AIRBUS DS COMMUNICATIONS

home of **VESTA®**

Lights, Camera, NG9-1-1!

Diana Gijselaers
diana.gijselaers@airbus-dscomm.com
August 26, 2015

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TODAY

- GIS
- NG9-1-1 Basics
- How GIS is used in NG9-1-1
- NG9-1-1 Call Flow Skit

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WHAT IS GIS?

- Geographic Information Systems
- According to Esri: ‘A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.’

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WHAT DOES GIS DO?

- Store, reference, combine, and analyze multiple layers – NG9-1-1Database
- Allows you to query based on geographic location – NG9-1-1Database
- Allows you to Visualize data - E9-1-1 & NG9-1-1Map

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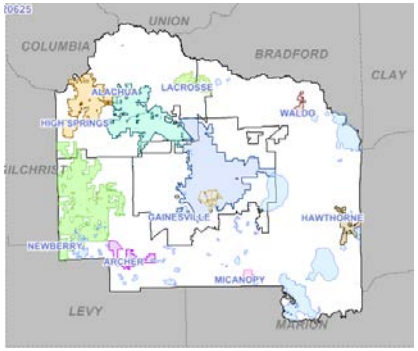
WHAT DOES GIS DO?

- GIS works with geographic features and their corresponding attribute information.
  - Vector - Point, line, polygon representations of real world features with associated attributes



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LOCATION AND ATTRIBUTES

statep010

FID	Shape *	AREA	PERIMETER	STATESP010	STATE	STATE_FIPS	ORDER_ADM	MONTH_ADM	DAY_ADM	YEAR_ADM
9	Polygon	0.017	0.866	11	District of Columbia	11	0		0	0
10	Polygon	0.533	5.489	10	Delaware	10	1	December	7	1787
45	Polygon	12.531	17.886	42	Pennsylvania	42	2	December	12	1787
46	Polygon	0.211	2.587	42	Pennsylvania	42	2	December	12	1787
30	Polygon	2.873	17.481	34	New Jersey	34	3	December	18	1787
12	Polygon	14.625	35.561	13	Georgia	13	4	January	2	1788
8	Polygon	1.391	7.986	9	Connecticut	09	5	January	9	1788
22	Polygon	2.293	23.275	25	Massachusetts	25	6	February	6	1788
23	Polygon	2.664	50.893	24	Maryland	24	7	April	28	1788
48	Polygon	7.795	34.72	45	South Carolina	45	8	May	23	1788
35	Polygon	2.677	10.086	33	New Hampshire	33	9	June	21	1788
53	Polygon	10.559	57.087	51	Virginia	51	10	June	25	1788
39	Polygon	13.909	42.221	36	New York	36	11	July	26	1788
40	Polygon	1.166	13.524	36	New York	36	11	July	26	1788
32	Polygon	12.705	64.572	37	North Carolina	37	12	November	21	1789
47	Polygon	0.304	6.629	44	Rhode Island	44	13	May	29	1790
54	Polygon	2.799	9.455	50	Vermont	50	14	March	4	1791
20	Polygon	10.664	22.51	21	Kentucky	21	15	June	1	1792
58	Polygon	10.89	22.359	47	Tennessee	47	16	June	1	1796
41	Polygon	11.325	19.294	39	Ohio	39	17	March	1	1803
42	Polygon	0.994	10.146	39	Ohio	39	17	March	1	1803
21	Polygon	11.474	59.94	22	Louisiana	22	18	April	30	1812
17	Polygon	9.673	17.293	18	Indiana	18	19	December	11	1816
18	Polygon	0.065	1.694	18	Indiana	18	19	December	11	1816
30	Polygon	11.881	26.186	28	Mississippi	28	20	December	10	1817
15	Polygon	15.408	21.66	17	Illinois	17	21	December	3	1818
16	Polygon	0.443	3.096	17	Illinois	17	21	December	3	1818
3	Polygon	12.879	21.642	1	Alabama	01	22	December	14	1819
24	Polygon	9.666	51.869	23	Maine	23	23	March	15	1820
29	Polygon	18.615	24.882	29	Missouri	29	24	August	10	1821
4	Polygon	13.586	21.737	5	Arkansas	05	25	June	15	1836
25	Polygon	18.991	63.131	26	Michigan	26	26	January	26	1837
26	Polygon	11.527	75.243	26	Michigan	26	26	January	26	1837
11	Polygon	13.477	112.896	12	Florida	12	27	March	3	1845
51	Polygon	65.141	87.126	48	Texas	48	28	December	29	1845
13	Polygon	15.856	20.132	19	Iowa	19	29	December	28	1846
57	Polygon	16.482	29.492	55	Wisconsin	55	30	May	29	1848
58	Polygon	2.739	23.805	55	Wisconsin	55	30	May	29	1848
6	Polygon	41.613	56.323	6	California	06	31	September	9	1850
27	Polygon	25.537	34.873	27	Minnesota	27	32	May	11	1858
28	Polygon	0.79	7.392	27	Minnesota	27	32	May	11	1858
44	Polygon	28.147	33.718	41	Oregon	41	33	February	14	1859
19	Polygon	22.005	21.41	20	Kansas	20	34	January	29	1861
59	Polygon	6.492	20.039	54	West Virginia	54	35	June	20	1863
38	Polygon	29.943	23.854	32	Nevada	32	36	October	31	1864
34	Polygon	21.614	24.233	31	Nebraska	31	37	March	1	1867
7	Polygon	28.039	22.017	8	Colorado	08	38	August	1	1876
33	Polygon	21.84	24.663	38	North Dakota	38	39	November	2	1889
49	Polygon	22.58	23.292	46	South Dakota	46	40	November	2	1889
31	Polygon	45.881	36.427	30	Montana	30	41	November	8	1889
55	Polygon	28.844	58.694	53	Washington	53	42	November	11	1889
56	Polygon	0.874	36.566	53	Washington	53	42	November	11	1889
14	Polygon	24.459	30.909	16	Idaho	16	43	July	3	1890

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MAPS TELL A STORY

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HOW IS GIS USED IN E9-1-1?

