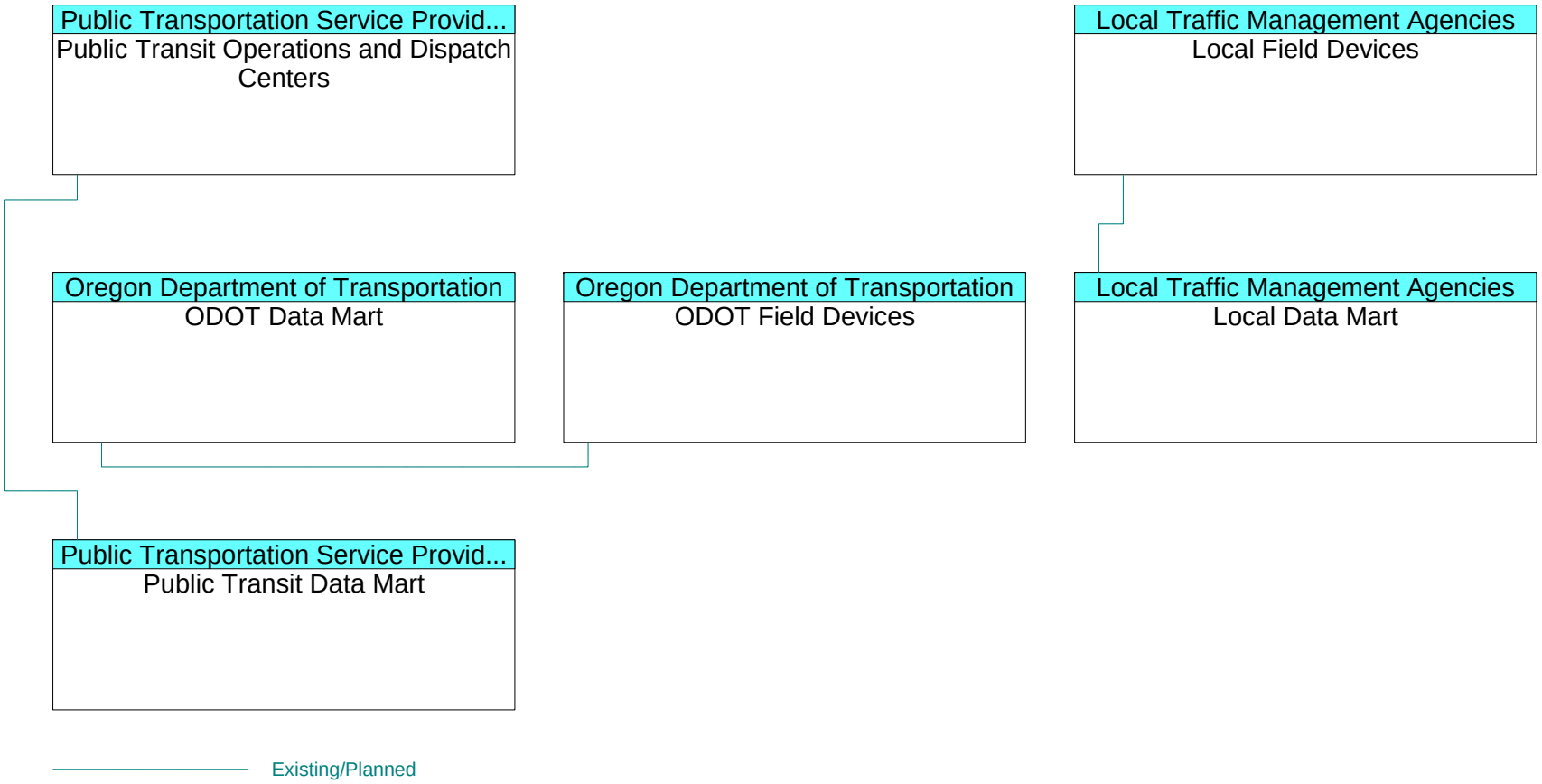
| Element | Element | Status |
|---|---|---|

### *Status Value Legend*

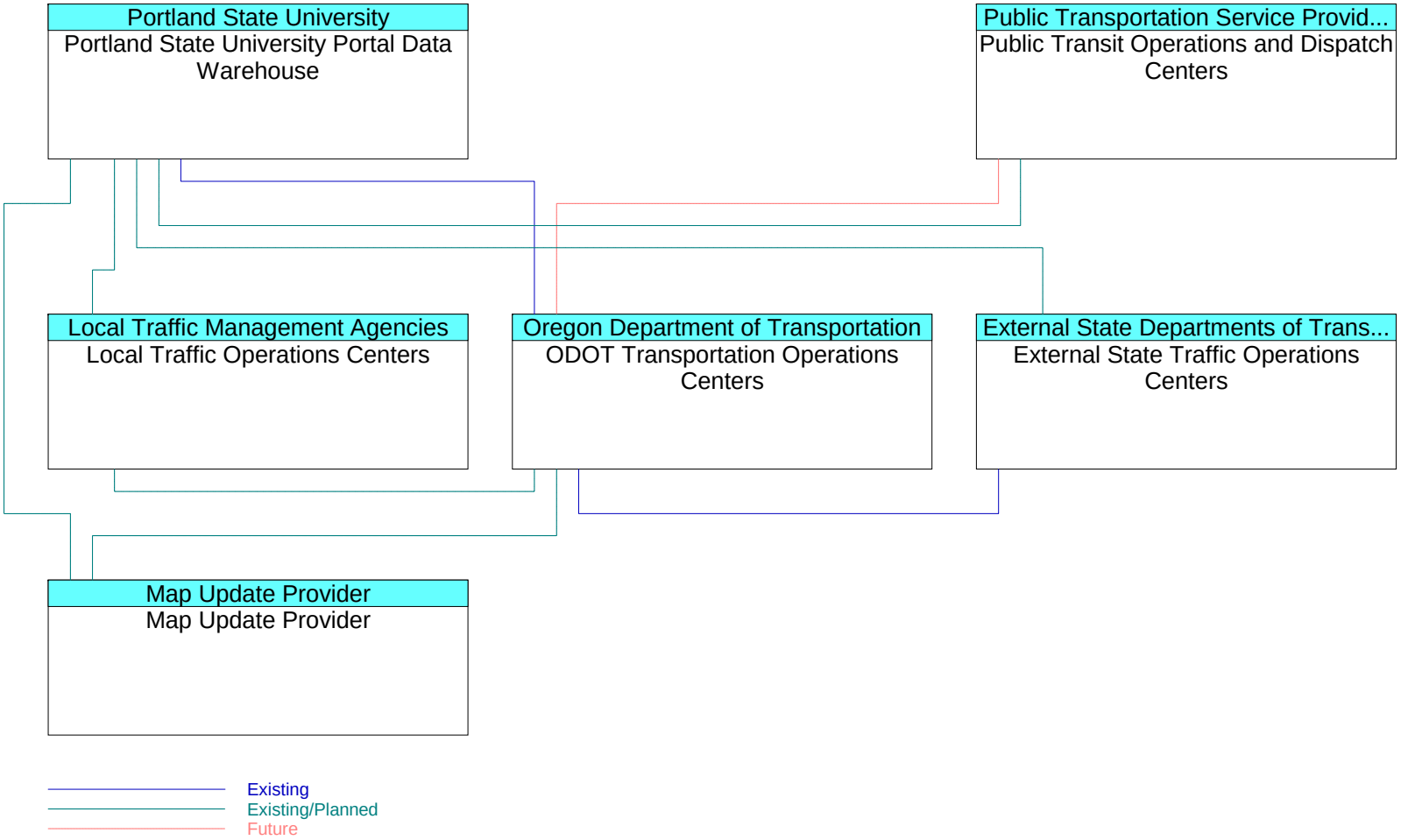
| Name | Description |
|---|---|
| Existing | An entity that currently exists. |
| Existing/Programmed | Some entities currently exist and others are planned and funded. |
| Existing/Planned | Some entities currently exist and others are planned but unfunded. |
| Existing/Future | Some entities currently exist and others are likely to occur in the future as technology advances or funding becomes available. |
| Programmed | Funding has been obtained for a planned entity. |
| Planned | An entity has been identified as planned within the next 10 years, but funding has not yet been obtained. |
| Future | An entity that is likely to occur in the future as technology develops or as other projects are completed but is not currently planned or funded. |
| Not Planned | |

# APPENDIX M: TURBO ARCHITECTURE FLOW REPORT

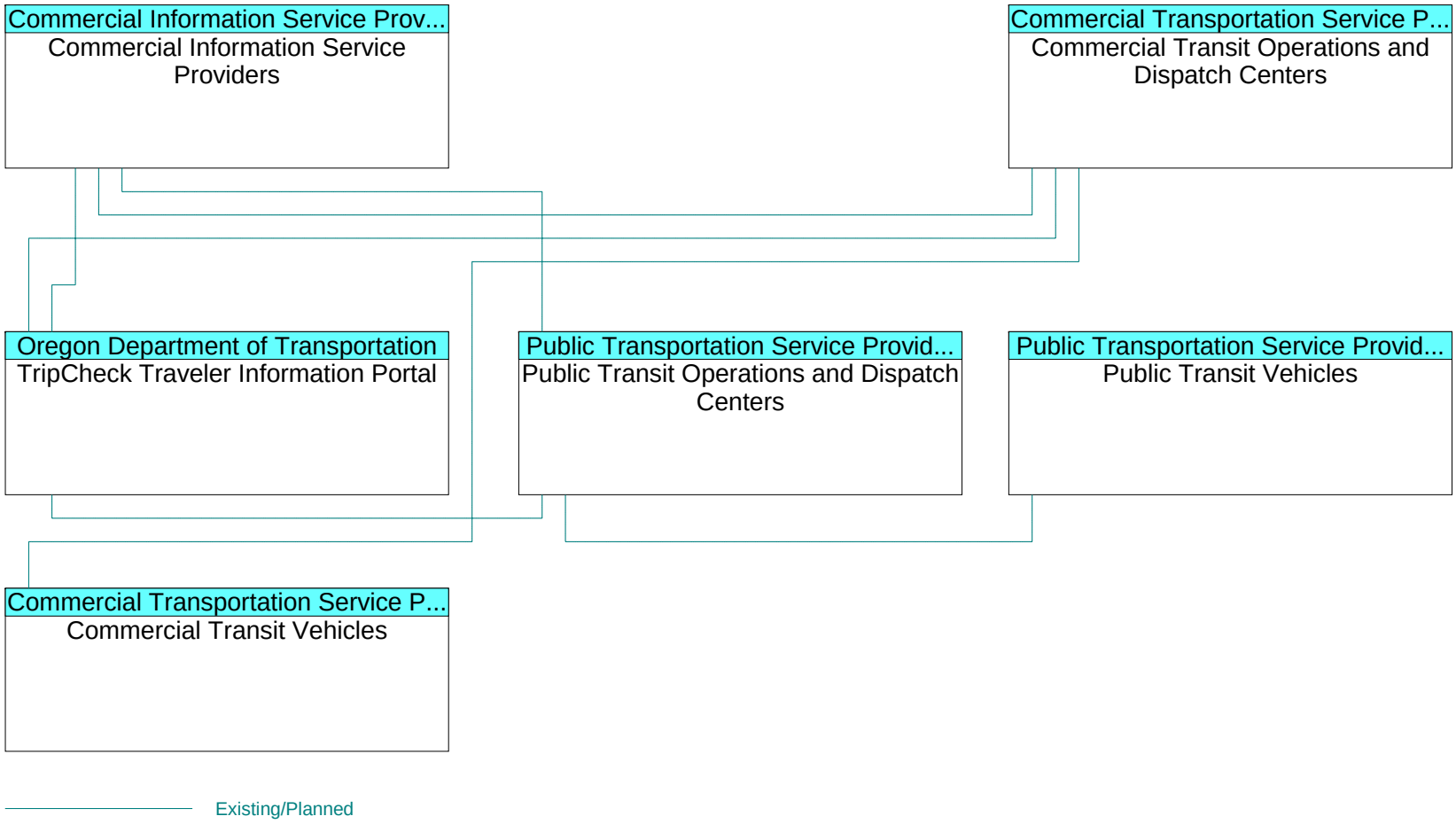
# AD1: ITS Data Mart



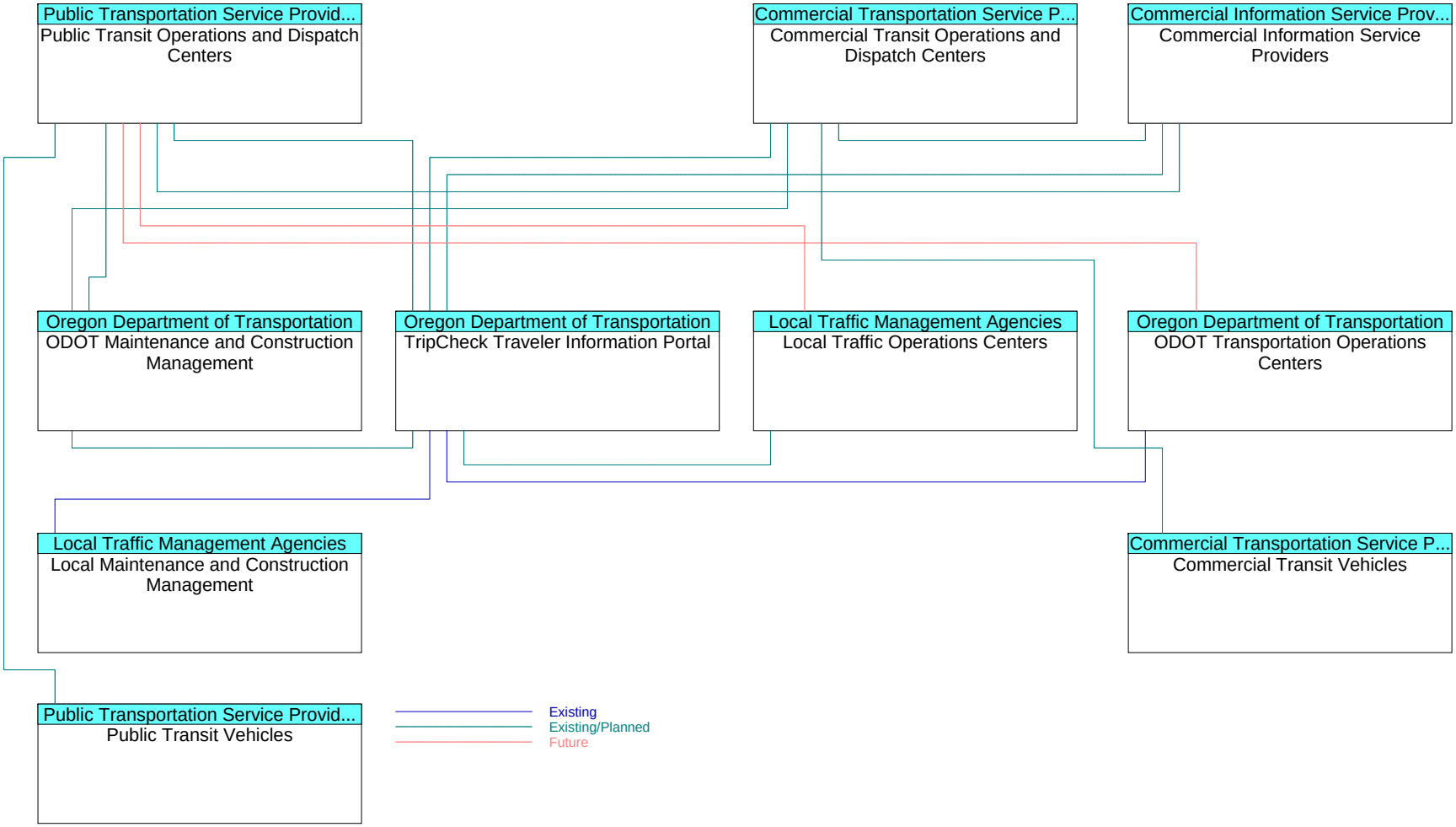
# AD2: ITS Data Warehouse



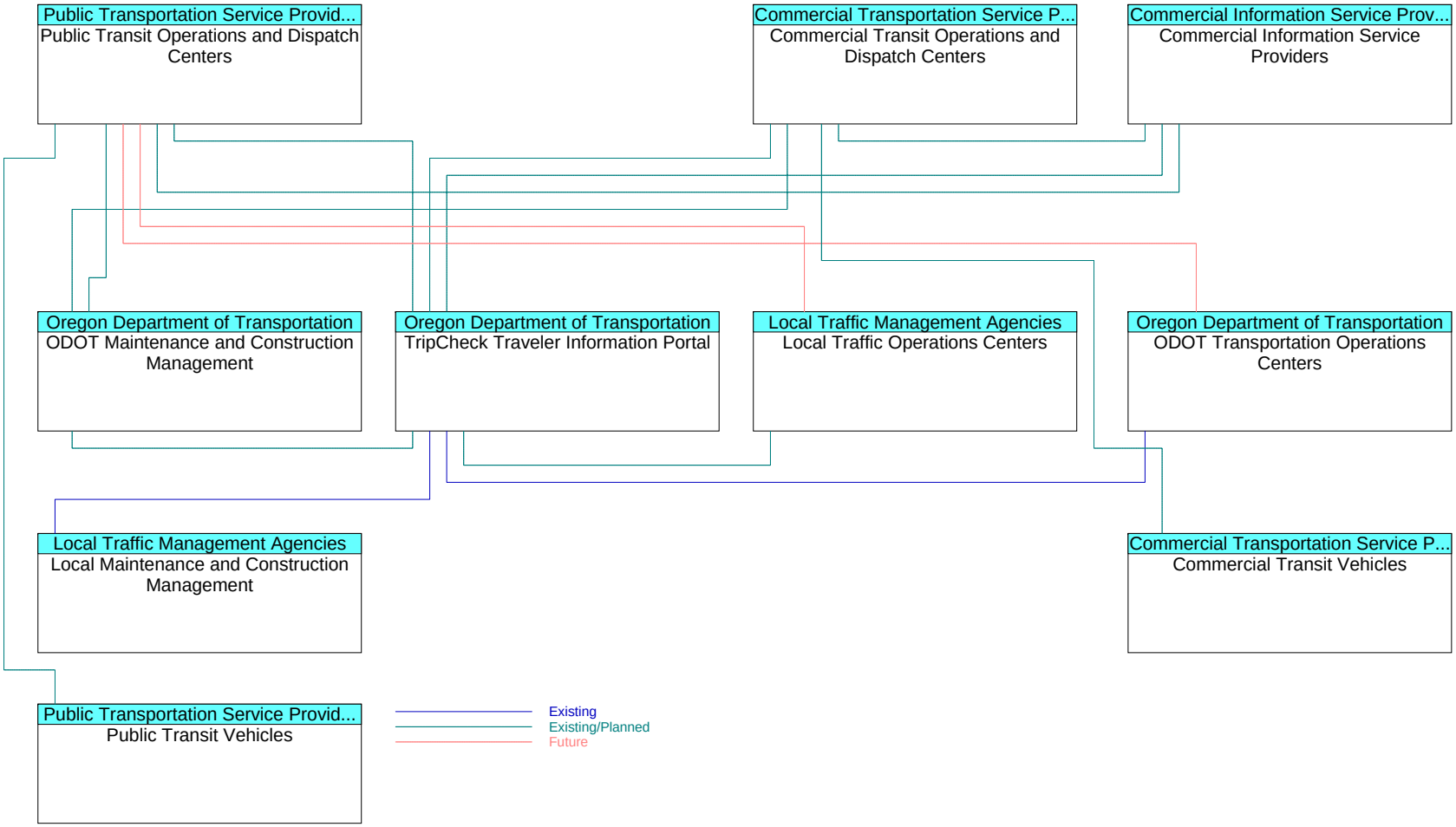
# APTS1: Transit Vehicle Tracking



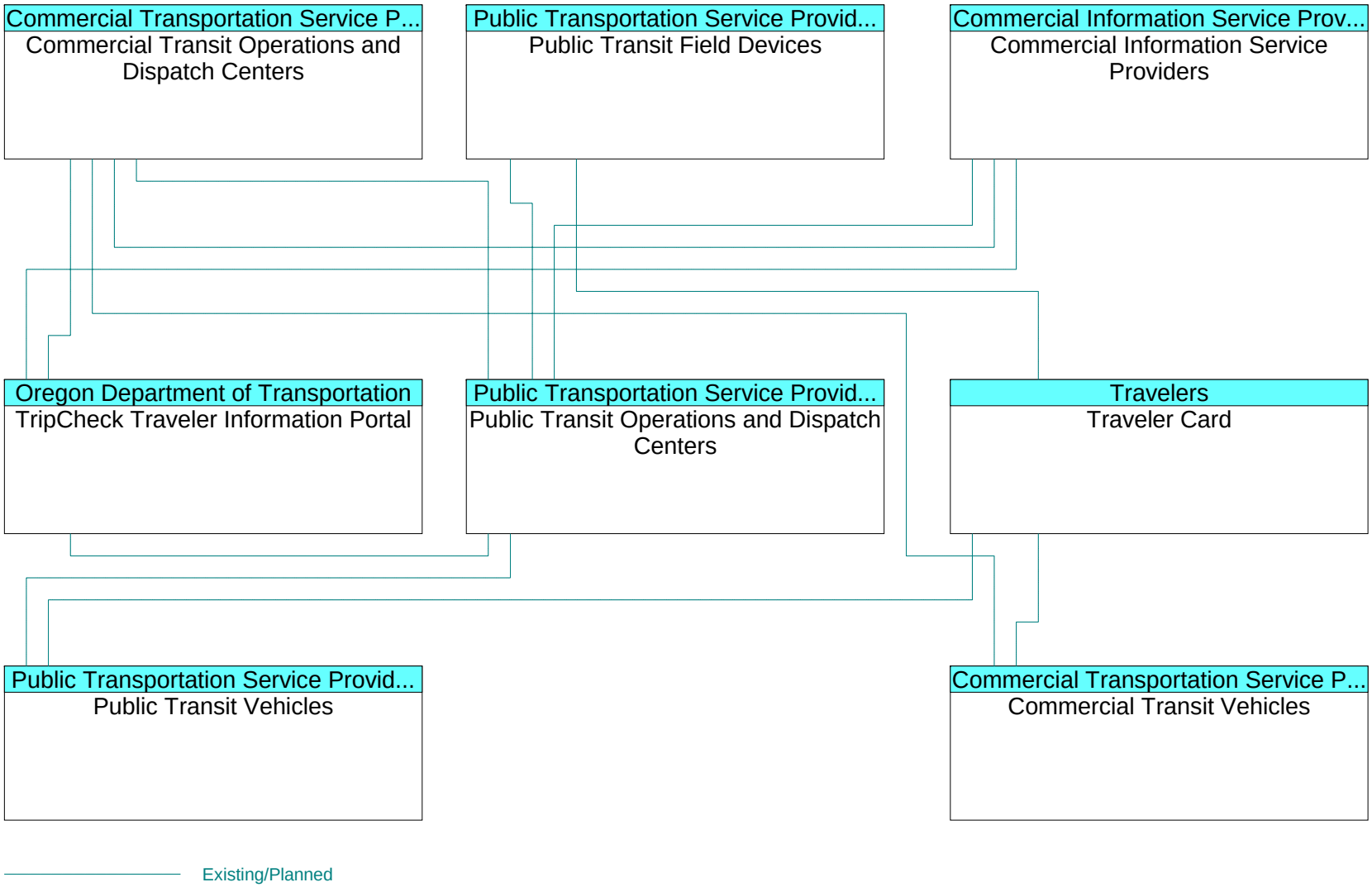
# APTS2: Transit Fixed-Route Operations



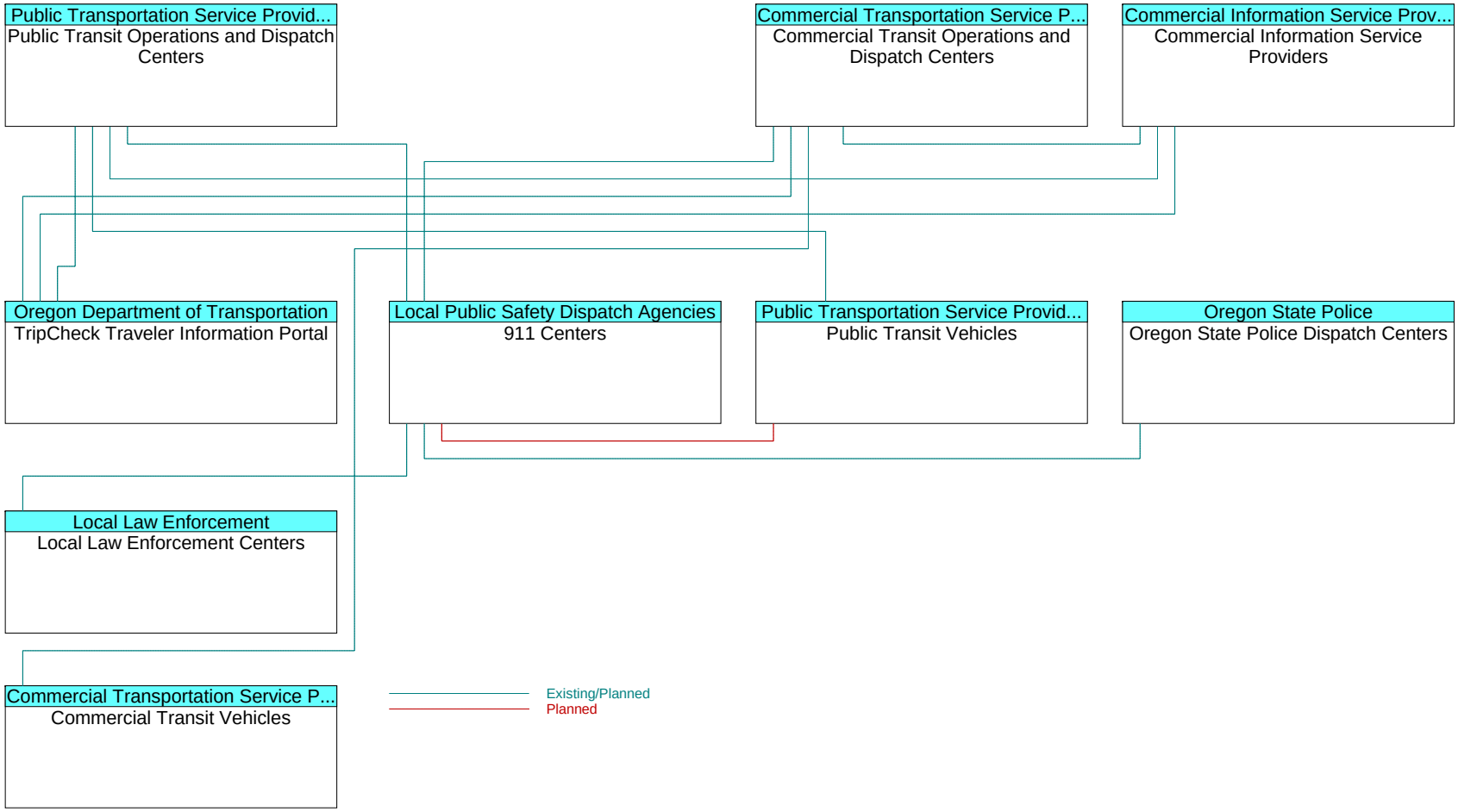
# APTS3: Demand Response Transit Operations



