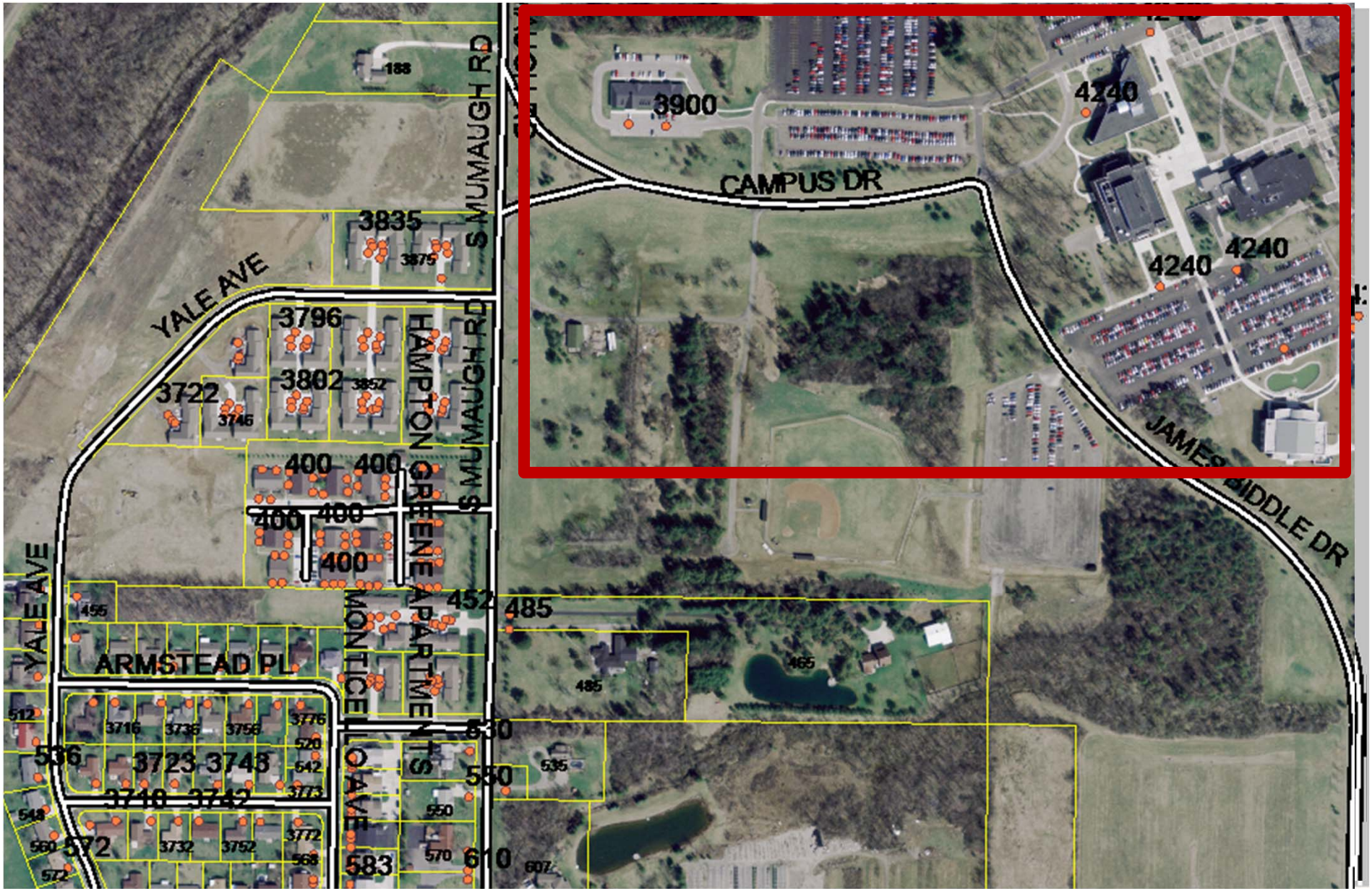
Synchronize ALI/Address to GIS



Synchronize ALI/Address to GIS

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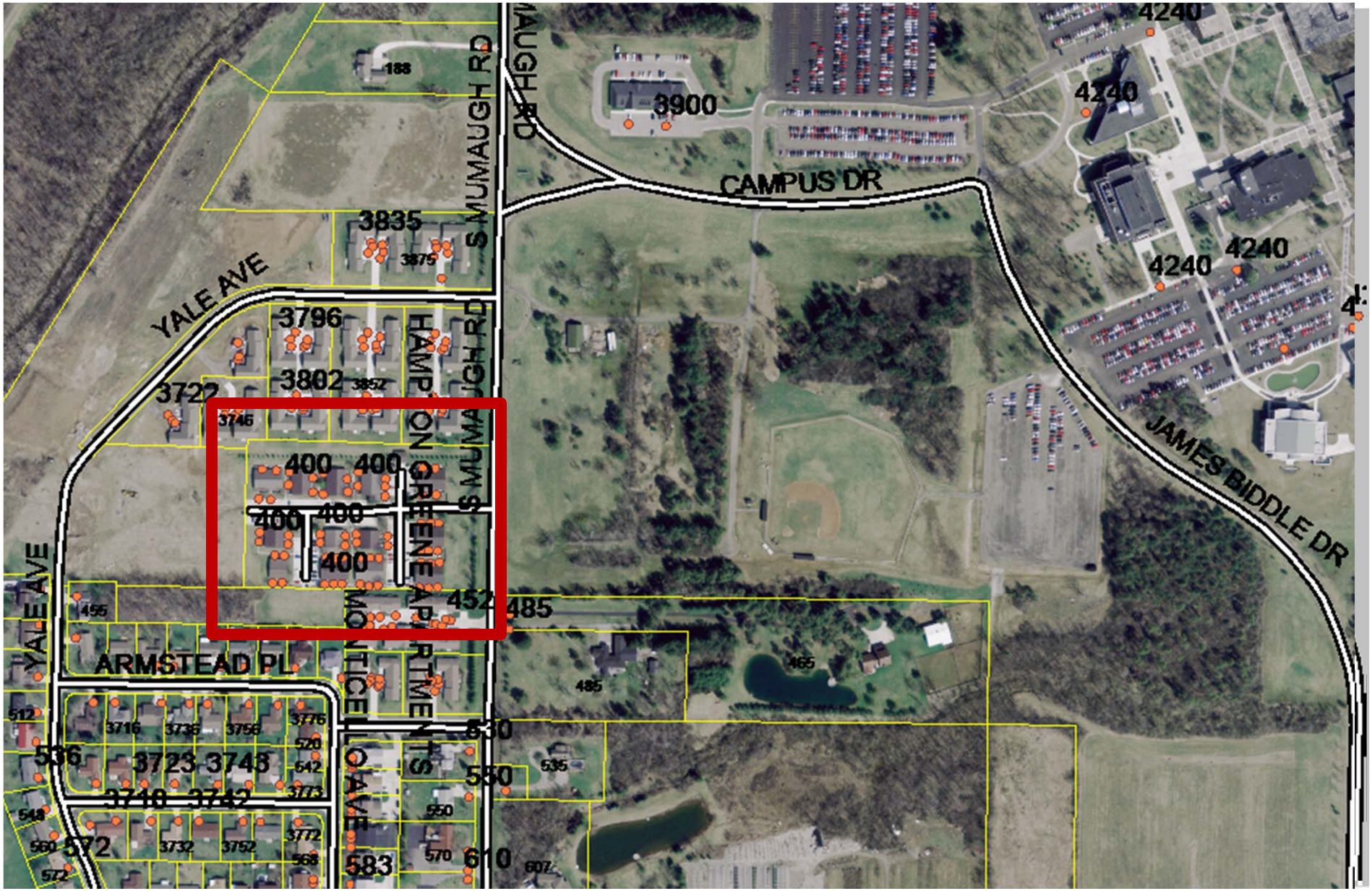
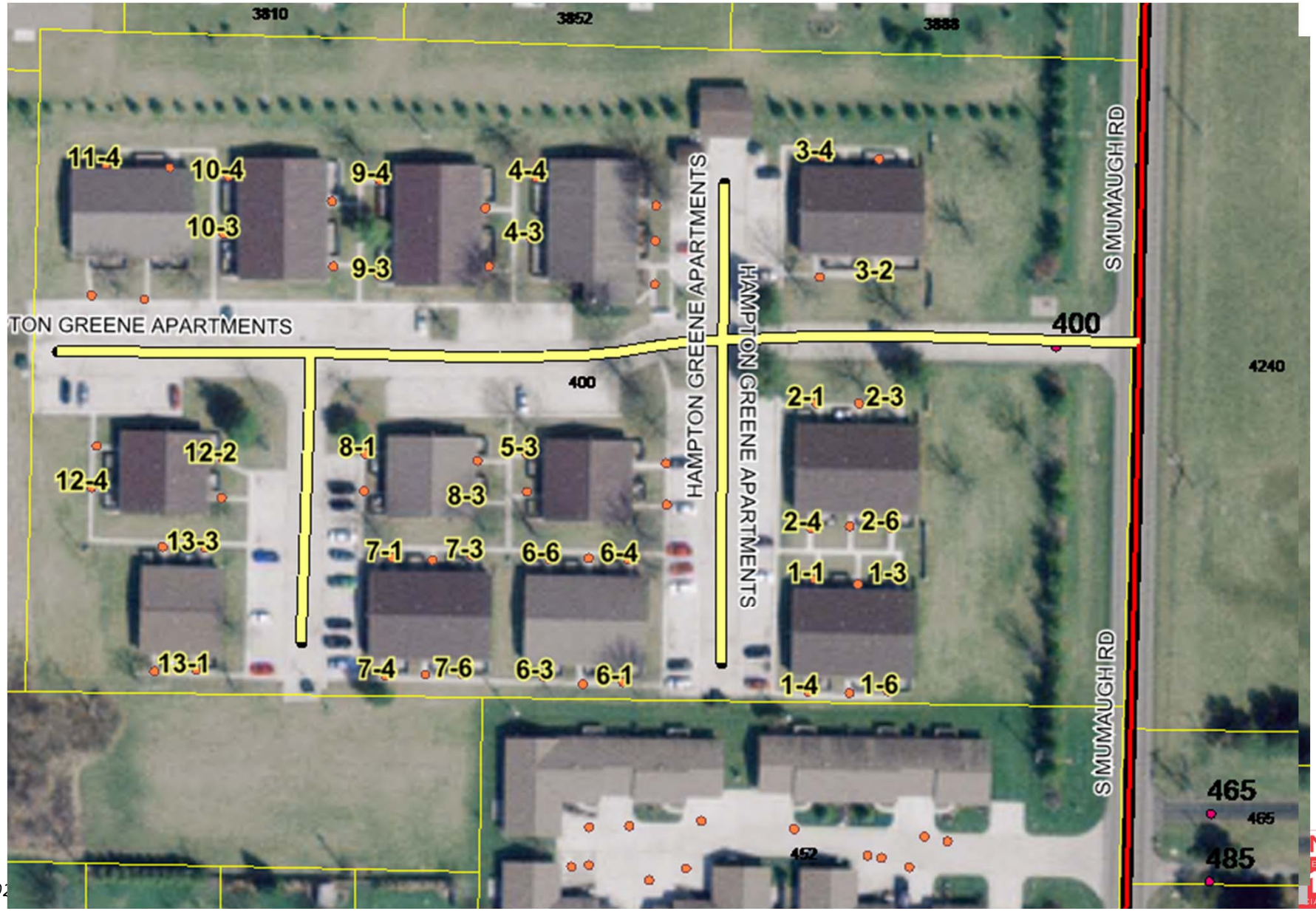
Synchronize ALI/Address to GIS



Synchronize ALI/Address to GIS



©2

Synchronize ALI/Address to GIS

Audit - ALI vs GIS Site Match

Audit Date: 01/01/2009 8:59:58 AM

ANI	House No	House No Suffix	Street	Customer	Provider Name	MSAG Road Name Match
KNEENAH CO.						
COPSTOWN						
(555) 555-2130			BEAR HILL RD	GETCHA, GONNA	ABC PHONE CO	Yes
(555) 555-3928			BEAR HILL RD	NAT PARCEL CO	ABC PHONE CO	Yes
(555) 555-3512	197	A	BEAR HILL RD	CHEEPO USED CARS	ABC PHONE CO	Yes
(555) 555-3032	392		BEAR HILL RD	BOBS BOOKSHOP	ABC PHONE CO	Yes
(555) 555-3098	1236		BEAR HILL RD	MALONE, SUGAR	ABC PHONE CO	Yes
(555) 555-3620	1236		BEAR HILL ST	JIGGS, JIMMY	ABC PHONE CO	No
(555) 555-3920	1521		BEAR HILL ST	FACTORY OUTLET STORE	ABC PHONE CO	No
(555) 555-3026	66		CEMETERY	COPSTOWN MUNICIPAL OFFICE	AAA TELCO	Yes
(555) 555-3126	2339		CEMETERY	YOUNG, IAM	AAA TELCO	Yes
(555) 555-2139	42	C	CHELSEA RD	CHEEPO, YOUNG	AAA TELCO	Yes
(555) 555-3958	550		CHELSEA AVE	VACANT, NO-CALLBACK	AAA TELCO	No
(555) 555-3168	932		E HILL RD	LACARTE, M		Yes
(555) 555-3167	932		E HILL RD	CAPONE, A J	VERIZON	Yes
(555) 555-4608	3277		EAGLE PEAK RD	KILLROY, K. C.	ACME TELECOM	No

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Responsible for GIS data?

In NG9-1-1 YOUR GIS data will be used for Location Validation and Call Routing

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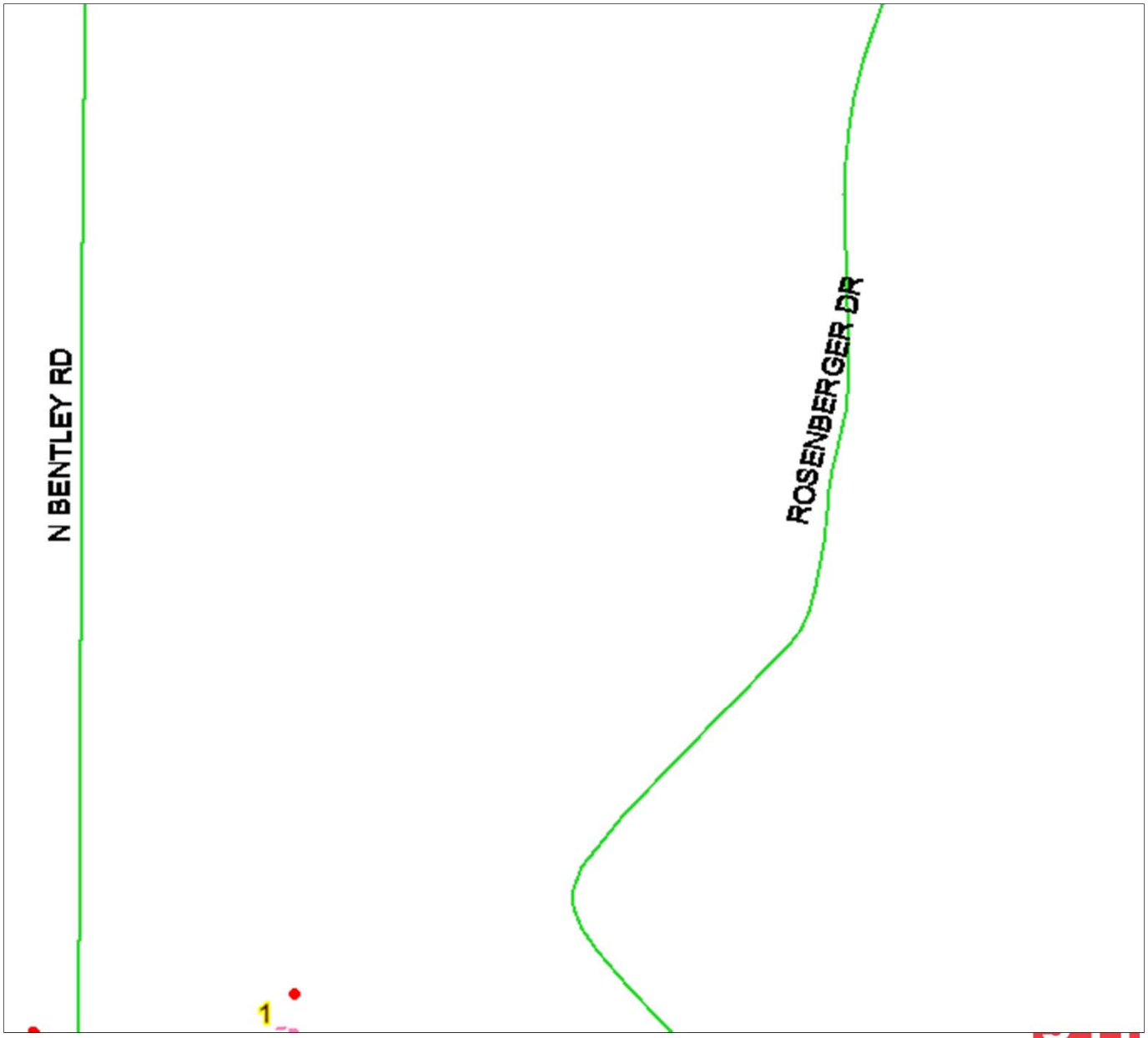
Geocoding

Geocoding does not yield the best results

Address:
1 University Drive

Plots on Map Display

Good Enough?