Map Display

- Confirming/validating emergency caller's location
- Display emergency caller's location on a map in order to determine location
- Provide vehicular routing

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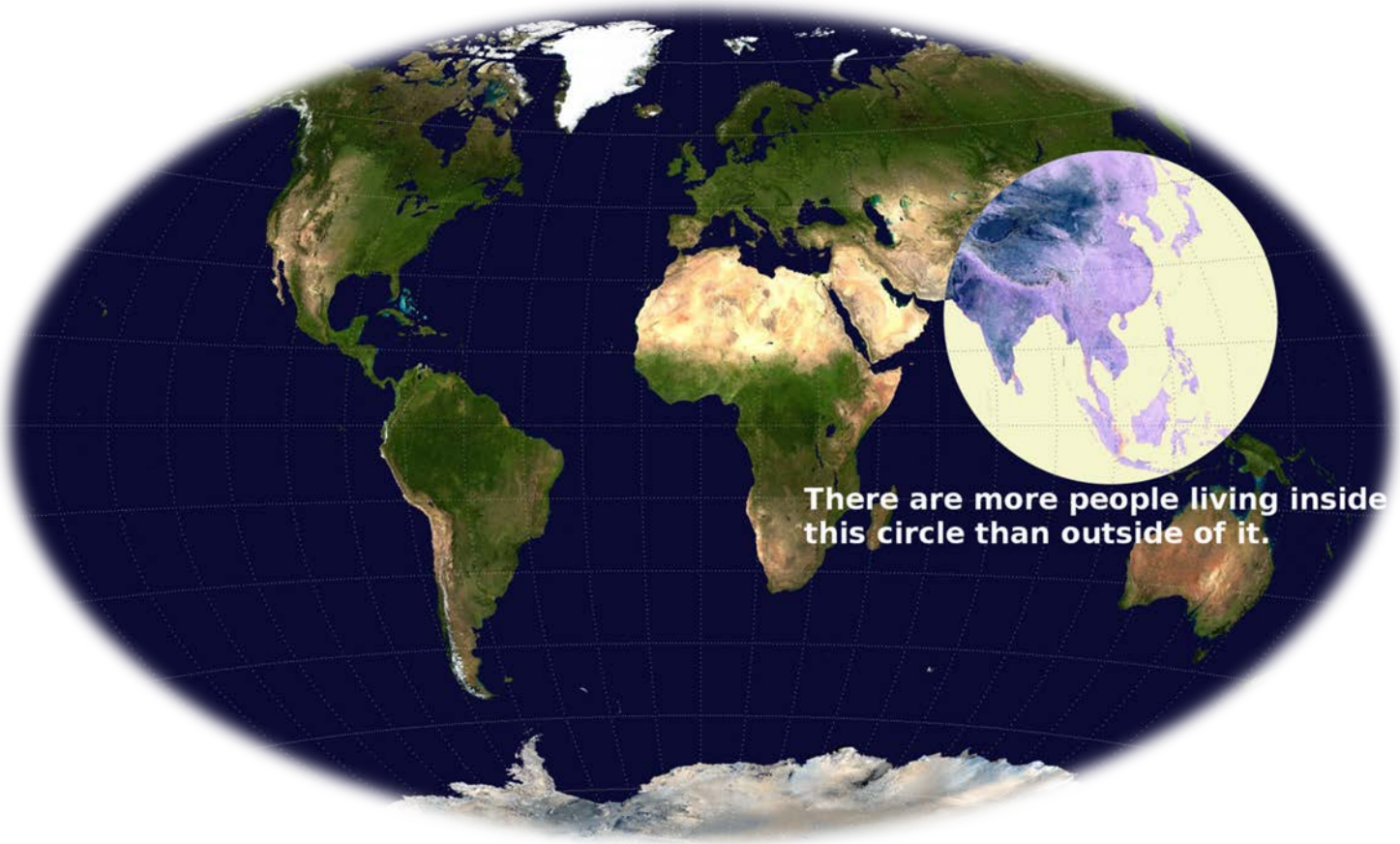
MAPS CAN TELL A STORY IN A LANGUAGE EVERYONE CAN UNDERSTAND

Maps can reveal data and help reach conclusions



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THE PSAP ENVIRONMENT

- 9-1-1 Centers are high stress environments!!!!