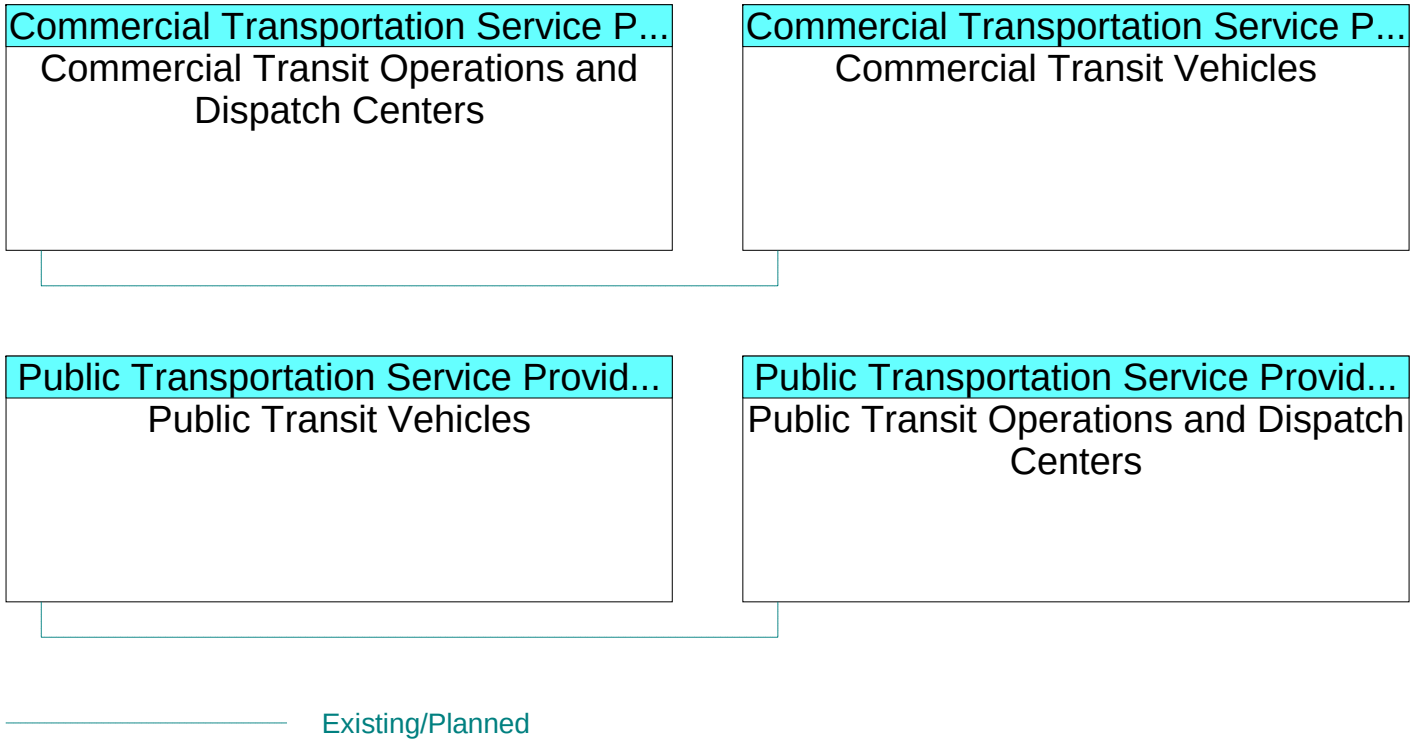
# APTS4: Transit Fare Collection Management



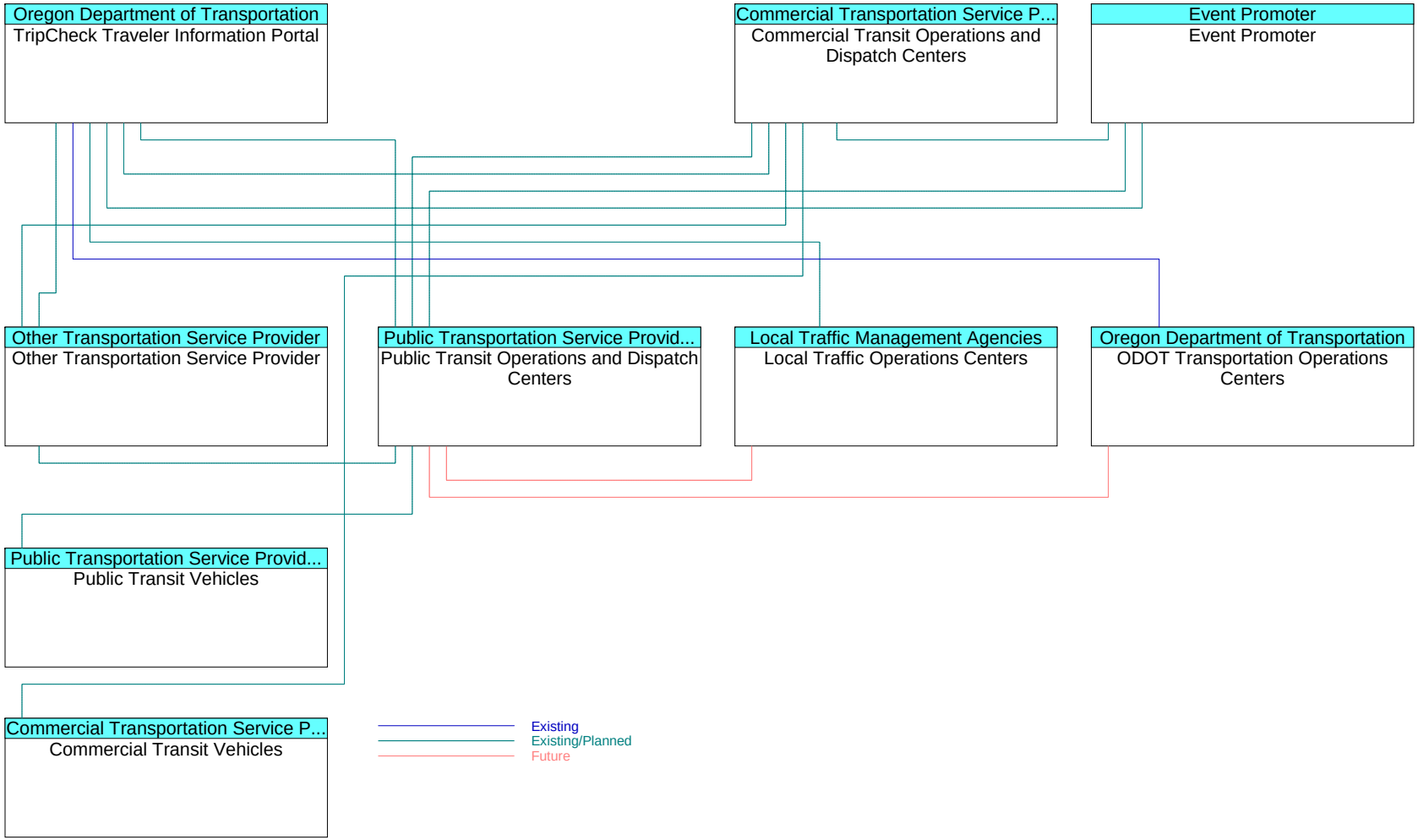
# APTS5: Transit Security



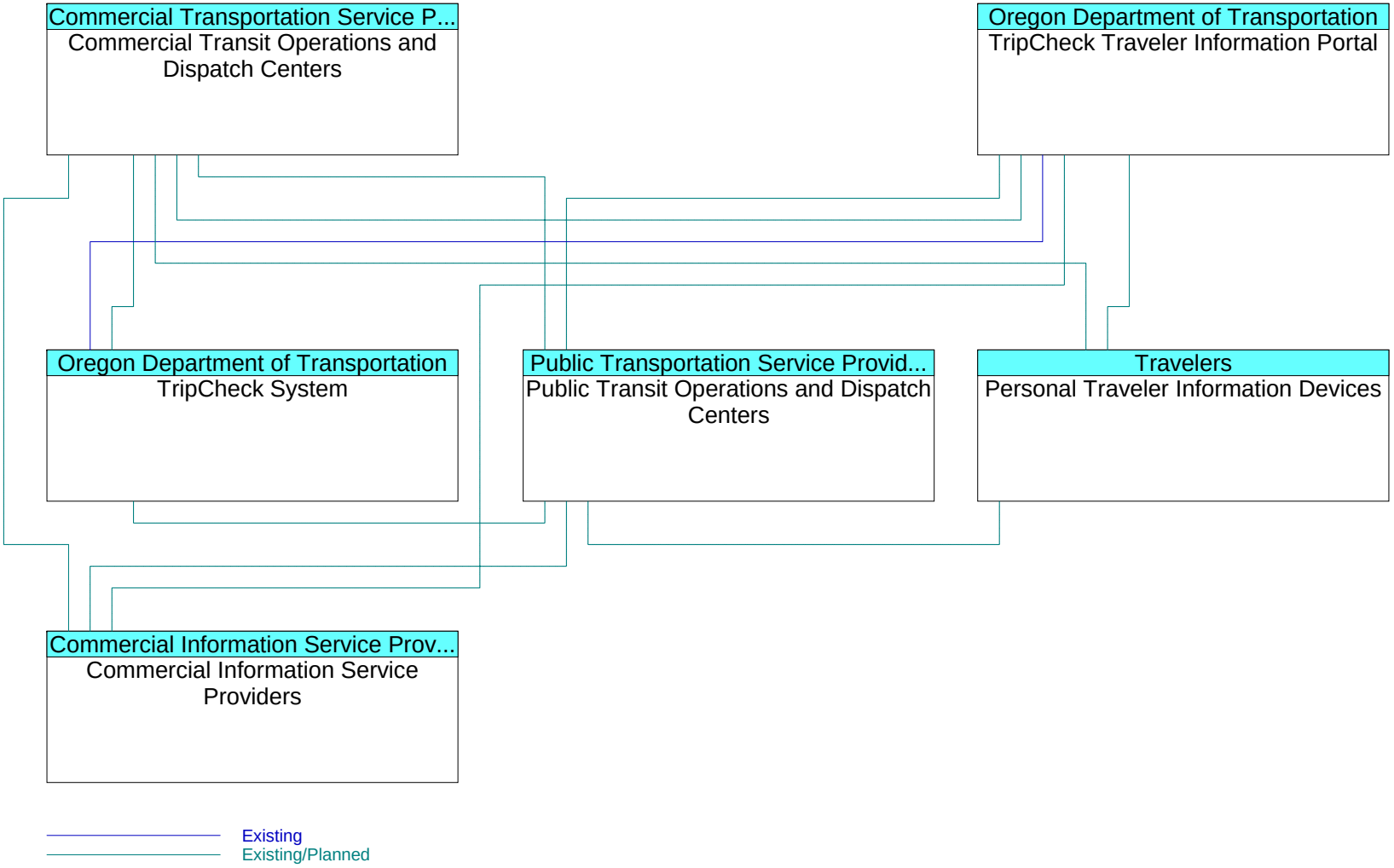
## APTS6: Transit Fleet Management



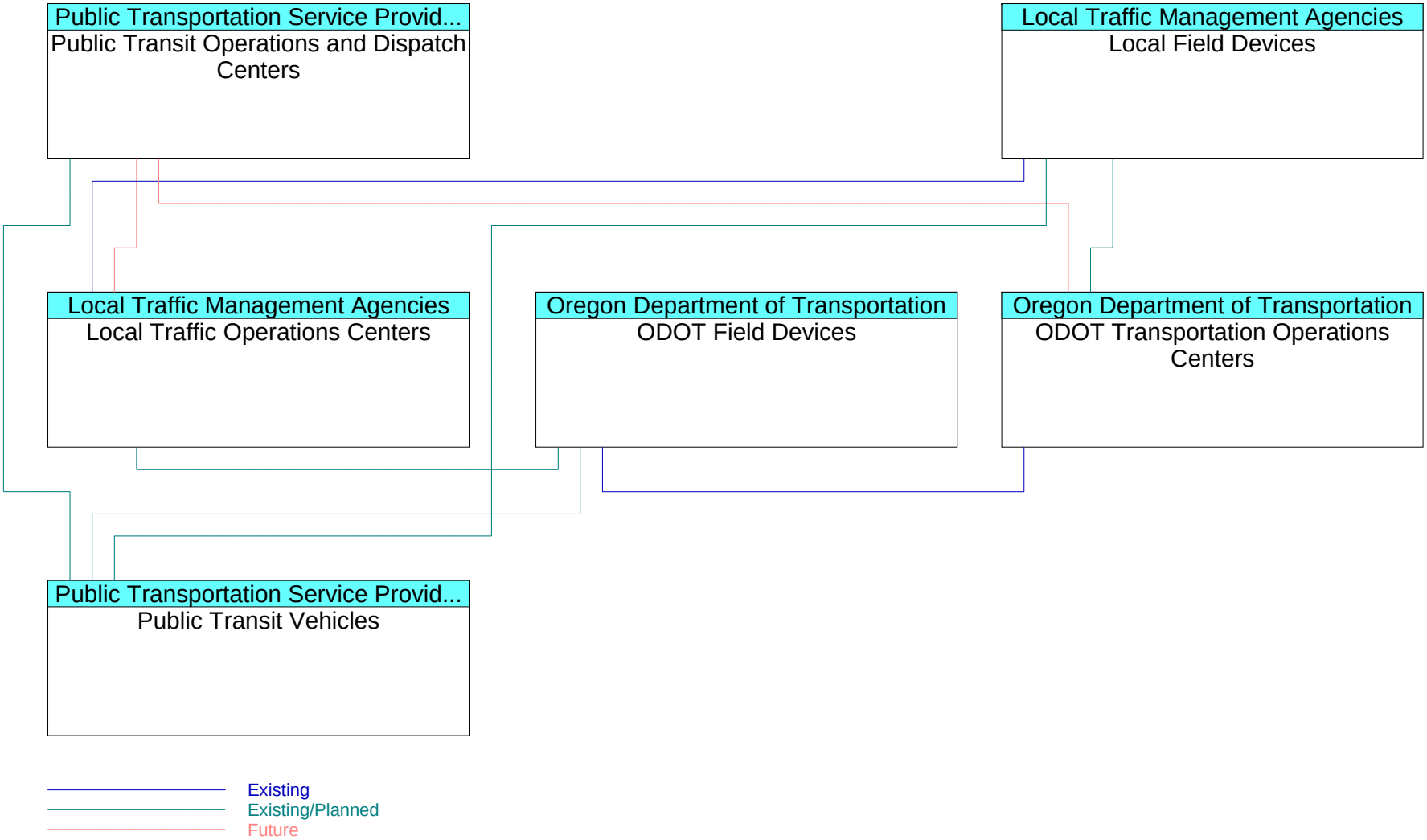
# APTS7: Multi-Modal Coordination



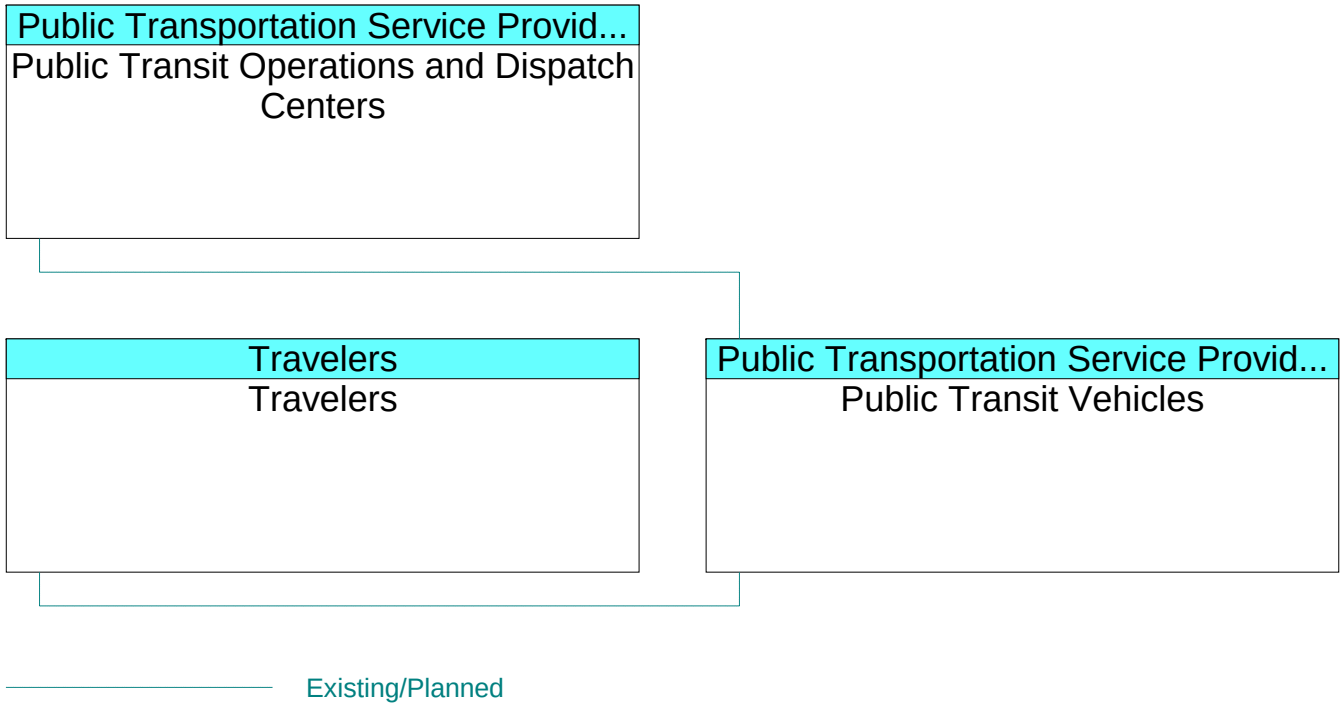
# APTS8: Transit Traveler Information



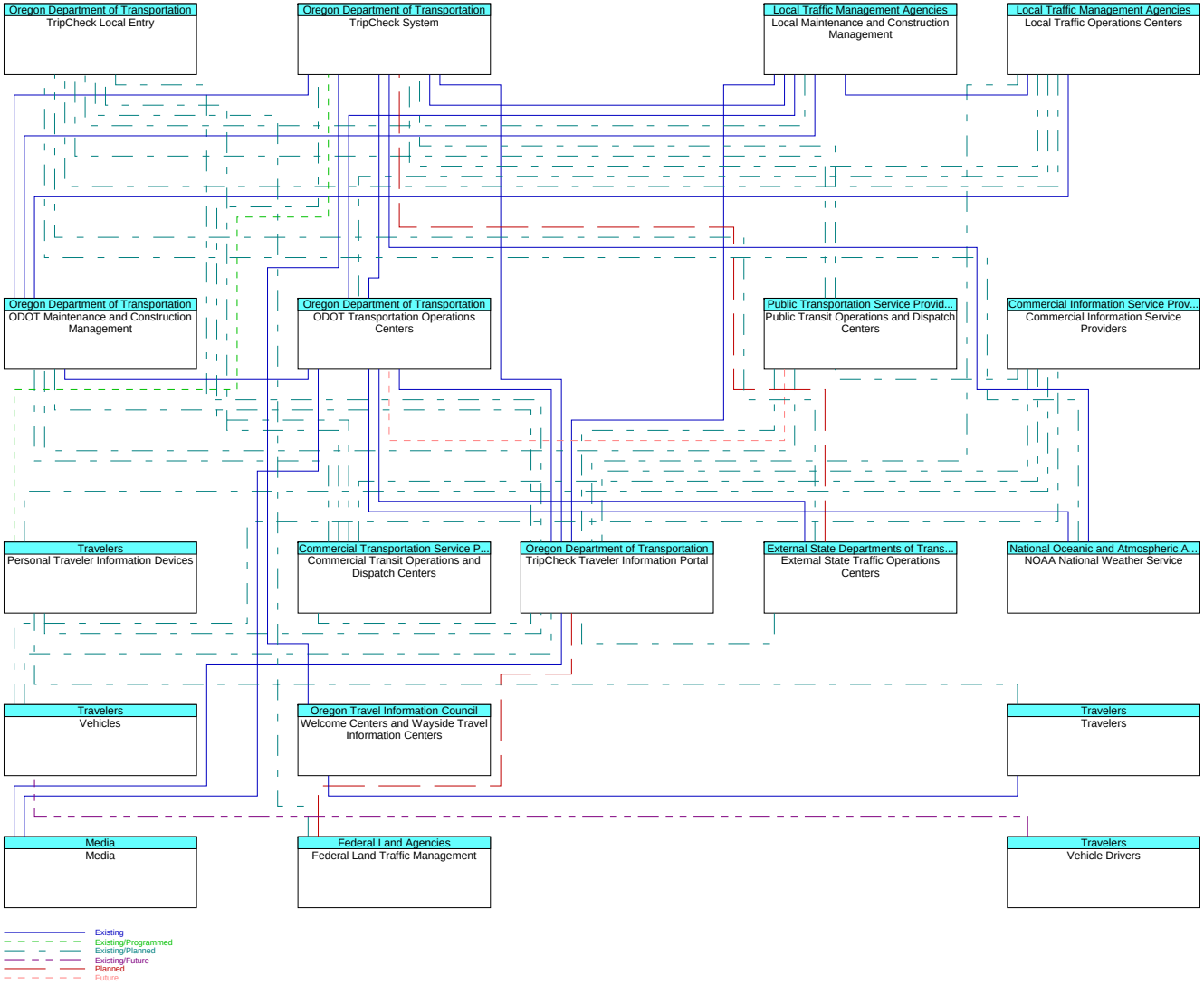
# APTS9: Transit Signal Priority



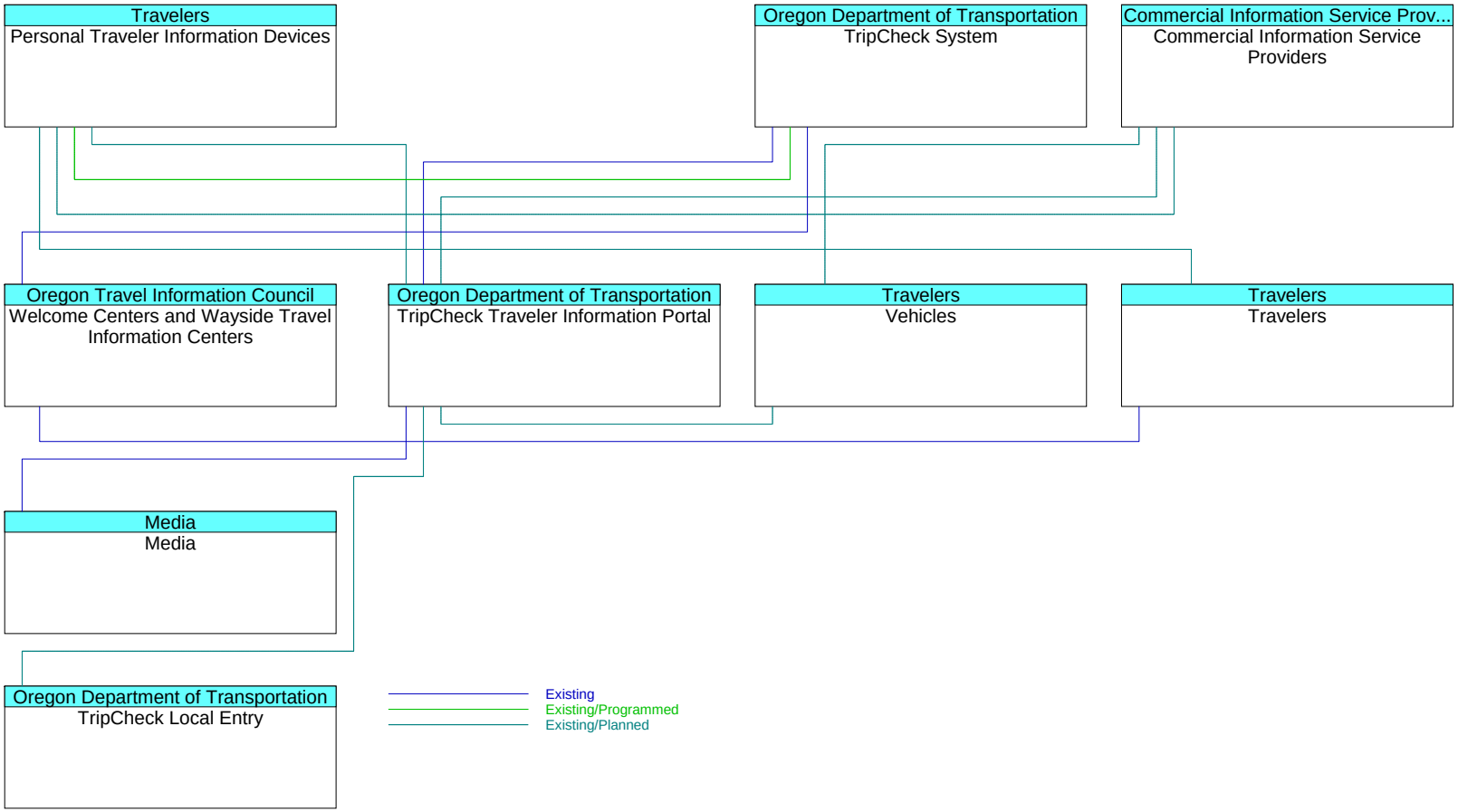
## APTS10: Transit Passenger Counting



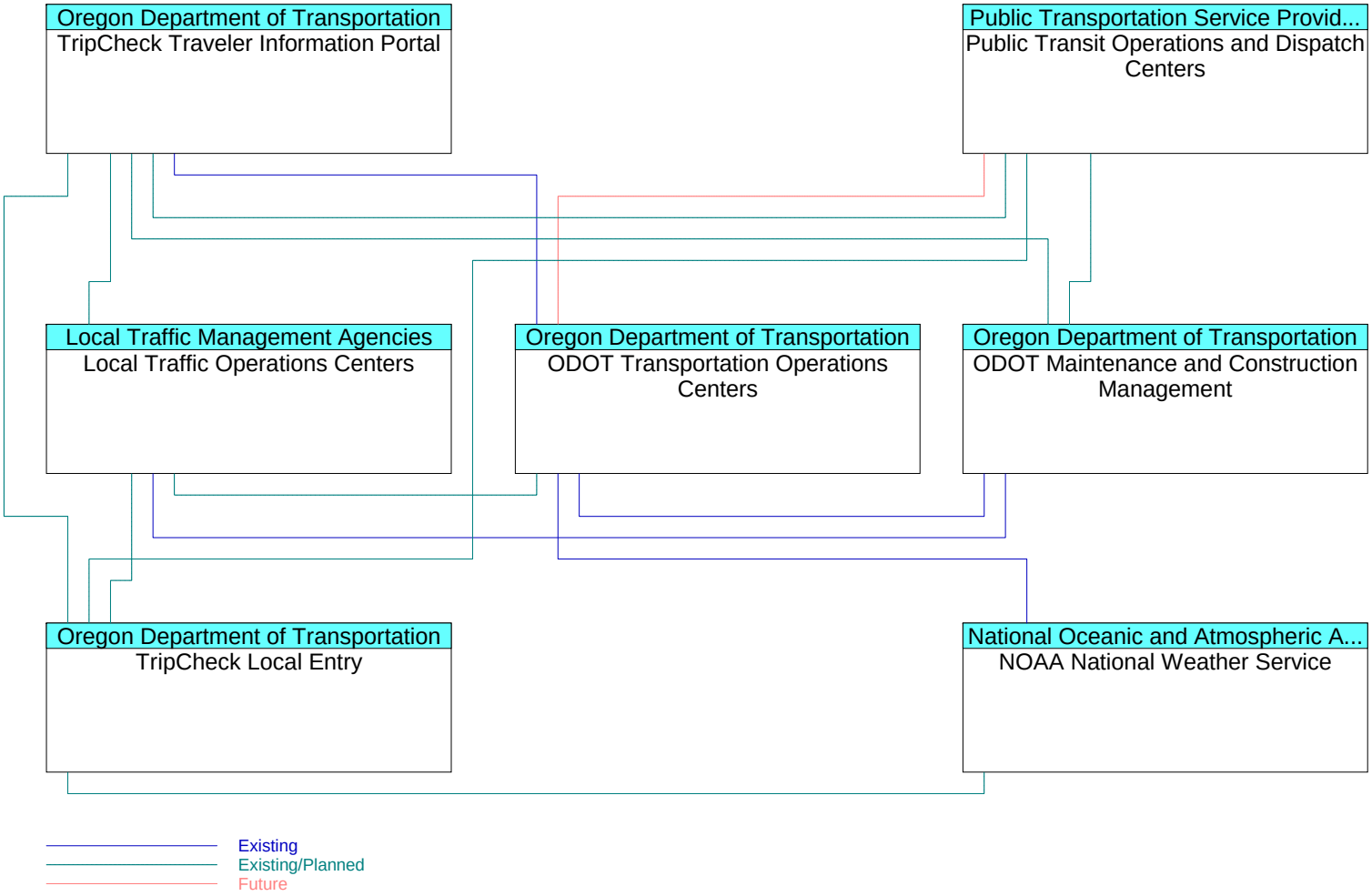
# ATIS1: Broadcast Traveler Information



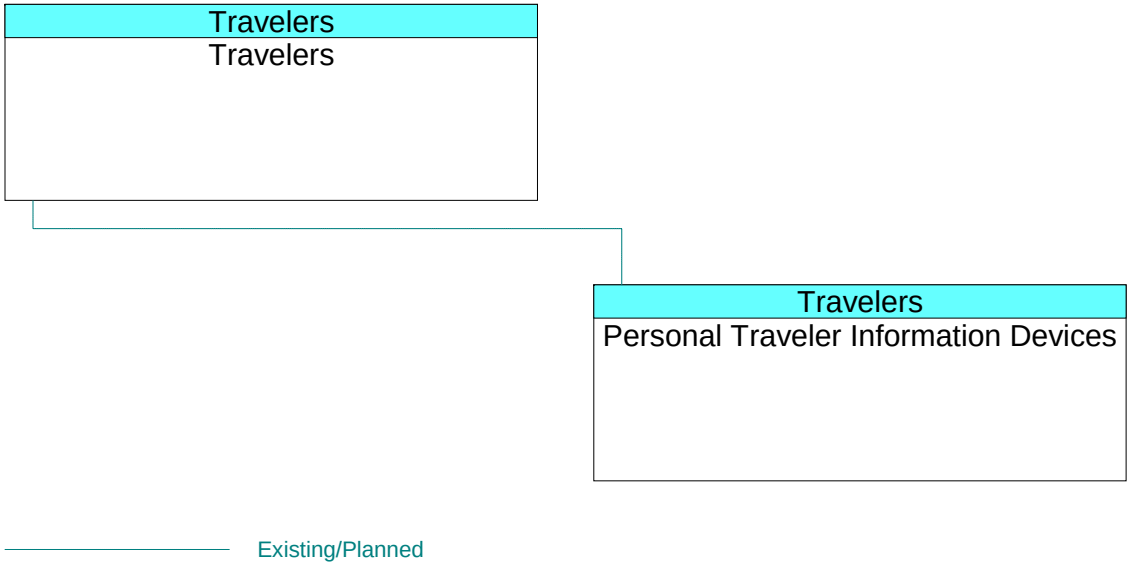
# ATIS2: Interactive Traveler Information



