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ESINets and Map Based Location Technology Use

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With the proliferation of GPS enabled mobile devices, wireless and Voice over IP (VoIP) in particular, it is far easier to locate a caller by geographic coordinates when these are provided in the Automatic Location Identification (ALI). For Public Safety Answering Point (PSAP) call response, this location information needs to be available to the call taker on an easy-to-use and up-to-date map display. With the requirement for the consumer to provide their address for nomadic VoIP services, the need for cross jurisdictional call transfers becomes a necessity. Map data requirements for systems designed to display all incoming calls, regardless of originating device and delivery technology, will also become more diverse as the geocoding of all consumer provided addresses becomes a necessity. In a Next-Generation 9-1-1 (NG9-1-1) environment, the key NextGen benefit for communications is passing call information across jurisdictional and even Local Access and Transport Area (LATA) boundaries between network connected entities. Providing map data access and exchange between agencies across the network is an additional benefit.

To achieve the goal of passing this information between entities, network connectivity, capacity and security will become critical concerns. Over the last decade, map displays for locating callers have improved in graphics rendering as well as data querying and analysis capabilities. However, there is some limitation to how much map display functionality is practical and efficient within the closed network environment of a single PSAP. The constantly changing location of a moving wireless caller, as they move along a road but back and forth between two different counties, can prove challenging for a PSAP tracking the caller's location when its map data only covers the single county it serves. To truly begin to leverage the power of Geographic Information Systems (GIS) technology, accessing data sources outside of the PSAP, in real time, must be facilitated by the 9-1-1 community. The following are six (6) areas in which widespread use of an Emergency Services IP Network (ESINet) could have a major impact, by improving 9-1-1 call taking and response when used in conjunction with map based call locating applications:

- Data access facilitation
- Data 'Synchronization'
- Data requirements and standards for NG 9-1-1
- 'Resiliency' and 'Redundancy' of 9-1-1 infrastructure
- Computer-Aided Dispatch (CAD) support
- Providing access to new and future data formats

Each of these will be addressed in more detail below, but the common need is the requirement for network access between all concerned parties.

In facilitating data access, an ESINet can provide for all jurisdictions using it to pull information from one or more databases, maintained by independent data steward agencies, for display on their PSAP mapping systems. This would be extremely beneficial to 9-1-1 operations in that multiple data steward agencies with a mandate to maintain independent GIS databases for their own jurisdictional extents would be able to more freely share information with each other. To achieve this, it would require secure, stable and robust network access between all operations. Once in place, this cooperative data exchange could potentially increase the capabilities of emergency response operations in those areas with access to an ESINet.

One challenge all PSAPs using map data must work with is keeping their database(s) updated and/or synchronized between the database administrator and the PSAP. The type of data that would initially be of interest in regards to availability or kept up-to-date through an ESINet, include the following broad categories:

Static GIS Data – Map layers maintained by an organization that do not change often or are updated on a weekly/monthly basis, at most. This is the current standard in the industry and data is typically maintained by a jurisdiction for its geographic area of responsibility only (i.e., data ends at the county line). With open access between PSAPs, map data extents would be able to cover other areas required during an event that are not maintained by the jurisdiction handling the call.

Dynamic GIS Data – Map layers that are changed often or are updated hourly/ daily would be more practical in PSAP operations with provisioning of network oriented services such as Web Mapping Services (WMS) and other online map data access points. In order for a PSAP map display application to access a map layer located off site, in real time, secure access through an ESINet is required. Entities that can provide map data would need to be allowed access to the network after being approved by the network administration authority. One example of this type of service would be the ability to provision PSAPs with live weather radar map overlays directly on top of their call taking map. This would provide a wealth of information and improve the situational awareness surrounding call handling. This capability is already built into many map displays but remains unused due to the lack of external data access.

Historical Data – With the increasing need for local governments to accumulate statistical data about their call handling operations, the need is growing for access to this information across secure networks. An ESINet would more easily facilitate the access to localized data compilation sources (i.e., databases at individual PSAPs). This wider access format could also serve as a catalyst for developers to leverage robust network access and potentially reduce hardware requirements through network based statistical application design.

