

# Personal Signal Assistant...

*...bringing the traffic signal into the vehicle...*



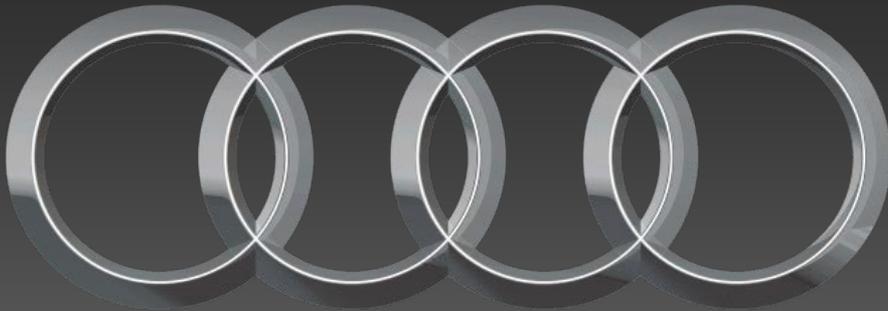
# Traffic Technology Services

- Technology firm specializing in data content for Connected Vehicle applications and services
- Expert team of traffic engineers, data scientists, and programmers
  - Global subject matter expert reputation
  - Inventors of patent-pending technology
- Shareholders include Heusch Boesefeldt, outside investors, and employees
- North American company incorporated in Delaware with head office in Oregon

# Heusch Boesefeldt

- Freeway traffic management software developer and ITS solutions provider
- Central European market leader for ATM control and management software
- Over 30 years of experience in traffic management, control and information
- More than 60 ATM systems currently operating across Europe
- Involved in Connected Vehicles research
- Headquartered in Aachen, Germany

# Our Customers



**Audi**



# What is Our Product?

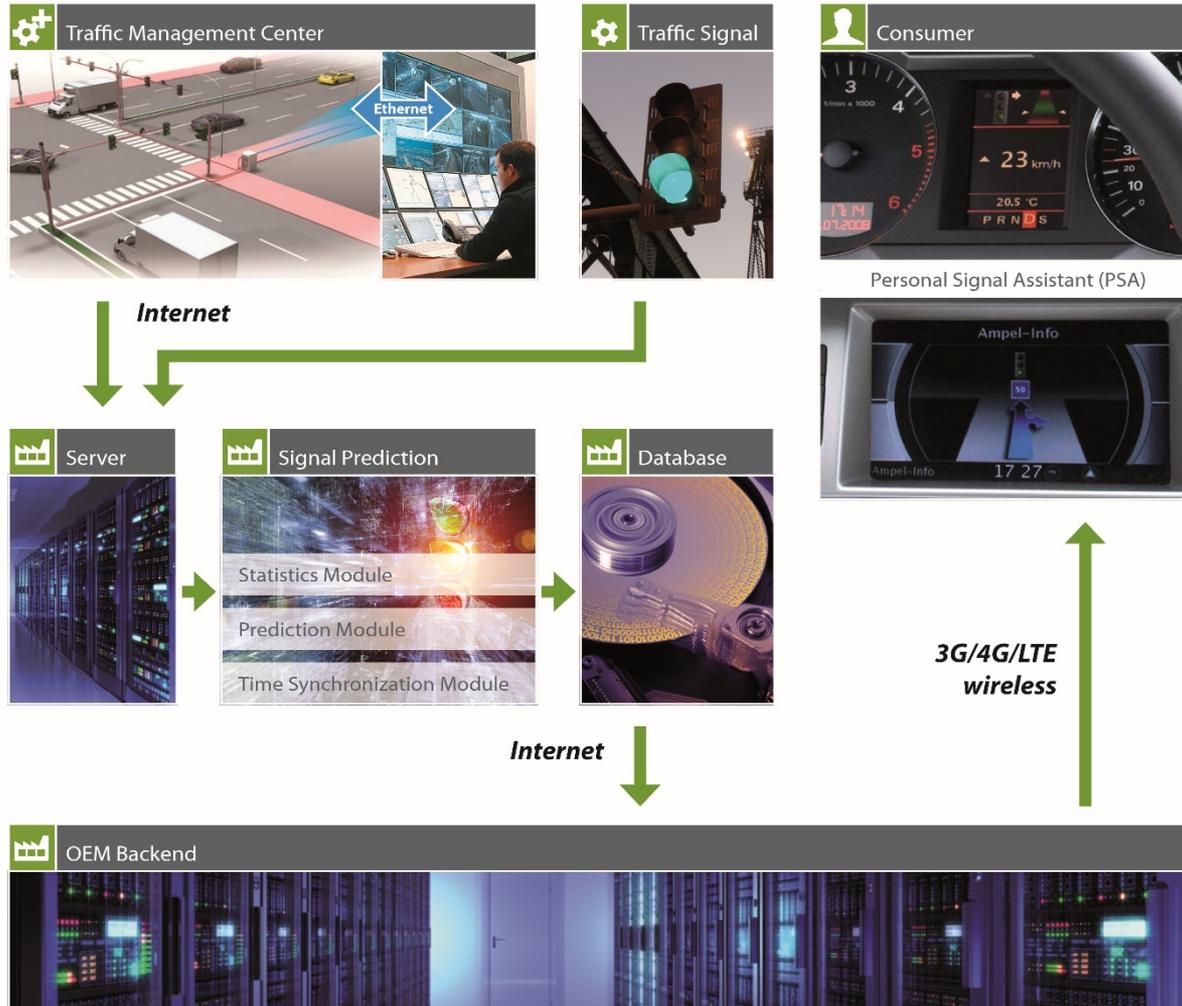
- Personal Signal Assistant
  - SPaT (Signal Phasing and Timing) message
    - current signal status
    - predicted signal switch times
  - MAP data message
    - Lanes
    - Phase assignments
    - Speed Limits