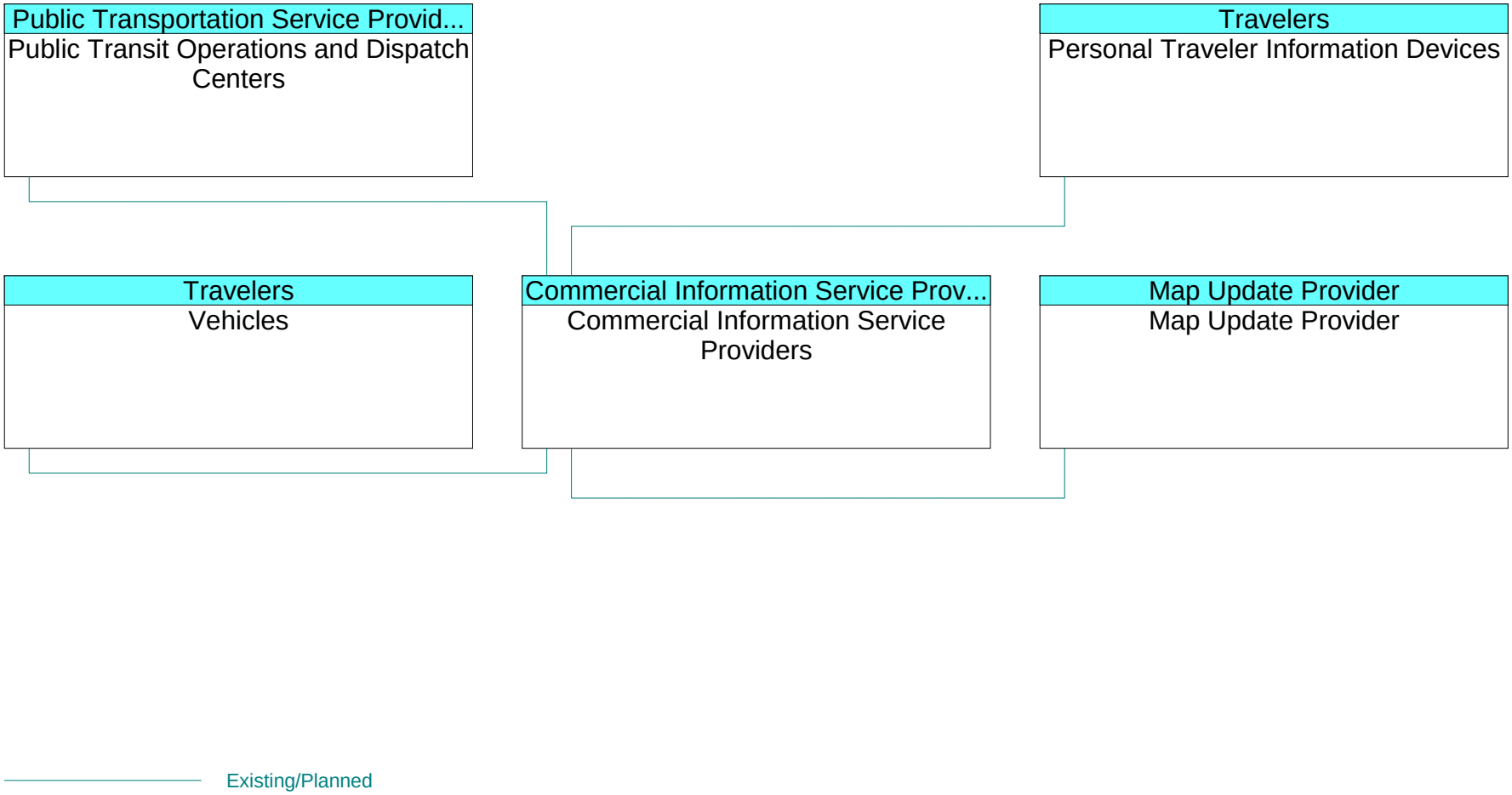
# ATIS6: Transportation Operations Data Sharing