- Information overload
- Multitasking

→

- Decreased productivity
- Impaired decision making

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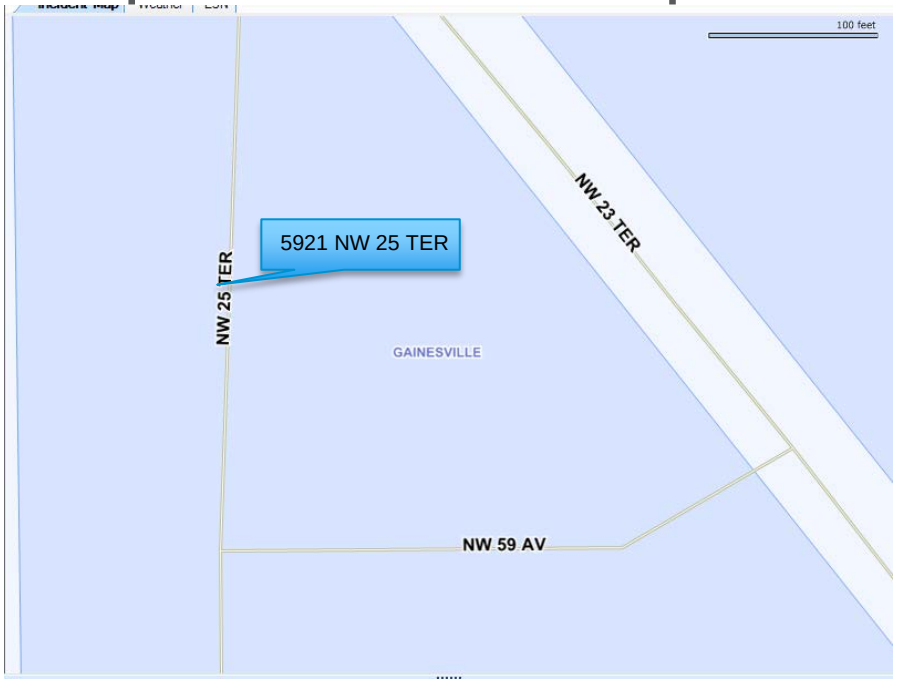
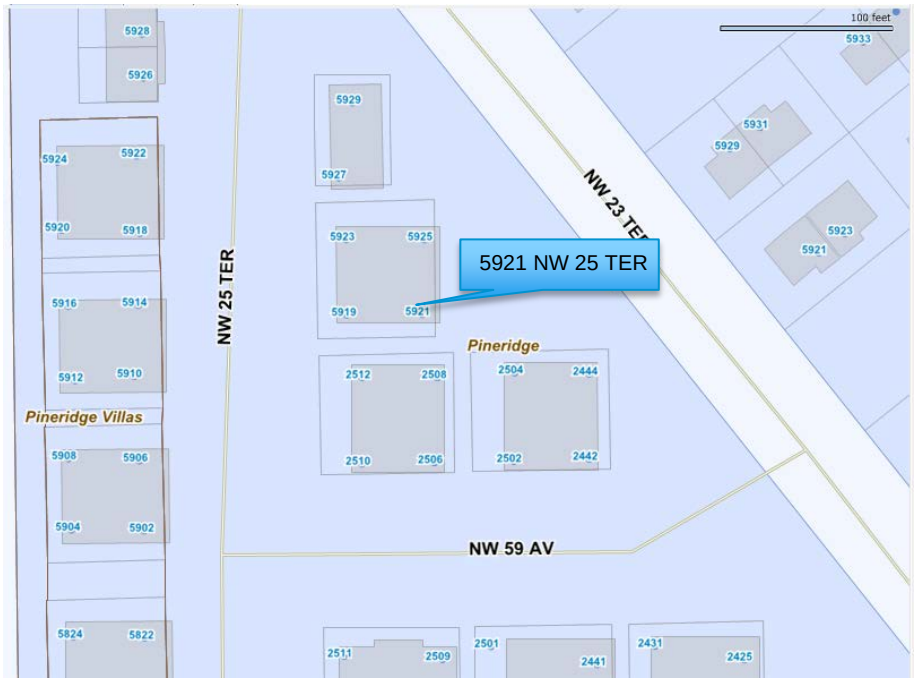
GOOD MAPS LEAD TO

- Improved decision making
- Increased ability to understand complex data and spatial relationships





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E9-1-1 LOCATION VALIDATION & CALL ROUTING

Master Street Address Guide (MSAG) – A data base of street names and house number ranges within their associated defining Emergency Services Zones (ESZs) and their associated Emergency Service Numbers (ESNs) to enable proper routing of 9-1-1 calls. Primary functions: validate address and assign ESN.

Selective Router (SR) – The routing of a 9-1-1 call to the proper PSAP based upon the location of the caller. Selective routing is controlled by the ESN which is derived from the customer location.

Selective Routing Data Base (SRDB) – The routing table that contains telephone number to ESN relationships which determine the routing of 9-1-1 calls.

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E9-1-1 TO NG9-1-1

E9-1-1	NG9-1-1
MSAG	GIS/LVF
Selective Router	ESRP
SRDB	GIS/ECRF

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HOW IS GIS USED IN NG9-1-1?

Database

- Location Validation
- Geospatial Call Routing

Map Display

- Confirming/validating emergency caller's location
- Display emergency caller's location on a map
- Provide vehicular routing