# Personal Signal Assistant



- Fuses proven technology with new analytics
- Works for all signal technology
- Uses standard ITS communication infrastructure and data protocols
- Limited bandwidth footprint from TMC/intersection to TTS servers
- Transmits to vehicle or mobile device via internet and 3G/4G/LTE wireless data communication

# How Does It Work?



# What Does It Require?

- Real-time data
  - Actuated signals
    - Phase active status (red, yellow, green)
    - Phase call status
    - Active timing plan
    - Cycle second
    - Preemption or transit signal priority
  - Fixed time signals
    - Active timing plan
    - Cycle second
- Offline data
  - Signal timing and phasing

# How is PSA Used?

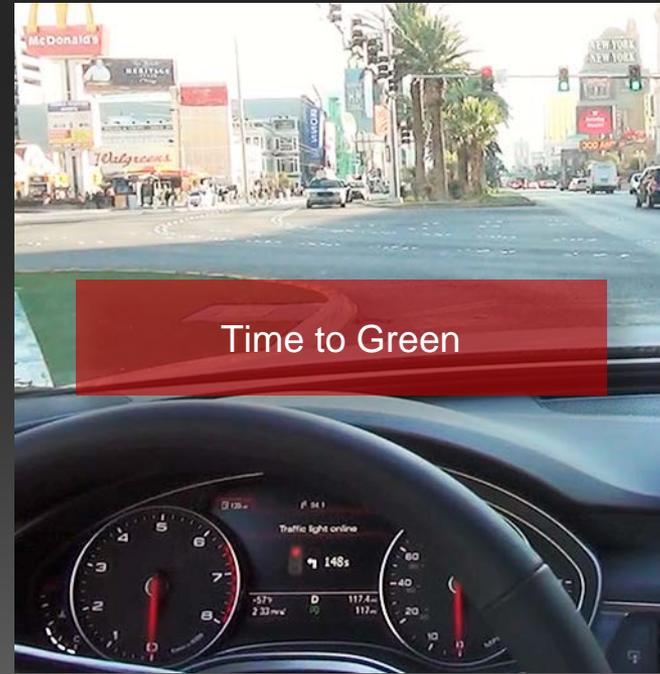
- Automotive Industry
  - Integrated messages, information into dashboard
  - Telematics: Start/Stop technology
- Commercial Fleets
  - Integrated into routing services
  - Telematics: Start/Stop technology
- Transit Operators
  - OBE for loading periods, departure windows
  - Telematics