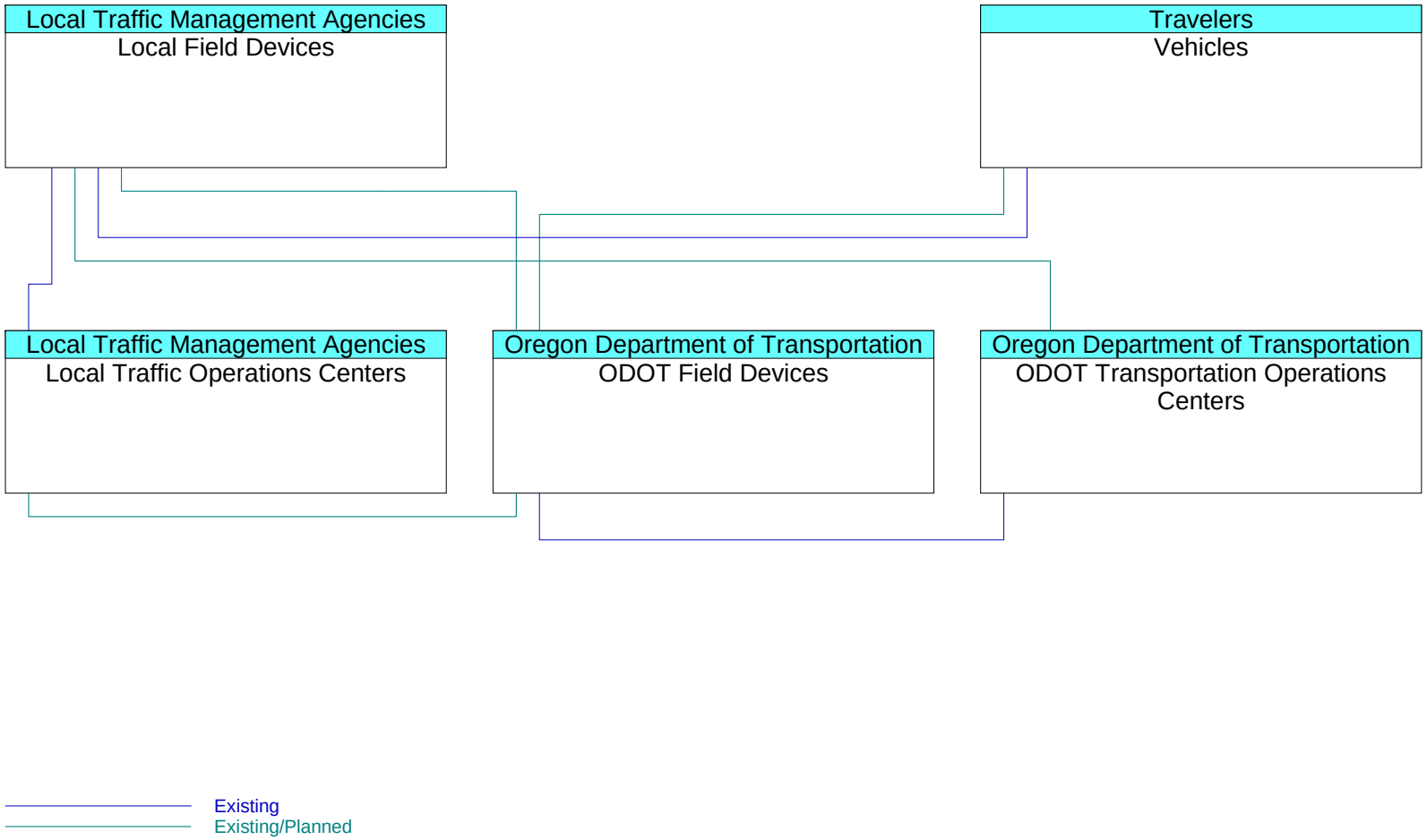
# ATIS7: Yellow Pages and Reservation



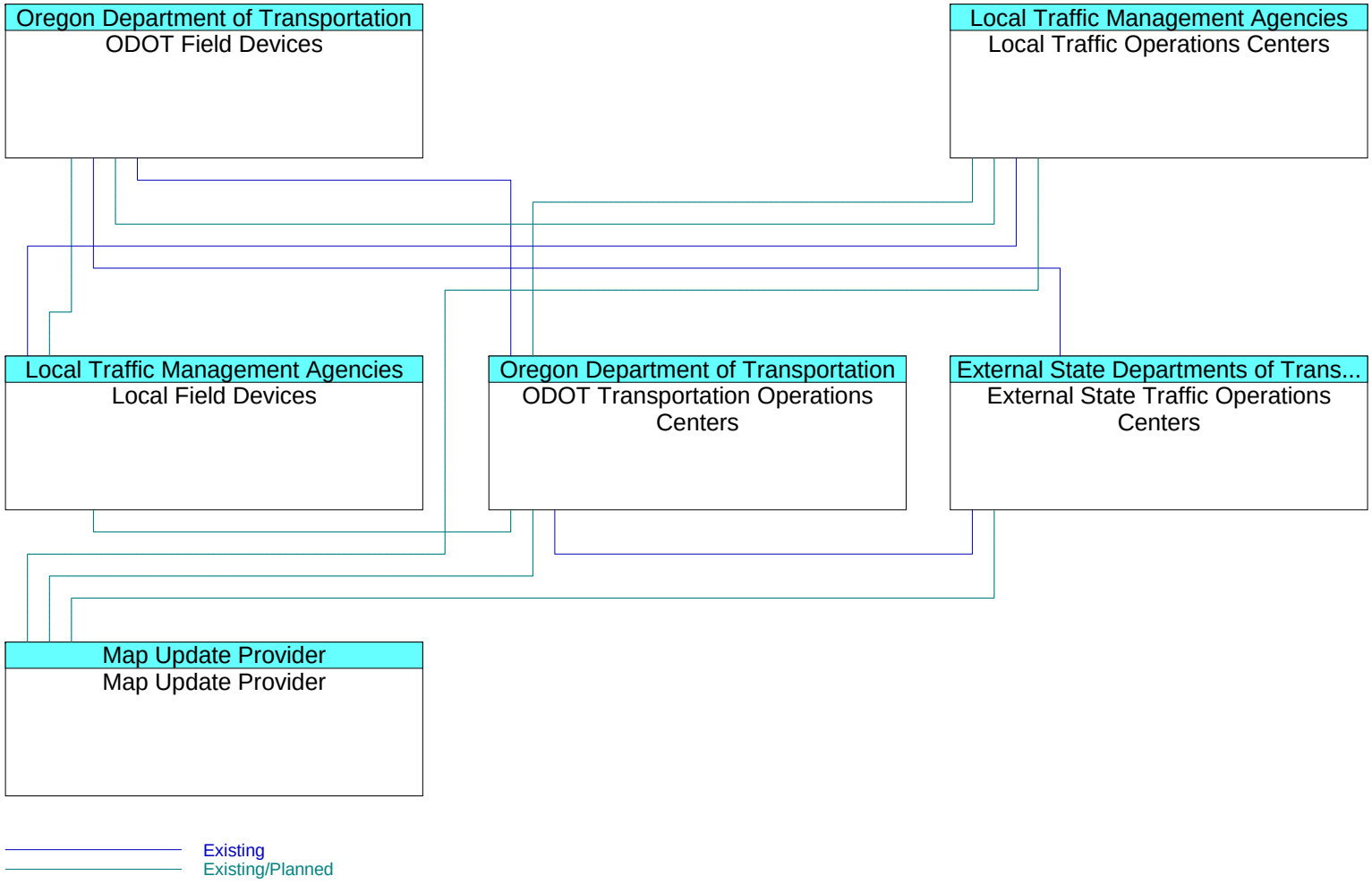
# ATIS8: Dynamic Ridesharing



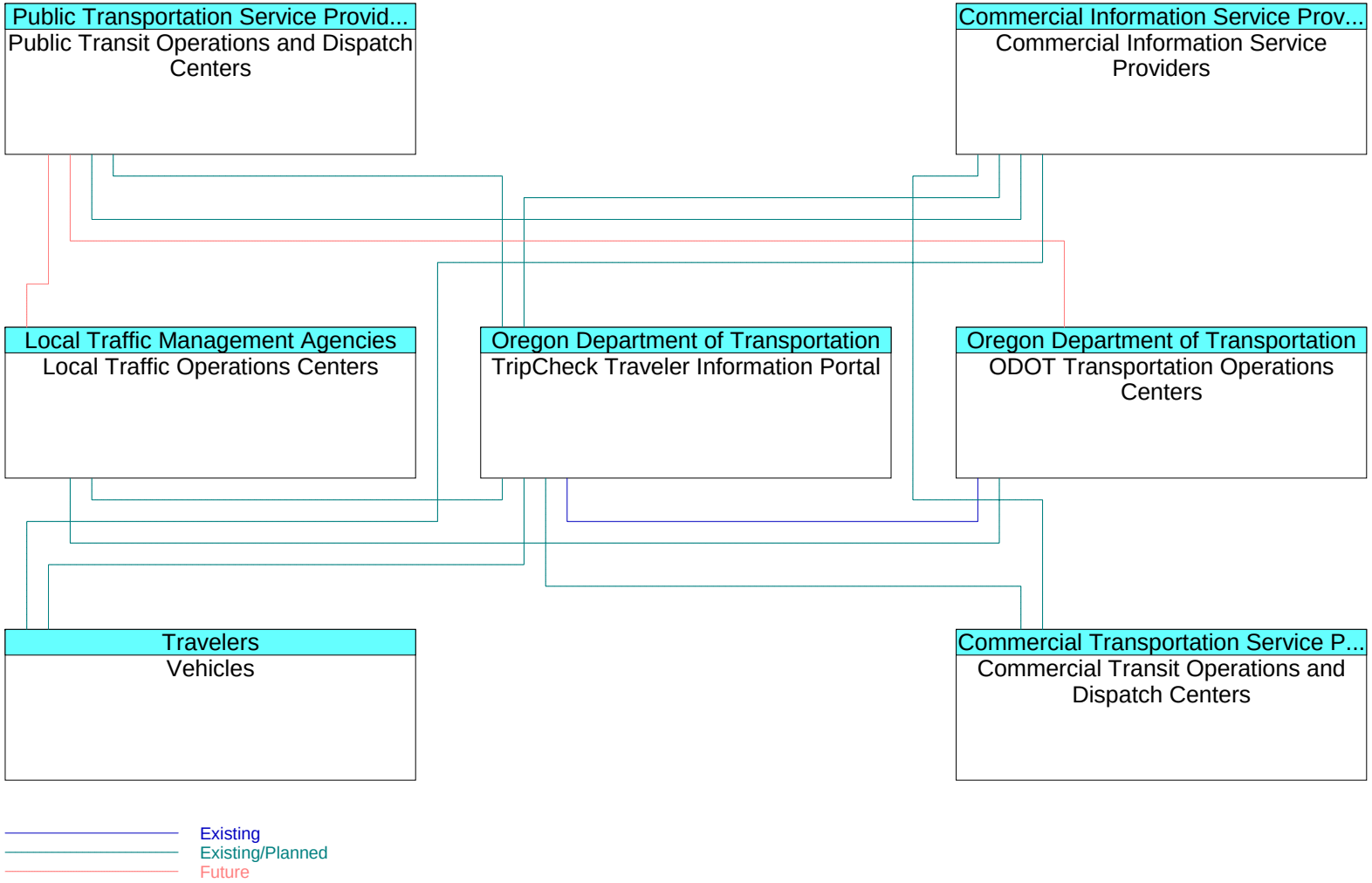
# ATIS9: In Vehicle Signing



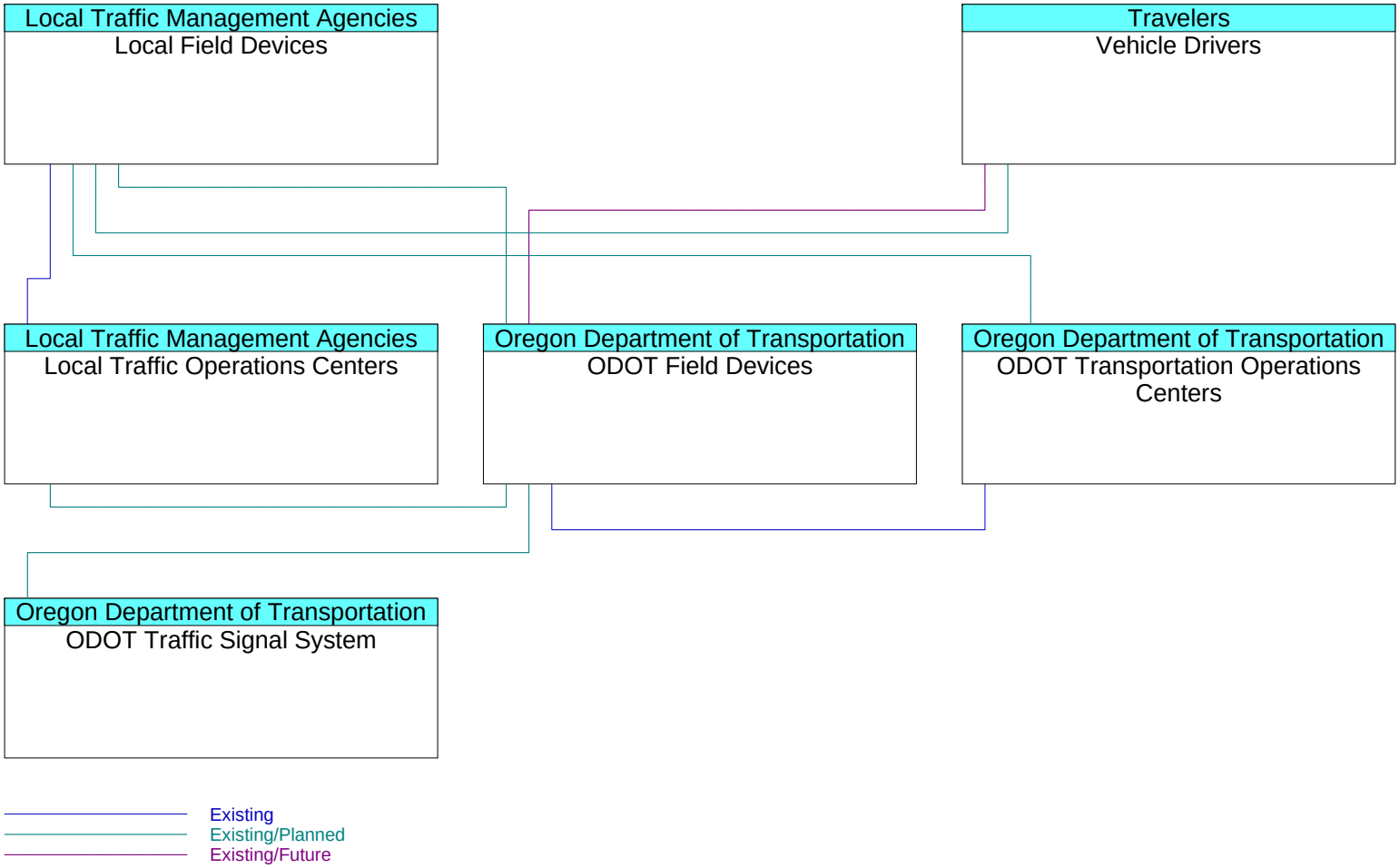
# ATMS1: Network Surveillance



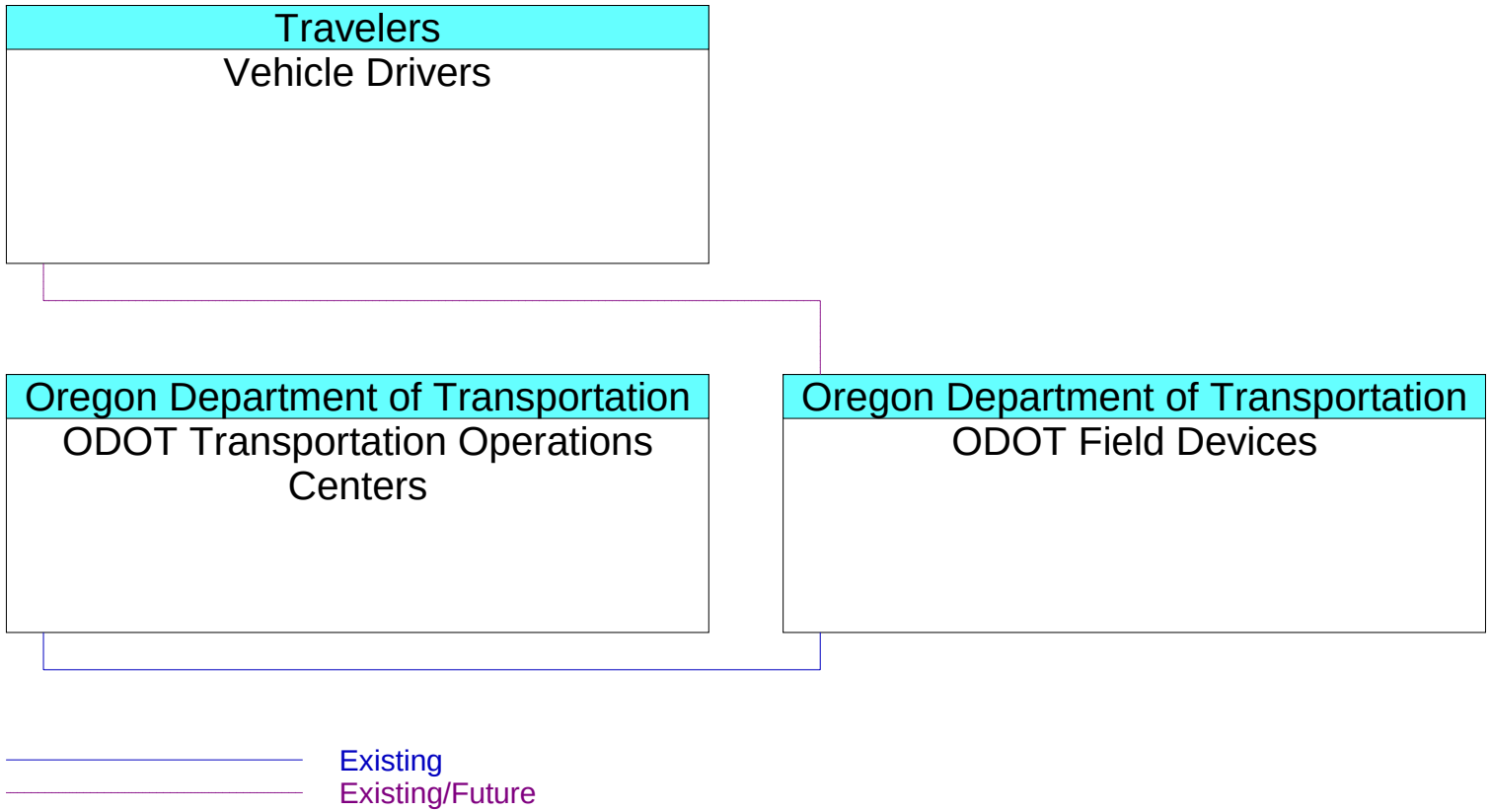
# ATMS2: Traffic Probe Surveillance



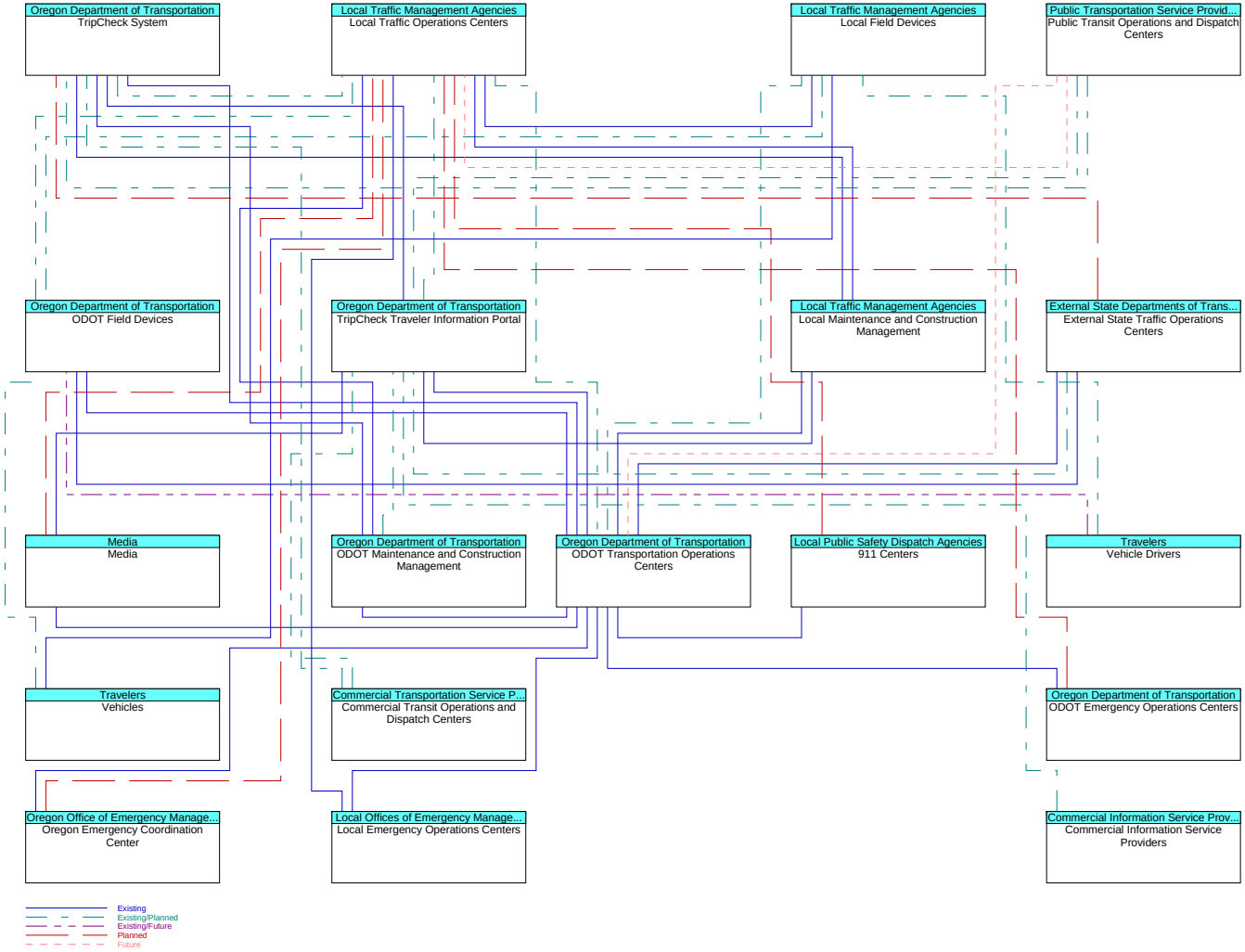
# ATMS3: Surface Street Control



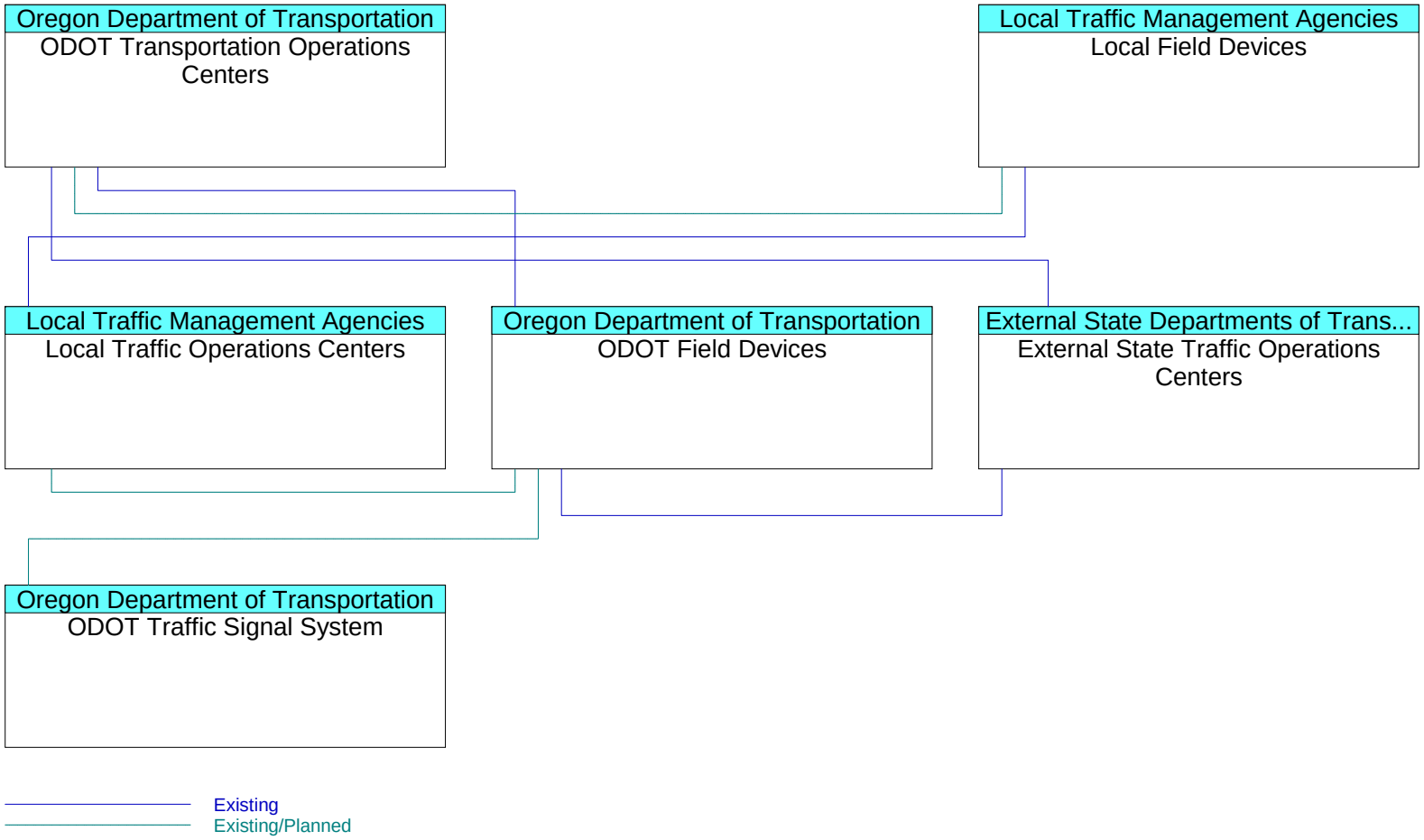
ATMS4: Freeway Control



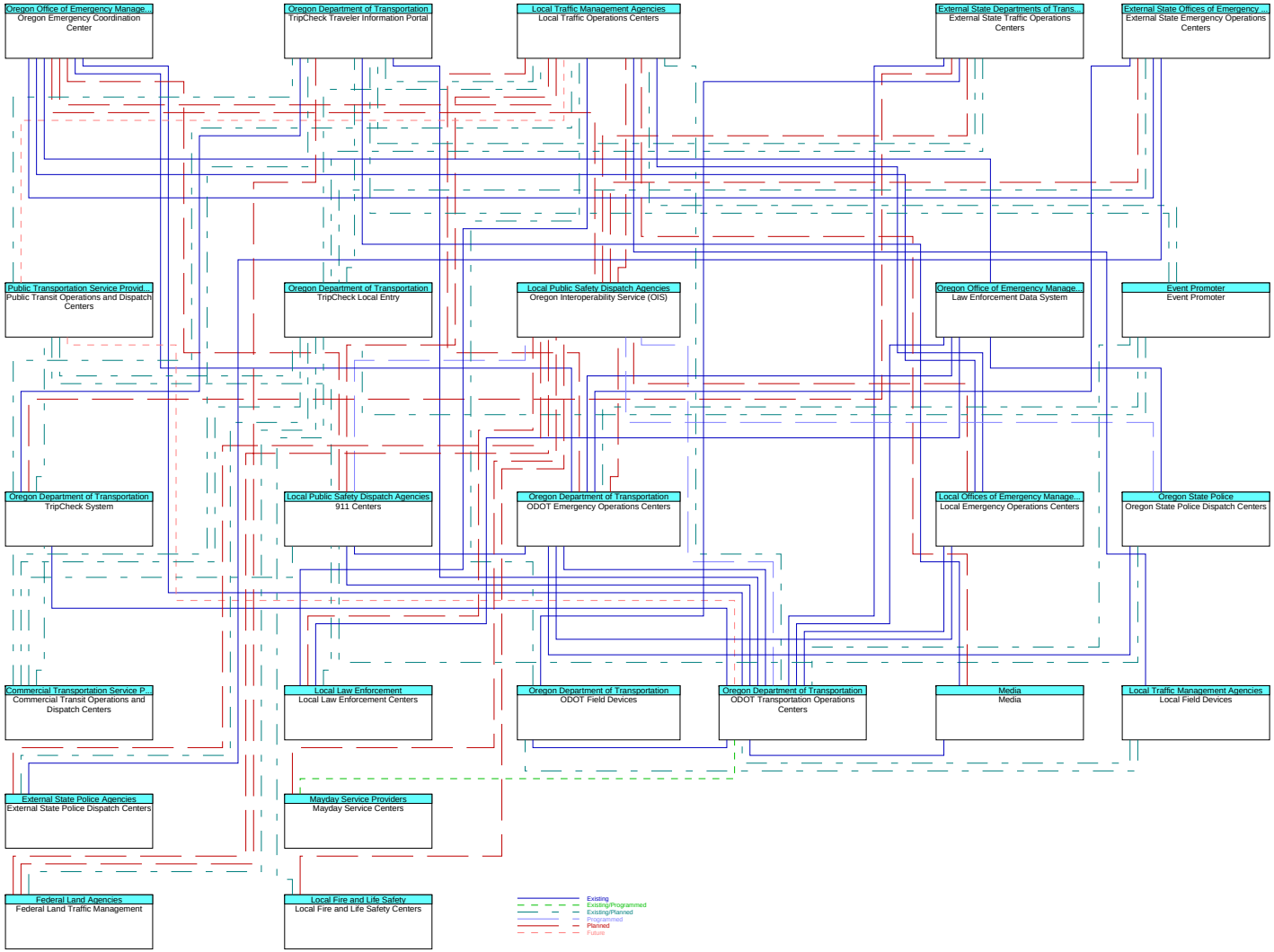
# ATMS6: Traffic Information Dissemination



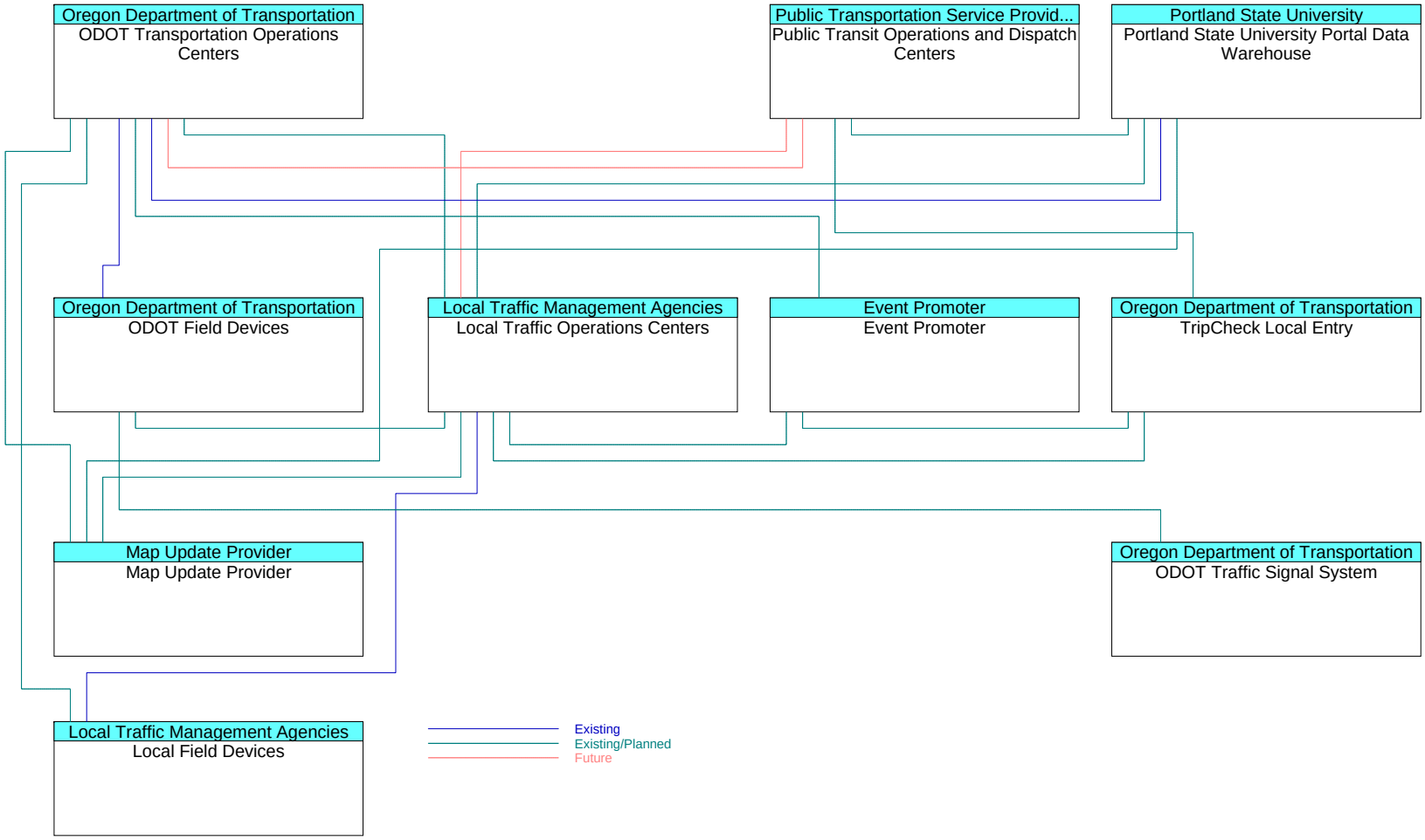
# ATMS7: Regional Traffic Management



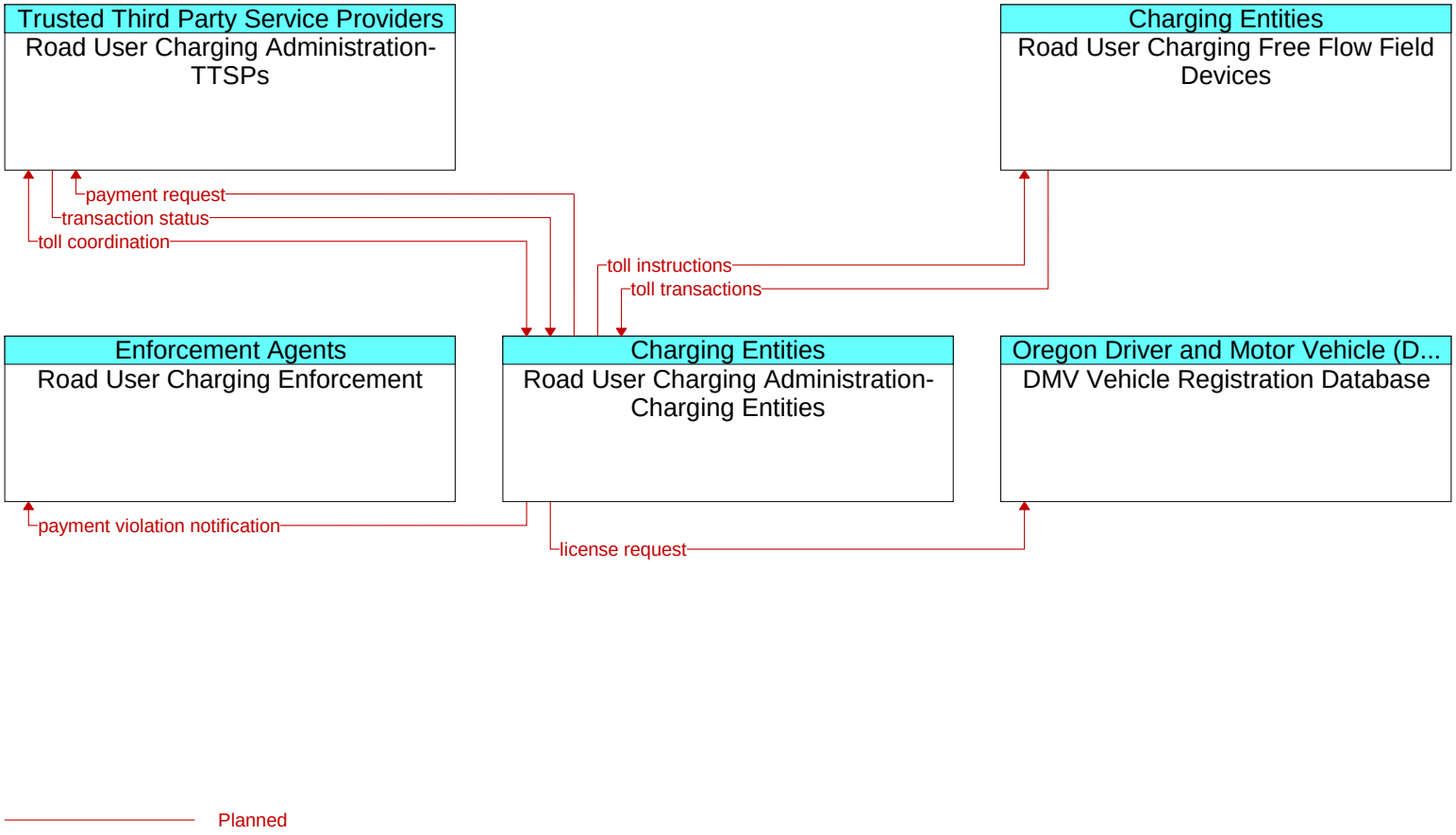
# ATMS8: Traffic Incident Management System



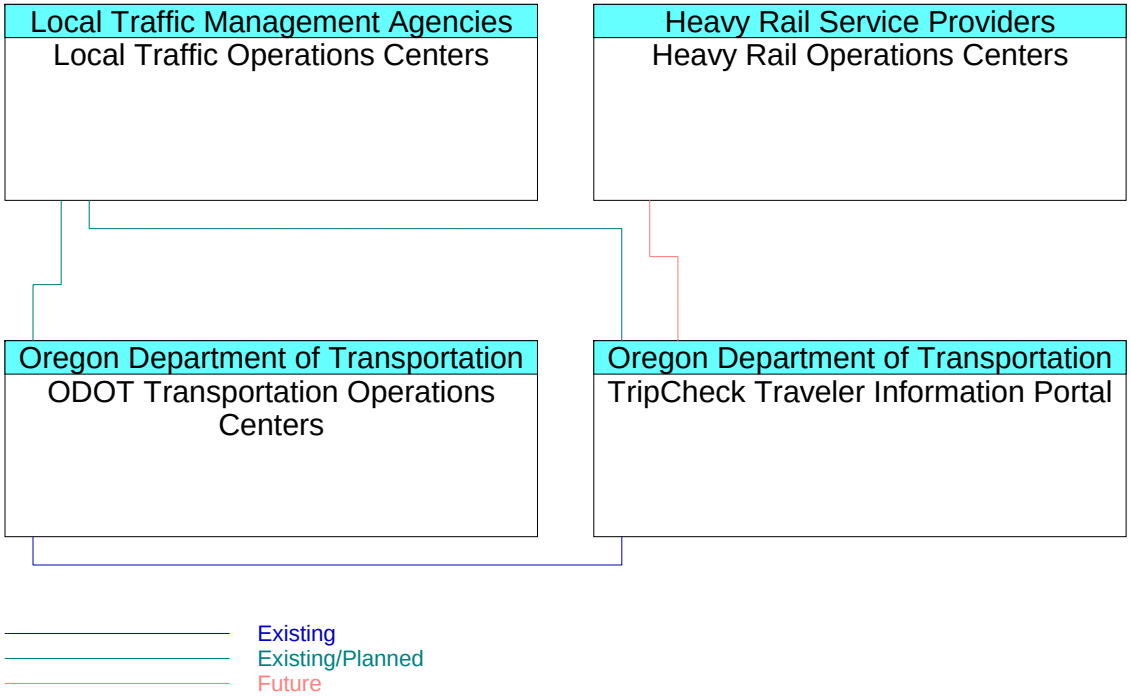
# ATMS9: Traffic Decision Support and Demand Management



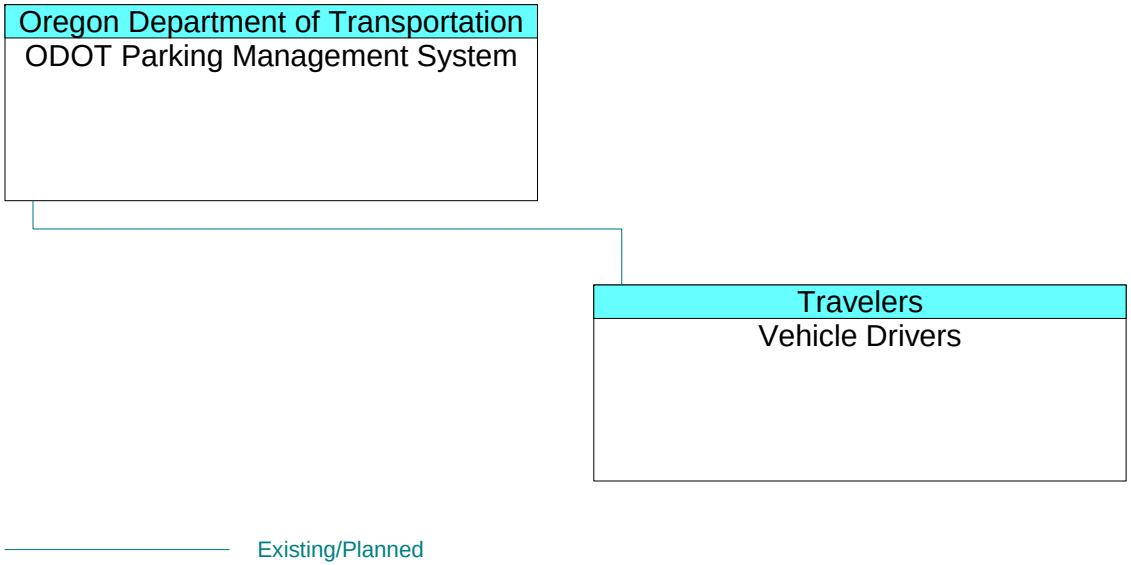
# ATMS10: Electronic Toll Collection



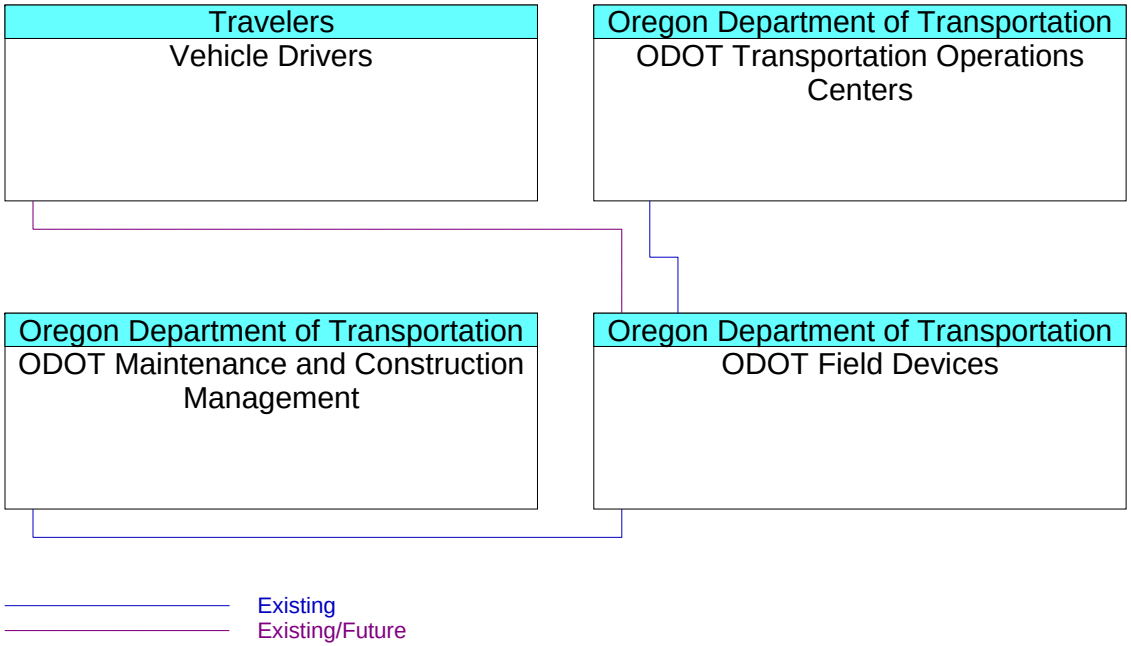
# ATMS15: Railroad Operations Coordination