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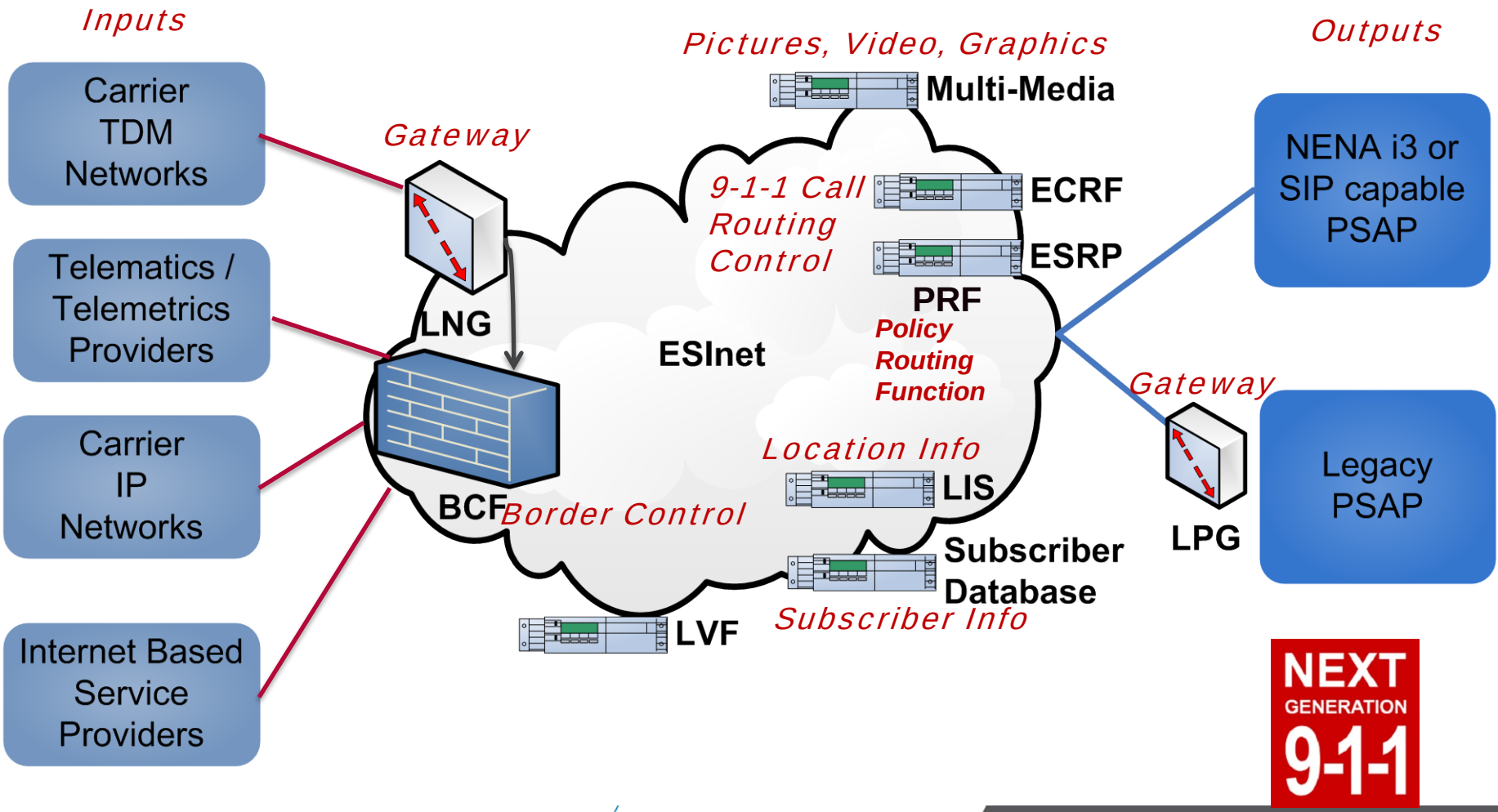
NENA NG9-1-1 – I3 ELEMENTS
SIMPLIFIED DIAGRAM (WITH ENGLISH SUBTITLES!)



NEXT GENERATION 9-1-1

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ACRONYMS!