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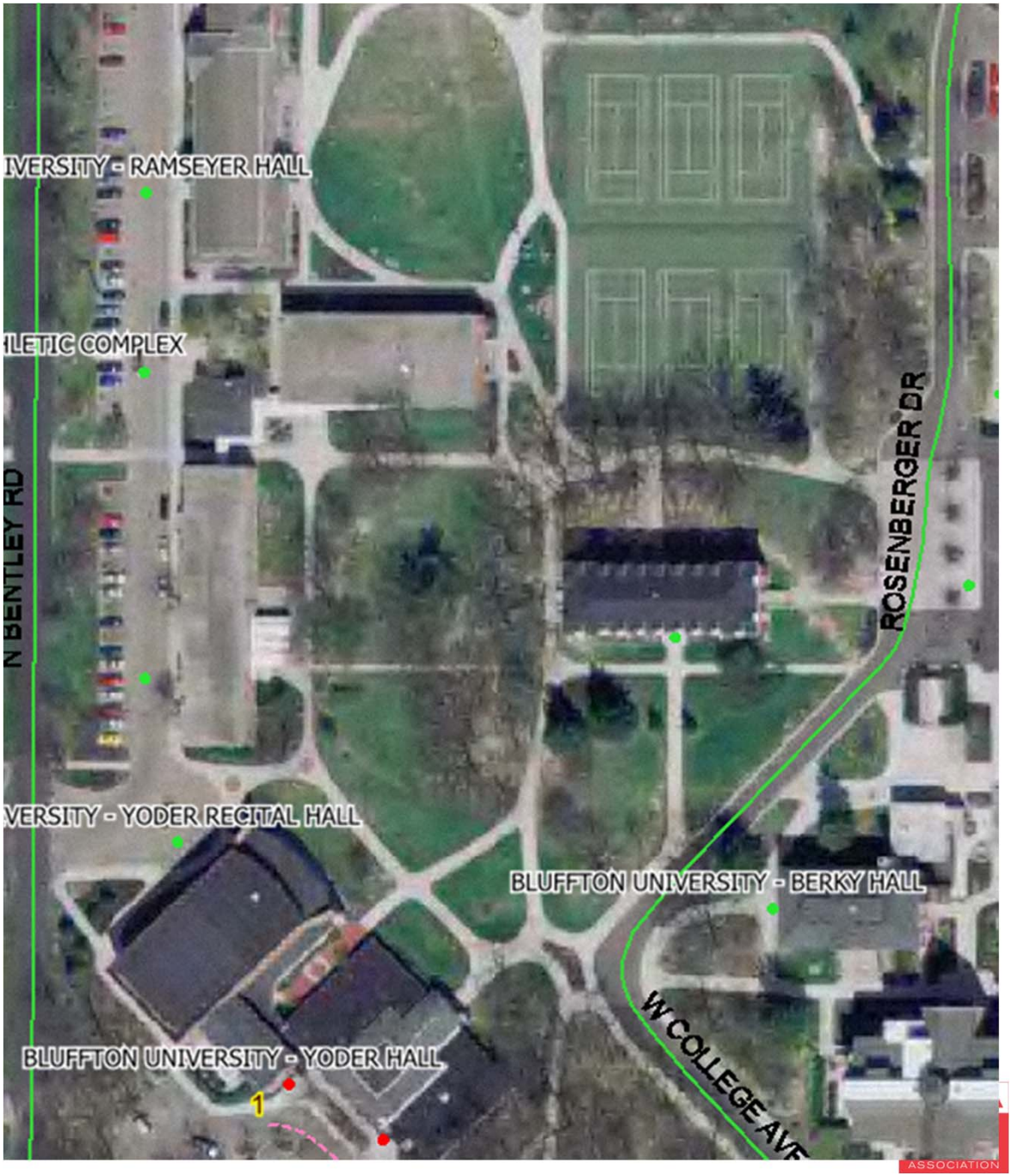
In this case, and many others, the answer for 9-1-1 is “NO!”

The complete address (Building, Suite, Lot,…) needs to match a point on the map display



Seconds Count !!

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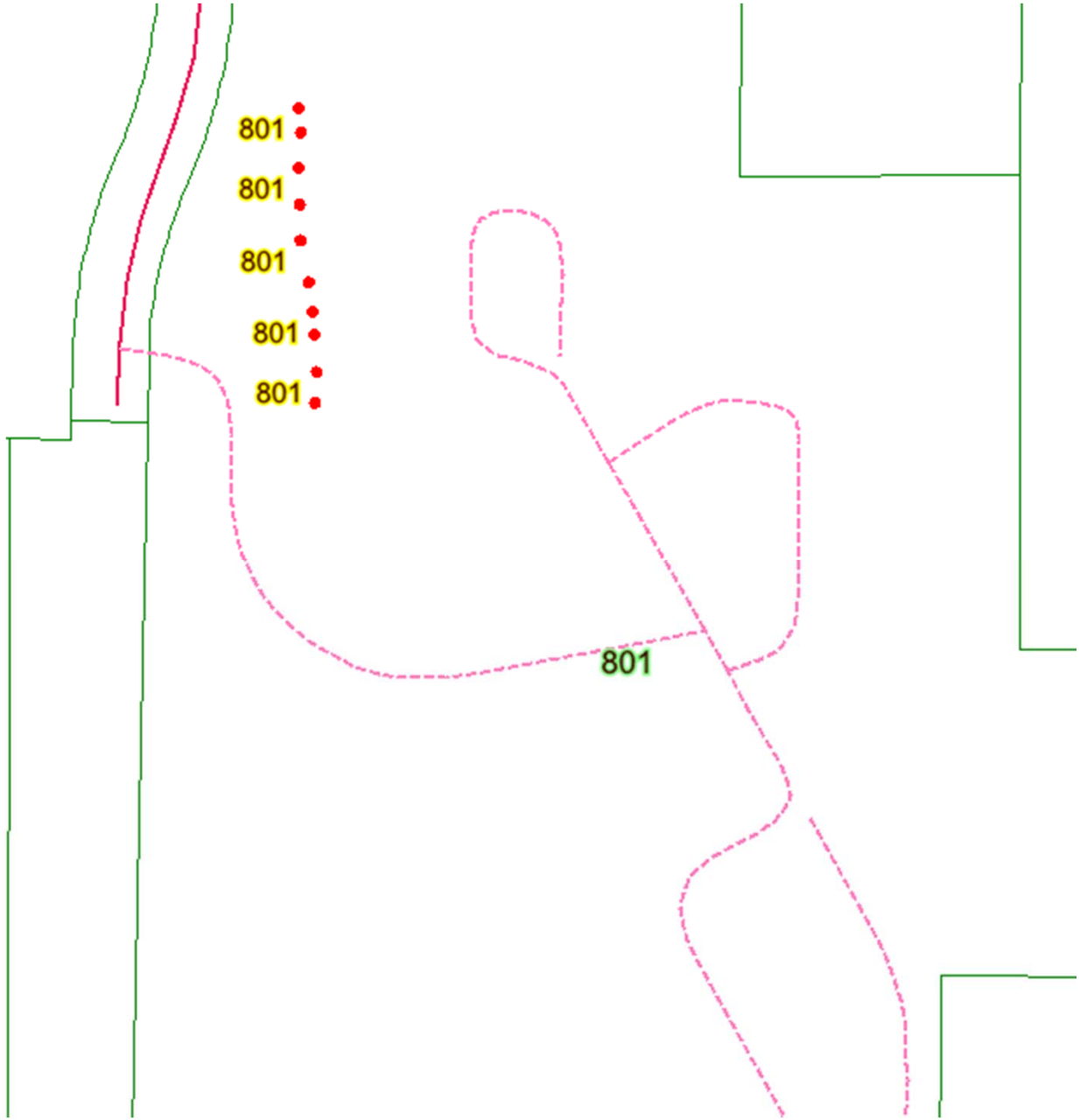
This example is better,
multiple locations, but
Are they correct?



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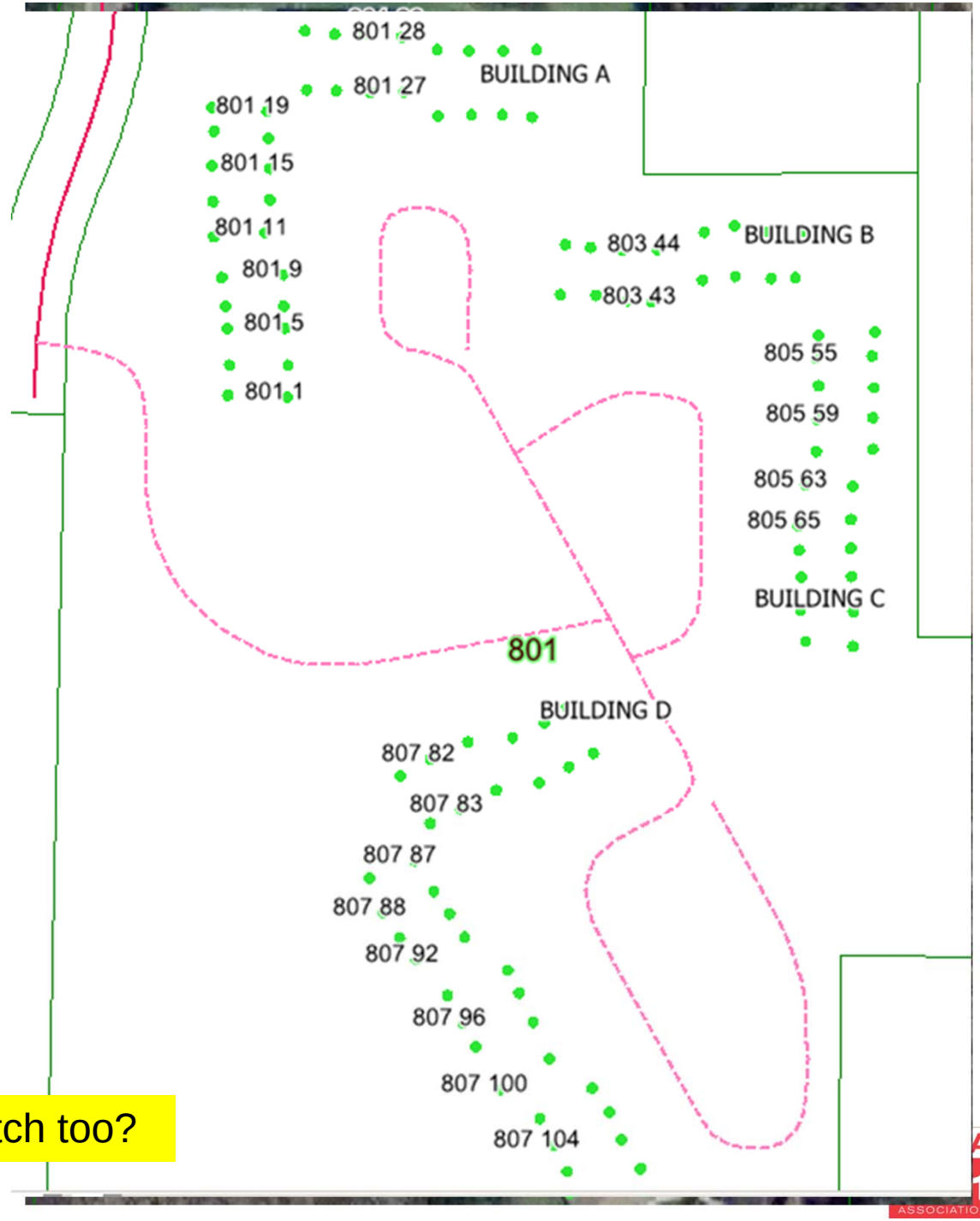
Guess Not



Which would you rather dispatch too?

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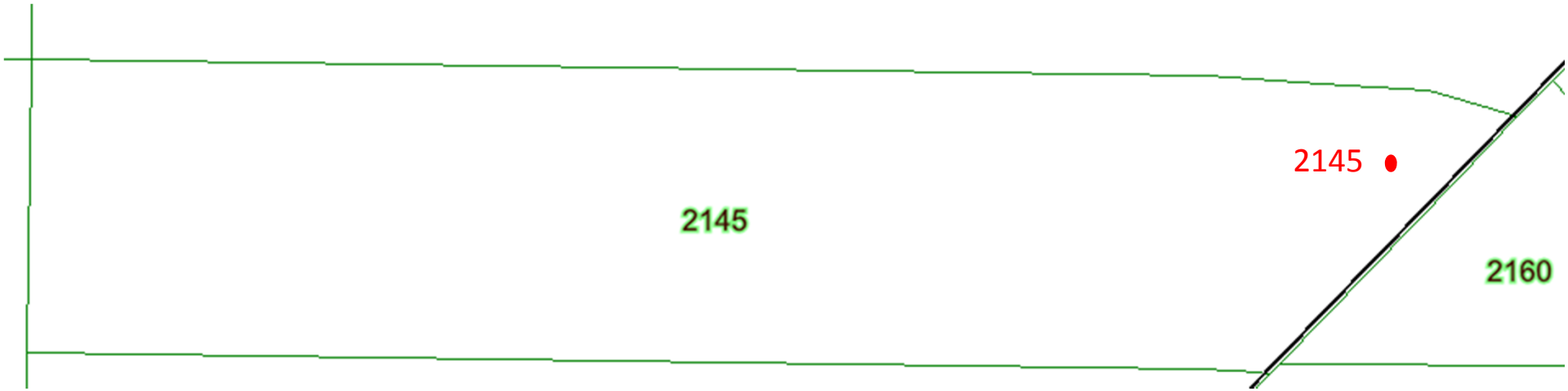
Geocoding

- Addresses for multi-tenant buildings, malls, schools, and others are often not assigned a unique house number
- Parcels do not reflect the structures on the Parcel
- For Responder to effectively locate these, the "Complete Address" must be tied to each location



You Need this Today!!!