# Application Example<sup>1</sup>



- Approach on red
  - Remaining time exceeds approach time with min speed advisory
  - Engine automatically shuts off and turns back on when remaining timer reaches 5 seconds

# Application Example<sup>1</sup>



- Approach on red for actuated left-turn
  - Blank – with no vehicle waiting and before own vehicle is detected
  - Provides positive feedback of detection system functioning
  - Engine automatically shuts off and turns back on when remaining timer reaches 5 sec

# Application Example<sup>1</sup>



- Approach on red
  - Remaining time less than approach time at speed limit

# Application Example<sup>1</sup>



- Approach on green
  - Speed advisory set to local speed limit

# Application Example<sup>1</sup>



- Approach with protected/permissive phasing
  - Speed advisory or time to green counter based on next available opportunity
    - Protected phase shown with turning arrow
    - Permissive phase displayed with shared through/turn arrow

# Demonstration Deployments

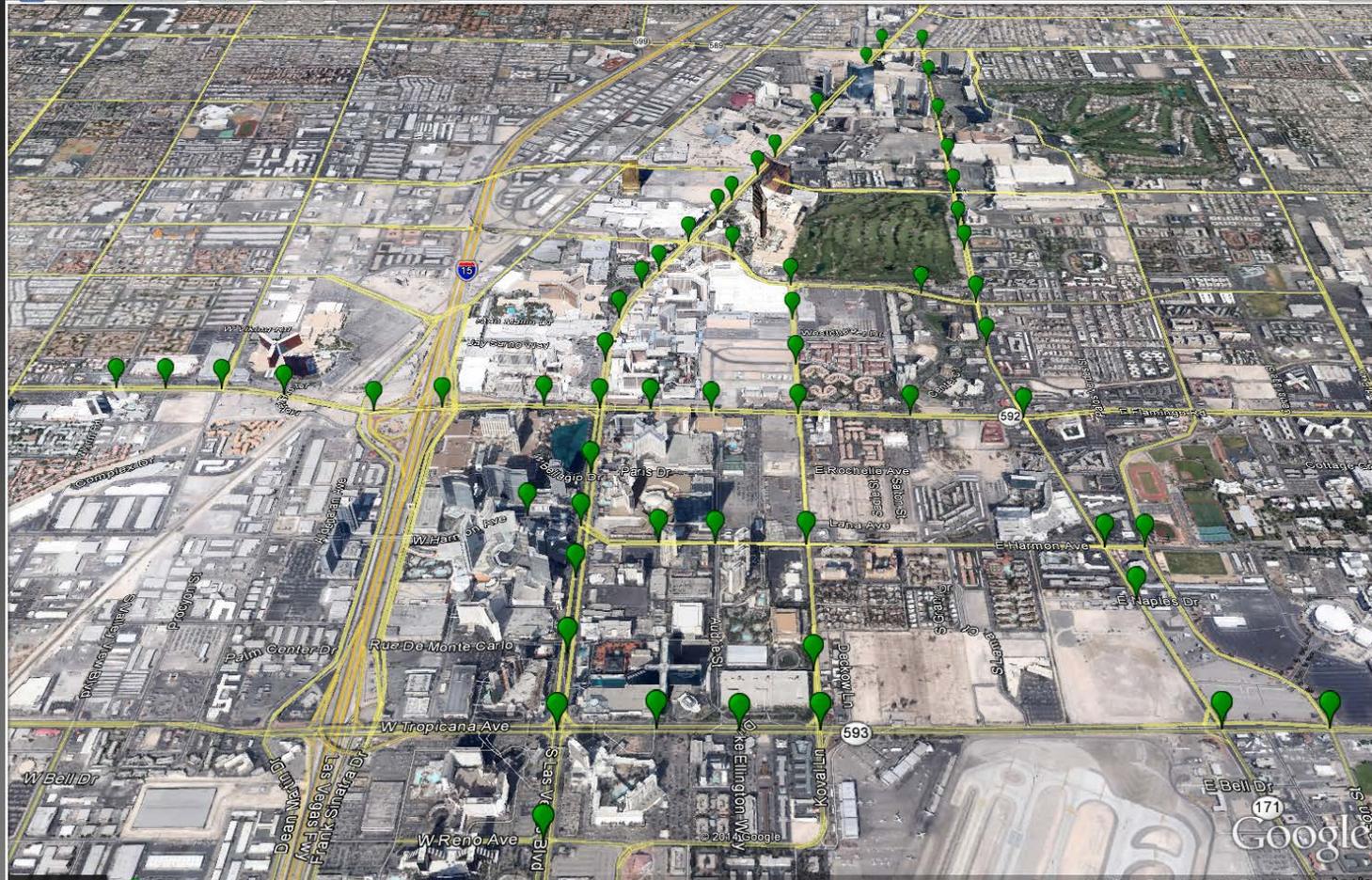
- Las Vegas, NV
  - 50 signals
    - Semi-actuated operation
    - Siemens NextPhase (36) and Trafficware (14) signal controller
    - AB3418 (23), NextPhase40 (13) and NTCIP (14) communication protocol
  - 24/7 operation since April 2013
  - Joint deployment with Audi
- Route NJ 1, Middlesex County, NJ
  - 10 signals
    - Semi-actuated control
    - Trafficware signal controller
    - NTCIP communication protocol
  - Expected operation by early 2015
  - Joint deployment with BMW
- Dortmund, Germany
  - 1 signal
    - Semi-actuated control
    - Siemens signal controller
  - Completed in Fall 2014
  - Technical proof-of-concept