PIDF-LO

Service URN

Route URI

LOST QUERY

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Service URN

Service Uniform Resource Name

nena:service:sos

Route URI

Route Uniform Resource Identifier

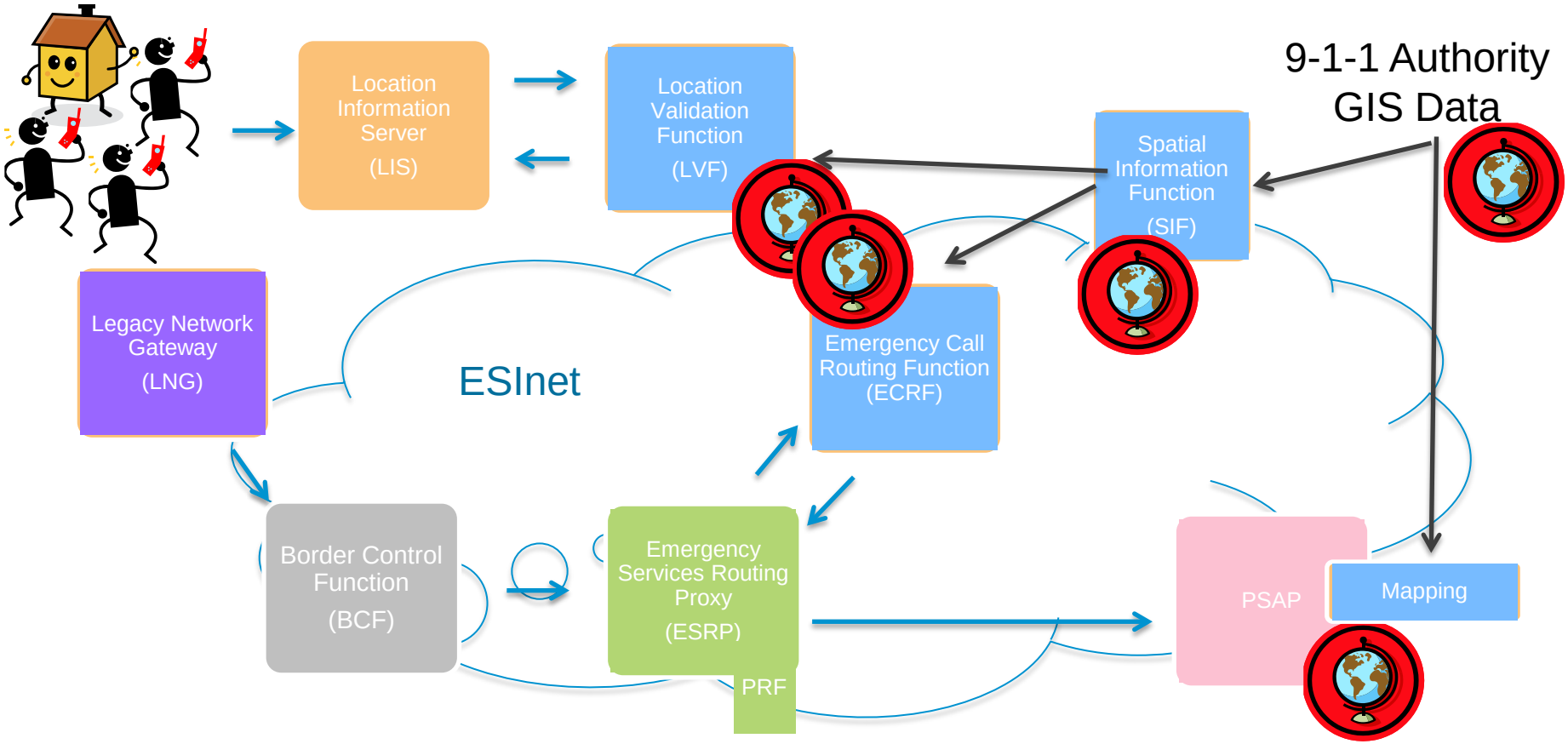
psap@AwesomePSAP.OR.us

LOST QUERY

Location-to-Service Translation

```
<?xml version="1.0" encoding="UTF-8"?> <findService
xmlns="urn:ietf:params:xml:ns:lost1" recursive="true"
serviceBoundary="value"> <location id="627b8bf819d0bcd4d"
profile="civic"> <civicAddress
xmlns="urn:ietf:params:xml:ns:pidf:geopriv10:civicAddr">
<country>US</country> <A1>OR</A1>
<A3>Brooks</A3> <RD>APCO</RD> <STS>ST</STS>
<HNO>911</HNO> </civicAddress> </location>
<service>urn:service:sos</service> </findService>
```

ESINET COMPONENTS & GIS



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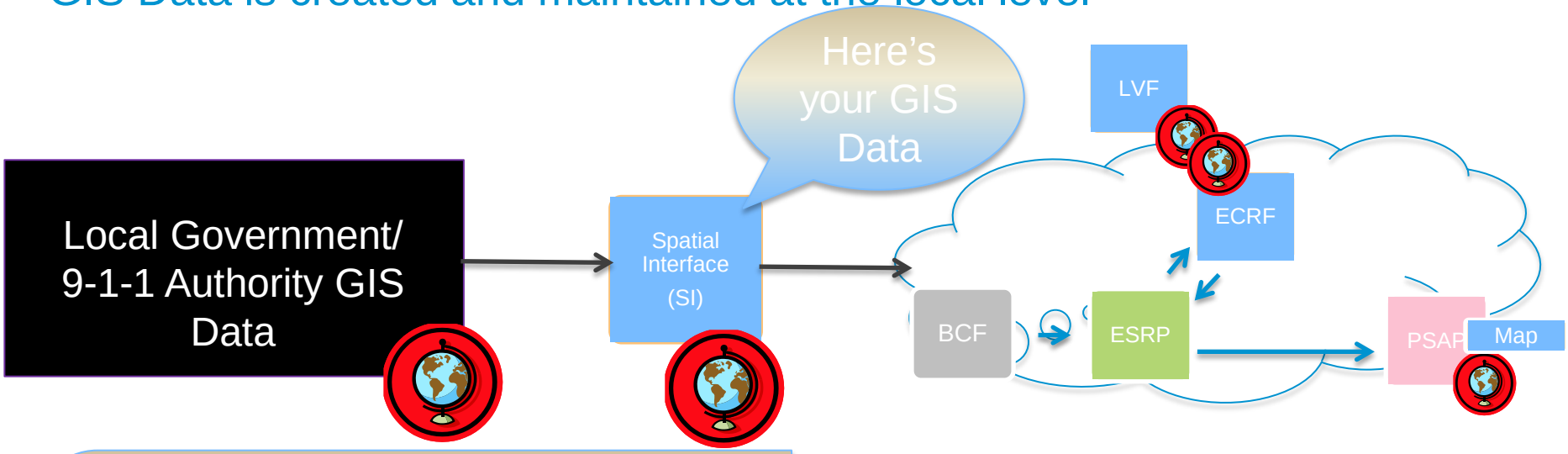
ACT I: GIS DATA PROVISIONING

GIS Data is created and maintained at the local level



SI – Spatial Information Function

- Base database for NG9-1-1 – maintains copies of required GIS layers
- Nearly all location related data is derived from the SI. SI supplies data for the ECRF/LVF and map views for alternate PSAPs
- Provisioned by the 9-1-1 Authority, or other government agencies
- Provides an interface between an authoritative copy of **GIS** data and **Functional Elements** within the ESInet

Three things done by the SI:

- Projection – WGS 84
- Layer replication – WFS + ATOM GeoRSS feed
- Transform data to CLDXF

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PURPOSES OF CLDXF

- Civic Location Data Exchange Format – NENA-STA-004

- Map a profile between IETF PIDF-LO and NENA
  PIDF - Presence Information Data Format
  - "hello, it's me and I'm waiting for an answer"

  LO - Location Object
  - "this is exactly where I am"
  - coordinate location or civic address

- Support the exchange of address data by providing "definitive set of core civic location data elements"
  - Ensure portability of address data
  - Permit efficient design of software systems
  - Meet functional needs of call-routing and dispatch

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LOST QUERY

Location-to-Service Translation

```
<?xml version="1.0" encoding="UTF-8"?> <findService
xmlns="urn:ietf:params:xml:ns:lost1" recursive="true"
serviceBoundary="value"> <location id="627b8bf819d0bcd4d"
profile="civic"> <civicAddress
xmlns="urn:ietf:params:xml:ns:pidf:geopriv10:civicAddr">
<country>US</country> <A1>OR</A1>
<A3>Brooks</A3> <RD>APCO</RD> <STS>ST</STS>
<HNO>911</HNO> </civicAddress> </location>
<service>urn:service:sos</service> </findService>
```