In NG9-1-1 it is Required for location validation

Location and Accuracy matters

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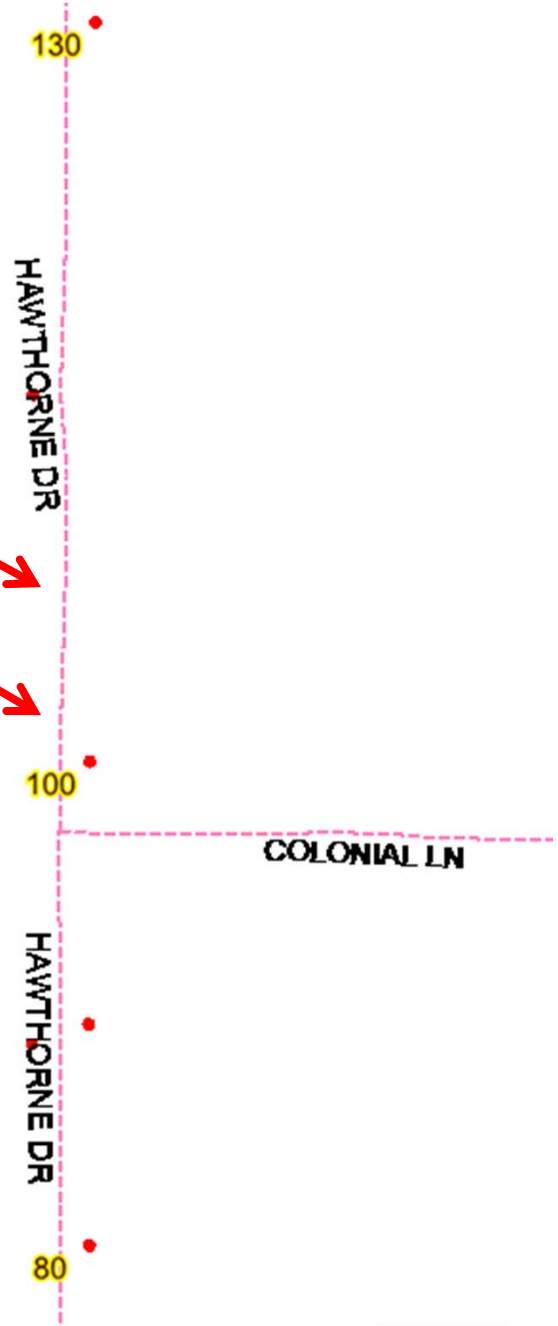
Where would 111 Hawthorne geocode?

Where would 107 Hawthorne geocode?



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Where are they really?

©2011 Marc Berryman, LNP

Need to Understand

How were pts created?

- GPS?
- Aerial imagery?
- Parcel Centroid?

What do they represent?

- Structures
- Access
- Parcel centroid?

Maintenance frequency?

- New points?

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Accurate Locations

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Why Address Points Matter

Address Verification in ALI and LVF in NG9-1-1

Geocoding to Centerline Issues

- **Rural areas may be off my miles**
- **Dense urban areas may be off by many lots**
- **Non-Standard Addressing**
- **Delays in Response**

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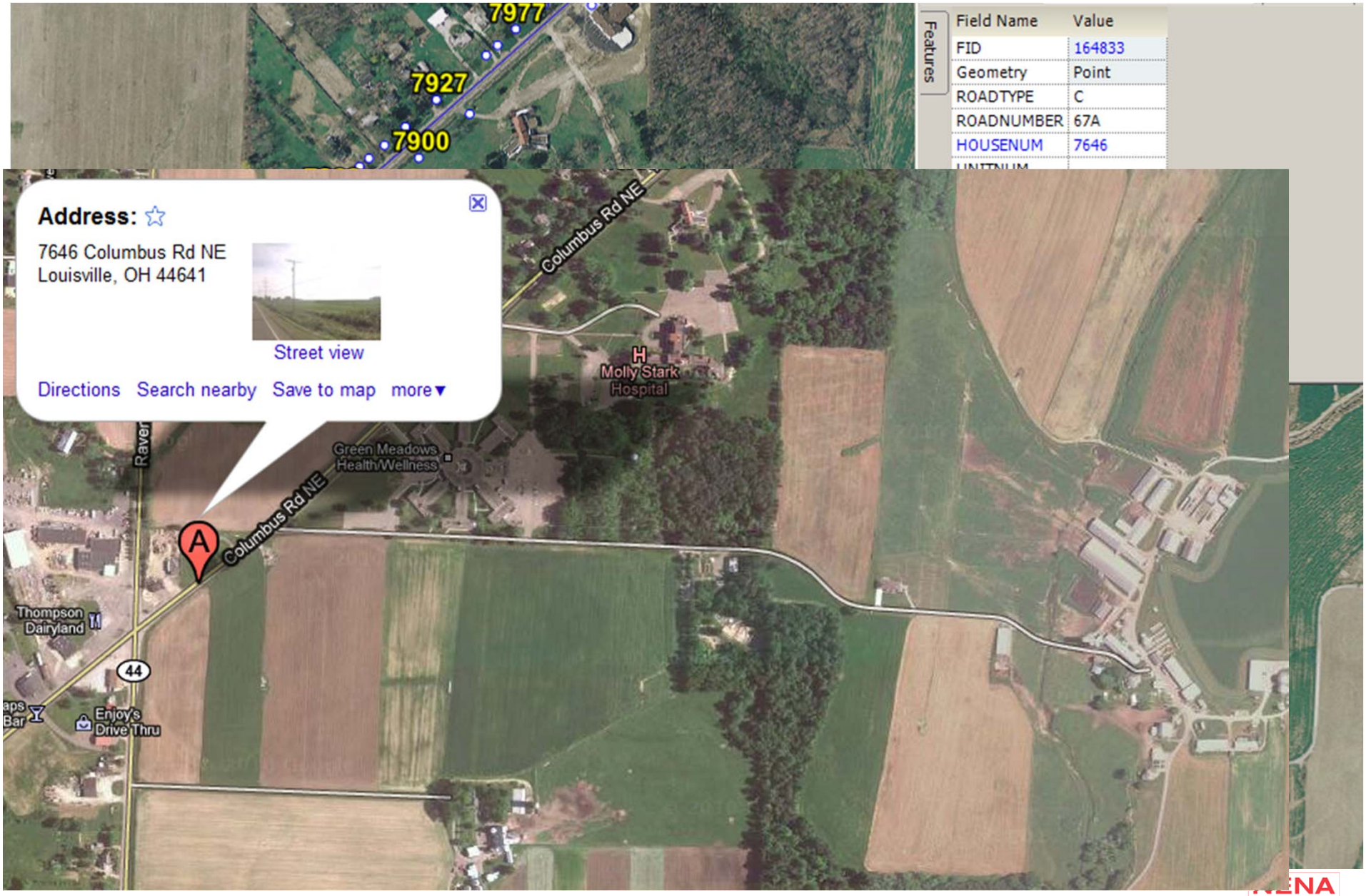

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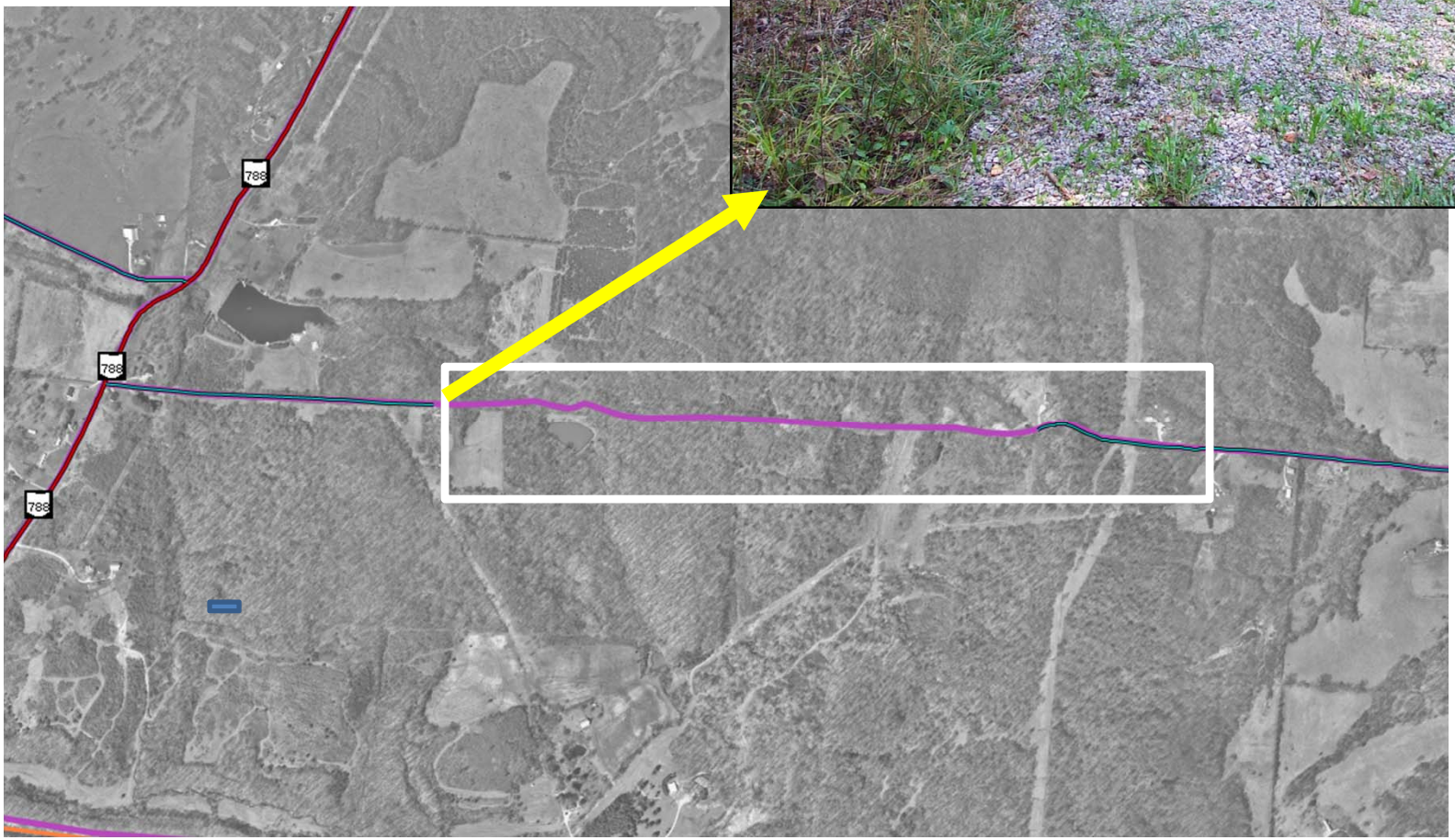
Road shown on Aerial Imagery and existing maps is *"Not a Road"*



Road shown on Aerial Imagery and existing maps is *"Closed for thru Traffic"*

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Field Verify

Want stake your agency's reputation or a persons life on anything less?

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Data Requirements - Maintenance

Identify

- Analyzing Accuracy of Each Database
- Comparing Each Database for Synchronization

Update

- It will require time and field work to validate
- Clean up errors and fallout

Maintain

- Set a process for maintaining the data
- Assign Responsibility

Re-evaluate

- Process in place to keeping the data synchronized

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Data Requirements

Public Safety needs and Standards *may not be met with GIS data from other Sources*

Those maintaining GIS *must understand* the needs of Public Safety and 9-1-1

Data must be accurate, current, and meet the demands of Public Safety

- **Road Closures for dispatch routing**
- **New Addresses & Roads Updated ASAP**
- **Jurisdictional Changes**

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NG9-1-1 Data Layers

Location Data

- Address points
- Road Centerlines

Service Boundary

- PSAP
- Fire
- Law
- Medical
- Coast Guard
- Etc….

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GIS in NG9-1-1

Support data associated with the caller location

Floor Plans

Fire Control Panels

Ingress, Egress, Stairwells

Fire Code Inspections

Past historical data (law and fire)

Building Inspections

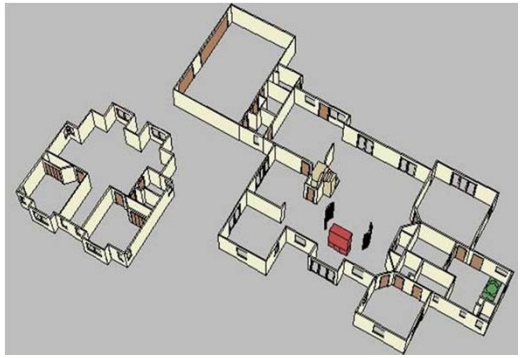
Hazardous Materials

Sensor Locations and Data

Historical Data

Surveillance Camera Locations

Campus / Facilities Layouts



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Next Generation 9-1-1

The NG9-1-1 solution appears complex, but initially we need only be concerned with the basics

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Next Generation 9-1-1
Items to be Covered

- LIS
- LVF
- BCF
- ECRF
- LoST protocol
- PIDF-LO
- ESRP
- ESInet
- i3 PSAP
- Policy Rules
- Gateways – Legacy, SR, PSAP

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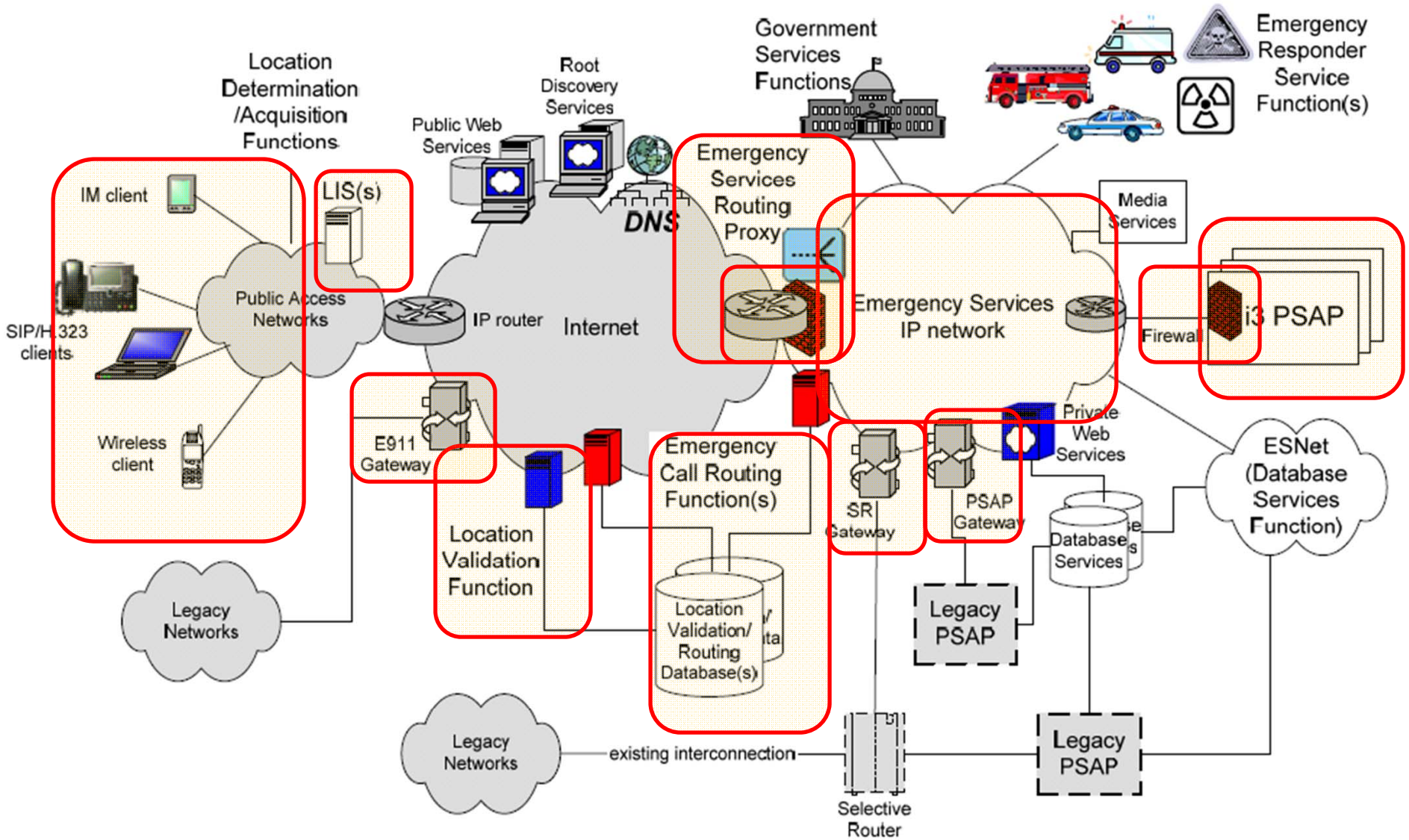
Next Generation 9-1-1