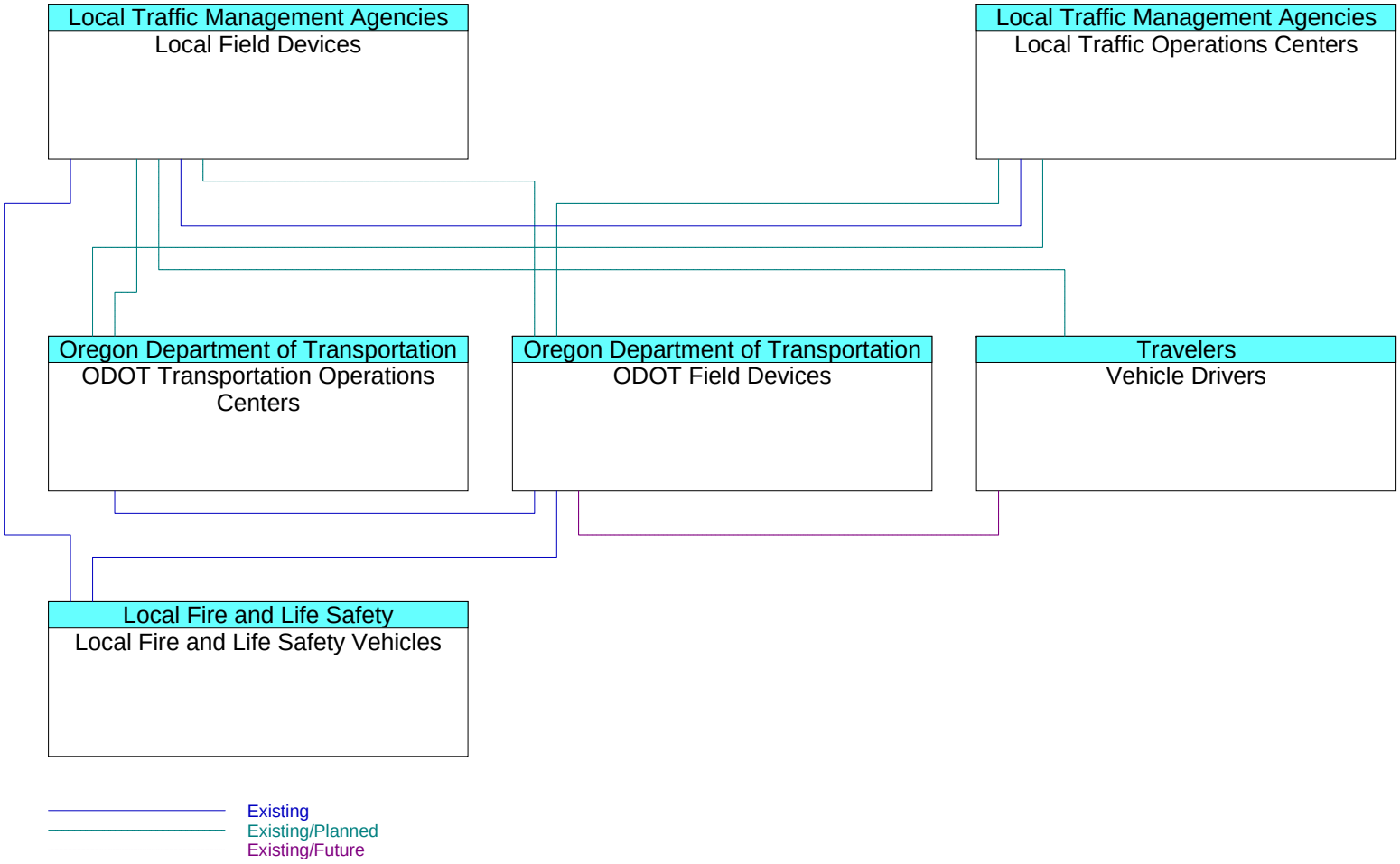
# ATMS16: Parking Facility Management



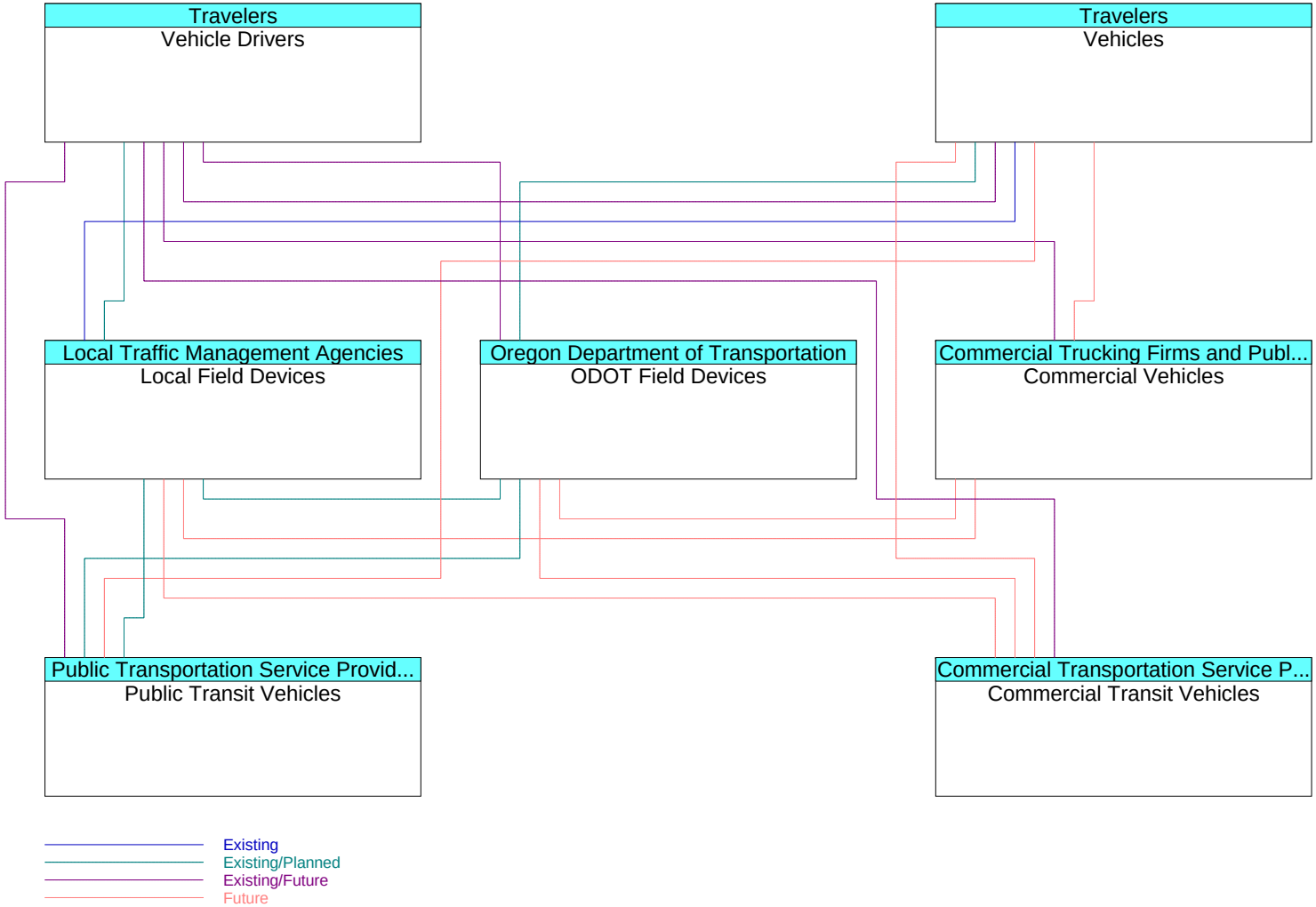
# ATMS19: Speed Monitoring



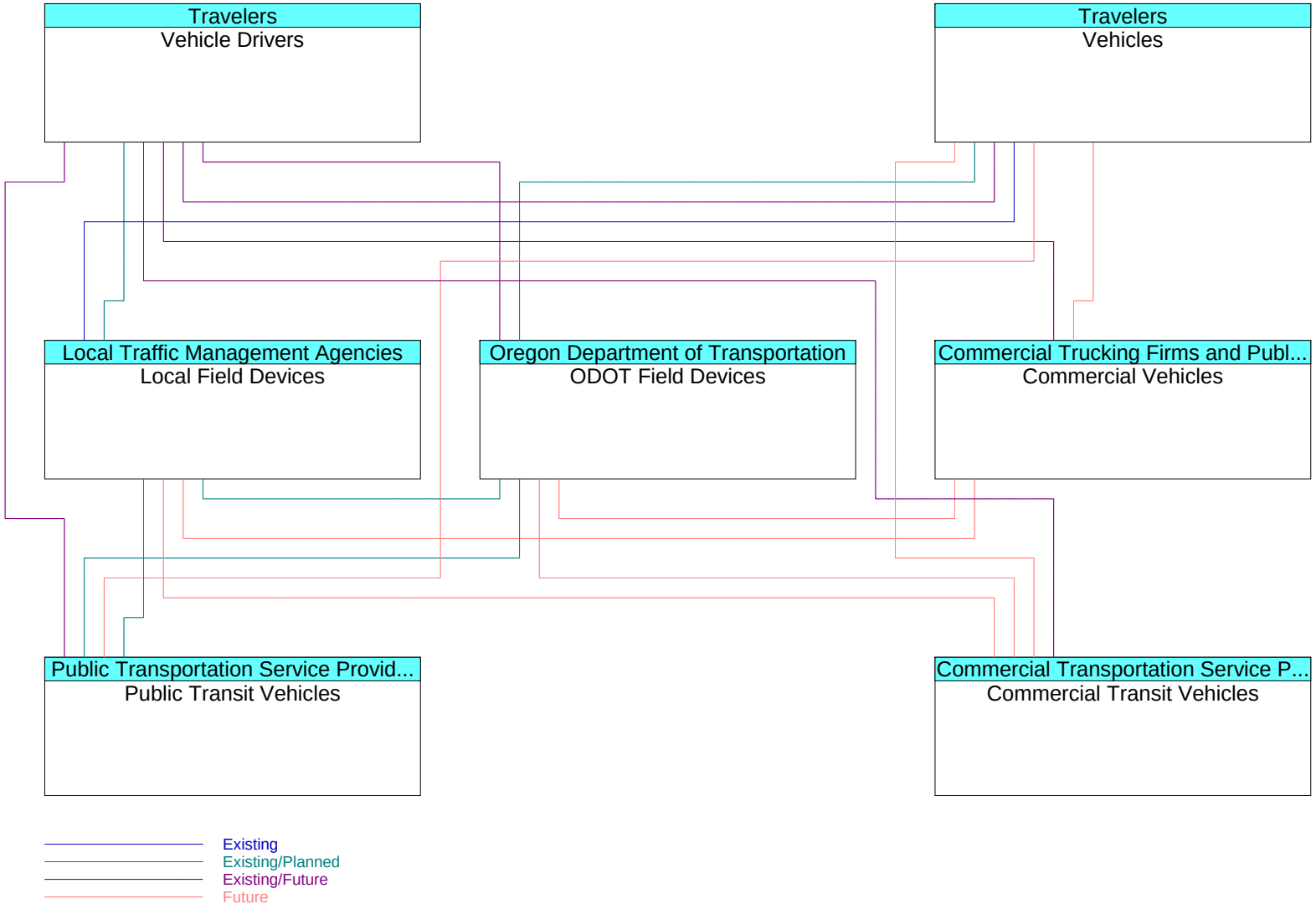
# ATMS21: Roadway Closure Management



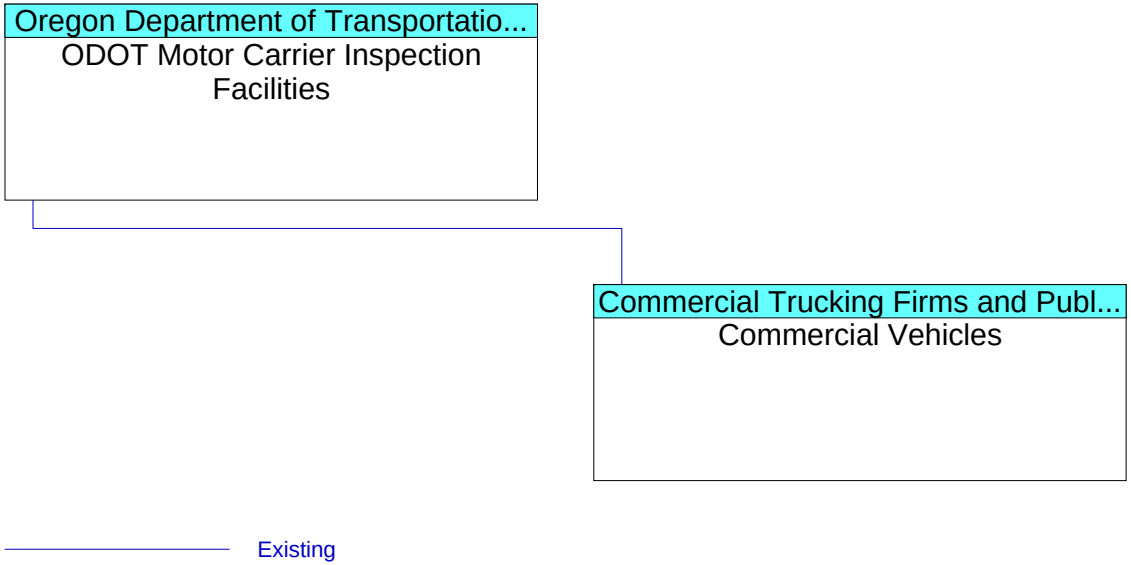
# AVSS5: Intersection Safety Warning



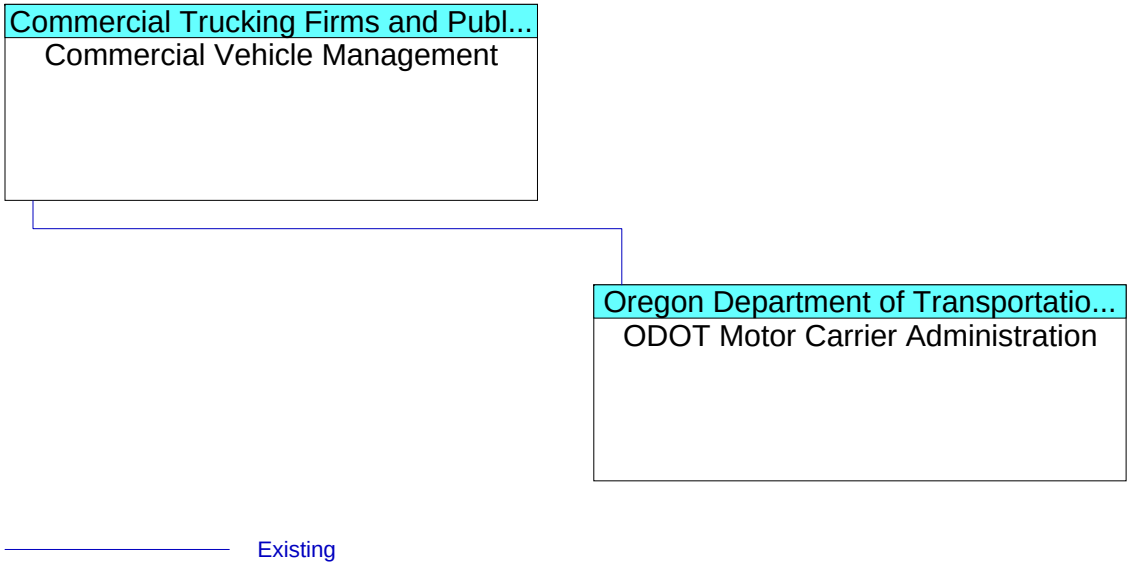
# AVSS10: Intersection Collision Avoidance



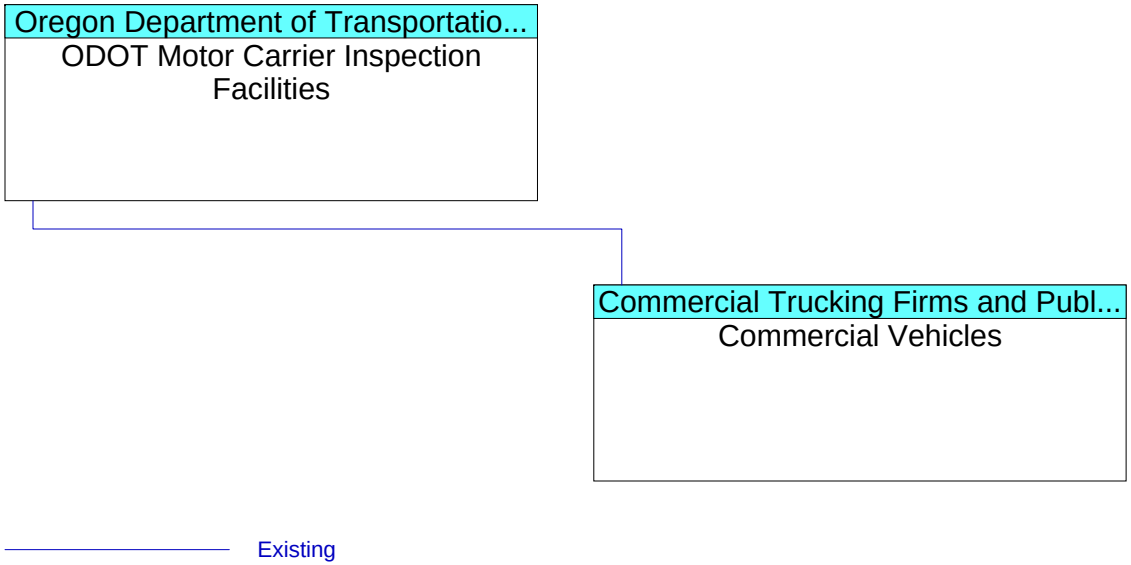
# CVO3: Electronic Clearance



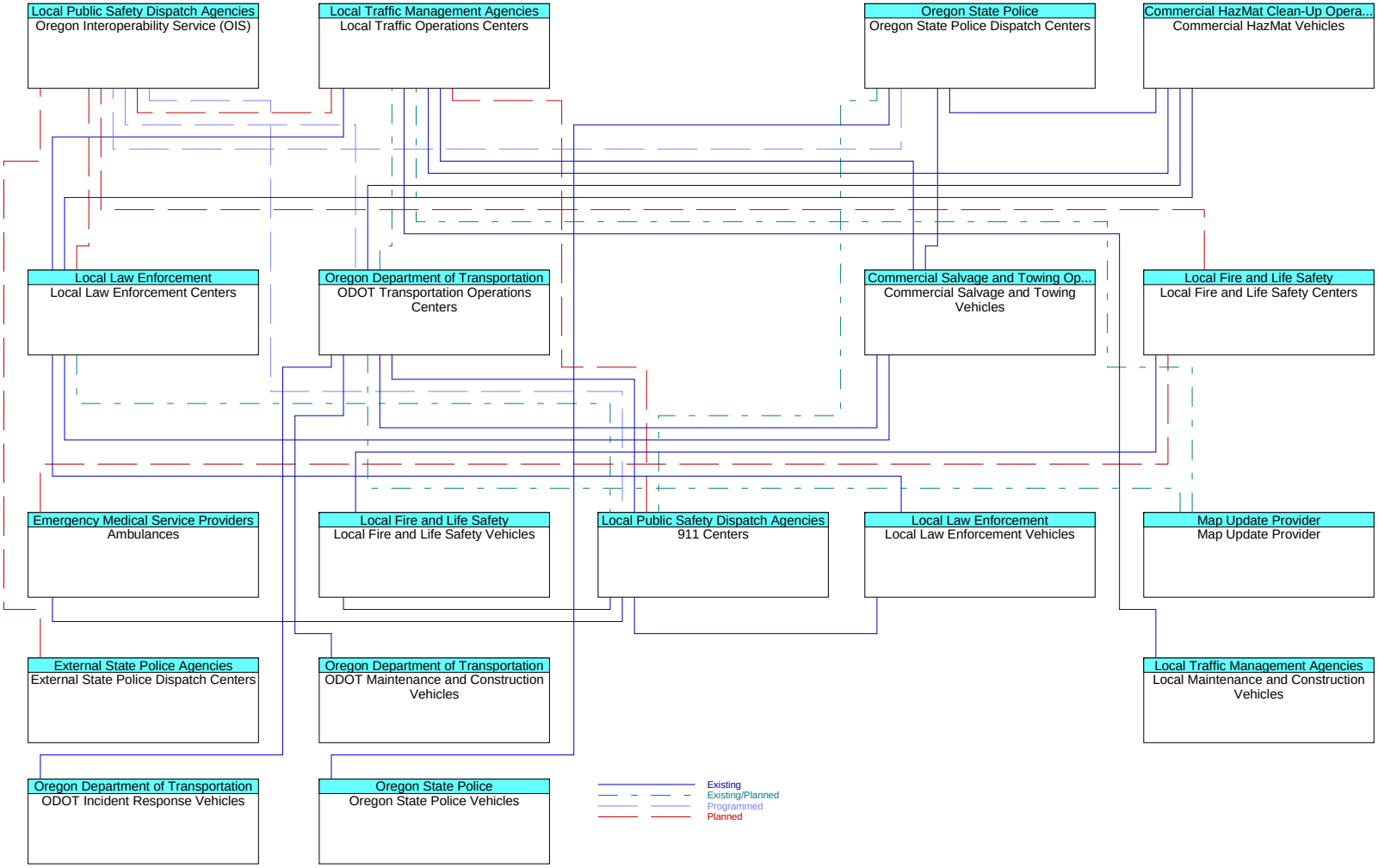
# CVO4: CV Administrative Processes



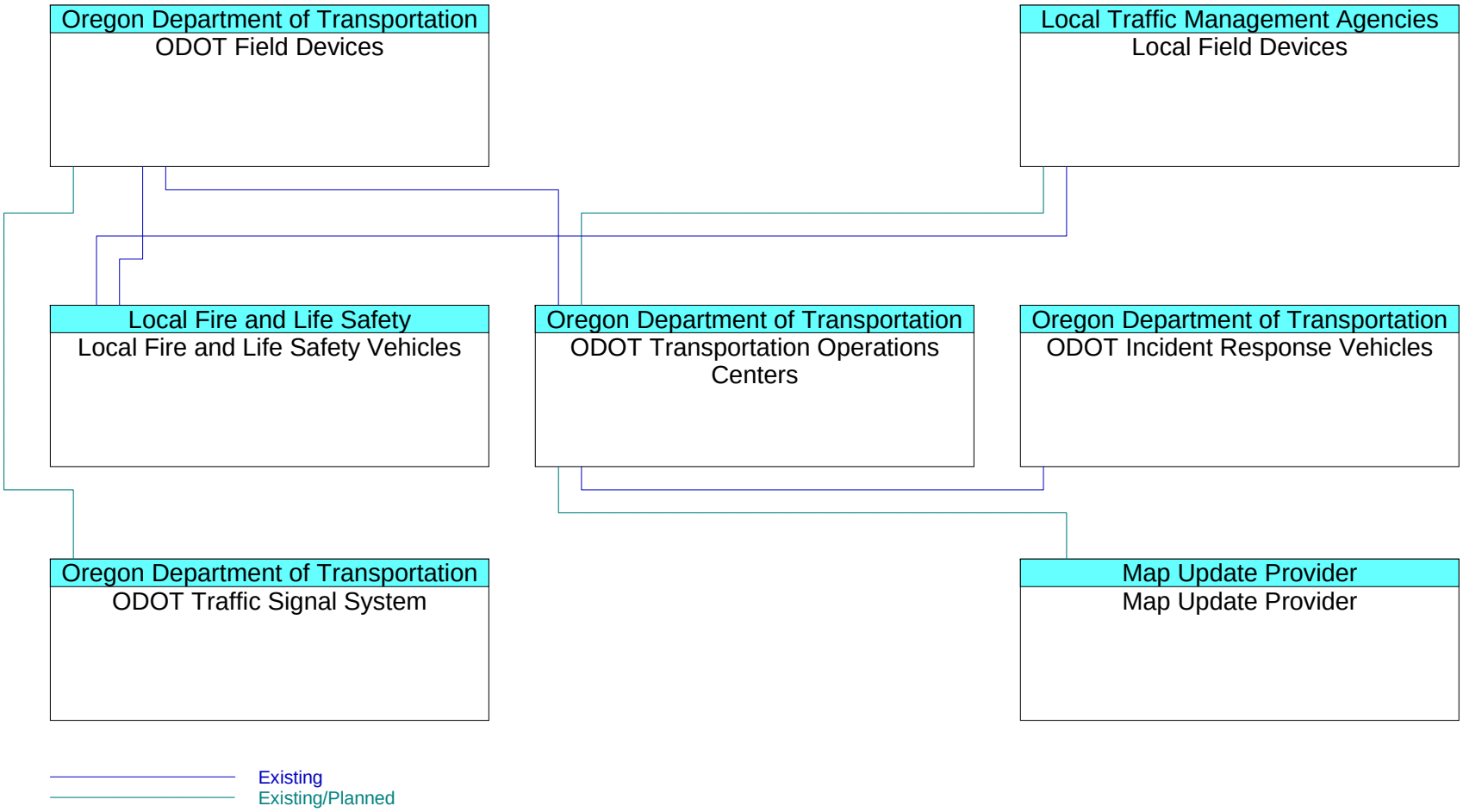
# CVO6: Weigh-in-Motion



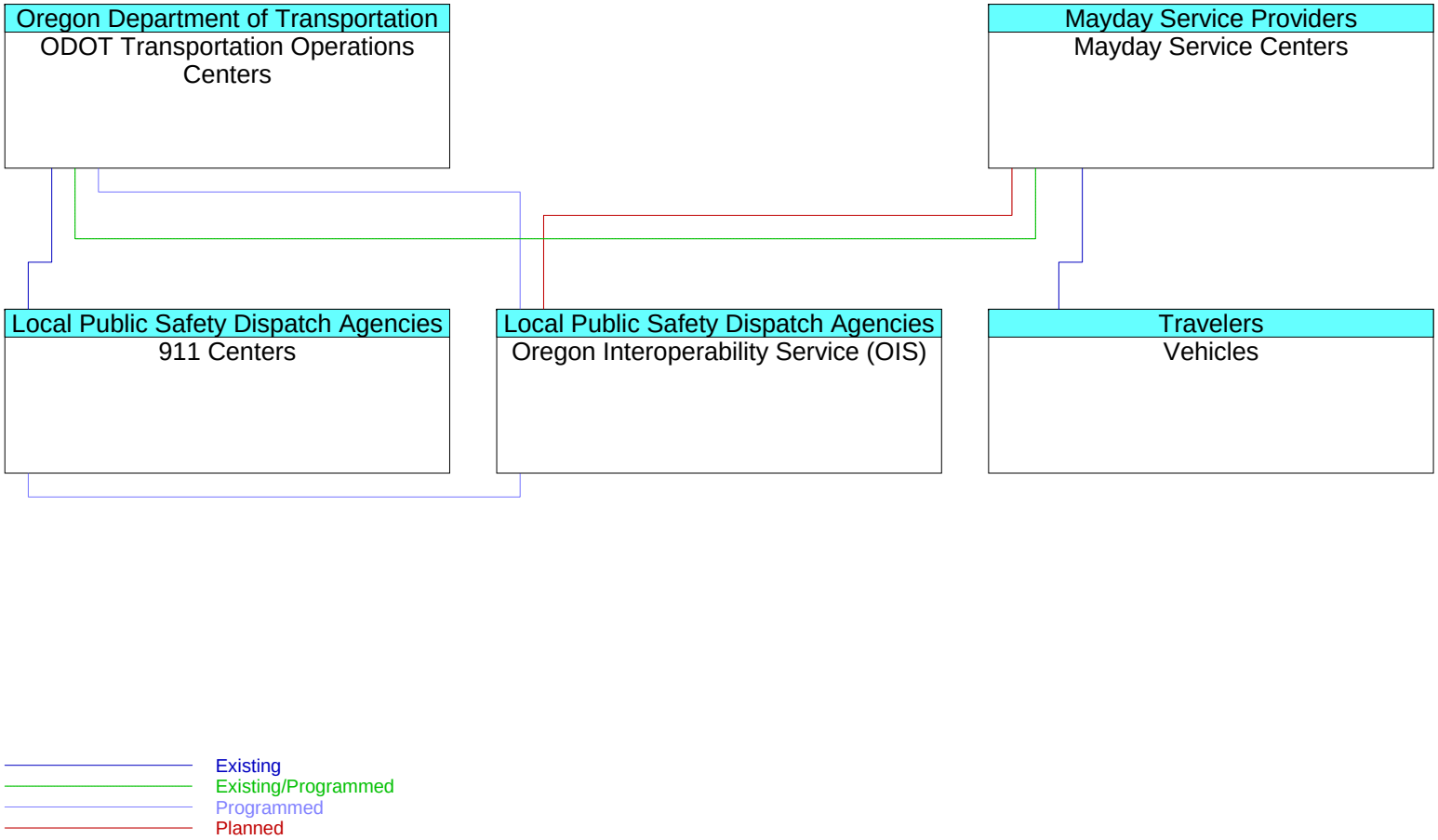
# EM01: Emergency Call-Taking and Dispatch