GIS DATA PROVISIONED BY THE SI

- Road Centerline - Required
- Emergency Services Boundary - Required
- Authoritative Boundary- Required

- Address Points – Strongly Recommended

Optional GIS Dataset for ECRF/LVF – can be useful to particular ECRF/LVF implementations to facilitate the URI mapping of invalid or incomplete civic location

- States or Equivalents – Strongly Recommended
- Counties or Equivalents – Strongly Recommended
- Municipal Boundary – Strongly Recommended

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Emergency Service Boundary

New Fields:

- Service URN – Service Uniform Resource Name
  nena:service:sos

- Route URI – Route Uniform Resource Identifier
  psap@awesomePSAP.OR.us

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LOCATION VALIDATION

E9-1-1

MSAG

Tabular database

NG9-1-1

LVF

GIS database

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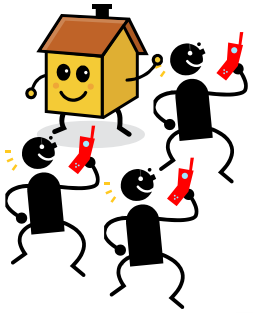
ACT II: NG9-1-1 LOCATION VALIDATION



Location Information Server (LIS)

PIDF-LO + service URN

'yes' or 'no'

Location Validation Function (LVF)

9-1-1 Authority GIS Data

Spatial Information Function (SIF)

Emergency Call Routing Function (ECRF)

Is this a valid location in GIS?

YES or NO

LIS – Location Information Server
- Calling devices query the LIS
- Civic addresses are validated prior to being stored in the LIS by the LVF – validated against the GIS
- Returns a **PIDF-LO (Presence Information Data Format – Location Object)** – can be a civic address or a geo-coordinate

LVF – Location Validation Function
- Pre-validation, validates before loading to the **LIS** database
- Similar to MSAG, verifies that the civic location matches a known address in the 9-1-1 Authorities service area
- Able to validate an address, not just address range
- Receives as input: **PIDF-LO** and **service URN** returns – location validation
- Queried by **LOST protocol**

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HOW IS GIS USED IN NG9-1-1?

- Location Validation – greater accuracy with address points

preDir	Street	Low	High	Comm	State	O/E	ESN
NE	5TH PL	920	929	Gainesville	FL	B	1
NE	5TH PL	1004	1035	Gainesville	FL	B	1
NE	5TH PL	1102	1115	Gainesville	FL	B	1

- 920 NE 5TH PL, Gainesville, FL
- 1020 NE 5TH PL, Gainesville, FL
- 1107 NE 5TH PL, Gainesville, FL

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CALL ROUTING

E9-1-1

Selective Router

Tabular query

NG 9-1-1

ESRP/ECRF

GIS query

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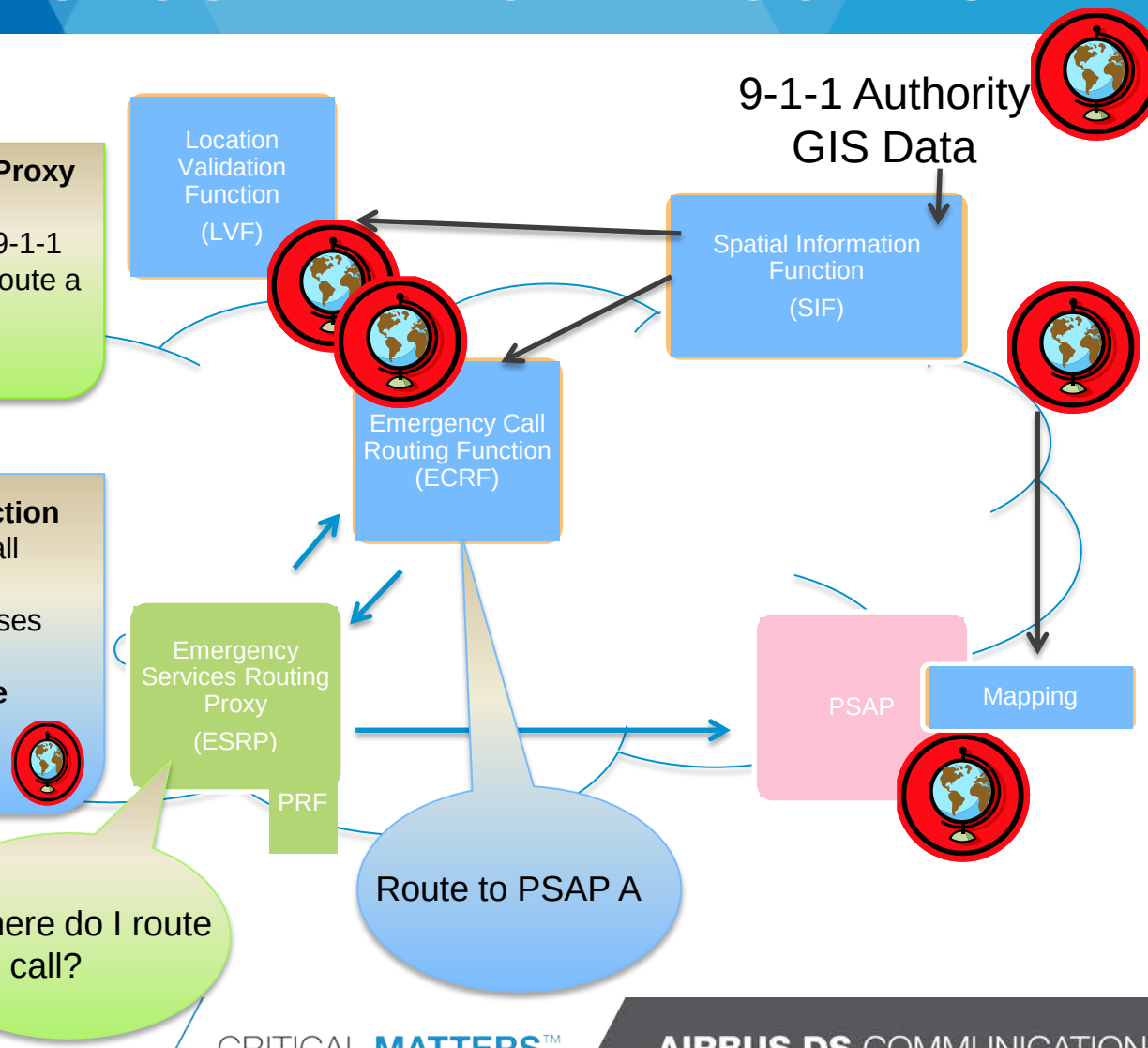
ACT III: NG9-1-1 GEOSPATIAL CALL ROUTING