This figure is simplified for illustrative purposes

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Next Generation 9-1-1

Let's start this with how the location is validated then "comes with the call". This brings in two new terms

- LIS – The Location Information Server

- LVF – The Location Validation Function

LVF

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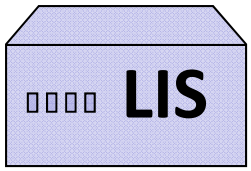
LIS

Location Information Server

- Location provided by the LIS for all “calls”
- Location can be civic address or geographic coordinate
- Replaces E9-1-1 ANI, ALI, and DBMS
- Locations for wireline may use existing ALI
- Exceeds today's Location needs



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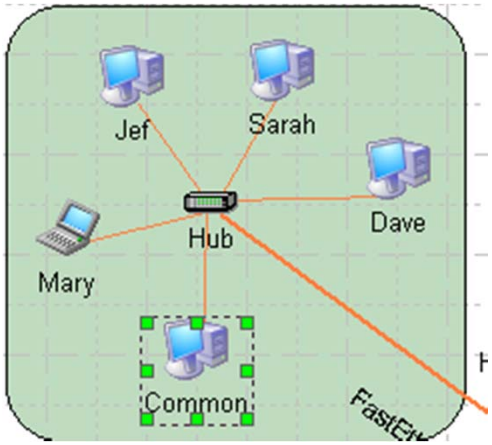
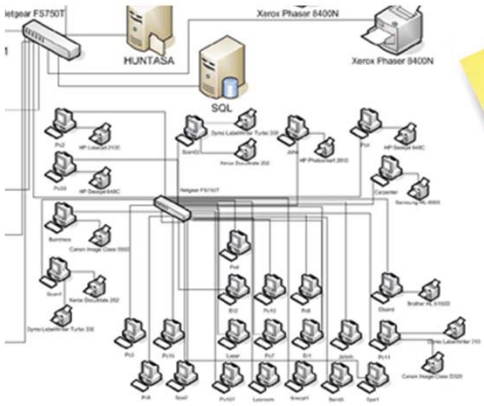
LIS

Location Information Server

- Locations can be determined by the network
- Locations are updated each time the client or the network changes
  - Wiremaps or intelligent networks
  - Subnet, switch, router, or port specific
  - WiFi access points, hotspots, hardwired ports





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LIS

Location Information Server

- Locations can be discovered by the network
  - Residential, enterprise, fixed, and mobile
  - WiFi access points, Personal mobile WiFi devices
  - Almost any 3G or 4G device

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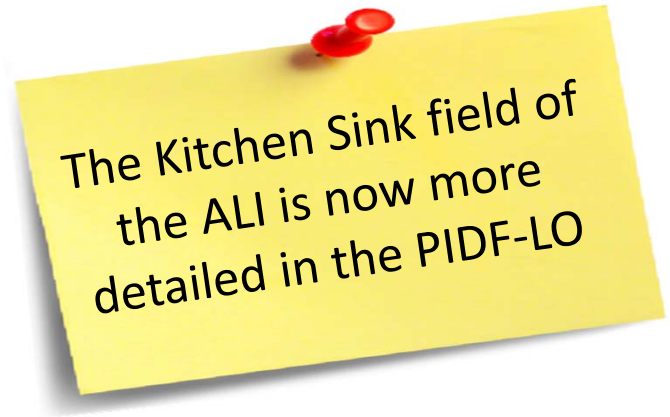
LIS

Location Information Server

MLTS (PBX) details of the location can now be used

- In the LIS
- In the PIDF-LO



Station, Number, Detailed Location

1000,4258817000,Redmond Campus Building 3 Room 427
1001,4258817001,Redmond Campus Building 1 Room 105
1002,4258817002,Redmond Campus Building 2 Eng Lab
1003,4258817003,Redmond Campus Accounting Office
1004,4258817004,Redmond Campus Building 2 Eng Lab
2478,4258854367,Bellevue Campus Lunchroom
2214,4258834321,Bellevue Campus Machine Shop

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Location Validation Function (LVF)

- Location stored in LIS
- LIS location in PIDF-LO format
- Validated prior to 9-1-1 call
- Uses same data as ECRF
- Uses Local GIS data
- LIS queries LVF with Location
- The LVF validates the Location

LVF

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Location Validation Today

E9-1-1 Address Validation using MSAG & ALI

MSAG

PD	STREET	ST_TYPE	LOW	HIGH	COMMUNITY
N	WEGER	AVE	100	199	LEE
E	WEGER	AVE	700	799	LEE
	WILDWOOD	AVE	700	799	LEE

100 N WEGER AVE	PASS
700 E WEGER AVE	PASS
702 E WEGER	PASS
101 N WEGER	PASS
702 WILDWOOD AVE	PASS
704 WILDWOOD AVE	PASS

701	HOUSE NUMBER DOES NOT FIT MSAG RANGE
709	STREET NOT IN MSAG FILE

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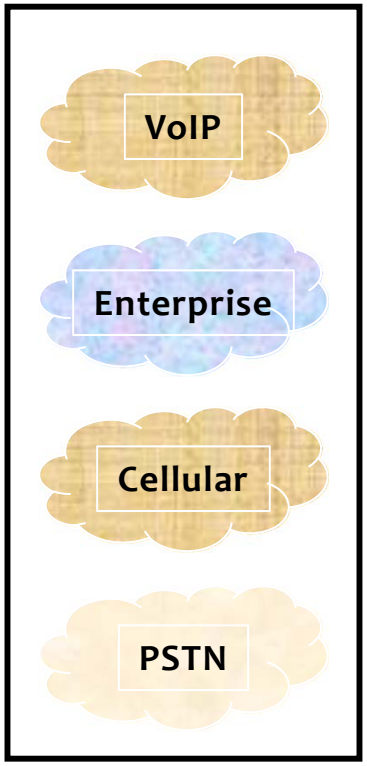
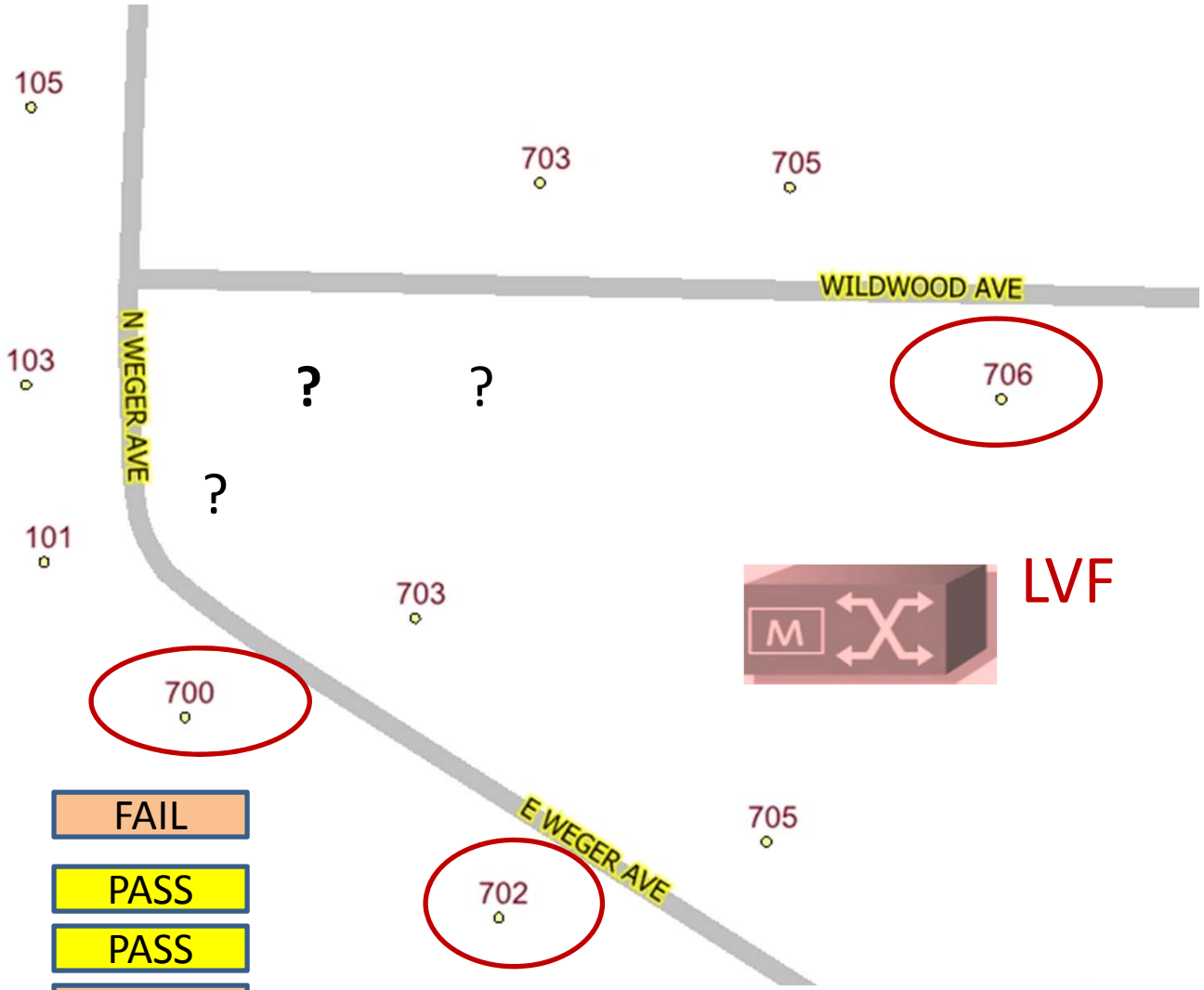
Location Validation Function (LVF)

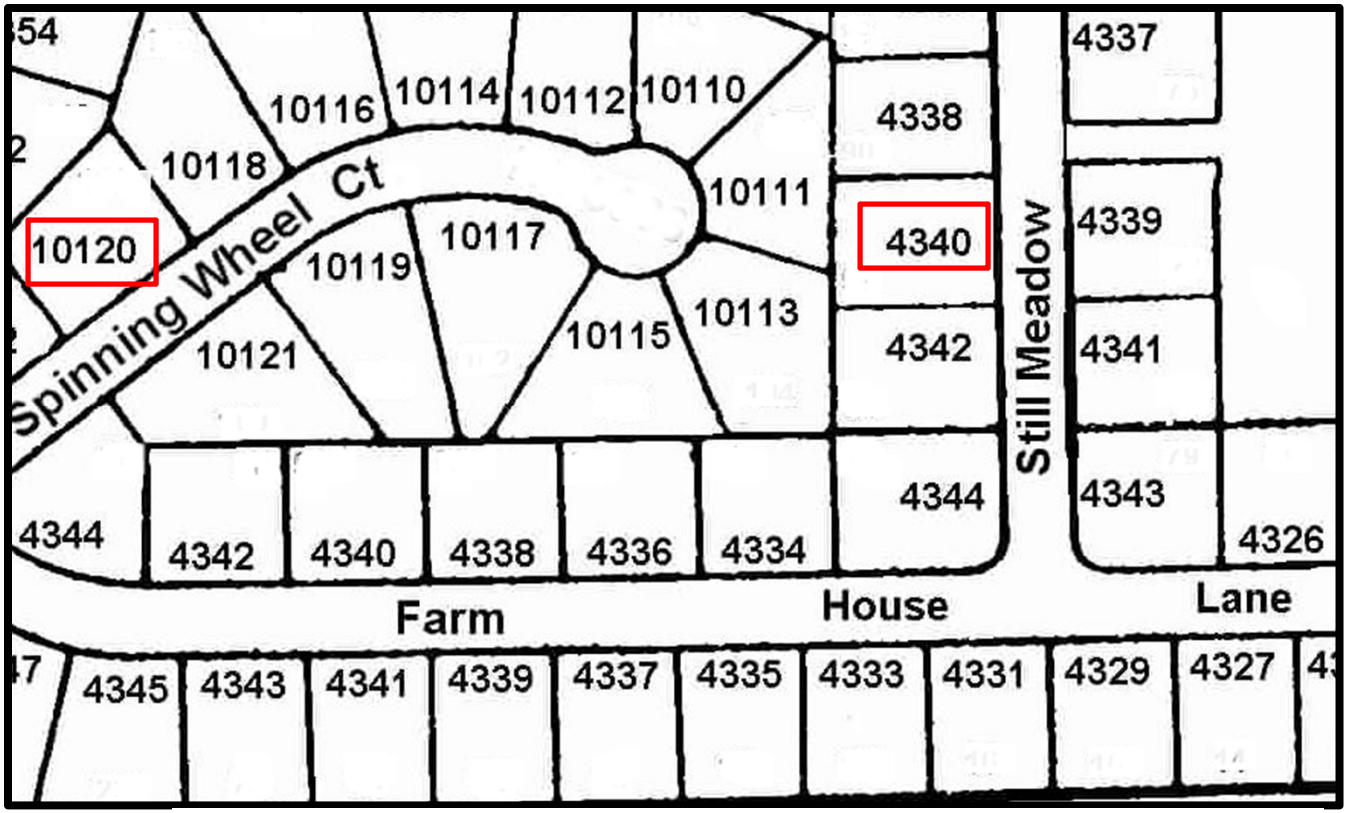




100 N WEGER AVE	FAIL
700 E WEGER AVE	PASS
702 E WEGER	PASS
100 N WEGER	FAIL
702 WILDWOOD AVE	FAIL
706 WILDWOOD AVE	PASS

Next Generation 9-1-1

NG9-1-1 Address Validation using LIS and LVF



10101 SPINNING WHEEL CT	FAIL
10120 SPINNING WHEEL CT	PASS
10102 SPINNING WHEEL CT	FAIL
4340 STILL MDW	PASS
4350 STILL MDW	FAIL
4400 STILL MDW	FAIL

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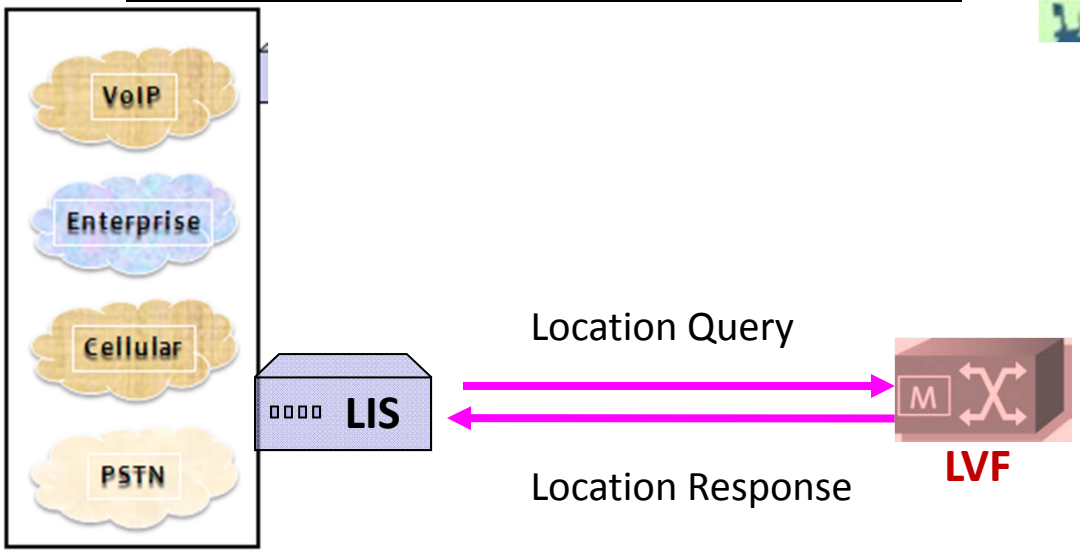
Location Validation Function (LVF)