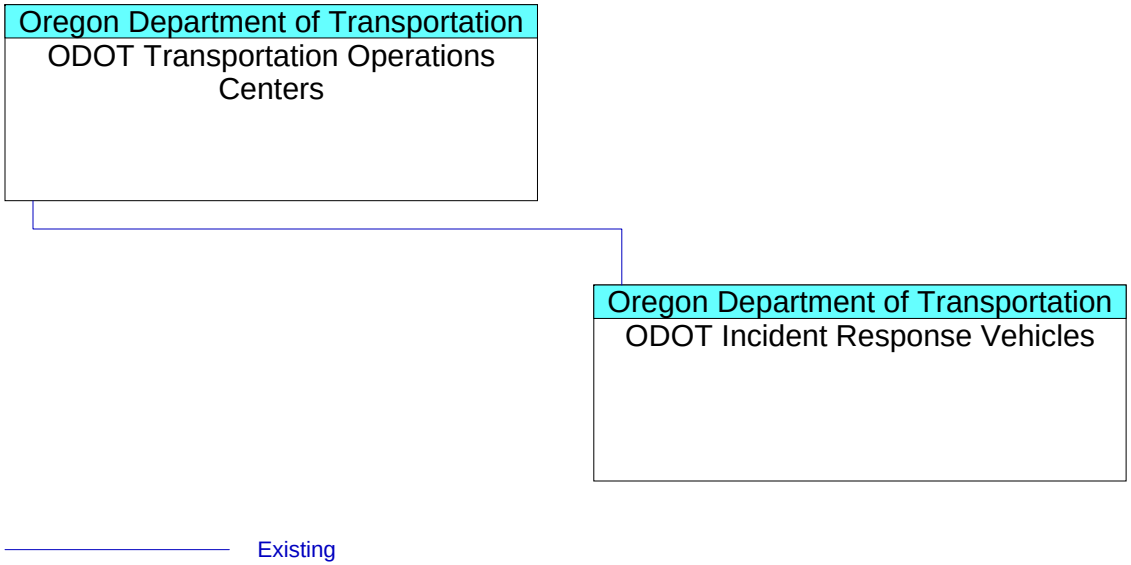
# EM02: Emergency Routing



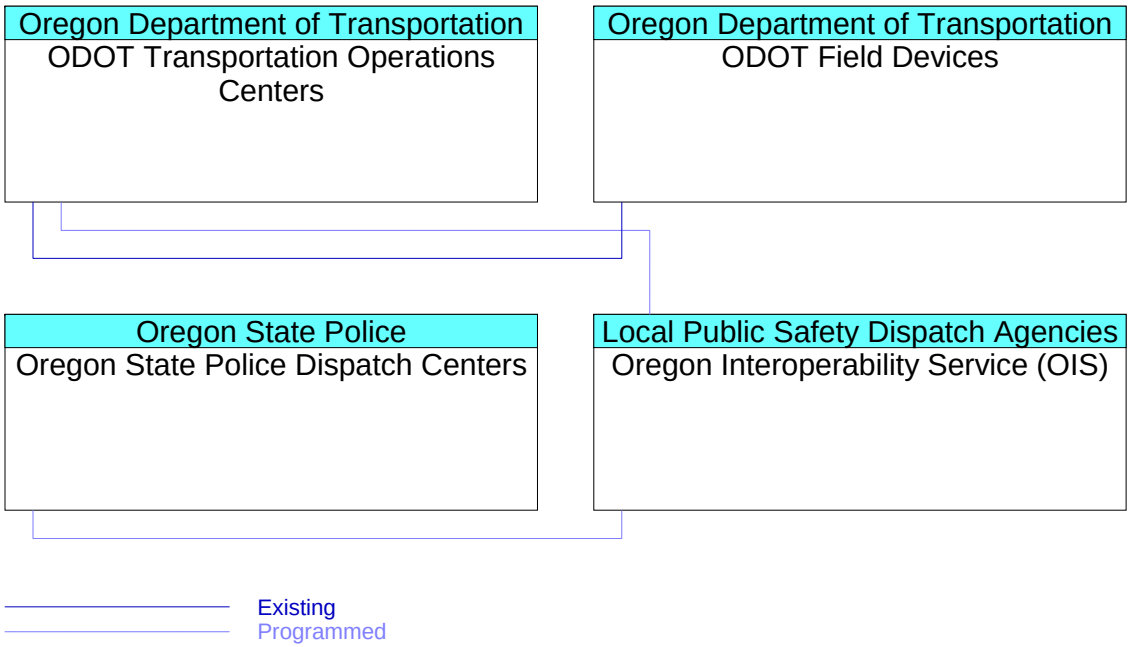
# EM03: Mayday and Alarms Support



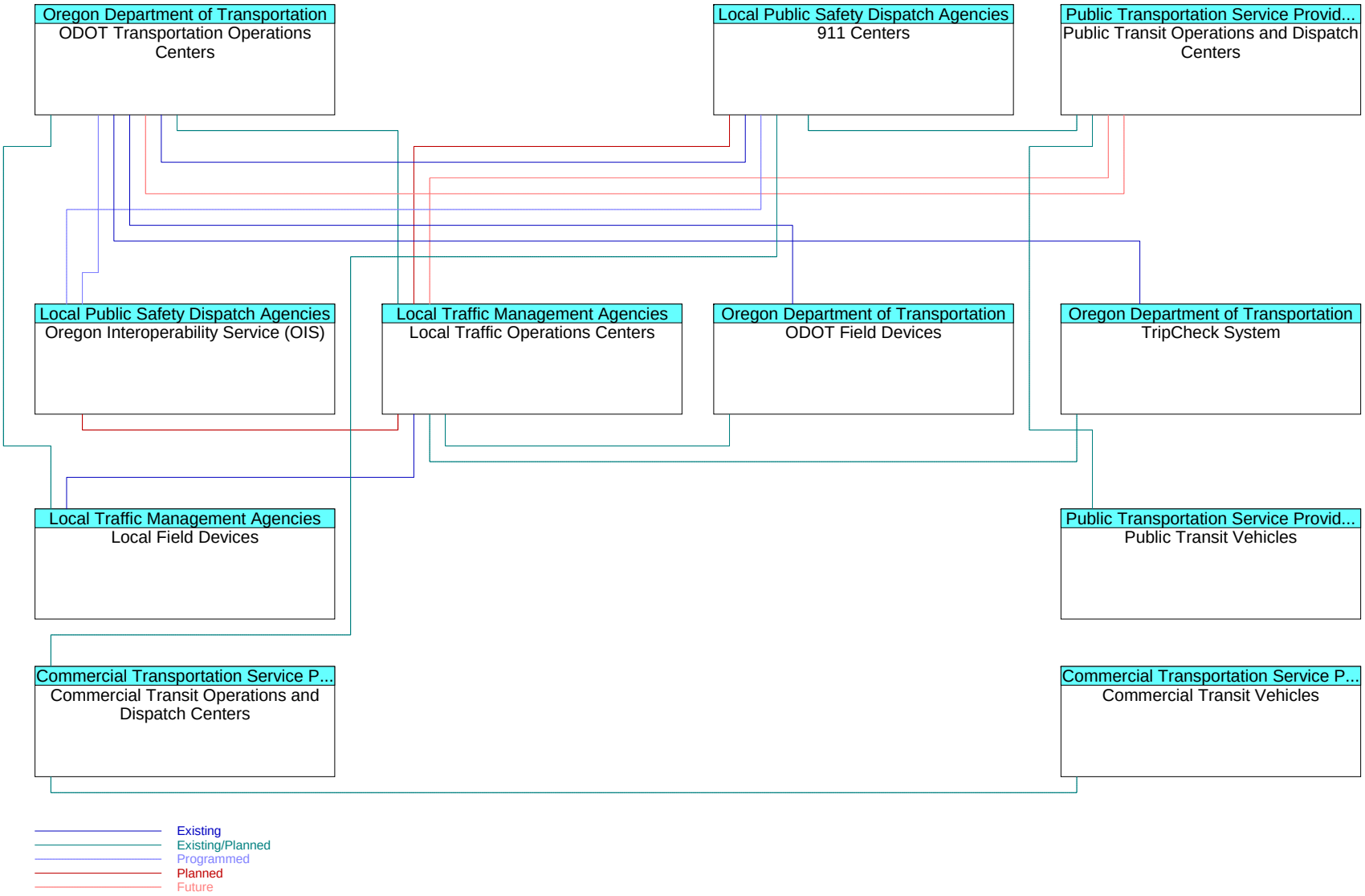
# EM04: Roadway Service Patrols



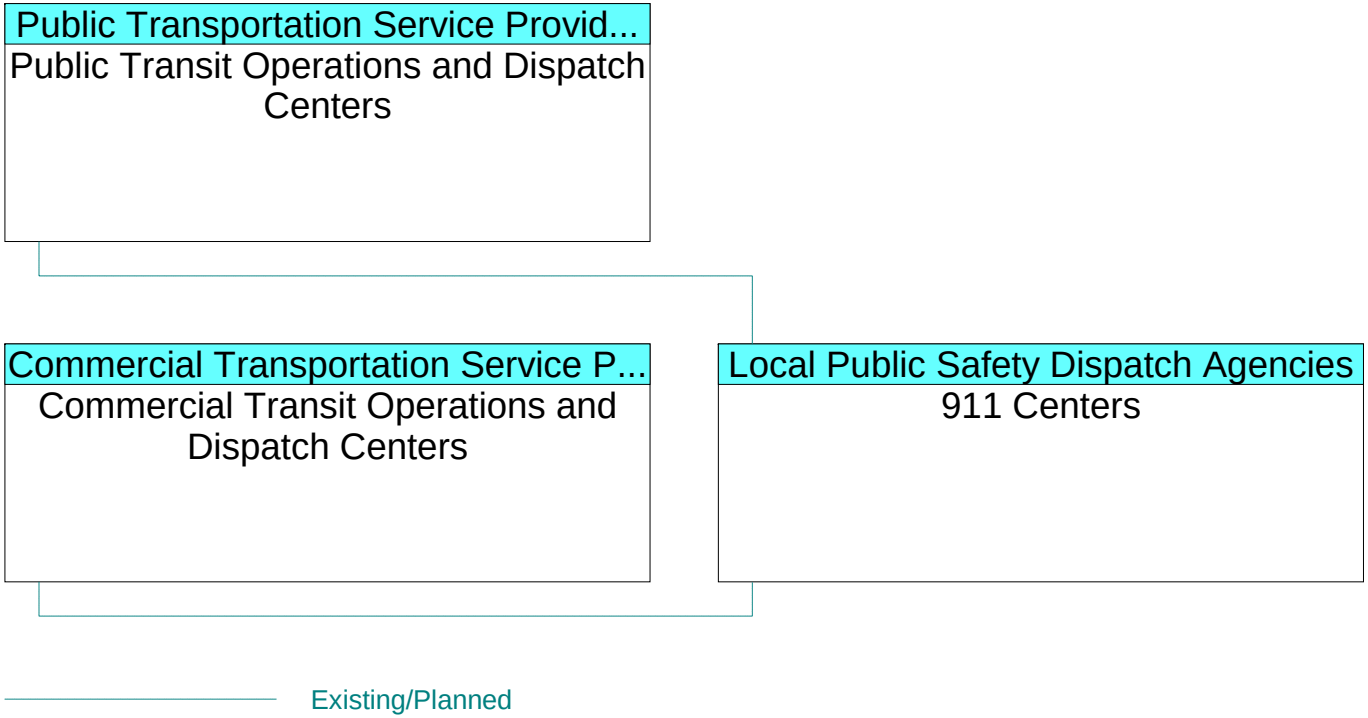
# EM05: Transportation Infrastructure Protection



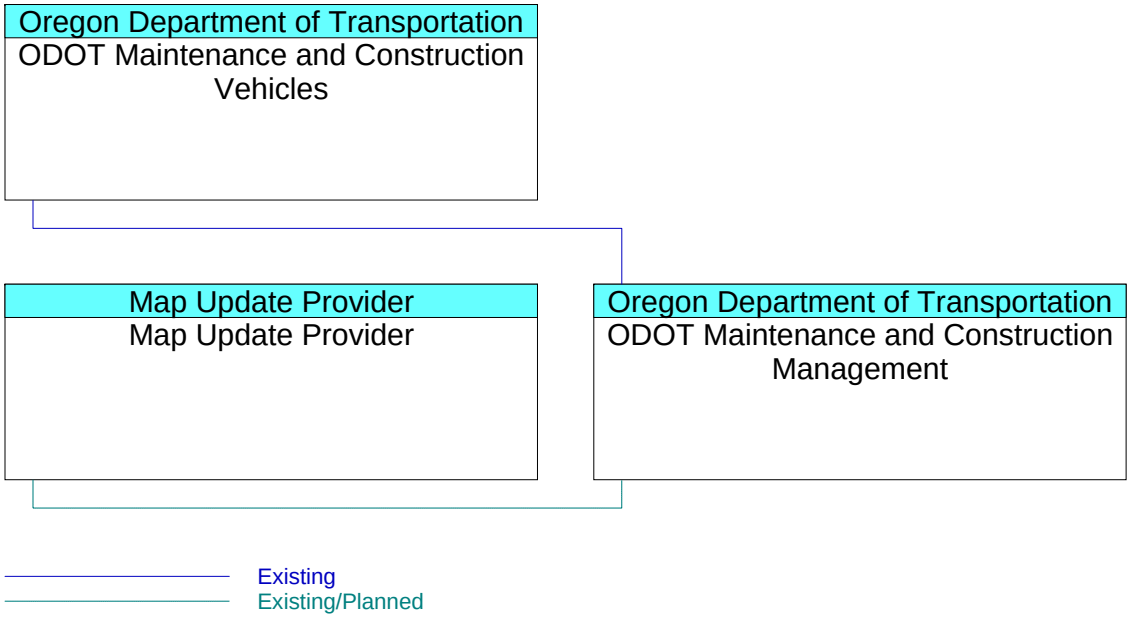
# EM06: Wide-Area Alert



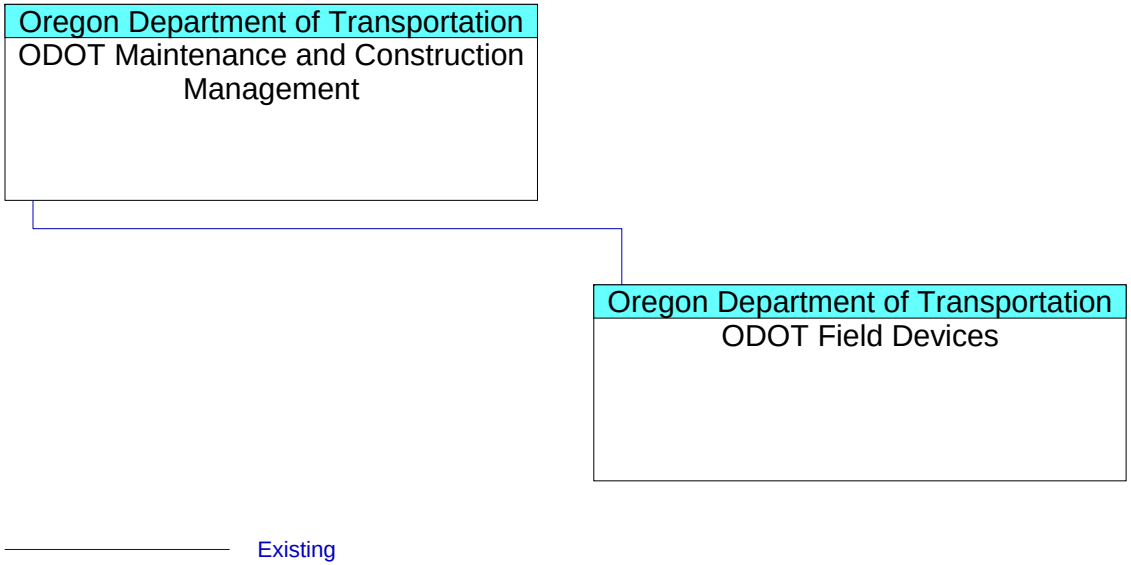
EM09: Evacuation and Reentry Management



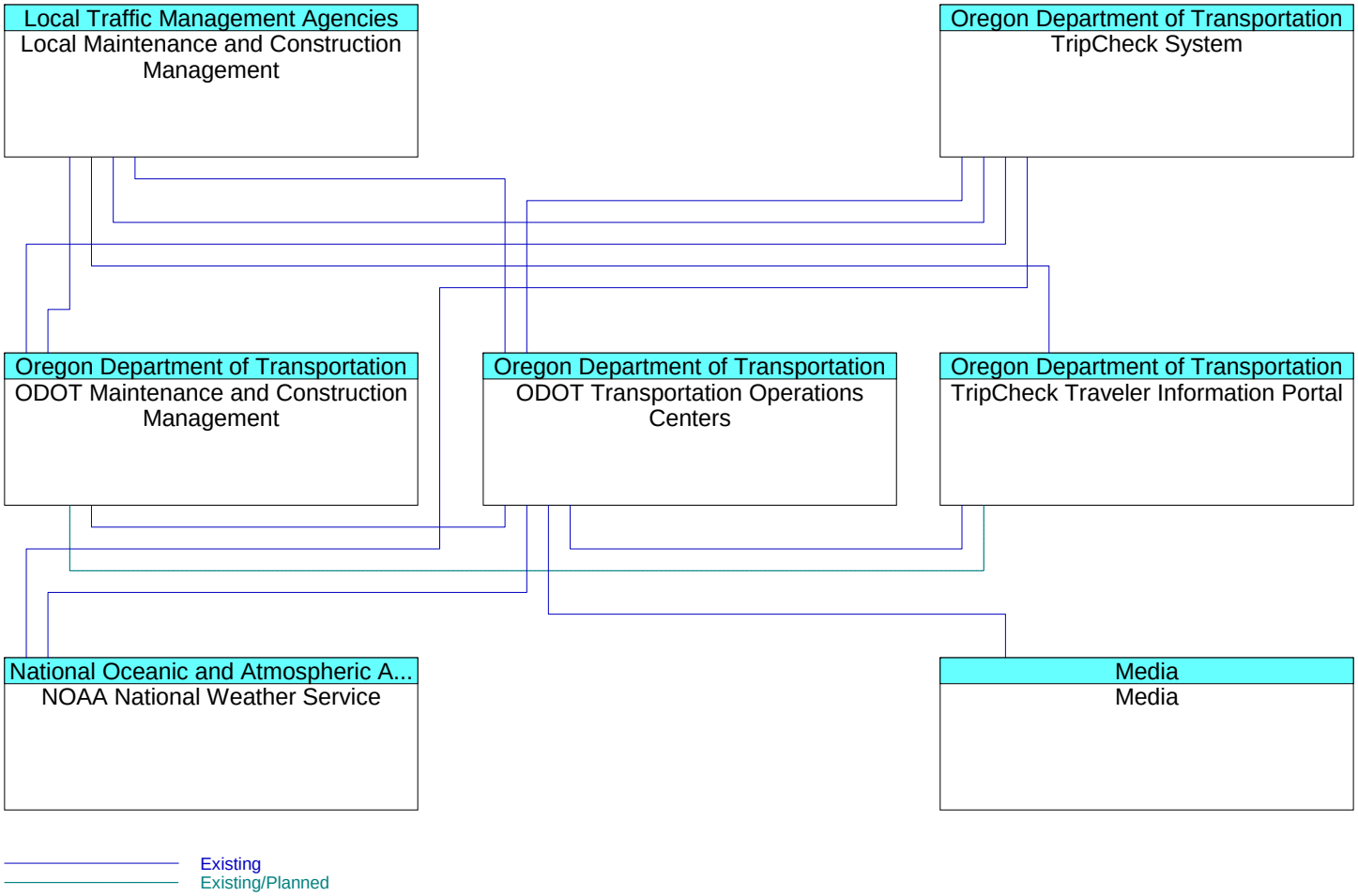
# MC01: Maintenance and Construction Vehicle and Equipment Tracking



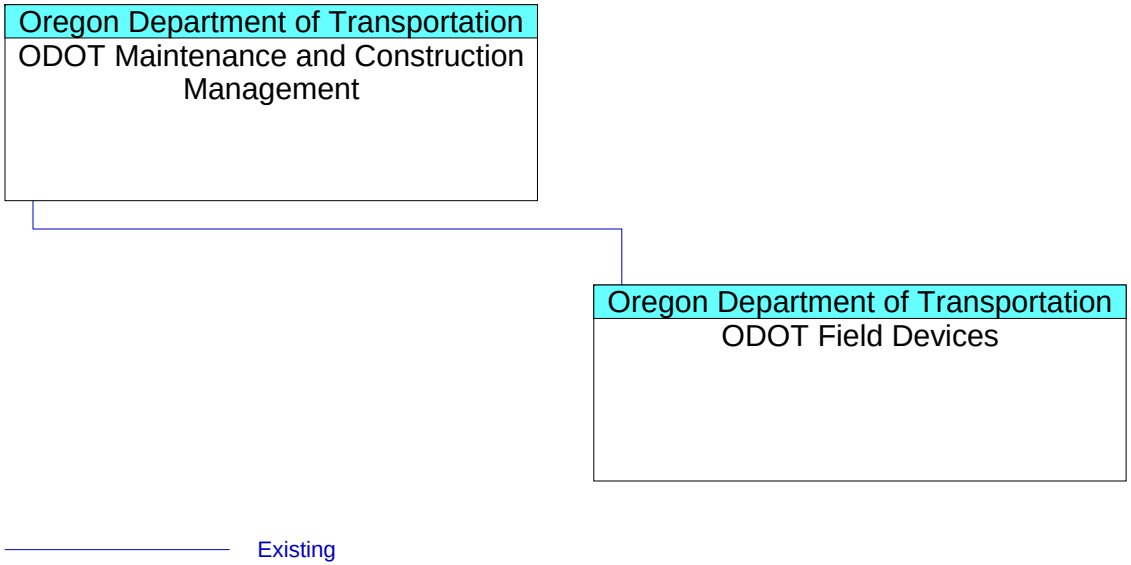
# MC03: Road Weather Data Collection



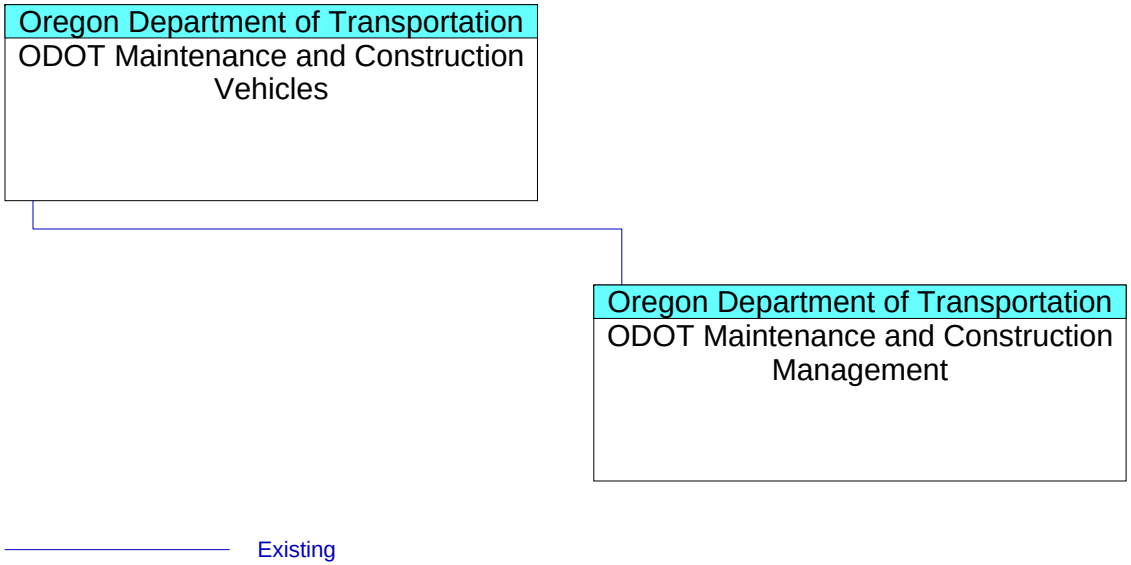
# MC04: Weather Information Processing and Distribution