# Deployment Areas

- Washington, DC
- Los Angeles, CA
- New York City
- San Francisco, CA
- Miami, FL
- Las Vegas, NV
- San Diego, CA
- Portland, OR
- Minneapolis, MN



# CES 2014 Audi Showcase



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- Media Coverage<sup>1</sup>

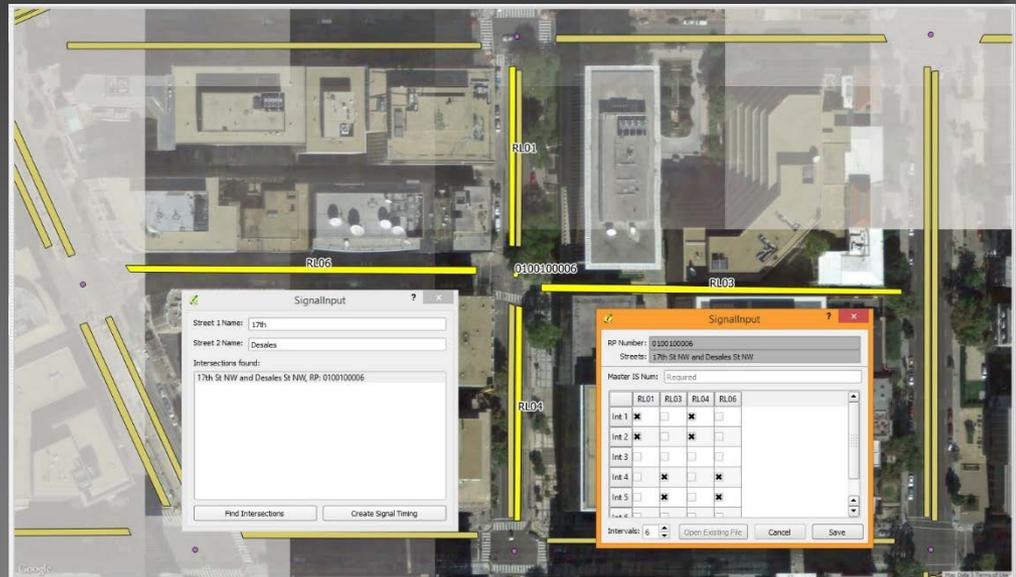
- [CNET TV](#)
- [YouTube video by Audi](#)
- [Autoblog](#)
- [YouTube video by The Verge](#)
- [Consumer Reports](#)
- [Car and Driver](#)



<sup>1</sup> Click on links to access web content.