PIDF-Lo

Element	Description	Example
country	Two letter country code	US
A1	State, providence, commonwealth	TX
A2	county, parish, district	Harris County
A3	city, township,	Houston
A4	borough, ward, district,	
A5	neighborhood, subdivision	Alverez Park
RD	street	Silverleaf
PRD	Leading street direction	N
POD	Trailing street direction	
STS	Street Suffix	DR
HNO	House number, number only	6085

Location – Pass - Fail



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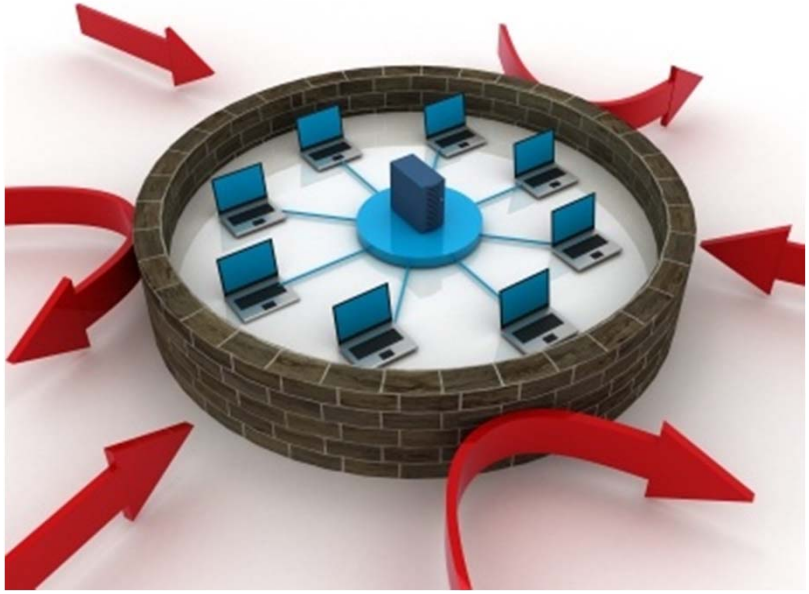
BCF

Border **C**ontrol **F**unction

- Security subsystem at edge of ESInet
  - Firewall functions ++
- ALL CALLS go through the BCF
- Connects to the Internet (which is why it is needed)
- Recommend a BCF in front of every PSAP as well
  - Trust, but verify

BCF



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Next Generation 9-1-1
Items Covered

- ✓ LIS
- ✓ LVF
- ✓ BCF
- ECRF
- LoST protocol
- PIDF-LO
- ESRP
- ESInet
- i3 PSAP
- Policy Rules
- Gateways – Legacy, SR, PSAP

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Next Generation 9-1-1

Let's look at a NG9-1-1 call and then break down the individual "parts" of the call flow

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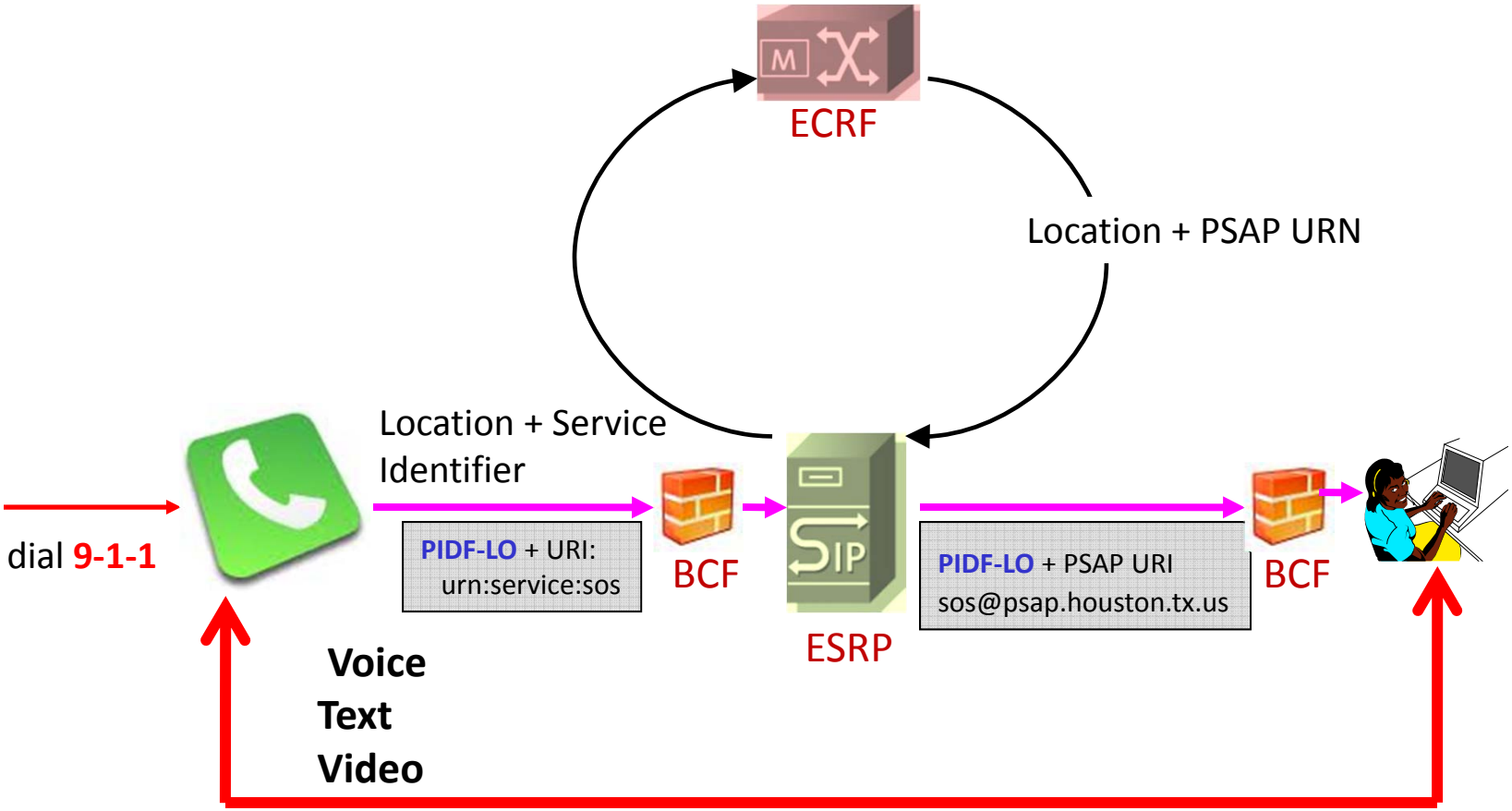
NG9-1-1



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URN and URI

- A URN is similar to a person's name
- A URI is like a street address
- A URI identifies a resource, the location of the resource
- URI: urn.service.sos – request for location of the 9-1-1 PSAP Service

  PIDF-LO + URI: urn:service:sos
- PSAP URN – name of the PSAP to connect call too

  psap.houston.tx.us

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Next Generation 9-1-1

- **ECRF**– **E**mergency **C**all **R**outing **F**unction (GIS data)

ECRF

- **ESRP** – **E**mergency **S**ervices **R**outing **P**roxy

ESRP

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ECRF

Emergency Call Routing Function

- Database is a subset of layers from your Local GIS
- GIS replaces Selective Router entirely
- GIS data uses call location to send “calls” to correct PSAP
- You send it location (in civic or geo form) and it gives you back a URL of the PSAP to forward the call too

ECRF

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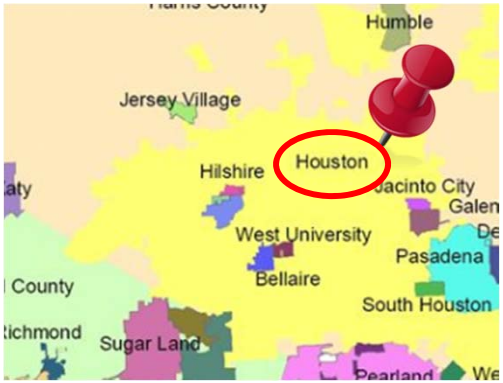
NG9-1-1

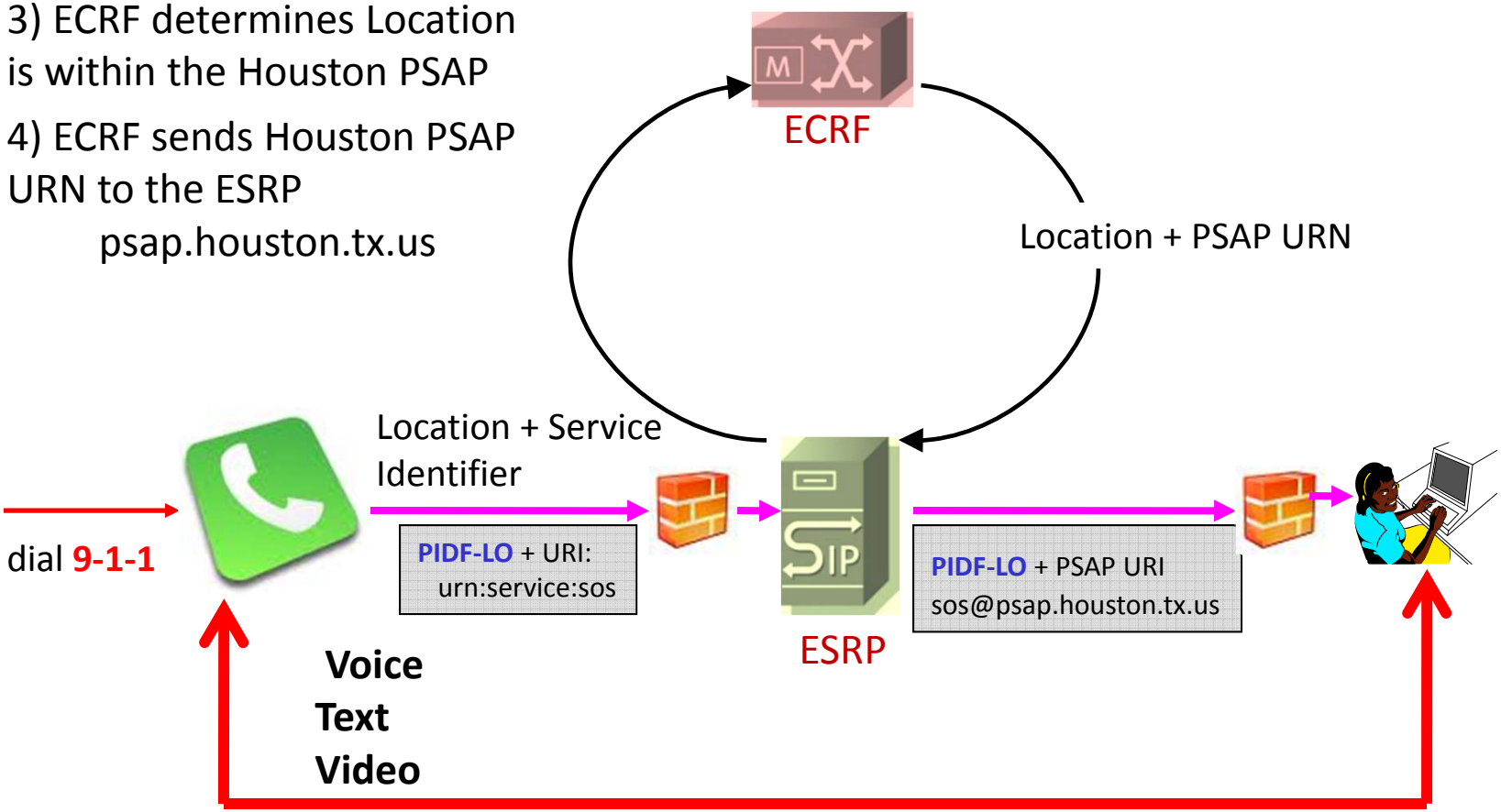
1) Location sent to ECRF:
354 W 34th St, Houston, TX

2) ECRF finds address point of:
354 W 34th St, Houston, TX

3) ECRF determines Location is within the Houston PSAP

4) ECRF sends Houston PSAP URN to the ESRP
psap.houston.tx.us





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ECRF

Emergency Call Routing Function

The ECRF is a LoST Server, it Uses LoST Protocol

Location to Service Translation (LoST)

- Input the **Lo**cation
- Request the **S**ervice – the PSAP - to send the call too
- **T**ranslates the **Lo**cation to the **S**ervice (psap.houston.tx.us)
- **Lo**cation to **S**ervice **T**ranslation – **LoST**

1) **Lo**cation sent to ECRF:
354 W 34th St, Houston, TX

2) ECRF finds address point of:
354 W 34th St, Houston, TX

3) ECRF determines Location is within the Houston PSAP

4) ECRF uses the Location to find (Translate) the requested Service
psap.houston.tx.us

ECRF

Location + PSAP URN

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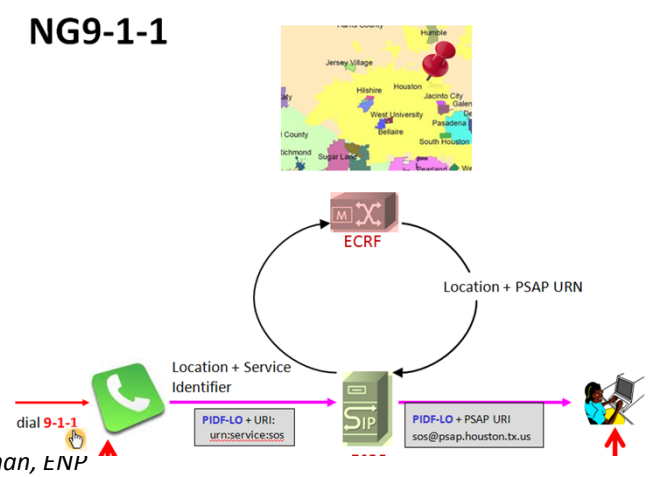
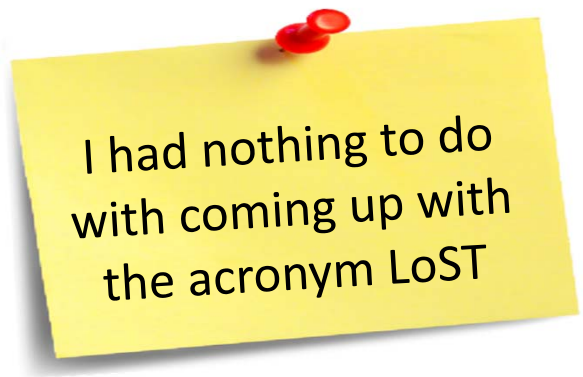
ECRF

Emergency Call Routing Function

The ECRF is a **LoST** Server

- The ESRP provides the input **Lo**cation
- The **S**ervice requested is sos (9-1-1)
- The ECRF takes the **Lo**cation and the **S**ervice request (urn.service.sos)
- The ECRF uses the GIS database to determine which Service area boundary the Location is within (in this example the PSAP)
- The ECRF **T**ranslates the **Lo**cation into the requested **S**ervice
  - **T**ranslates the **Lo**cation to the **S**ervice (PSAP)
  - **Lo**cation to **S**ervice **T**ranslation – **LoST**





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ESRP

Emergency Services Routing Proxy

- New Routing element
- Gets a location, queries ECRF
- Uses URN from ECRF to send call to Correct PSAP*
  - *Applies a "Policy Routing Function" – Policy Based Routing
  - *Policy can Override PSAP URN provided by ECRF