ESRP – Emergency Services Routing Proxy
- Call routing engine
- Closest thing to a selective router in NG9-1-1
- Uses the **ECRF**(GIS) to choose how to route a 9-1-1 call

ECRF – Emergency Call Routing Function
- Provides GIS based Next Generation call routing
- Replaces legacy selective router databases
- Allows for alternate dynamic call routing
- Receives as input: **PIDF-LO** and **service URN**– returns –**route URI**
- Queried by **LoST protocol**



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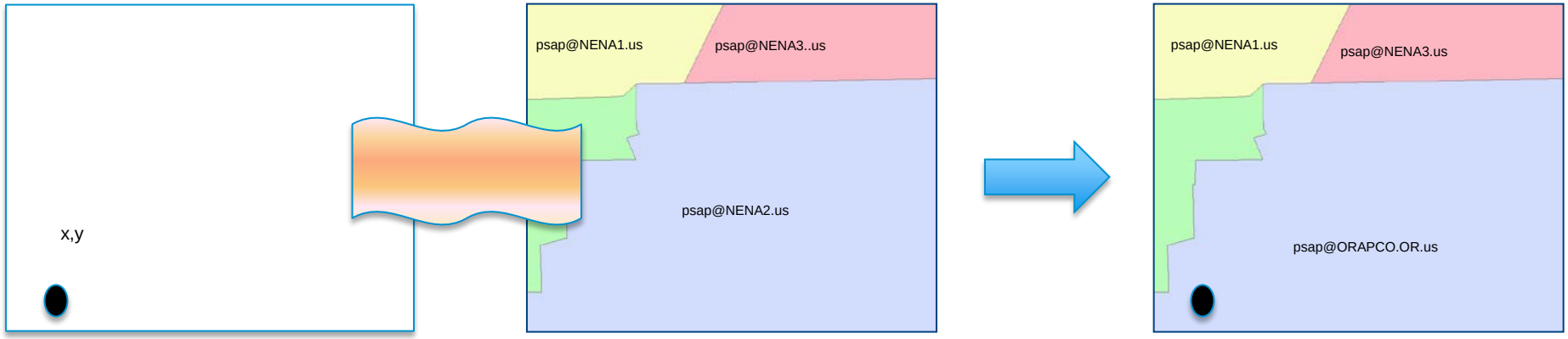
HOW GIS IS USED IN NG9-1-1

Geospatial call routing – ECRF GIS Query



Location coordinate of emergency call

PSAP Boundary with Service URN

nena:service:sos

Route URI from PSAP boundary

psap@NENA2.us

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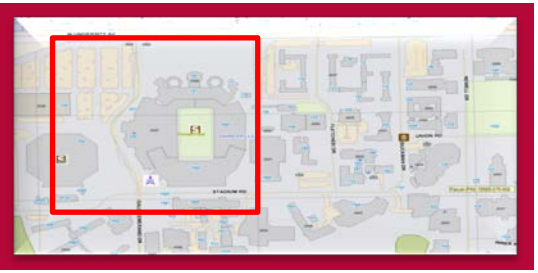
HOW GIS IS USED IN NG9-1-1

Geospatial call routing

Route to a **PSAP**



Route to **Mobile Command Center**

Route to a **Queue**

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BENEFITS OF GIS AND NG9-1-1

- Allows call validation to an address point, not just a street based address range
- Enables on the fly call routing changes that take effect within minutes
- Allows 9-1-1 calls to routed based on location to a specific PSAP or call queue

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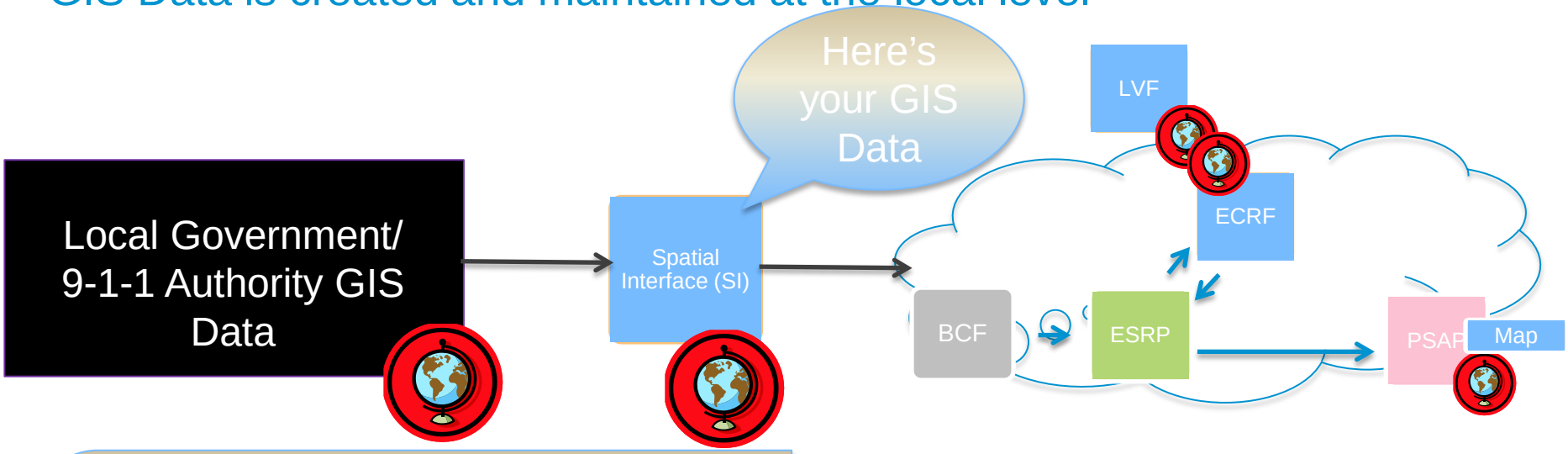