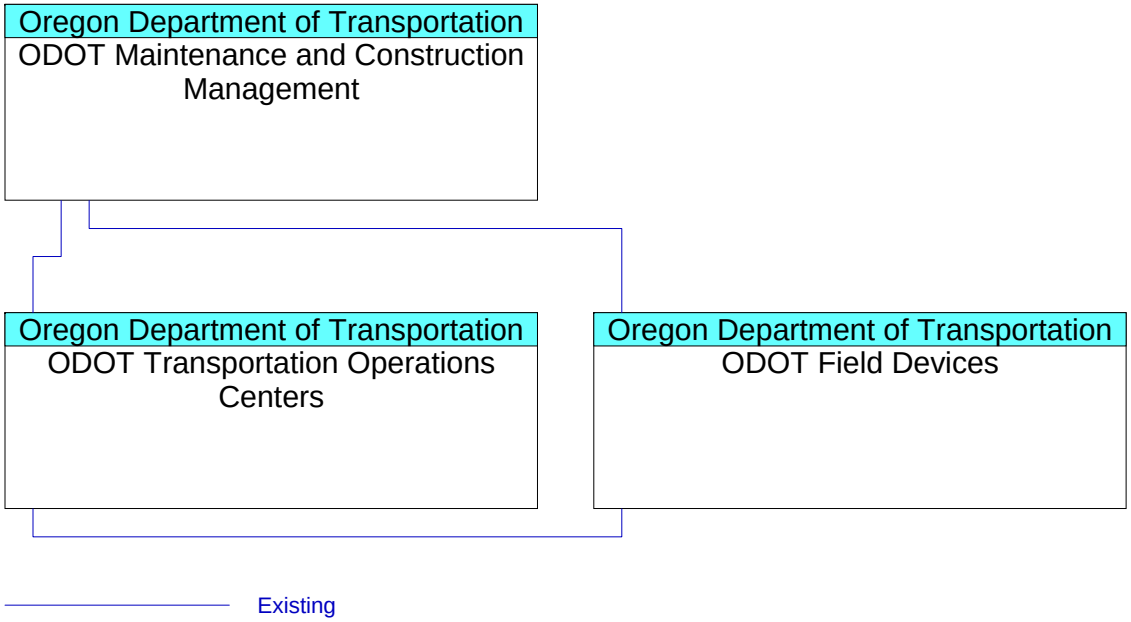
# MC05: Roadway Automated Treatment



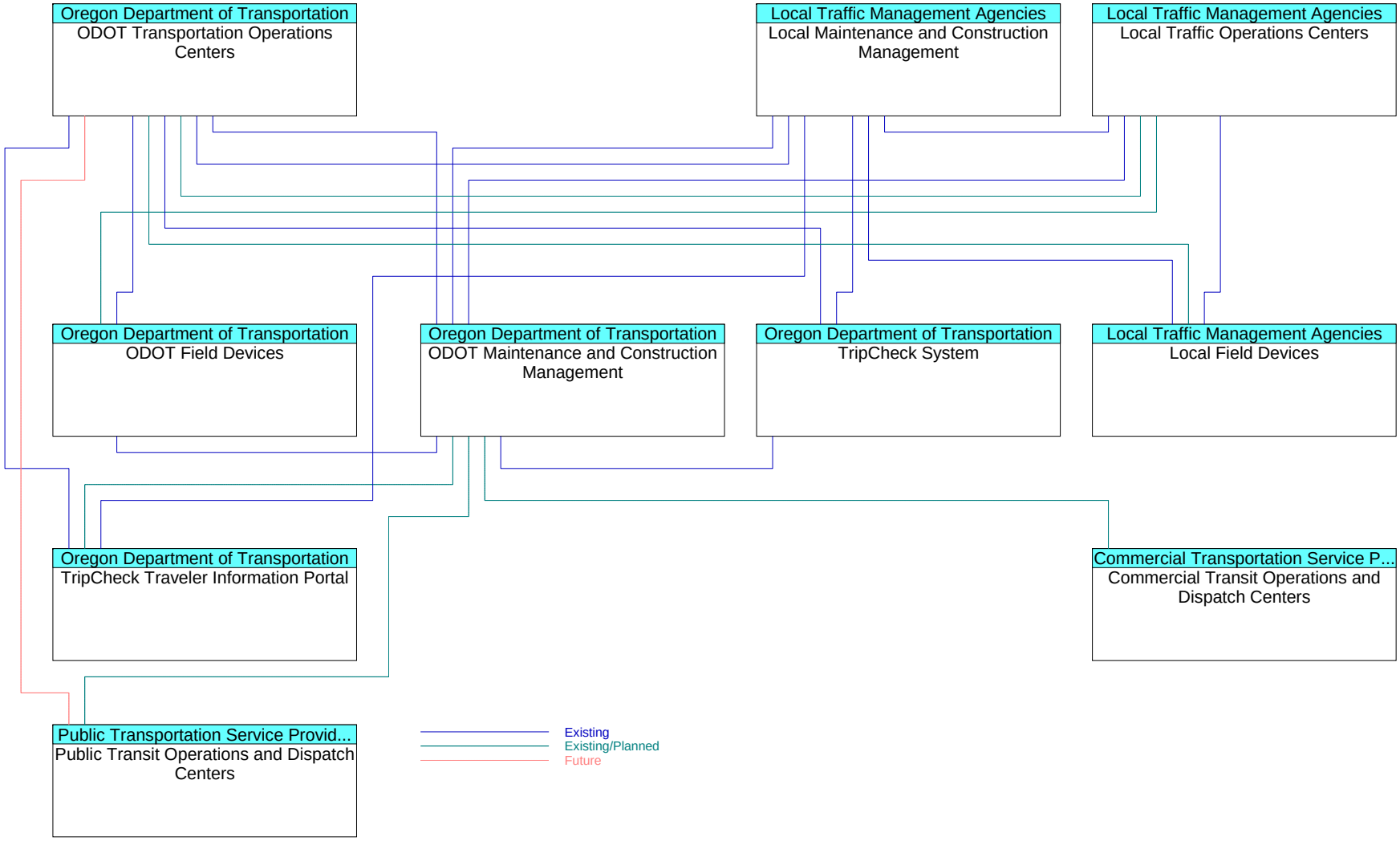
# MC06: Winter Maintenance



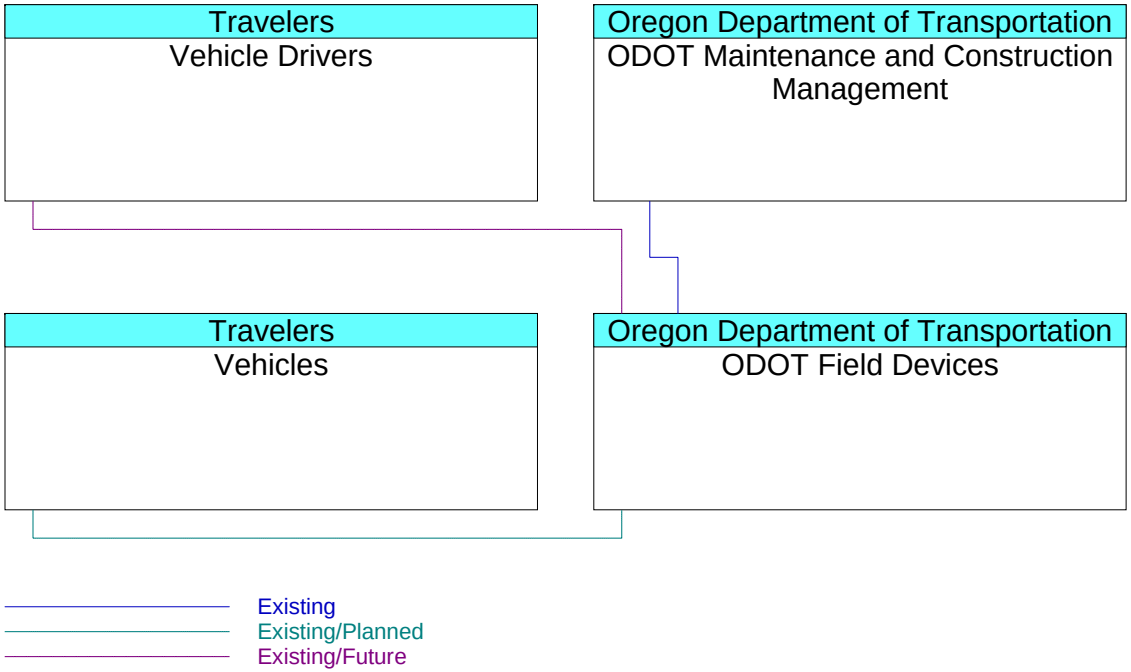
# MC07: Roadway Maintenance and Construction



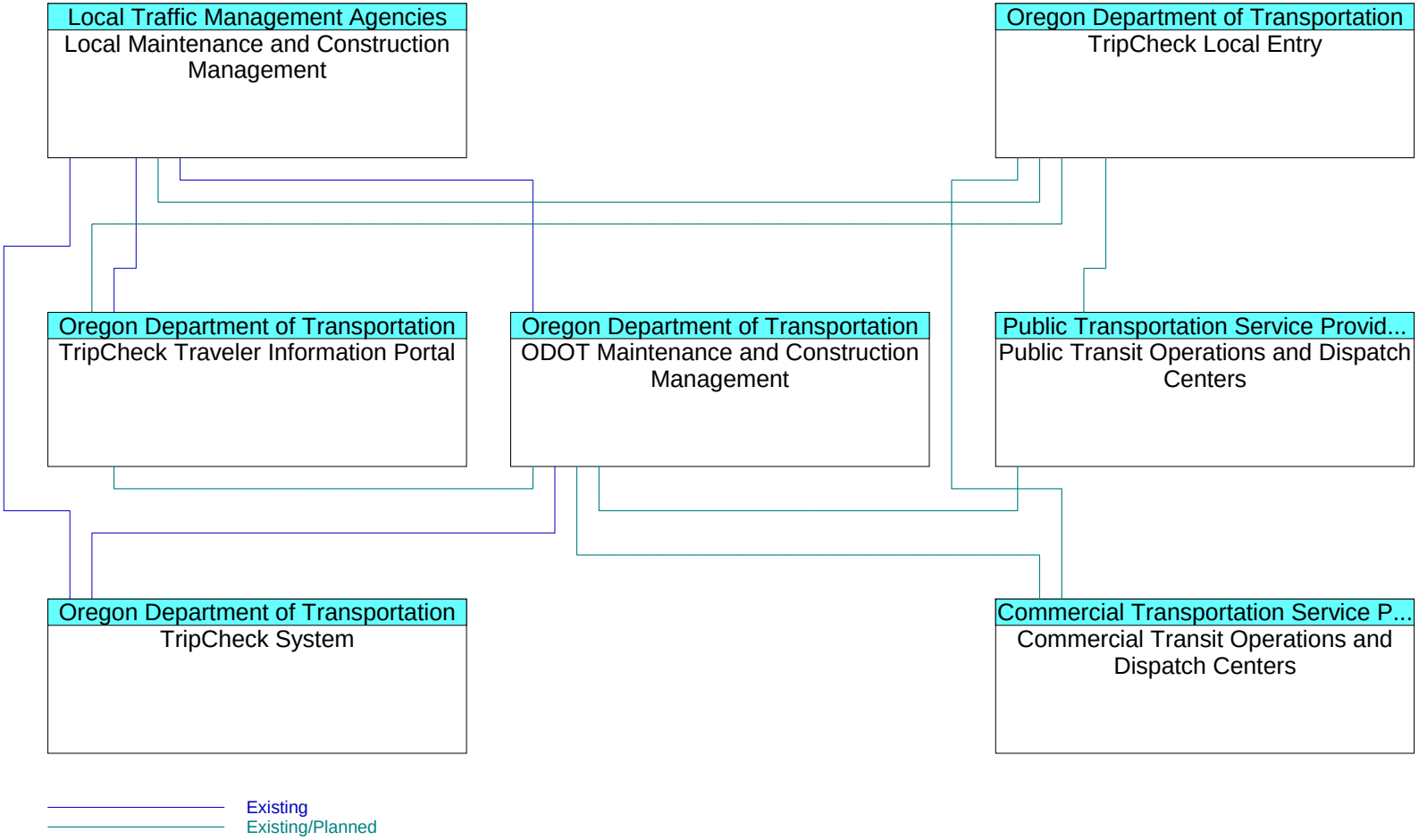
# MC08: Work Zone Management



# MC09: Work Zone Safety Monitoring



# MC10: Maintenance and Construction Activity Coordination



# APPENDIX N: TURBO ARCHITECTURE OPERATIONAL CONCEPT REPORT

# Operational Concept (Roles & Responsibilities)

## Sorted by Stakeholder

## Oregon Statewide ITS Architecture (Region)

5/31/2012 2:54:31PM

### Certification Agents

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Maintain and keep current on all changes to the common standards and keep the Charging Entities and TTSPs appraised of any changes and their impact. | Planned |
| Maintain and keep current a list of all certified road user charging collection equipment. | Planned |
| Maintain and record configuration management of all road user charging collection equipment. | Planned |
| Test and certify that Charging Entities' and TTSPs' road user charging collection equipment meets the interface, common standards and protocol standards established by the Statewide Charging Standards Committee. | Planned |

### Charging Entities

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Audit and monitor TTSPs, customer surveys, and overall efficiency of system. | Planned |
| Collect transaction data (road usage) from travelers either directly or indirectly through another Charging Entity. | Planned |
| Consolidate transactions by TTSP and reconcile with TTSP on payments. | Planned |
| Design/construct/maintain/operate roadside equipment (electronic toll transceivers, image based system, and vehicle count/classification system). | Planned |
| Handle accounts that do not qualify or choose not to do business with a TTSP. | Planned |
| Handle exempt accounts that legally are not required to pay charges. Once established by legislation, these may include transit vehicles, police vehicles, fire and life safety vehicles, state vehicles, military vehicles, etc. [One way to handle exempt accounts is to provide an OBU for vehicle tracking.] | Planned |
| Set prices, through the Oregon Transportation Commission as applicable, for all charging applications within the Charging Entity's domain. These may be set by legislation (e.g. taxes). Pricing may also include base charges, travel demand charges, and environmental charges. | Planned |
| Work with Enforcement Agent to enhance compliant behavior for travelers. Ensure non-compliance travelers who do not report road usage directly or travelers who attempt to avoid payments are prosecuted. | Planned |

### Commercial Information Service Providers

*RR Area:* **Traveler Information**

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Create/maintain open GTFS data. | Existing/Planned |
| " Disseminate traveler information through commercial transportation company systems (e.g. Web sites) and commercial information service providers. | Planned |
| " Provide transit traveler information (e.g. routes, schedules, special accommodations) to the TripCheck system for Transportation Options. | Planned |
| " Provide transit vehicle location information to TTIP. | Planned |

## Commercial Salvage and Towing Operators

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide salvage or towing vehicle(s) and personnel at an incident site when dispatched by ODOT. | Existing |

## Commercial Transportation Service Providers

*RR Area:* **Emergency Management**

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide transportation services for evacuations and reentry during emergencies. | Existing/Planned |

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Manage reservations and dispatch vehicles. | Existing/Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Create/maintain open GTFS data. | Existing/Planned |
| " Disseminate traveler information through commercial transportation company systems (e.g. Web sites) and commercial information service providers. | Planned |
| " Provide transit traveler information (e.g. routes, schedules, special accommodations) to the TripCheck system for Transportation Options. | Planned |
| " Provide transit vehicle location information to TTIP. | Planned |

## Emergency Medical Service Providers

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide ambulance(s) and medical personnel at an incident site when dispatched. | Existing |

## Enforcement Agents

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Issue citations for non-compliant behavior. | Planned |
| Monitor travelers for charge compliance. | Planned |
| Provide DMV with updated information about travelers and their vehicles when this information is collected through the enforcement process. | Planned |
| Report monitoring and enforcement activities to Charging Entity. | Planned |

## Event Promoters

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Coordinate with transportation service providers in advance of special events for transportation services. | Existing/Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide special event information to transportation service providers, ODOT, and local traffic management agencies. | Existing/Planned |

## Exempt (Non-Revenue) Account Holders

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Optional: Maintain an operable road user charging on-board unit (OBU) in exempt vehicles. | Planned |
| Set up exempt accounts with Charging Entity. | Planned |

## External State Departments of Transportation

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information and device control (as applicable) with ODOT TOCs and ODOT EOCs. | Existing/Planned |
| " Activate DOT EOCs per state protocols. | Planned |

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide incident information to travelers using TLE and TTIP. | Programmed |
| " Post incident messages on permanent and portable dynamic message signs. | Planned |
| " Share information and device control (as applicable) with ODOT TOCs. | Planned |
| " Share information with 911 centers using OIS message broker. | Planned |

*RR Area:* **Maintenance and Construction Operations**

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Coordinate maintenance and construction activities near the state line with ODOT using TLE and TTIP. | Programmed |

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Contribute to interstate traffic control planning. | Existing/Future |
| " Share real-time traffic information and device control (as applicable) with ODOT TOCs. | Planned |

*RR Area:* **Road Weather Operations**

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate weather monitoring and pavement sensor systems. | Existing |
| " Coordinate winter weather maintenance activities near the state line with ODOT using TLE and TTIP. | Programmed |
| " Share weather information with ODOT using TLE and TTIP. | Programmed |

*RR Area:* **Transportation Operation Centers (TOCs)**

ODOT's regional transportation operations centers (TOCs) and other TOCs (local traffic management agencies and external state departments of transportation) are the hub for the operations, management, and maintenance activities related to the Oregon transportation network.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Take calls from the public and the media. | Existing |
| " Actively monitor and manage the DOT roadway network (e.g. video, traffic flow conditions, road/weather conditions). | Planned |
| " Coordinate with ODOT TOCs, State Police, Emergency and Incident Management Teams, and 911 centers. | Planned |
| " Disseminate traffic information to travelers (e.g. DMS, HAR, state DOT Web site, TTIP). | Planned |
| " Manage and dispatch DOT maintenance crews. | Planned |
| " Manage/control freeway ramp meter system. | Planned |
| " Monitor and manage maintenance work, construction activities, and road closures. | Planned |
| " Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching incident responders, maintenance crews, and towing/salvage operators. | Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs, highway advisory radio, weather stations). | Existing/Planned |
| " Disseminate traveler information* through external state systems (e.g. state Web sites). | Existing/Planned |
| " Provide traveler information* to TLE. | Existing/Planned |

## External State Offices of Emergency Management

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information with Oregon ECC. | Existing |
| " Activate the State EOC per state protocols. | Planned |
| " Lead emergency management/operations coordination statewide. | Planned |

## Federal Land Agencies

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Request assistance from ODOT or local traffic management agencies through the EOC/OERS. | Existing |

## Heavy Rail Service Providers

*RR Area:* **Maintenance and Construction Operations**

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Coordinate maintenance and construction activities for at-grade rail crossings with public agencies and private utility companies using TLE and TTIP. | Future |

*RR Area:* **Regional Traffic Control**

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information (e.g. train arrivals/interaction with at-grade crossings) with TOCs. | Future |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide rail information (e.g. train location, maintenance and construction activities) to TTIP and TLE. | Future |

## Local Fire and Life Safety

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Lead the incident command at the incident site per the Emergency Operations Plan. | Existing |
| " Provide fire and life safety vehicle(s) and personnel at an incident site when dispatched. | Planned |

## Local Law Enforcement

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide local law enforcement vehicle(s) and personnel at an incident site per roadway jurisdiction when dispatched. | Existing |

## Local Offices of Emergency Management

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Report to ECC during statewide emergencies and support their coordination efforts. | Existing |
| " Activate local EOCs per local protocols. | Planned |

## Local Public Safety Dispatch Agencies

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information with TOCs and other 911 centers using OIS message broker. | Programmed |
| " Contact ODOT TOC when ODOT incident responders are required. | Planned |
| " Dispatch law enforcement, fire and life safety, and emergency medical services when required. | Planned |

## Local Traffic Management Agencies

*RR Area:* **Archived Data Management**

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/maintain infrastructure that supports data transfer to agency-owned data mart(s) and the PORTAL data warehouse. | Existing/Planned |
| " Design/construct/maintain/operate field equipment that supports automated data collection. | Planned |
| " Maintain agency-owned data mart(s). | Planned |

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information and device control (as applicable) between TOCs and EOCs. | Existing/Planned |
| " Report to local EOCs during emergencies and support their coordination efforts. | Planned |

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide incident information to travelers using TLE and TTIP. | Programmed |
| " Implement coordinated traffic signal timing plans for incident operations on alternate routes. | Planned |
| " Post incident messages on permanent and portable dynamic message signs. | Planned |
| " Share information with 911 centers using OIS message broker. | Planned |
| " Share information and device control (as applicable) with other TOCs. | Planned |

*RR Area:* **Maintenance and Construction Operations**

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Manage work zones using cameras, dynamic message signs, and variable speed limits. Provide travelers with delay and detour information. | Existing/Planned |
| " Coordinate maintenance and construction activities with other public agencies (including public transportation agencies)and private utility companies using TLE and TTIP. | Planned |

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Operate traffic signals with transit signal priority and monitor performance. | Existing/Planned |
| " Design/construct/maintain/operate transit signal priority equipment associated with traffic signals. | Planned |

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Contribute to regional traffic control planning. | Planned |
| " Design/construct/maintain/operate surveillance and traffic control equipment on arterial roadways. | Planned |
| " Design/implement/operate coordinated traffic signal timings across jurisdictional boundaries. | Planned |
| " Establish cooperative agreements for local and regional traffic management. | Planned |
| " Implement and operate central traffic signal systems. | Planned |
| " Share real-time traffic information and device control (as applicable) with other Local and ODOT TOCs. | Planned |
| " Deploy RSUs at traffic signals and on key highways for IntelliDrive. | Future |

*RR Area:* **Road Weather Operations**

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate weather monitoring and pavement sensor systems. | Existing/Planned |
| " Coordinate winter weather maintenance activities within agency and with other agencies using TLE and TTIP. | Programmed |
| " Share weather information with other agencies using TLE and TTIP. | Programmed |

*RR Area:* **Transportation Operation Centers (TOCs)**

ODOT's regional transportation operations centers (TOCs) and other TOCs (local traffic management agencies and external state departments of transportation) are the hub for the operations, management, and maintenance activities related to the Oregon transportation network.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Take calls from the public and the media. | Existing |
| " Actively monitor and manage the local roadway network (e.g. video, traffic flow conditions, road/weather conditions). | Planned |
| " Coordinate with Regional ODOT TOCs, other Local TOCs, and 911 centers. | Planned |
| " Disseminate traffic information to travelers (e.g. DMS, local agency Web site, TTIP). | Planned |
| " Implement coordinated traffic signal timing plans for incidents. | Planned |
| " Monitor and manage maintenance work, construction activities, and road closures. | Planned |
| " Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching local incident responders and maintenance crews. | Planned |

*RR Area:* **Traveler Information**

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs). | Planned |
| " Disseminate traveler information* through local systems (e.g. local Web sites). | Planned |
| " Provide traveler information* to TLE. | Planned |

## Mayday Service Providers

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information about Oregon incidents with ODOT. | Existing/Planned |
| " Take service calls from customers. | Planned |

## Media

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Disseminate traveler information* through the media (e.g. television and radio broadcasts). | Existing/Planned |
| " Subscribe to TTIP to obtain current real-time traveler information*. | Planned |

## National Oceanic and Atmospheric Administration

*RR Area:* **Road Weather Operations**

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide weather forecasts, watches, and warnings for Oregon to TTIP. | Existing |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide weather information to the ODOT TOCs and TripCheck system. | Existing |

## Oregon Department of Transportation

*RR Area:* **Archived Data Management**

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Define performance measurement standards to monitor transportation system network performance. | Existing/Planned |
| " Design/maintain infrastructure that supports data transfer to ODOT data marts and the PORTAL data warehouse. | Existing/Planned |
| " Design/construct/maintain/operate field equipment that supports automated data collection. | Planned |
| " Maintain ODOT data marts (TOCS, HTCRS, etc.). | Planned |

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information and device control (as applicable) between TOCs and ECC/EOCs. | Existing/Planned |

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Activate ODOT EOCs per the ODOT EOP. These may include the Agency Operations Center, Region EOCs, District EOCs, Resource Management Center, Bridge Section Command Center, and Information Systems Command Center. | Planned |
| " Report to ECC during statewide emergencies and support their coordination efforts. | Planned |

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide incident information to travelers using the TripCheck system. | Existing |
| " Dispatch ODOT incident responders, HazMat responders, or maintenance crews to an incident site when needed. | Planned |
| " Dispatch towing/salvage vehicles to incident sites. | Planned |
| " Implement alternate routes for major incidents. | Planned |
| " Implement coordinated traffic signal timing plans for incident operations. | Planned |
| " Monitor CCTV cameras, system detectors, and radio broadcasts for incidents. | Planned |
| " Patrol state highways for incidents. | Planned |
| " Post incident messages on permanent and portable dynamic message signs. | Planned |
| " Provide all on-scene motorist assistance for minor incidents that do not require the presence of emergency management agencies. | Planned |
| " Provide on-scene support to emergency management agencies for major incidents. | Planned |
| " Provide support to local traffic management agencies when resources are available. | Planned |
| " Share information with 911 centers using OIS message broker. | Planned |
| " Share information and device control (as applicable) with other TOCs. | Planned |

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Turn ramp meters on or off to manage traffic near an incident or on an alternate route. | Planned |
| " Verify incidents using CCTV cameras and radio communications with ODOT crews. | Planned |

*RR Area:* **Maintenance and Construction Operations**

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Automate maintenance and construction activity scheduling. | Planned |
| " Coordinate maintenance and construction activities with local traffic management agencies, external state DOTs, public and commercial transportation service providers, and private utility companies using HTCRS/TTIP. | Planned |
| " Deploy over-dimension warning systems in work zones when over-dimension vehicles are required to detour to an alternate route. | Planned |
| " Develop statewide standards and requirements for work zone safety. | Planned |
| " Integrate HTCRS with TOCS and TTIP. | Planned |
| " Manage work zones using cameras, dynamic message signs, highway advisory radio, and variable speed limits. Provide travelers with delay and detour information. | Planned |
| " Monitor travel times through work zones and provide travel time information to the public. | Planned |
| " Track maintenance/construction vehicle location and activity throughout the state. | Planned |

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Operate traffic signals with transit signal priority and monitor performance. | Existing/Planned |
| " Act as a liaison for the rest of ODOT. | Planned |
| " Design/construct/maintain/operate transit signal priority equipment associated with traffic signals. | Planned |

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Encourage and support using the ITS Architecture for project planning and implementation. | Planned |
| " Fund advanced public transportation system improvements. | Planned |
| " Provide coordination and oversight in the procurement and implementation of new ITS projects. | Planned |

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Contribute to regional and interstate traffic control planning. | Planned |
| " Design/construct/maintain/operate surveillance and traffic control equipment on state freeways, highways and arterial roadways. | Planned |
| " Design/implement/operate coordinated traffic signal timings across jurisdictional boundaries. | Planned |
| " Design/implement/operate ramp meter timings and coordination with surface street traffic signals. | Planned |
| " Establish cooperative agreements for local and regional traffic management. | Planned |
| " Implement and operate central traffic signal systems. | Planned |
| " Share real-time traffic information and device control (as applicable) with Local TOCs and External State TOCs. | Planned |
| " Share traffic control actions with other agencies. | Planned |
| " Deploy RSUs at traffic signals and on key highways for IntelliDrive. | Future |

*RR Area:* **Road Weather Operations**

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Coordinate winter weather maintenance activities within ODOT and with other agencies using TTIP. | Existing |
| " Disseminate road weather hazard information, travel restrictions, and chain requirements to travelers (e.g. DMS, HAR, TripCheck system). | Existing |
| " Notify maintenance personnel of severe winter weather events. | Existing |
| " Share weather information with other agencies using TTIP. | Existing |
| " Design/construct/maintain/operate weather monitoring and pavement sensor systems. Areas of concern include passes, bridges, and other critical roadway sections. | Existing/Planned |

*RR Area:* **Road Weather Operations**

Although a subset of maintenance and construction operations, road weather operations is an important service area of public agencies in Oregon due to the transportation network impacts caused by inclement winter weather, rain, and high winds. These agencies monitor road weather conditions, track available equipment and personnel, and coordinate a response during inclement weather events.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate systems that detect adverse winter weather conditions and automatically treat the roadway when needed. | Existing/Future |
| " Expand winter traveler information for mountain passes on the TripCheck Web site. | Planned |
| " Automatically track maintenance vehicle location (e.g. snow plows, deicers) and activity throughout the state to support resource allocation decisions. | Future |

*RR Area:* **Transportation Operation Centers (TOCs)**

ODOT's regional transportation operations centers (TOCs) and other TOCs (local traffic management agencies and external state departments of transportation) are the hub for the operations, management, and maintenance activities related to the Oregon transportation network.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Take calls from the public and the media. | Existing |
| " Actively monitor and manage the ODOT roadway network (e.g. video, traffic flow conditions, road/ weather conditions). | Planned |
| " Coordinate with other ODOT TOCs, Local TOCs, External State TOCs, OSP, Emergency and Incident Management Teams, and 911 centers. | Planned |
| " Develop, implement, operate and maintain TOCS. | Planned |
| " Disseminate traffic information to travelers (e.g. DMS, HAR, TripCheck). | Planned |
| " Implement coordinated traffic signal timing plans for incidents. | Planned |
| " Manage and dispatch ODOT maintenance crews. | Planned |
| " Manage/control freeway ramp meter system and SWARM module. | Planned |
| " Monitor and manage maintenance work, construction activities, and road closures. | Planned |
| " Provide incident management capabilities (e.g. detection, verification, response, on-site assistance). This includes dispatching ODOT incident responders, ODOT maintenance crews, and towing/salvage operators. | Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/construct/maintain/operate ITS equipment to support traveler information* (e.g. cameras, system detectors, dynamic message signs, highway advisory radio, weather stations). | Planned |
| " Maintain/operate TLE and interface to the TripCheck system and TTIP. | Planned |
| " Manage commercial information service provider and other subscriber access to TTIP. | Planned |
| " Manage TripCheck system and disseminate traveler information* through the system. | Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Manage TripCheck Traveler Information Portal (TTIP) infrastructure and disseminate traveler information* through the system. | Planned |
| Maintain/operate interface between the TripCheck system and TTIP. | Planned |
| " Monitor direction of traveler information industry and tailor traveler information* for devices most commonly used by the public. | Future |

## Oregon Driver and Motor Vehicle (DMV) Services Division

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| [Not Defined] | |

## Oregon Office of Emergency Management

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information with EOCs throughout Oregon. | Existing |
| " Act as an extension of the Governor's Office during statewide emergencies. Lead emergency management/operations coordination. | Planned |
| " Activate the Oregon Emergency Communication Center (ECC) per the State of Oregon Emergency Management Plan. | Planned |

## Oregon State Police

*RR Area:* **Incident Management**

*RR Area:* **Incident Management**

Per the ODOT Emergency Operations Plan, "Incidents may include disabled vehicles, obstacles or debris on the roadway, spilled cargo or material, motor vehicle accidents, or any other situation which affects normal traffic flow or poses a hazard to the public." The incident management service area includes all of the roadway subsystems, communications, and agency coordination required to quickly and accurately identify incidents and implement a response that safely minimizes incident-related impacts such as delay to people and freight and negative environmental effects. ODOT has taken a proactive approach to incident management by using their TOCs to monitor, detect, and verify incidents on state roadways, using highway service patrols to detect and respond to incidents, and by partnering with emergency management agencies to provide a coordinated response. Local traffic management agencies provide incident management on a smaller scale using their emergency management departments and maintenance crews. The incident management operational concept covers the roadway incidents that occur on a day-to-day basis while the emergency management operational concept described in the next section focuses on major emergencies.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Share information with TOCs and 911 centers using OIS message broker. | Existing/Planned |
| " Exchange calls for service with ODOT TOCs. | Planned |
| " Provide ODOT TOCs with access to TOW rotation application data. | Planned |
| " Provide OSP vehicle(s) and personnel at an incident site on state highways when dispatched. | Planned |

## Oregon Travel Information Council

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide traveler services information (e.g. fuel, dining, lodging, tourist attractions) to the TripCheck system. | Existing |
| " Operate traveler information kiosks, which access the TripCheck Web site, at State Welcome Centers. | Planned |

## Portland State University

*RR Area:* **Archived Data Management**

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Collect and archive data from additional archived data sources at other agencies. | Existing/Planned |
| " Develop analytical tools to guide planning decisions. | Planned |
| " Develop interface between PORTAL and regional/statewide data warehouses in neighboring states. | Planned |

*RR Area:* **Archived Data Management**

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Develop system upgrades to PORTAL to include statewide archived data. | Planned |
| " Maintain existing PORTAL data warehouse for Portland and southwest Washington metropolitan areas. | Planned |
| " Monitor transportation system network performance. | Planned |
| " Develop predictive algorithm applications to forecast travel conditions. | Future |

## Public Transportation Service Providers

*RR Area:* **Archived Data Management**

The archived data management service area includes the tasks associated with archiving, sharing, and analyzing historic ITS data.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Design/maintain infrastructure that supports data transfer to agency-owned data mart(s) and the PORTAL data warehouse. | Existing/Planned |
| " Design/construct/maintain/operate field equipment and in-vehicle systems that support automated data collection. | Planned |
| " Maintain agency-owned data mart(s). | Planned |

*RR Area:* **Emergency Management**

The emergency management service area includes the mitigation, preparedness, response, and recovery actions associated with major emergencies larger in scale than incidents, which are defined in the Incident Management Operational Concept section. Emergencies include any manmade (e.g. riot, terrorist attack) or natural event (e.g. forest fire, earthquake, volcano) that threatens or causes the loss of life, injury to person or property, or financial loss at a local, regionwide, or statewide level. The operational concept for emergency management includes the additional ITS components used for emergency management beyond those already described in the Incident Management Operational Concept. See the ODOT Emergency Operations Plan and the State of Oregon Emergency Management Plan for detailed documentation of emergency management in Oregon.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide transportation services for evacuations and reentry during emergencies. | Existing/Planned |

*RR Area:* **Maintenance and Construction Operations**

Public agencies and private utility companies throughout Oregon conduct maintenance and construction activities on a day-to-day basis to monitor, operate, maintain, or manage the physical condition of the roadway or other assets. The maintenance and construction operations service area focuses on these activities.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Coordinate maintenance and construction activities with other public agencies and private utility companies using TLE and TTIP. | Planned |

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Manage the logistics of determining eligibility for special categories of transit riders (low income, elderly, students, etc.) | Existing/Planned |
| " Coordinate service with other public transportation service providers at system transfer points. | Planned |
| " Design/construct/integrate/maintain/operate transit systems and transit field devices. | Planned |
| " Dispatch fixed-route vehicles. | Planned |
| " Lead the installation of transit signal priority with ODOT and local traffic management agencies. Provide transit signal priority equipment on transit vehicles. | Planned |
| " Manage reservations and dispatch demand response and flexible route vehicles. | Planned |

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide transit operation status, incident, parking, and transfer operational information to TTIP, where ODOT and local traffic management agencies may access the information. | Planned |

*RR Area:* **Traveler Information**

Public agencies and the private sector coordinate to collect and disseminate static and real-time traveler information to Oregon travelers primarily using the TripCheck system, which is also supplemented by field devices and systems linked to TripCheck.