ESRP

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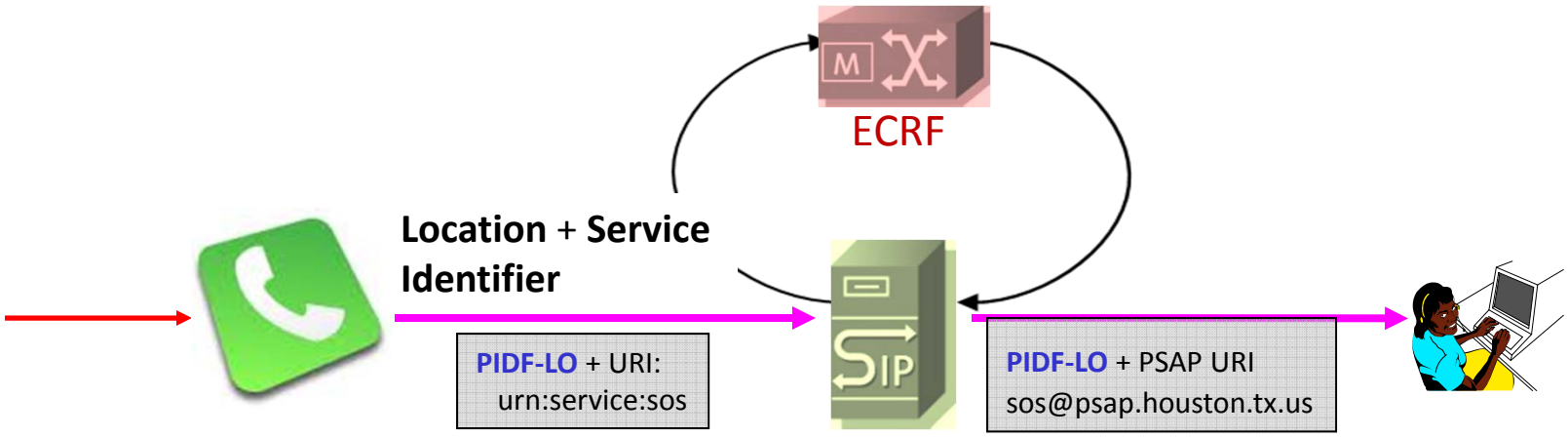
Next Generation 9-1-1



- **Location** information is contained in the **PIDF-Lo**
- **Service Identifier** in this case is a 9-1-1 call
- **PSAP URI** is the IP reference to the PSAP

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New Location Object – PIDF-LO

Element	Description	Example
country	Two letter country code	US
A1	State, providence, commonwealth	Texas
A2	county, parish, district	Harris
A3	city, township,	Houston
A4	borough, ward, district,	Fifth Ward
A5	neighborhood, subdivision	
RD	street	Sawyer
PRD		N
POD		
STS		ST
HNO	number, number only	602
HNS	House number suffix	B
LMK	Landmark or vanity address	
LOC	Additional location information	NW corner of bldg
FLR	Floor	7
NAM	business, office, or residence name	Kilby's Kookies
PC	Postal Code	77007

The Kitchen Sink field is gone in the PIDF-LO

Note: Not all fields shown

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New Location Object – PIDF-LO

Element	Description	Example
country	Two letter country code	US
A1	State, providence, commonwealth	Ohio
A2	county, parish, district	Williams County
A3	city, township,	Dupont Township
A4	borough, ward, district,	
A5	neighborhood, subdivision	Maplewood Park
RD	street	Silverleaf
PRD	Leading street direction	N
POD	Trailing street direction	
STS	Street Suffix	DR
HNO	House number, number only	6085
HNS	House number suffix	
LMK	Landmark or vanity address	
LOC	Additional location information	Lot 38
FLR	Floor	
NAM	business, office, or residence name	
PC	Postal Code	43123

PIDF-LO
Allows for very detailed information
Replaces ALI in NG9-1-1

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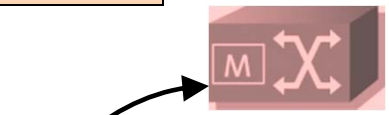
PIDF-Lo

Element	Description	Example
country	Two letter country code	US
A1	State, providence, commonwealth	TX
A2	county, parish, district	Harris County
A3	city, township,	Houston
A4	borough, ward, district,	
A5	neighborhood, subdivision	Alverez Park
RD	street	Silverleaf
PRD	Leading street direction	N
POD	Trailing street direction	
STS	Street Suffix	DR
HNO	House number, number only	6085

PSAP URN = sos@psap.houston.tx.us



ECRF

Location + PSAP URN

Location + Service Identifier

dial **9-1-1**

PIDF-LO + URI:
urn:service:sos

ESRP

PIDF-LO + PSAP URI
sos@psap.houston.tx.us

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Next Generation 9-1-1
Items Covered

- ✓ LIS
- ✓ LVF
- ✓ BCF
- ✓ ECRF
- ✓ LoST protocol
- ✓ PIDF-LO
- ✓ ESRP
- ESInet
- i3 PSAP
- Policy Rules
- Gateways – Legacy, SR, PSAP

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NENA THE 9·1·1 ASSOCIATION

Next Generation 9-1-1

Almost done and only a few more to go.

Next up:

- ESInet

- i3 PSAP

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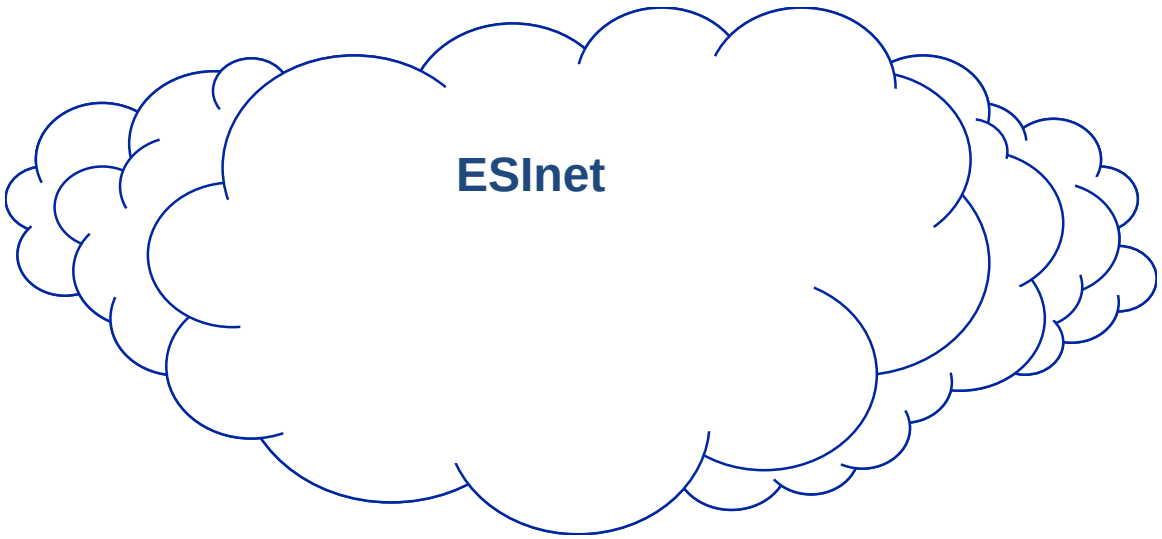
ESInet
Emergency Services IP network

An IP-based network shared by all emergency services agencies in a region or state

- Highly Secure
- Highly Reliable
- Private managed network
- A network of components running IP
- The network that i3 runs within



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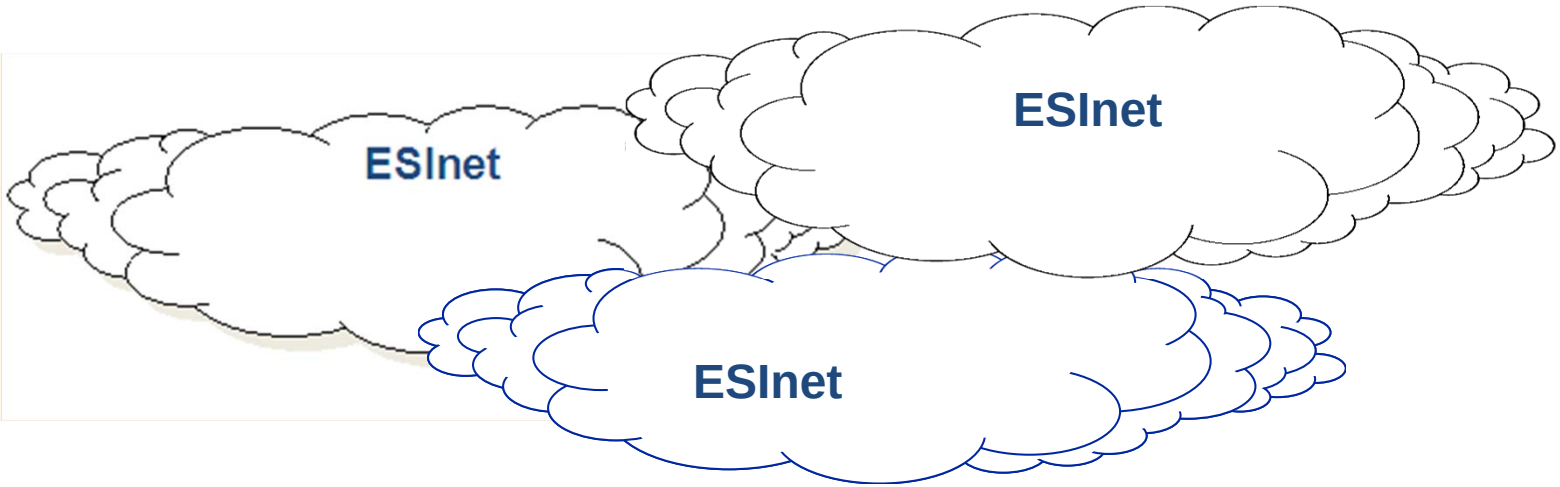
ESInet
Emergency Services IP network

An ESInet can service many PSAPs and allow for sharing of cost and resources

ESInets connect together, allowing sharing of data and information across a state or nation (network of networks)



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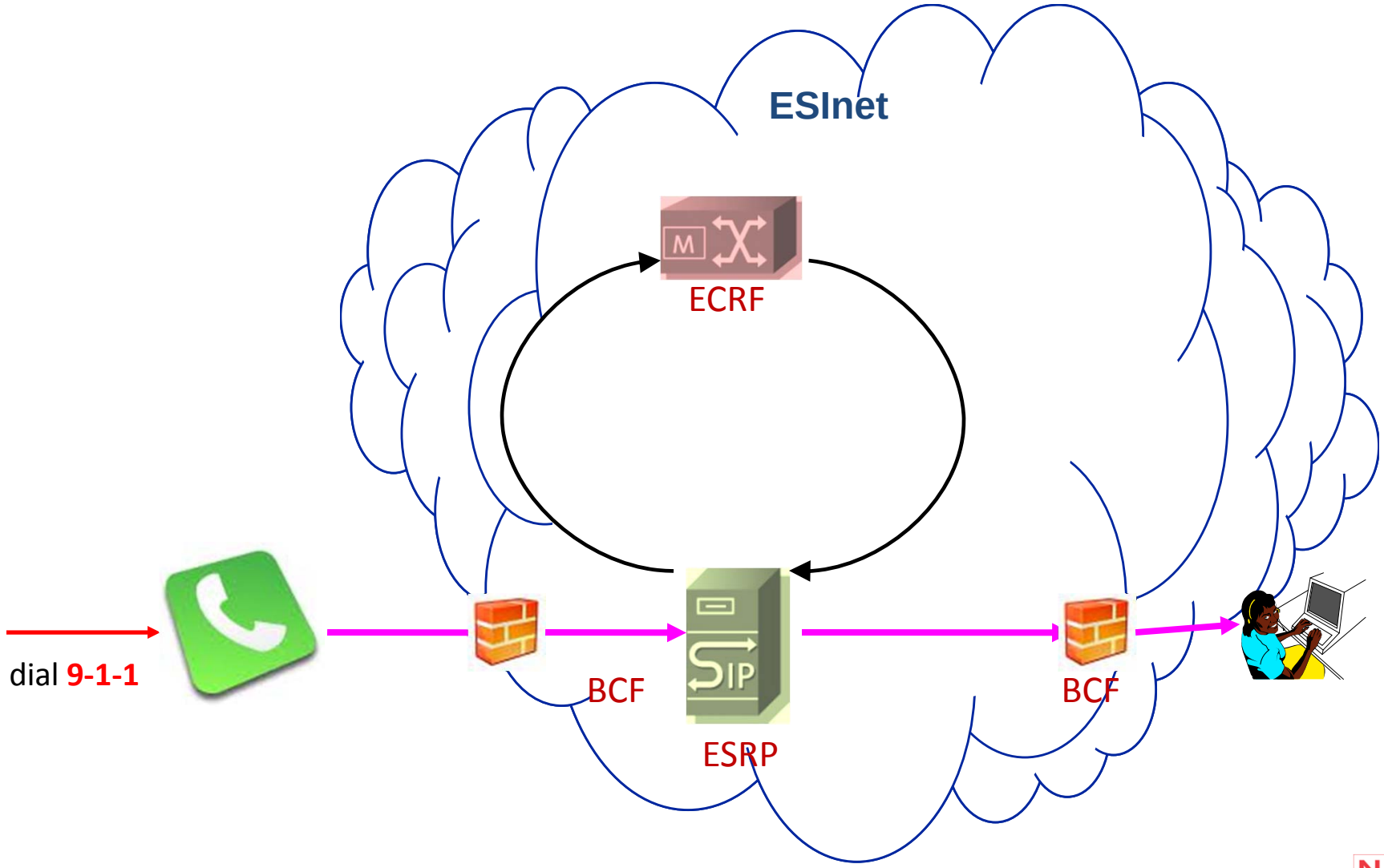
ESInet
Emergency Services IP network



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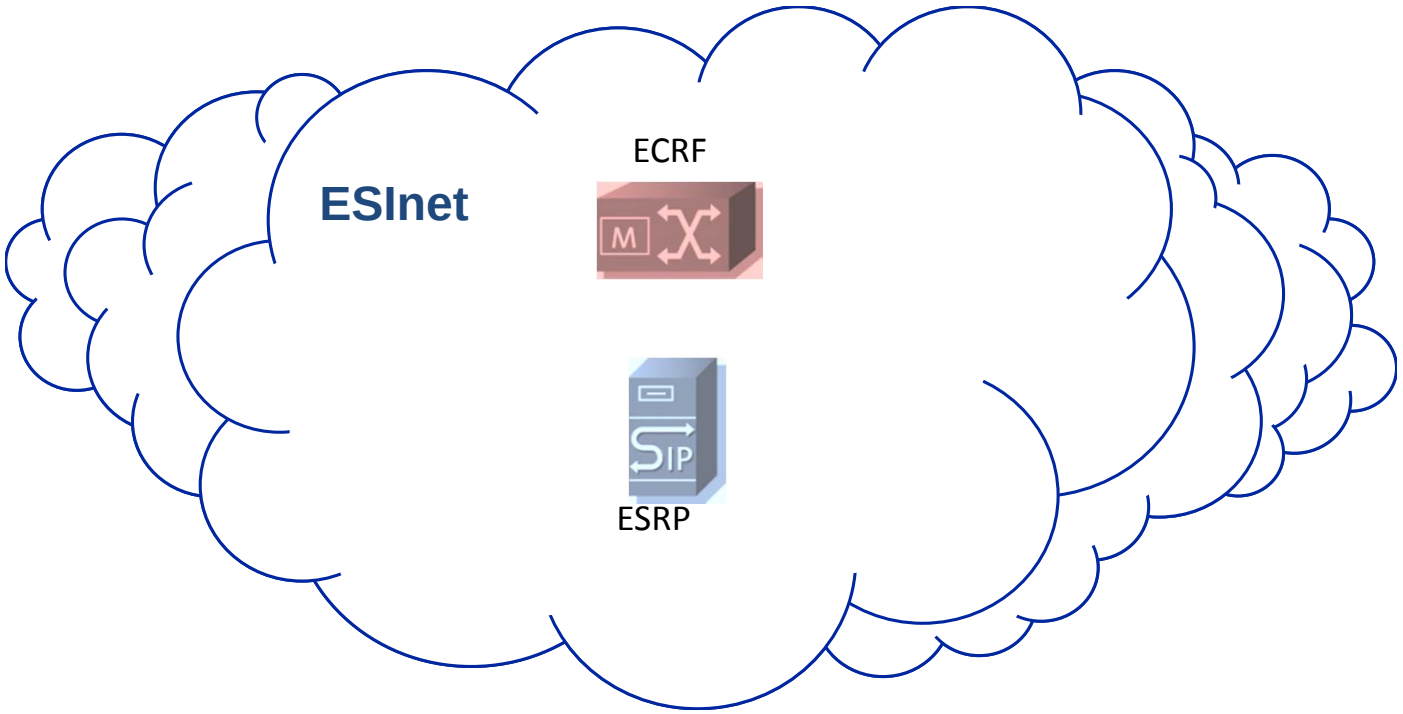
ESInet
Emergency Services IP network