A key element in developing and maintaining data will be globally recognized (at least by all members of a particular ESINet) and followed standards for formatting and maintenance. The National Emergency Number Association (NENA) has recommended standards for utilizing GIS data in a NG9-1-1 environment. With the removal of Tandems and the addition of GIS servers for locating callers and routing them to the correct PSAPs, the need for a coordinated effort of data provisioning will become immediately apparent. It is unknown at this time as to who (or what) will accept data from individual agencies and place it on GIS servers used for geocoding calls for routing.

More information will be maintained in the GIS datasets (e.g., MSAG communities, postal communities, political communities, zip codes, etc.) to adequately geocode addresses generated by consumers (VoIP). A methodology for taking individual jurisdictional datasets and merging them may require field name and structure changes. This process, to be automated, will also require that data layers submitted for incorporation into the routing servers have the layer names, as well as the field structures themselves, remain as they were originally programmed into the system. A coordinated

monitoring effort will have to be employed to ensure this consistency remains in place and that it is known in advance to appropriately accommodate structural changes.

With growing requirements for improved system/network resiliency and security in the 9-1-1 community, an ESINet will serve as a development catalyst for centralizing a data repository and strengthening redundancy capabilities. Today, most PSAPs using map displays contract for GIS services or GIS hardware/software to build and maintain their own map data. There are a high proportion of sites that are duplicating effort where each police department, fire department and Emergency Medical Service (EMS) location is developing their own mapping capabilities. An economy of scale can be achieved when map data and maintenance duties are centralized and shared between multiple agencies. In a coordinated map data administration environment, multiple remote PSAPs would have local map data but remote access to a main database site for back-up copies in addition to remote updating functionality. This centralization of data maintenance would allow for the concentration of specially trained staff to focus on building and maintaining data. Following this coordination paradigm would likely lower operational costs for participating agencies over time through the reduction of duplication in specialized GIS staffing, hardware and software.

The majority of PSAP call taking operations in the U.S. is based on traditional telephony solutions coupled with, at a minimum, a basic map display. CAD systems, oriented more for managing response assets rather than the call itself, are, in many cases, in use side-by-side with traditional 9-1-1 telephony solutions. In most cases, a map is used by one or the other applications for PSAP operations—it would be more practical if both used the same display. While this gap is closing by the manufacturing sector in some cases, database access for CAD has been and continues to be local PSAP-oriented.

There are already commercial telephony solutions on the market that can immediately take advantage of an ESINet, CAD is another area of 9-1-1 operations that would benefit from access through an ESINet to a remote database. A secure robust network would facilitate the needs of CAD, as well as normal 9-1-1 traffic. It will even serve to help close the gap between CAD and telephony map data needs, as both types of systems could potentially utilize the same map data resources if both are simultaneously provided access to it. This would also reduce the potential of having to maintain two separate databases (one for CAD and one for GIS) if both are accessed equally across the same network.

As time moves on and technology changes continue to come in to play, it is obvious that the need to provide an avenue to funnel other types of information to the PSAP, in addition to ALI, from the outside is becoming more imperative. Pictures, video and telematics each pose their own challenges with regards to formatting and bandwidth requirements. In addition, a new area of commercial interest and of potentially immense benefit to 9-1-1 call centers is the allowance of commercial service providers to make customized data available as a subscriber service to all members of an ESINet.

The need will be for processes to be developed and implemented by the coordinating body of the ESINet to allow for application access to the members on the network. This opens up an entirely new area of concern but also significant benefit for the 9-1-1 community who, in the past, had no ability to access commercial data sources outside of

their traditionally closed networks. The common thread between these, however, is that all may need to utilize a secure and robust network with controlled access to external sources in order to be accessible by PSAPs and the applications within them, particularly those that are map based.

The expanding next-generation world will continue to affect all aspects of PSAP operations, and in particular, database development and access as well as map display needs and capabilities. What is required now is a forethought in designing, testing and implementing the networks across which data can be accessed and passed by all manner of participating 9-1-1 organizations and service providers. In this, PlantCML® is proud to support these development efforts and stands ready as a knowledgeable technical resource and committed partner in the next-generation technology initiatives that are underway in the 9-1-1 community.

About PlantCML

PlantCML, an EADS North America company, is the industry's leading provider of crisis communications and response technologies. Today, PlantCML is pioneering the next generation of E9-1-1 and secure network communications through Voice over IP-enabled applications, interoperable P25 radio systems and advanced emergency notification technologies. PlantCML's solutions are resident in 14 of the top 20 most populous U.S. cities and largest first responder operations.

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