# Agency Benefits (1)

- Georeferenced lane, phase (interval) topology inventory (KML) for all connected signals
  - Interface to other GIS
  - Data for other tools
  - MAP format

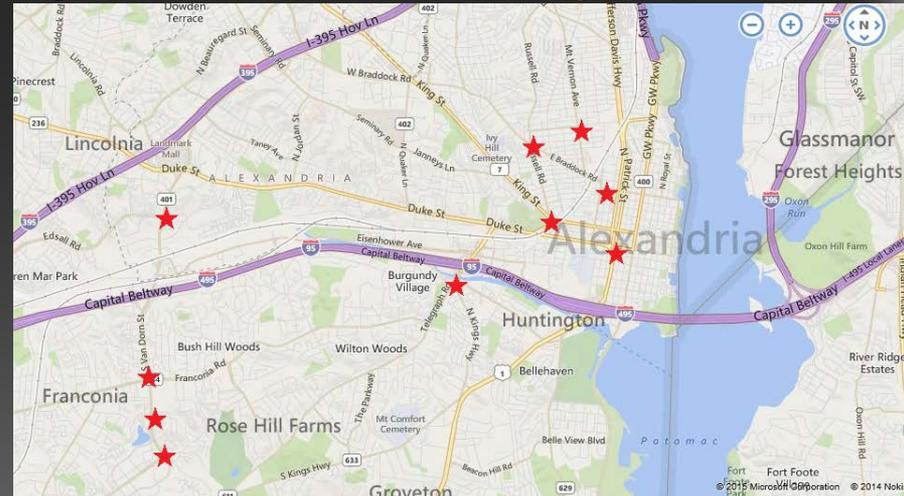


# Agency Benefits (2)

- Signal Operations Report (Monthly)
  - Metrics
    - Communication downtime
    - Time in offset seeking
    - Detector faults
  - Filter
    - Number of Faults
    - Hourly (weekday/weekend)
  - Data source
    - Signal operations status

# Agency Benefits (3)

- Signal Performance Report (Quarterly)
  - Metrics
    - Delay
    - Number of stops
    - Arrivals on green/red
  - Filter
    - Selected intersections
    - Hourly (weekday/weekend)
  - Data source
    - GPS probe and signal phase status



# Public Benefits



- Save Fuel & Energy
  - Automatically turn off engine during red
  - Adjust speed to arrive on green
  - Reduce consumption and emissions
  - 10-15% savings from field and simulation



- Save time
  - Optimize routing based on anticipated signal delay



- Improve safety
  - Provide more information to the driver

# Safety Benefits (1)



Providing advanced signal warning directly in the dashboard

# Safety Benefits (2)



Providing additional information when visibility is impaired

# Safety Benefits (2)



Providing additional information when visibility is impaired

# Safety Benefits (2)



Providing additional information when visibility is impaired

# Safety Benefits (3)



Positive detection feedback, reducing red light running

# Safety Benefits (4)



Providing supplemental information in crowded spaces

# Advantages Over DSRC Solution



- New Traffic Signals
  - Current Connected Vehicle demonstration test beds use DSRC to communicate switch times to approaching vehicles
  - Expensive hardware solution
  - Current controller firmware products cannot predict switch times



- Existing Traffic Signals
  - Currently no cost effective solution exists for more than 350,000 existing signals
  - Nationwide DSRC coverage expected to be years off given high infrastructure retrofit expenditure

# Liability Mitigation



- Provide assistance to the driver without adding any distraction
  - Direct integration into vehicle's human/machine interface developed by HMI professionals
  - No app
- Hide time to red countdown timer during last 2 seconds to force drivers to look at actual signal and not rely on displayed counter<sup>1</sup>
- Only display speed limit when approaching on green to not provide motivation for speeding
- Data licensing agreement that clearly shields agency from all claims

# Other Opportunities

- Potential to extend technology to:
  - Transit Priority
  - Civil fleets
  - Freight Priority
  - Pedestrians/bicyclists
- Ability to work with third-parties, such as app developers or navigation providers
- Revenue sharing long term, either through direct agreement or via grant system for expanding systems

**THANK YOU!**



# NEW YORK

ATLES 2014