The ESRP and ECRF are functional elements within the ESInet. Without the ECRF and ESRP there is no NG9-1-1



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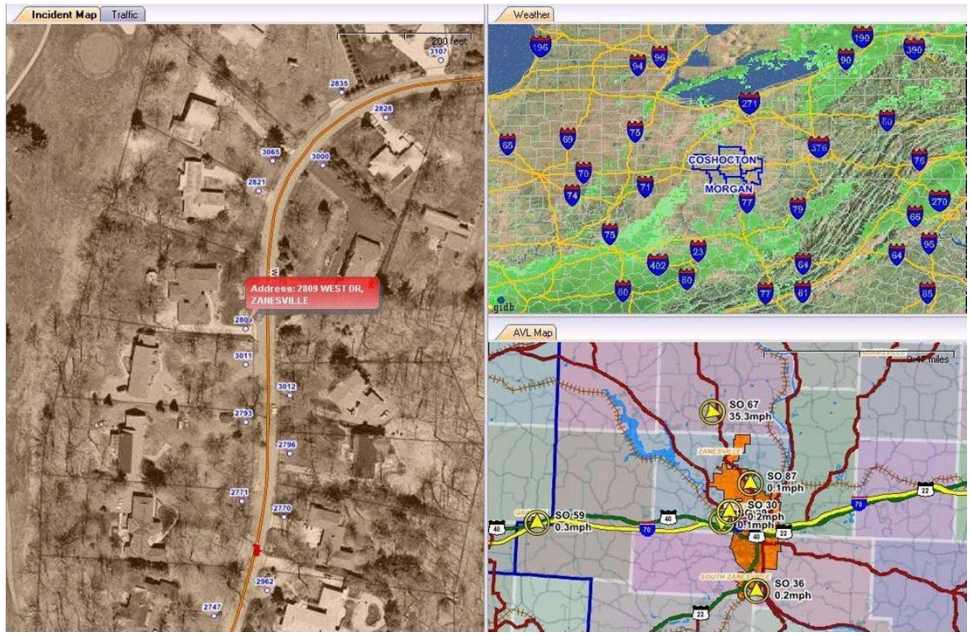
Next Generation 9-1-1
i3 PSAP

- Must be able to understand SIP
- Must be able to understand PIDF-LO
- Will be on the Internet (behind a firewall)
- Inherently Multi-media (Voice, video, image, text,..)
- Will need to be intelligent



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Next Generation 9-1-1
Items Covered

- ✓ LIS
- ✓ LVF
- ✓ BCF
- ✓ ECRF
- ✓ LoST protocol
- ✓ PIDF-LO
- ✓ ESRP
- ✓ ESInet
- ✓ i3 PSAP
- Policy Rules
- Gateways – Legacy, SR, PSAP

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Policy Rules

Policy Rules reside in the Policy Routing Function (**PRF**) Database

- ESRP checks Policy Rules each time the ECRF returns a URN
- Policy rules can influence:
  - PSAP call delivery
  - Call Taker skill set
  - Other criteria

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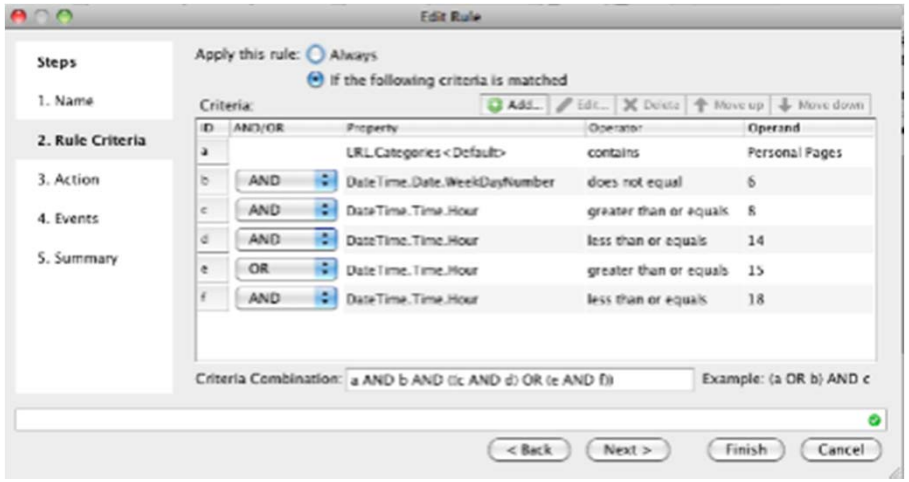
Next Generation 9-1-1
Policy Rules

- Used to alter the normal route of a call, based on criteria
- Policy Rules can be modified as required
- Policy Set by the Upstream Entity
  - ESRP Operator
  - ECRF Operator
  - 9-1-1 Authority
  - PSAP



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Policy Rules

Examples

Possible Policy Rules

- PSAP may be in a busy condition
  - too many calls in queue
- PSAP may be out of service due to trouble
  - network or equipment failure
- PSAP may be out of service by choice
  - maintenance, upgrade, night service, move in progress

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NG 9-1-1

ECRF

Location + PSAP URN

PRF

PSAP B

Location + Service Identifier

PIDF-LO + URI: urn:service:sos

PIDF-LO + PSAP URN sos@psap.harris_so.tx.us

dial 9-1-1

ESRP

PSAP A

Voice
Text
Video

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Next Generation 9-1-1
Gateways

- **Gateways** are used to convert from one *protocol* to another *protocol*
- Legacy **Gateways**
  - Convert from CAMA or SS7 protocols to SIP
  - Convert ALI data into PIDF-LO
  - Convert SIP to CAMA
  - Convert PIDF-LO to ALI

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Next Generation 9-1-1
Items Covered

- ✓ LIS
- ✓ LVF
- ✓ BCF
- ✓ ECRF
- ✓ LoST protocol
- ✓ PIDF-LO
- ✓ ESRP
- ✓ ESInet
- ✓ i3 PSAP
- ✓ Policy Rules
- ✓ Gateways – Legacy, SR, PSAP

Did we miss anything?

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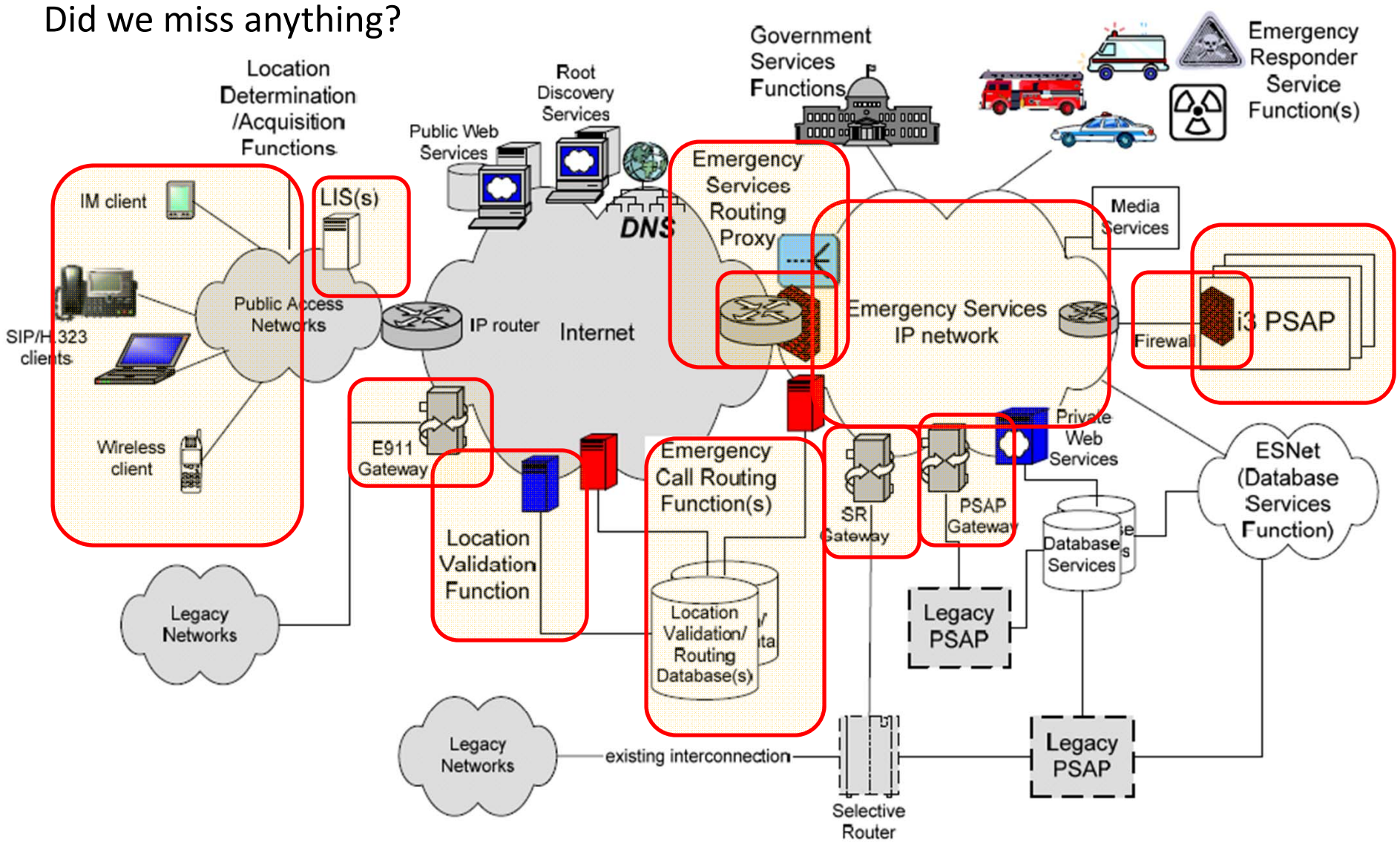
Next Generation 9-1-1

Did we miss anything?



This figure is simplified for illustrative purposes

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PIDF-Lo

Element	Description	Example
country	Two letter country code	US
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A2	county, parish, district	Harris County
A3	city, township,	Houston
A4	borough, ward, district,	
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POD	Trailing street direction	
STS	Street Suffix	DR
HNO	House number, number only	6085

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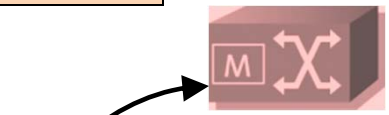

ECRF

Location + PSAP URN

Location + Service Identifier

dial **9-1-1**

PIDF-LO + URI:
urn:service:sos

ESRP

PIDF-LO + PSAP URI
sos@psap.houston.tx.us

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NENA i3 NG9-1-1 Warning

There are a lot of people promoting Next Generation 9-1-1

NG9-1-1is complex and deep in the land of Geek Speak

Unfortunately some people are selling NG9-1-1 that is really only IP, and not NENA i3 compatible

If you have ANY Questions regarding NG9-1-1, contact me and ask!!! Really!

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Ohio's Location Based Response System:

How one set of highly accurate, shared mapping data is saving time, money and lives across the Buckeye State

Ohio Department of Administrative Services
Ohio Office of Information Technology
30 E. Broad Street, 39th Floor
Columbus, Ohio 43215
614.644.6446

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Duplication was extensive

Local governments electric and utilities were spending $80 million to $100 million yearly in digital mapping

County engineers, auditors, city planning were spending tax dollars independently of each other for their needs

9-1-1 Authority's spending tax money to buy or produce datasets to route emergency vehicles

Department of Transportation spending more for their own needs

Even the U.S. Census Bureau was spending tax dollars to develop their own version of the local roadway network.

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Create It Once – The Solution…

- Location Based Response System (LBRS)
  - State-level plan for every Ohio county
    - Memorandums of Agreement between the Counties and the State
  - Create spatially accurate street centerlines with field verified site-specific address locations, with emphasis on linear referencing/mileposts

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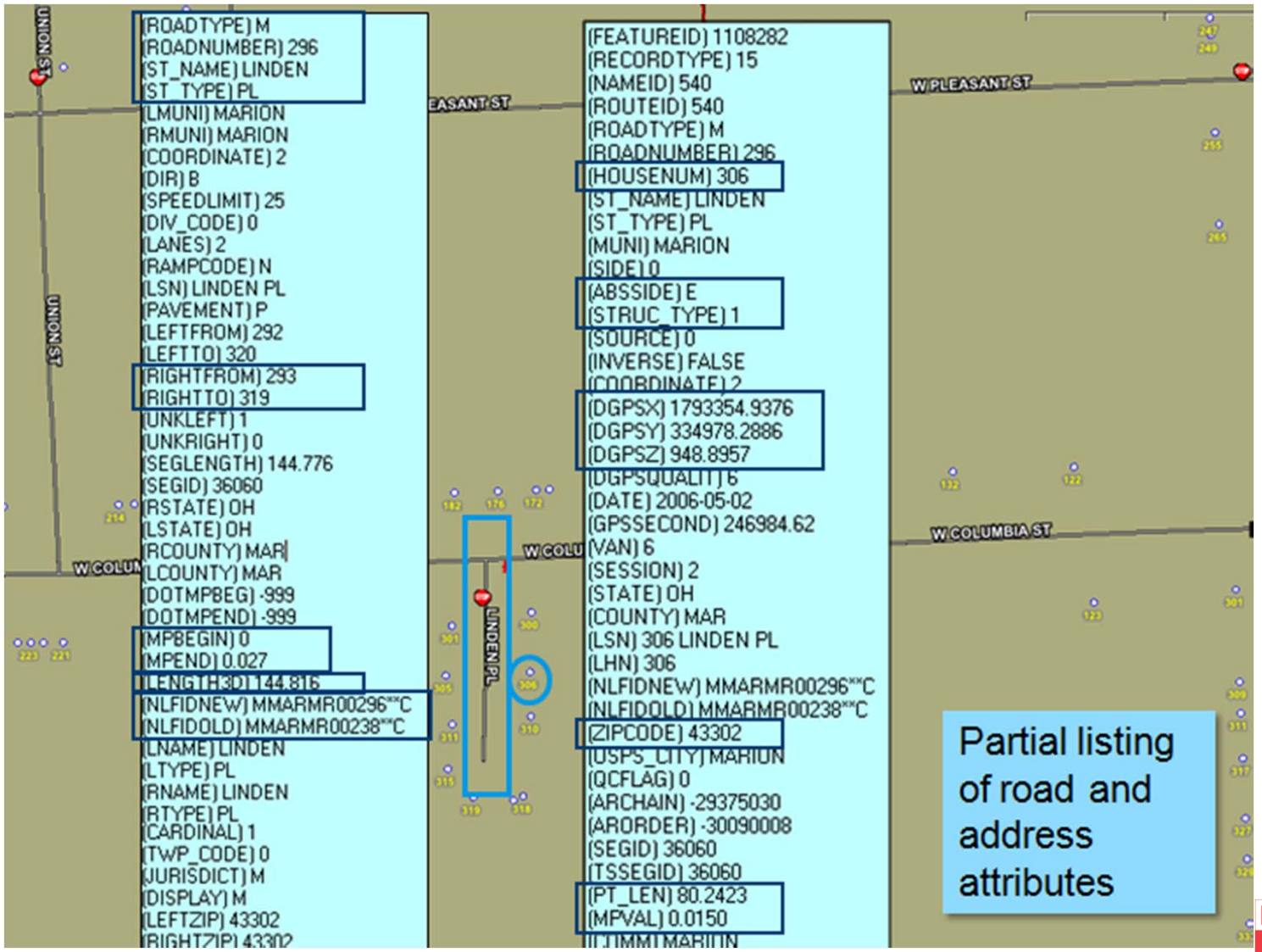
Multipurpose data designed

