So some of you are saying “What is this GIS I keep hearing about?” A GIS or Geographic Information System integrates hardware, software and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information or location information. It does this by displaying information in layers.

As you all know, 9-1-1 systems are falling behind the advancements in technology that are widely used by the general public, such as text messaging, pictures and video from cell phones, emails sent from cell phones and telematics services such as what Onstar provides in automobiles. Today’s legacy 9-1-1 systems cannot deliver any of this information to 9-1-1 centers.

The Next Generation 9-1-1 (NG9-1-1) Internet Protocol (IP) infrastructure being planned by the State of Minnesota 9-1-1 Program will provide the capability for these new technologies to interface with the 9-1-1 network. The goal, according to the National Emergency Number Association (NENA) is to provide “EMERGENCY HELP, Anytime, Anywhere, Any device ™.” NG9-1-1 technology is based on Internet Protocols (IP) Standards. IP technology is quickly dominating North America and implementing NG9-1-1 will allow the ability to dispatch from and transfer to a public safety entity almost anywhere in the world.
Traditionally E911 location database systems performed three main functions that have remained mostly unchanged over the last 30 years:

- Validation of the 9-1-1 caller’s location to a valid street address contained in a Master Street Address Guide (MSAG)
- Assignment of Emergency Service Number (ESN) for emergency call routing and selective call transfers
- Automatic delivery of location information associated with the telephone number calling 9-1-1 (Automatic Location Information or ALI)

Address validation and call routing information must now be accessed by a host of new service providers, creating new issues of functionality, data management, and security. The National Emergency Number Association (NENA) has begun the identification of standards to transition from the legacy 9-1-1 system of today to the NG9-1-1 system of tomorrow.

These new efforts are divided into two groups:

- i2 - an interim solution which leverages the existing 911 infrastructure, and
- i3 – a long term solution based on full IP network connectivity within the 911 and emergency services community.
Both i2 and i3 solutions make use of several new key components in the 9-1-1 network that emulate and improve functions performed by traditional 9-1-1 location databases. The i2 architecture includes:

- **Address validation** performed by a **Validation Database (VDB)** – This database is used when a subscriber (i.e. VoIP subscriber) registers an address. This database also converts the Civic/Postal address to an MSAG valid address.
- **Emergency Routing Database (ERDB)** – This database is used during the 911 call to determine routing by providing the following information during the 9-1-1 call:
  - Provides routing instructions based on location rather than telephone number.
  - Identifies the Emergency Services Zone (ESZ)/Emergency Service Number (ESN) for the 9-1-1 call location.
  - Provides the MSAG Valid Address of the 9-1-1 caller.
- **Management and provision of the subscriber record** by a **Location Information System (LIS)** - This address is the registered address entered by the subscriber of the service. Conceptually you could order a telecommunications service and enter in your address as you sign up for the service. This would be your registered address. This registered address would bounce up against the VDB or MSAG validated address. Theoretically whether your address is a latitude and longitude that changes as you take your device with you or a postal address of a static device, it could be converted to an MSAG valid address now driven by GIS, allowing your call to be sent to the correct PSAP that should answer your call.

The i3 architecture is simpler and more robust and changes the function names above for i2 to the following in i3:

- **VDB** - Validation Database (i2) becomes **LVF** - Location Validation Function (i3)
- **ERDB** - Emergency Routing Database (i2) becomes **LoST** - Location to Service Translation (i3)

i3 will also allow public safety dispatchers and responders access to more information such as:
- **Additional Information about the call** **Location** such as
  - Floor plans, construction, best entrances, fire control panels
  - Access to surveillance video, HVAC, Elevator, etc.
  - Code and inspection histories or previous citations
- **Additional Information about the Caller** such as
  - Medical data and notations, such as “In emergency, please contact…”, for a particular person will be available no matter what device that person dials 9-1-1 caller from.
- **Additional Information about the Call** such as
  - Contact data for the Caller's service provider
  - Telematics (like Onstar) or other call related information
You might be asking yourself “what does GIS (Geographical Information Systems) have to do with all that stuff you just read?”

The demands and challenges of the Next Generation 9-1-1, require a new and innovative approach and GIS is a critical part of the solution. The GIS will create a Graphic/Spatial MSAG, in other words the GIS will drive the creation and maintenance of the MSAG. All database changes originate from GIS data through a graphical user interface (GUI) and are then passed digitally to the 9-1-1 MSAG, CAD, and GIS databases. This new NG9-1-1 MSAG/GIS data model automates the process, from creation or update of an address or geographic feature to disseminating the revised data into the relevant CAD, MSAG and GIS databases. This methodology has proven to reduce the time and resources needed to maintain the combined datasets, quicker updates, and fewer errors.

Geographic Information Systems-

- GIS becomes one of the central data stores
- GIS is fully integrated and required for Next Generation 911
- GIS does not require a separate ALI feed into the PSAP CPE equipment
  - Caller location data comes with the 911 call
  - Responder information comes with the 911 call as polygons (explain polygons) with associated contact data
  - Emergency Service Zones (ESZ), Police beats, Response areas, floor plans, images, etc. comes with the 911 call
  - GIS allows complete integration into 911 call taking, Computer Aided Dispatch (CAD) systems, Emergency Services (not sure what this is unless the comma taken out to say "Emergency Services dispatch and response."), Dispatch and Response.

Over time, management of the MSAG will migrate into the combined LVF/LoST system where the master copy of the MSAG is managed in a spatial (describe spatial) database (GIS) and all other systems using MSAG type data will get their updates from the LVF/LoST system.

The Basics of NG911 Location Information
The 911 authority must provide the MSAG to all authorized Voice over Internet Protocol (VoIP), Wireless and Telephone Company service providers. There must be procedures and infrastructure in place to ensure that the MSAG data is kept current and updated electronically in real-time and presented to authorized parties in a real-time format.

In the i2 and i3 environment, the MSAG and Postal addressing data will be combined to create a comprehensive validation system. In this new type of MSAG there will be links to alternative location information such as “also known as” or “AKA’s” and access to them will be secure and not open to the public. Discrepancies and “fall out” of these processes will be cleaned up with help from the 9-1-1 authority or MSAG Source.
In the i2 and i3 environment, The ERDB/LoST will be the Emergency Service Routing Database that takes the civic address of the 9-1-1 calls and provides the Emergency Service Number (ESN) so calls are selectively routed to the correct PSAP.

This is where GIS information becomes part of the data management process." The ERDB/LoST has access to the VDB/LVF data and GIS information, to help it make the routing decision.

GIS Information is managed with the combined MSAG and Postal data to support routing based on civic address and/or geocoded data (latitude & longitude).

Over time, management of the MSAG will migrate into the combined LVF/LoST system where the master copy of the MSAG is managed in a spatial database. A spatial database is by definition a “database that is optimized to store and query data related to objects in space, including points, lines, and polygons and their spatial components <i.e. Geometry or feature>” this is otherwise known as a GIS. In Next Generation all other systems using MSAG type data will get their updates from the LVF/LoST system and be driven by GIS.

For NG9-1-1 to become viable and efficient, it will be important to have correct data, updated data, and data that is seamless across the entire region, the state, the nation, and internationally. GIS data will be
very useful to emergency responders. It will be very important for the state, the counties and the emergency responders to form a partnership with each other to create the most accurate GIS data.

To have a successful integration to NG9-1-1 with GIS features will increase the need for every involved entity to…….

**Coordinate**

**Cooperate**

**Collaborate**

**Communicate!!**