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Three things done by the SIF:

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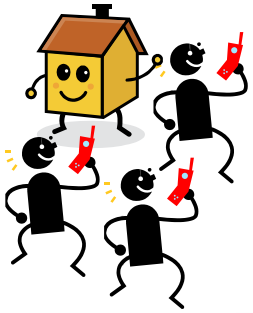

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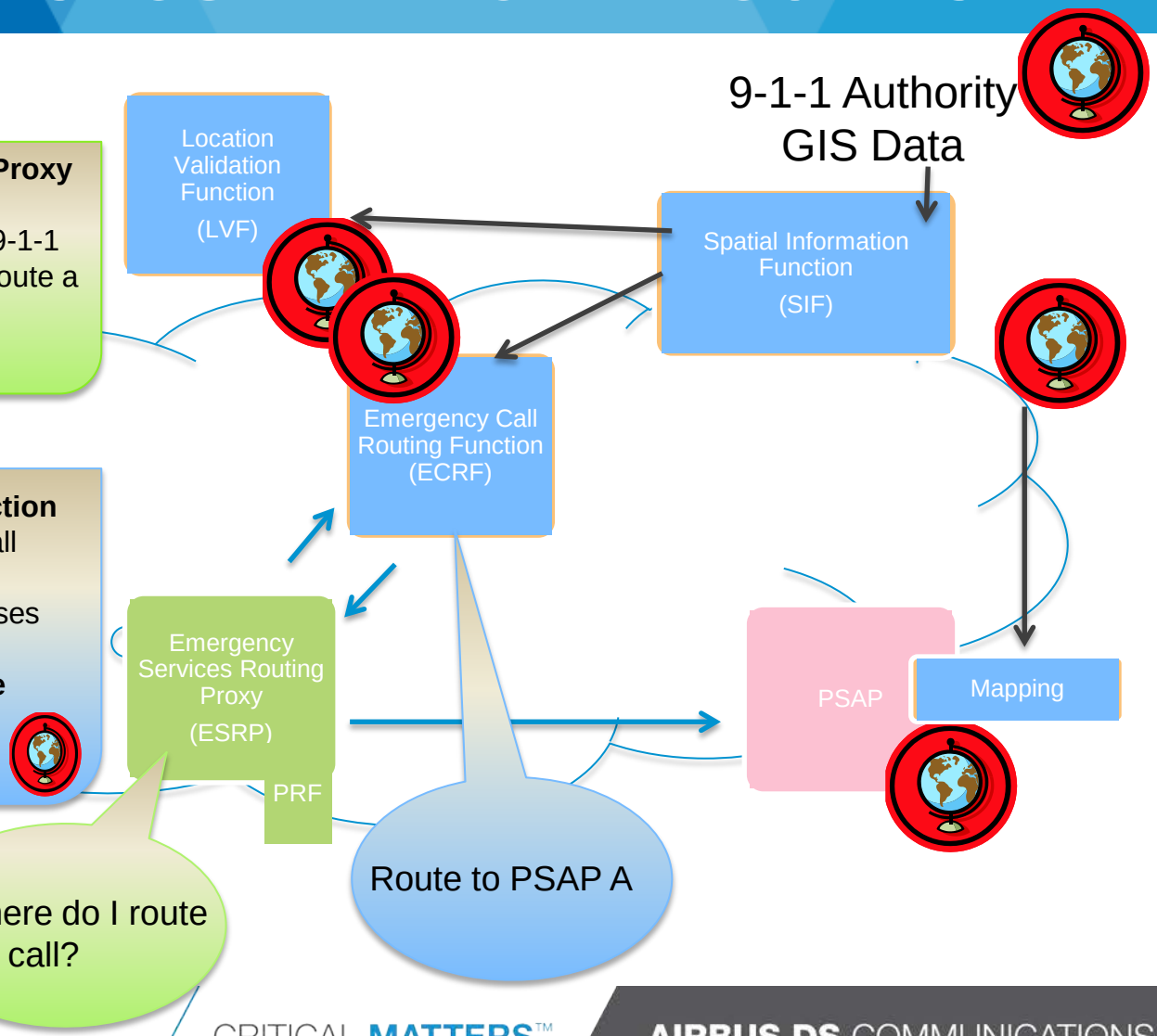

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WHAT TO TAKE AWAY

‘Check’ Your NG9-1-1 GIS Checklist:

Do you know the Importance of GIS in NG 9-1-1 environment?

Do you understand NG9-1-1 Call Flow and which components rely on GIS?

Is your current GIS data ready for NG9-1-1?

Is your GIS data in sync and consistent with the MSAG and ALI?

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