Road Network and Addresses that supports NG9-1-1 and data needs for ALL stakeholders



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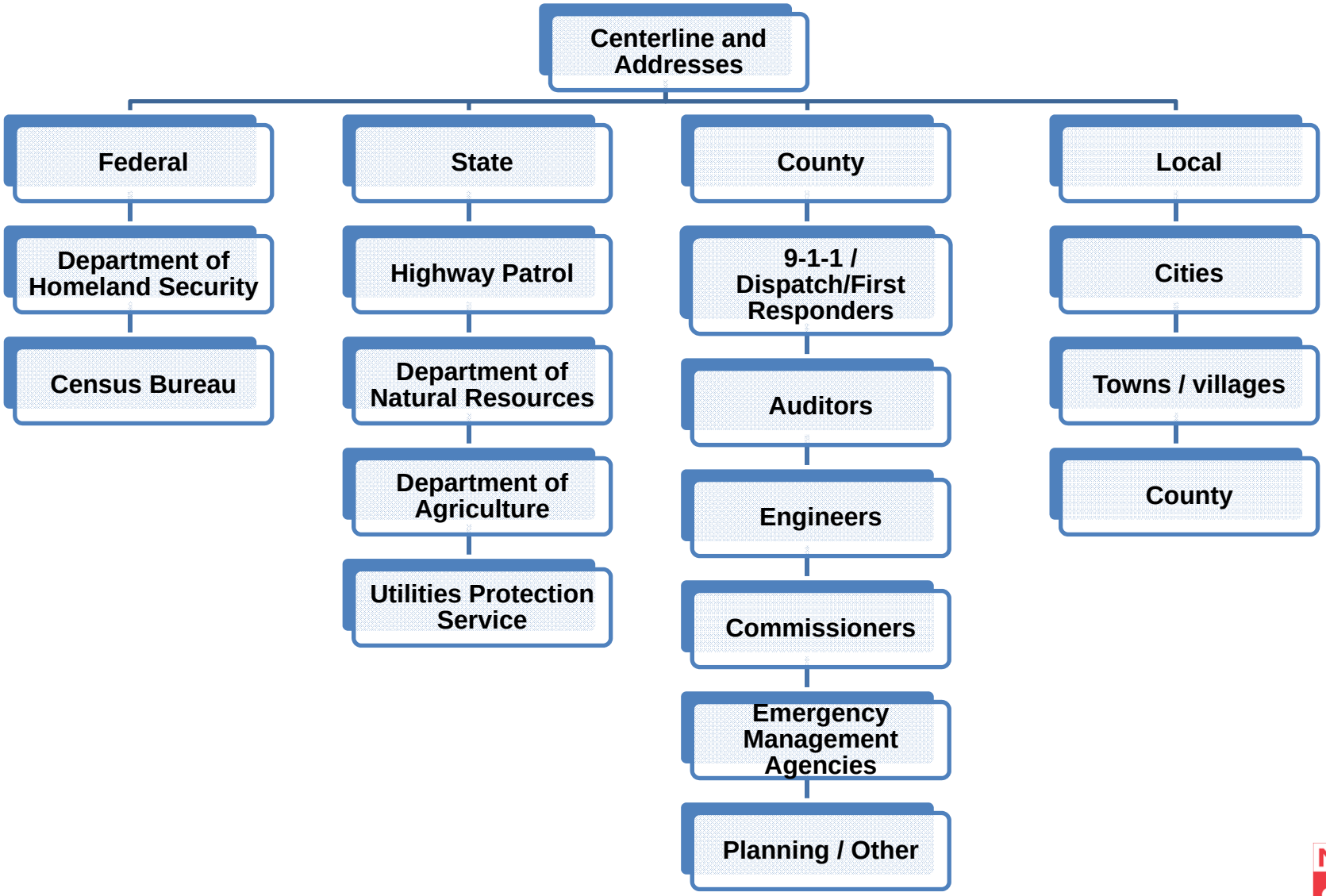
Users



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Agency name	Function data supports
9-1-1 Dispatch / First Responders	Pinpoint call location; better response time
Departments of Public Safety	Improved crash analysis; jurisdictional data
Departments of Development	Enhanced economic development efforts
Departments of Commerce	Location of underground tanks
Departments of Taxation	Streamlined sales tax
Bureaus of Motor Vehicles	Tax district determination
County Health Departments	Improved disease and outbreak tracking
County Emergency Management Agencies	Enhanced coordination & response capabilities
County Boards of Elections	Easier voter precinct determination
County Engineers	Better road inventories, planning capabilities
County Auditors/Assessors	Faster, more accurate assessments
U.S. Census Bureau	More precise map data; demographic analysis

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How LBRS is structured in Ohio

Government Entity	Role
Individual Counties	Project management Data development Data quality assurance Data maintenance
Department of Transportation	Program sponsor Data verification Data integration
Ohio Geographically Referenced Information Program	Program administration Data dissemination

Having a maintenance program that allows any authorized user at anytime to update data ensures the most recent map data is available to those who rely on it most.

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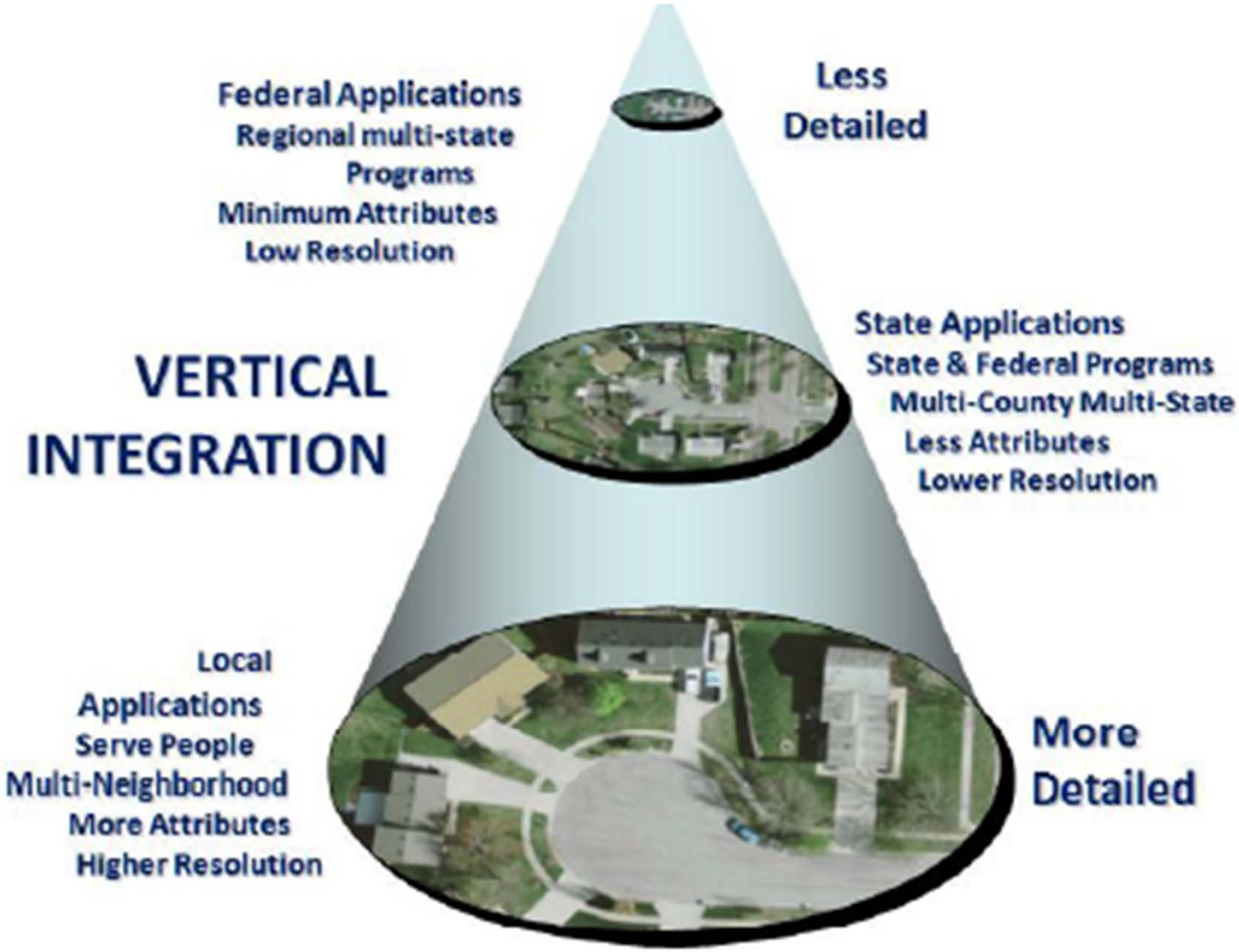

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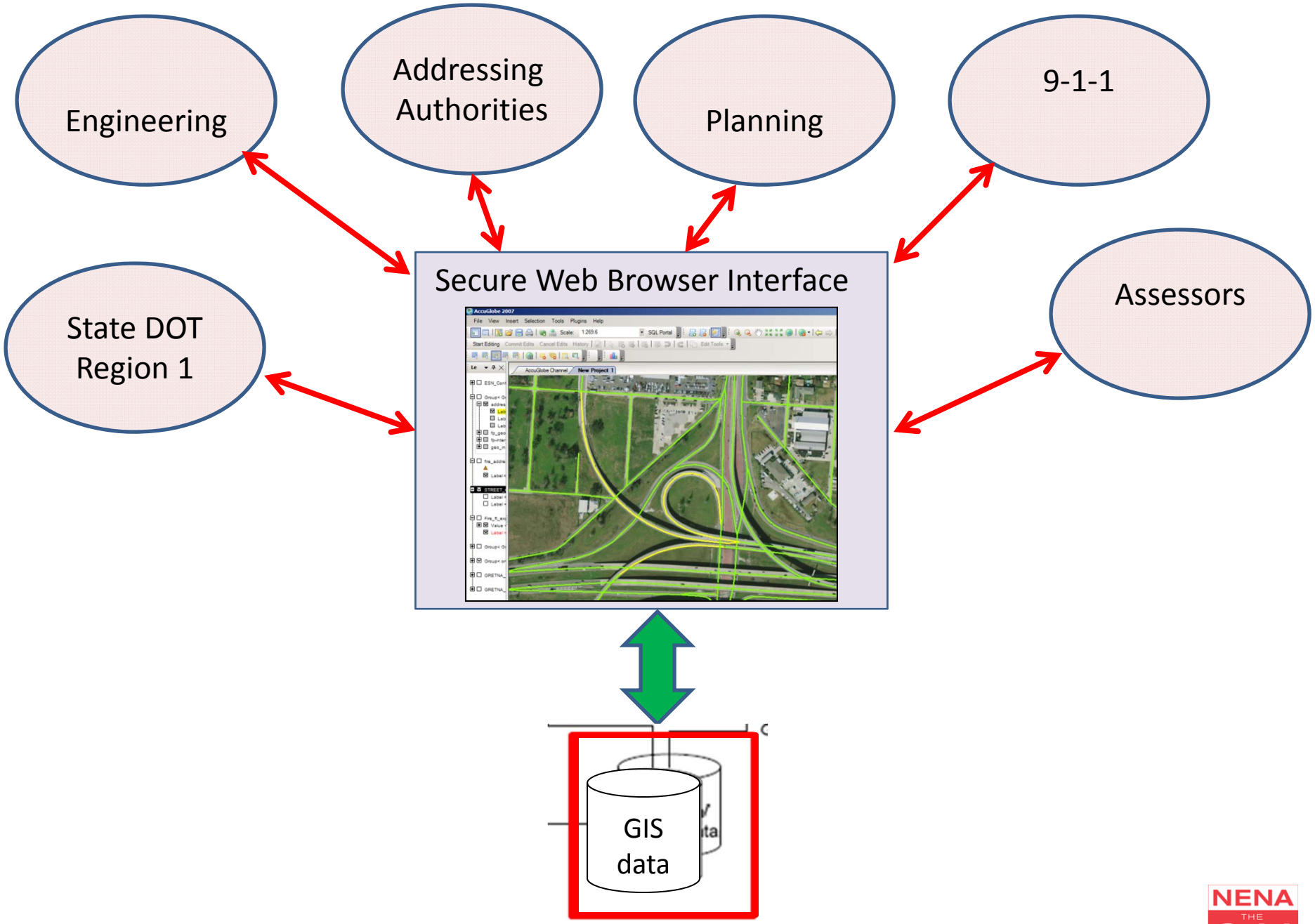

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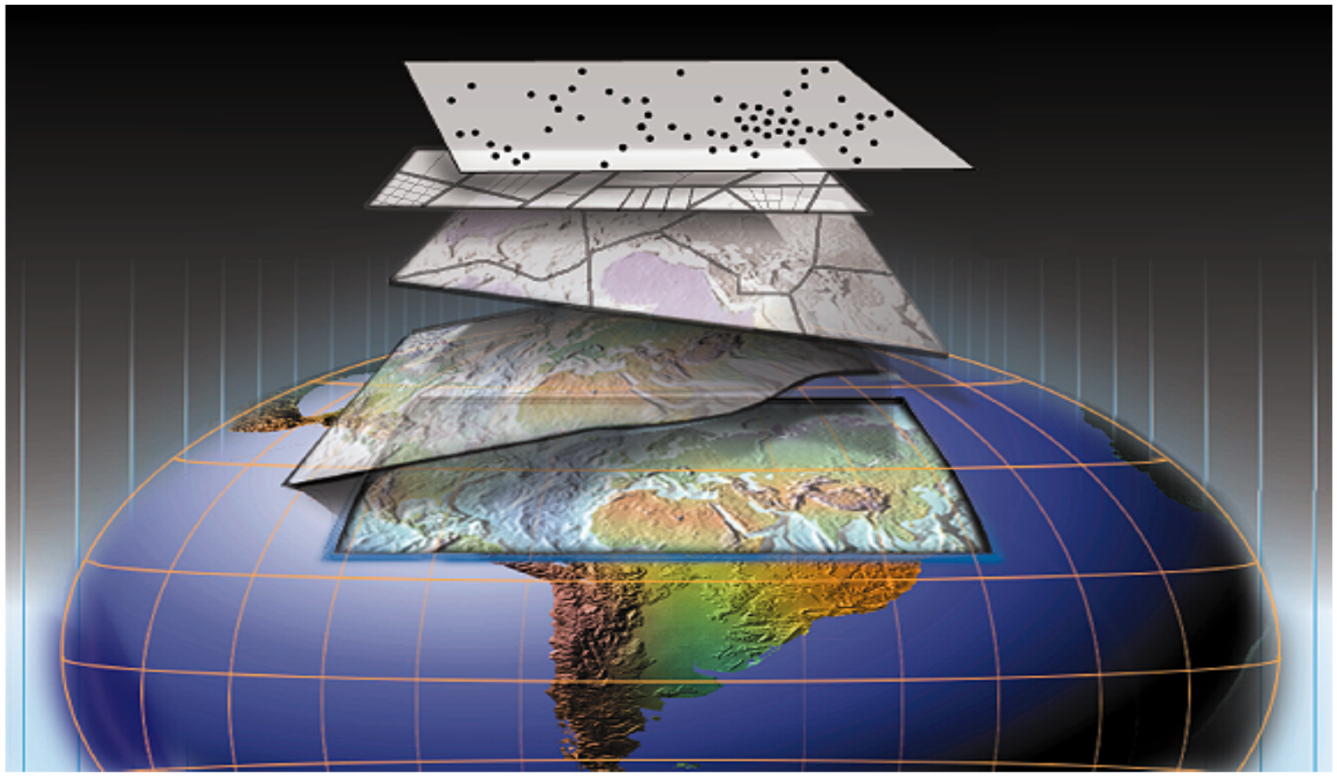
Questions

Confusion?

Marc Berryman, ENP

mberryman@ddti.net



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