*Traveler information includes, but is not limited to, information about road/traffic conditions, weather, transit, heavy rail, parking, incidents, major emergencies, maintenance and construction activities, special events, and traveler services.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Create/maintain open GTFS data. | Planned |
| " Design/construct/maintain/operate ITS equipment to support transit traveler information (e.g. transit arrival signs, on-board systems). | Planned |
| " Disseminate transit traveler information through public transportation agency systems (e.g. transit Web sites and phone systems) and commercial information service providers. | Planned |
| " Provide transit traveler information (e.g. routes,schedules, special accommodations, fares) to the TripCheck system for Transportation Options. | Planned |
| " Provide transit vehicle location information to TTIP. | Planned |

## Statewide Charging Standards Committee

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Establish interface and protocol standards for road user charging collection in Oregon. | Planned |

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Identify data flows that require standardization for interoperability. | Planned |
| Work with national standards organizations on the development of road user charging ITS standards. | Planned |

## Travelers

*RR Area:* **Public Transportation**

The public transportation operational concept describes the statewide concept for advanced public transportation systems in Oregon. It describes advanced public transportation systems that can be applied to improve the customer experience including systems that deliver real-time transit traveler information, and improve the speed and reliability of transit vehicles.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Pay for public transportation services using a traveler fare card. | Planned |
| " Provide feedback on transit system, passenger amenities, and transit information to transit management. | Planned |

*RR Area:* **Regional Traffic Control**

Unlike any other state in the nation, public agencies in Oregon have a long tradition of utilizing common traffic signal control systems and devices across the state. Interagency coordination and information exchanges are critical to supporting regional traffic control management and responses. Common standards-based traffic control and surveillance systems across Oregon will support an integrated response to maintain local, regional and statewide travel times.

| *Roles and Responsibilities* | *Status* |
|---|---|
| " Provide personal vehicle/device probe data. | Future |

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Choose any TTSP or the Charging Entity to handle road user charge records and payments. | Planned |
| Optional: Maintain an operable road user charging on-board unit (OBU) in the traveler's vehicle or maintain alternate technology (e.g. mobile phone with GPS). | Planned |
| Report road or facility usage to Charging Entity either directly or through the assistance of a TTSP. | Planned |
| Retain road usage mileage and facility usage records. | Planned |

## Trusted Third Party Service Providers

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Optional: provide travelers with other value added services (e.g. traveler information) to entice them to use a particular TTSP over other TTSPs or the Charging Entity. | Planned |
| Provide a service profile that offers travelers value over the Charging Entity service profile and operates at a lower operational fee (value for money). | Planned |
| Provide subscribing travelers with on-board units for their vehicles or provide alternate technology that is certified and compliant by the Certification Agent (e.g. smart phones with verified and compliant apps). | Planned |

## Value Added Service Providers

*RR Area:* **Road User Charging**

| *Roles and Responsibilities* | *Status* |
|---|---|
| Be open to expanded markets and TTSP access to wider markets for services. | Planned |
| Identify and provide unique value added services for the travelers' end-to-end experience. | Planned |
| Provide value added services either directly to travelers or as part of a package provided to travelers through TTSPs. | Planned |

### *Status Value Legend*

| Name | Description |
|---|---|
| Existing | An entity that currently exists. |
| Existing/Programmed | Some entities currently exist and others are planned and funded. |
| Existing/Planned | Some entities currently exist and others are planned but unfunded. |
| Existing/Future | Some entities currently exist and others are likely to occur in the future as technology advances or funding becomes available. |
| Programmed | Funding has been obtained for a planned entity. |
| Planned | An entity has been identified as planned within the next 10 years, but funding has not yet been obtained. |
| Future | An entity that is likely to occur in the future as technology develops or as other projects are completed but is not currently planned or funded. |
| Not Planned | |

# APPENDIX O: ITS STANDARDS DEVELOPMENT STATUS

Published Standards - Standards that are available for purchase



## Published ITS Standards Listed by SDO

Standards development statuses as of December 6, 2010

**AASHTO/ITE**

Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC) ITE TMDD

TMDD & MS/ETMCC Guide Standard for Functional Level Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications ITE TMDD Guide

**AASHTO/ITE/NEMA**

Simple Transportation Management Framework (STMF) NTCIP 1101

Octet Encoding Rules (OER) Base Protocol NTCIP 1102

Transportation Management Protocols (TMP) NTCIP 1103

Center-to-Center Naming Convention Specification NTCIP 1104

Global Object Definitions NTCIP 1201

Object Definitions for Actuated Traffic Signal Controller (ASC) Units NTCIP 1202

Object Definitions for Dynamic Message Signs (DMS) NTCIP 1203

Object Definitions for Environmental Sensor Stations (ESS) NTCIP 1204

Object Definitions for Closed Circuit Television (CCTV) Camera Control NTCIP 1205

Object Definitions for Data Collection and Monitoring (DCM) Devices NTCIP 1206

Object Definitions for Ramp Meter Control (RMC) Units NTCIP 1207

Object Definitions for Closed Circuit Television (CCTV) Switching NTCIP 1208

Data Element Definitions for Transportation Sensor Systems (TSS) NTCIP 1209

Object Definitions for Signal Control and Prioritization (SCP) NTCIP 1211

Class B Profile NTCIP 2001

Point to Multi-Point Protocol Using RS-232 Subnetwork Profile NTCIP 2101

Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile NTCIP 2102

Point-to-Point Protocol Over RS-232 Subnetwork Profile NTCIP 2103

Ethernet Subnetwork Profile NTCIP 2104

Transportation Transport Profile NTCIP 2201

Internet (TCP/IP and UDP/IP) Transport Profile NTCIP 2202

Simple Transportation Management Framework (STMF) Application Profile NTCIP 2301

Trivial File Transfer Protocol (TFTP) Application Profile NTCIP 2302

File Transfer Protocol (FTP) Application Profile NTCIP 2303

Application Profile for DATEX-ASN (AP-DATEX) NTCIP 2304

Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML) NTCIP 2306

Profile Framework NTCIP 8003

Structure and Identification of Management Information NTCIP 8004

NTCIP 8005 Process, Control & Info Mgmt Policy NTCIP 8005

Testing and Conformity Assessment Documentation within NTCIP Standards Publications NTCIP 8007

NTCIP Guide NTCIP 9001

XML in ITS Center-to-Center Communications NTCIP 9010

Testing Guide for Users NTCIP 9012

**ANSI**

Commercial Vehicle Safety Reports ANSI TS284

Commercial Vehicle Safety and Credentials Information Exchange ANSI TS285

Commercial Vehicle Credentials ANSI TS286

**APTA**

Standard for Transit Communications Interface Profiles APTA TCIP-S-001 3.0.0

**ASTM**

Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications ASTM E2213-03

Standard Guide for Archiving and Retrieving ITS-Generated Data ASTM E2259-03

Standard Practice for Metadata to Support Archived Data Management Systems ASTM E2468-05

Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data ASTM E2665-08

**EIA**

Data Radio Channel (DARC) System EIA 794

Subcarrier Traffic Information Channel (STIC) System EIA 795

**IEEE**

Standard for Message Sets for Vehicle/Roadside Communications IEEE 1455-1999

Standard for Common Incident Management Message Sets for use by Emergency Management Centers IEEE 1512 -2006

Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers IEEE 1512.1-2006

Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers IEEE 1512.2-2004

Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers IEEE 1512.3-2006

Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection IEEE 1570-2002

Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager IEEE 1609.1-2006

Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages IEEE 1609.2-2006

Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services IEEE 1609.3

Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation IEEE 1609.4-2006

The Survey and Analysis of Existing Standards and those Under Development Applicable to the Needs of the Intelligent Transportation System (ITS) Short Range and Wide Area Wireless and Wireline Technologies IEEE SH94633-SH94638

**NEMA/AASHTO/ITE**

Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) ITE ATC API

Advanced Transportation Controller (ATC) ITE ATC Controller 5.2

ITS Standard Specification for Roadside Cabinets ITE ITS Cabinet

**SAE**

Truth-in-Labeling Standard for Navigation Map Databases SAE J1663

Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications SAE J1708

ISP-Vehicle Location Referencing Standard SAE J1746

Standard Metrology for Vehicular Displays SAE J1757

ITS Data Bus Data Security Services SAE J1760

Location Referencing Message Specification (LRMS) SAE J2266

On-Board Land Vehicle Mayday Reporting Interface SAE J2313

Mayday Industry Survey Information Report SAE J2352

Message Set for Advanced Traveler Information System (ATIS) SAE J2354

ITS Data Bus Architecture Reference Model Information Report SAE J2355

Calculation of the Time to Complete In-Vehicle Navigation and Route Guidance Tasks SAE J2365

ITS Data Bus - IDB-C Physical Layer SAE J2366/1

ITS Data Bus - Low Impedance Stereo Audio SAE J2366/1L

ITS Data Bus - Link Layer SAE J2366/2

ITS Data Bus - Thin Transport Layer SAE J2366/4

ITS Data Bus - Application Message Layer SAE J2366/7

Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media SAE J2369

Field Test Analysis Information Report SAE J2372

Stakeholders Workshop Information Report SAE J2373

ITS In-Vehicle Message Priority SAE J2395

Definitions and Experimental Measures Related to the Specification of Driver Visual Behavior Using Video Based Techniques SAE J2396

Adaptive Cruise Control (ACC) Operating Characteristics and User Interface SAE J2399

Human Factors in Forward Collision Warning Systems: Operating Characteristics and User Interface Requirements SAE J2400

Comparison of GATS Messages to SAE ATIS Standards Information Report SAE J2539

Messages for Handling Strings and Look-Up Tables in ATIS Standards SAE J2540

RDS (Radio Data System) Phrase Lists SAE J2540/1

ITIS (International Traveler Information Systems) Phrase Lists SAE J2540/2

National Names Phrase List SAE J2540/3

Converting ATIS Message Standards from ASN.1 to XML SAE J2630

Dedicated Short Range Communications (DSRC) Message Set Dictionary SAE J2735

Search Standards | Standards Listed by Development Status

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Approved Standards - Standards that have passed all necessary ballots and have been approved by a SDO, but not yet published.



## Approved ITS Standards Listed by SDO

Standards development statuses as of December 6, 2010

**NEMA/AASHTO/ITE**

Advanced Transportation Controller (ATC) Standard Specification for the Type 2070 Controller  ITE ATC Type 2070

**AASHTO/ITE**

Standard for Functional Level Traffic Management Data Dictionary (TMDD)  ITE TM 1.03

Message Sets for External TMC Communication (MS/ETMCC)  ITE TM 2.01

**AASHTO/ITE/NEMA**

Object Definitions for Electrical and Lighting Management Systems (ELMS)  NTCIP 1213



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In Ballot - Standards that are being voted upon by a committee or working group, or are undergoing other SDO procedures.



## ITS Standards In Ballot, Listed by SDO

Standards development statuses as of December 6, 2010

**IEEE**

Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification IEEE 802.11p

Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers IEEE P1512.4

Search Standards | Standards Listed by Development Status

Under Development - Standards that are being written, but are not yet ready for a formal ballot



## ITS Standards Under Development, Listed by SDO

Standards development statuses as of December 6, 2010

**IEEE**

Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture IEEE P1609.0

Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS) IEEE P1609.11

**AASHTO/ITE/NEMA**

Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters NTCIP 1210

Object Definitions for Conflict Monitor Units (CMU) NTCIP 1214



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# APPENDIX P: TURBO ARCHITECTURE ITS STANDARDS REPORT

# Relevant Standards Activities

5/31/2012 2:57:11PM

## Standards for Oregon Statewide ITS Architecture

NOTE: The ITS standards list has been customized or a standards group has been modiffed. The ITS standards presented in this report may represent a superset off options, and in some cases, provide redundant capabilities. In addition, these ITS standards are at different maturity levels. Care should be taken to select the standards that best meet the needs off the region or project.

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|
| AASHTO/ITE | Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC) | | ITE TMDD |
| AASHTO/ITE/NEMA | NTCIP Center-to-Field Standards Group | | (See Footnote) |
| AASHTO/ITE/NEMA | USER DEFINED: NTCIP Center-to-Center Standards Group | | (See Footnote) |
| AASHTO/ITE/NEMA | Global Object Definitions | | NTCIP 1201 |
| AASHTO/ITE/NEMA | Object Definitions for Actuated Traffic Signal Controller (ASC) Units | | NTCIP 1202 |
| AASHTO/ITE/NEMA | Object Definitions for Dynamic Message Signs (DMS) | | NTCIP 1203 |
| AASHTO/ITE/NEMA | Object Definitions for Environmental Sensor Stations (ESS) | | NTCIP 1204 |
| AASHTO/ITE/NEMA | Object Definitions for Closed Circuit Television (CCTV) Camera Control | | NTCIP 1205 |
| AASHTO/ITE/NEMA | Object Definitions for Data Collection and Monitoring (DCM) Devices | | NTCIP 1206 |
| AASHTO/ITE/NEMA | Object Definitions for Ramp Meter Control (RMC) Units | | NTCIP 1207 |
| AASHTO/ITE/NEMA | Object Definitions for Closed Circuit Television (CCTV) Switching | | NTCIP 1208 |
| AASHTO/ITE/NEMA | Data Element Definitions for Transportation Sensor Systems (TSS) | | NTCIP 1209 |
| AASHTO/ITE/NEMA | Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters | | NTCIP 1210 |
| AASHTO/ITE/NEMA | Object Definitions for Signal Control and Prioritization (SCP) | | NTCIP 1211 |
| AASHTO/ITE/NEMA | Object Definitions for Conflict Monitor Units (CMU) | | NTCIP 1214 |

**Standards for Oregon Statewide ITS Architecture**

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|
| ANSI | Electronic Filing of Tax Return Data | | ANSI TS813 |
| APTA | Standard for Transit Communications Interface Profiles | | APTA TCIP-S-001 3.0.3 |
| ASTM | Dedicated Short Range Communication at 915 MHz Standards Group | | (See Footnote) |
| ASTM | Standard Practice for Metadata to Support Archived Data Management Systems | | ASTM E2468-05 |
| ASTM | Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data | | ASTM E2665-08 |
| ASTM/IEEE/SAE | Dedicated Short Range Communication at 5.9 GHz Standards Group | | (See Footnote) |
| IEEE | Incident Management Standards Group | | (See Footnote) |
| IEEE | Standard for Message Sets for Vehicle/Roadside Communications | | IEEE 1455-1999 |
| SAE | Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group | | (See Footnote) |
| SAE | Advanced Traveler Information Systems (ATIS) General Use Standards Group | | (See Footnote) |
| SAE | Dedicated Short Range Communications (DSRC) Message Set Dictionary | | SAE J2735 |

**Standards for Oregon Statewide ITS Architecture**

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|

**Footnotes:**

**Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| SAE | Location Referencing Message Specification (LRMS) | SAE J2266 |
| SAE | Message Set for Advanced Traveler Information System (ATIS) | SAE J2354 |
| SAE | Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media | SAE J2369 |
| SAE | Messages for Handling Strings and Look-Up Tables in ATIS Standards | SAE J2540 |
| SAE | RDS (Radio Data System) Phrase Lists | SAE J2540/1 |
| SAE | ITIS (International Traveler Information Systems) Phrase Lists | SAE J2540/2 |
| SAE | National Names Phrase List | SAE J2540/3 |

**Advanced Traveler Information Systems (ATIS) General Use Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| SAE | Location Referencing Message Specification (LRMS) | SAE J2266 |
| SAE | Message Set for Advanced Traveler Information System (ATIS) | SAE J2354 |
| SAE | Messages for Handling Strings and Look-Up Tables in ATIS Standards | SAE J2540 |
| SAE | RDS (Radio Data System) Phrase Lists | SAE J2540/1 |
| SAE | ITIS (International Traveler Information Systems) Phrase Lists | SAE J2540/2 |
| SAE | National Names Phrase List | SAE J2540/3 |

**Dedicated Short Range Communication at 5.9 GHz Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| ASTM | Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications | ASTM E2213-03 |
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager | IEEE 1609.1-2006 |
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages | IEEE 1609.2-2006 |
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services | IEEE 1609.3 |
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation | IEEE 1609.4-2006 |
| IEEE | Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification | IEEE 802.11p |

## Standards for Oregon Statewide ITS Architecture

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|

**Dedicated Short Range Communication at 5.9 GHz Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| IEEE | Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture | IEEE P1609.0 |

**Dedicated Short Range Communication at 915 MHz Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| ASTM | Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band | ASTM E2158-01 |

**Incident Management Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| IEEE | Standard for Common Incident Management Message Sets for use by Emergency Management Centers | IEEE 1512 -2006 |
| IEEE | Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.1-2006 |
| IEEE | Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.2-2004 |
| IEEE | Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers | IEEE 1512.3-2006 |
| IEEE | Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers | IEEE P1512.4 |

**NTCIP Center-to-Field Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| AASHTO/ITE/NEMA | Octet Encoding Rules (OER) Base Protocol | NTCIP 1102 |
| AASHTO/ITE/NEMA | Transportation Management Protocols (TMP) | NTCIP 1103 |
| AASHTO/ITE/NEMA | Point to Multi-Point Protocol Using RS-232 Subnetwork Profile | NTCIP 2101 |
| AASHTO/ITE/NEMA | Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile | NTCIP 2102 |
| AASHTO/ITE/NEMA | Point-to-Point Protocol Over RS-232 Subnetwork Profile | NTCIP 2103 |
| AASHTO/ITE/NEMA | Ethernet Subnetwork Profile | NTCIP 2104 |
| AASHTO/ITE/NEMA | Transportation Transport Profile | NTCIP 2201 |
| AASHTO/ITE/NEMA | Internet (TCP/IP and UDP/IP) Transport Profile | NTCIP 2202 |
| AASHTO/ITE/NEMA | Simple Transportation Management Framework (STMF) Application Profile | NTCIP 2301 |
| AASHTO/ITE/NEMA | Trivial File Transfer Protocol (TFTP) Application Profile | NTCIP 2302 |
| AASHTO/ITE/NEMA | File Transfer Protocol (FTP) Application Profile | NTCIP 2303 |

**USER DEFINED: NTCIP Center-to-Center Standards Group**

| SDO | Standard Name | Document ID |
|---|---|---|
| AASHTO/ITE/NEMA | Octet Encoding Rules (OER) Base Protocol | NTCIP 1102 |
| AASHTO/ITE/NEMA | Center-to-Center Naming Convention Specification | NTCIP 1104 |
| AASHTO/ITE/NEMA | Ethernet Subnetwork Profile | NTCIP 2104 |
| AASHTO/ITE/NEMA | Internet (TCP/IP and UDP/IP) Transport Profile | NTCIP 2202 |
| AASHTO/ITE/NEMA | File Transfer Protocol (FTP) Application Profile | NTCIP 2303 |
| AASHTO/ITE/NEMA | Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML) | NTCIP 2306 |

**Standards for Oregon Statewide ITS Architecture**

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|

## Standards for Oregon Statewide ITS Architecture

| Lead SDO | Standard Name | Version | Document ID |
|---|---|---|---|

### *Filters*

**Entity Class**

| Show | Class |
|---|---|
| Yes | Center |
| Yes | Field |
| Yes | Traveler |
| Yes | Vehicle |

**Entity Type**

| Show | Type |
|---|---|
| Yes | System |
| Yes | Human |
| Yes | Environment |

**Interconnects**

| Show | Interconnect |
|---|---|
| Yes | Center to Center |
| Yes | Center to Field |
| Yes | Center to Traveler |
| Yes | Center to Vehicle |
| Yes | Field to Field |
| Yes | Field to Vehicle |
| Yes | Traveler to Field |
| Yes | Traveler to Traveler |
| Yes | Traveler to Vehicle |
| Yes | Vehicle to Vehicle |

**Flow Type**

| Show | Type |
|---|---|
| Yes | Request |
| Yes | Information |

**Flow Status**

| Show | Status |
|---|---|
| Yes | Existing |
| Yes | Existing/Programmed |
| Yes | Existing/Planned |
| Yes | Existing/Future |
| Yes | Programmed |
| Yes | Planned |
| Yes | Future |

**Flow Futuristic**

| Show | Futuristic |
|---|---|
| Yes | Futuristic |

**Market Package**

| Show | Market Package |
|---|---|
| Yes | All |

# APPENDIX Q: PAST ACKNOWLEDGMENTS

# ACKNOWLEDGMENTS- VERSION 1


## Project Manager

| | |
|---|---|
| Galen McGill | Oregon Department of Transportation – ITS Unit |

## Statewide Architecture Committee

| | |
|---|---|
| Hau Hagedorn | Oregon Department of Transportation – ITS Unit |
| Patrick Hoke | Oregon Department of Transportation – ITS Unit |
| Chuck Larsen | Oregon Department of Transportation – ITS Unit |
| Doug Spencer | Oregon Department of Transportation – ITS Unit |
| Nathaniel Price | Federal Highway Administration |

## Other Stakeholders

| | |
|---|---|
| Adam Bradford | Oregon Department of Transportation – ITS Unit |
| Kelle Forbes | Oregon Department of Transportation – ITS Unit |
| Glen Hammer | Oregon Department of Transportation – ITS Unit |
| Robert Fijol | Federal Highway Administration |

## Consultant Team

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| Jim Peters | DKS Associates |
| Renee Hurtado | DKS Associates |
| Danella Whitt | DKS Associates |

# ACKNOWLEDGMENTS- VERSION 2


## Project Manager

| | |
|---|---|
| Galen McGill | Oregon Department of Transportation – ITS Unit |

## Statewide Architecture Committee

| | |
|---|---|
| Adam Bradford | Oregon Department of Transportation – ITS Unit |
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| Doug Spencer | Oregon Department of Transportation – ITS Unit |
| Kelle Forbes | Oregon Department of Transportation – ITS Unit |
| Glen Hammer | Oregon Department of Transportation – ITS Unit |
| Amy Mastraccio | Oregon Department of Transportation – ITS Unit |
| Greg Ek-Collins | Oregon Department of Transportation – Office of Maintenance and Operations |
| Dennis Mitchell | Oregon Department of Transportation – Region 1 |
| Nathaniel Price | Federal Highway Administration |

## Public Transportation Advisory Committee (PTAC)

| | |
|---|---|
| Michael Ward | ODOT – Public Transit Division |
| Matthew Barnes | ODOT – Public Transit Division |
| Joni Bramlett | ODOT – Public Transit Division |
| Dinah Van Der Hyde | ODOT – Public Transit Division |
| Jean Palmateer | ODOT – Public Transit Division |
| Julie Brown | Rogue Valley Transportation District (RVTD) |
| Mary Jo Carpenter | Oregon Transit Association (OTA) |
| Roxanne Daniel | Salem-Keizer Transit |
| Bill Hall | Lincoln County Commission |
| Sally Lawson | Oregon State Area Agencies on Disabilities, NW Senior and Disability Services (NWSDS) |
| Annette Le | Federal Transit Administration, Region X |
| Bob Lowry | Oregon Passenger Rail Advisory Committee (OPRAC) |
| Tim McQueary | Governor's Commission on Senior Services |
| Heather Ornelas | Bend Area Transit District, City of Bend |
| Ernie Palmer | Basin Transit Service, Klamath Falls |
| Terry Parker | Lane Transit District (LTD) |
| Allan Pollock | Salem Area Mass Transit District (SAMTD) |
| Claire Potter | TriMet |
| Roxanne Rolls | Salem-Keizer Transit |
| John Wenholz | Association of Oregon Counties (AOC) |

## Consultant Team

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| Jennifer Bachman | DKS Associates |
| Danella Whitt | DKS Associates |