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L.R.Kimball℠

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THE DATA DIFFERENCE IN NEXT GENERATION 9-1-1 SYSTEMS

A white paper from FE/Kimball

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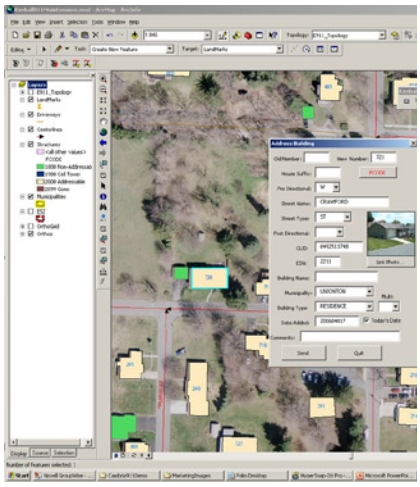

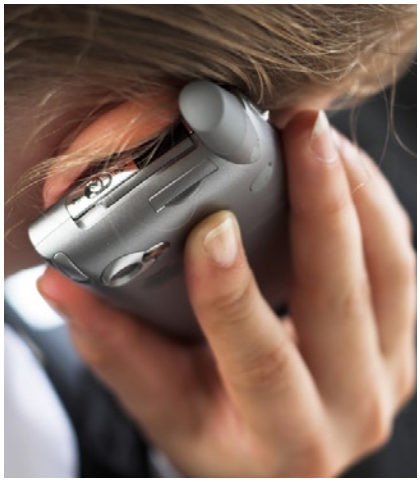

HIGHLIGHTS

Key terminology:

GIS - geographic information system

ALI - automatic location identification

MSAG - master street address guide

LIS - location identification server

ESInet - emergency services IP network

ECRF - emergency call routing function

LoST - location to server translation

Data for NG9-1-1: A Complete 180 From Traditional Data Handling

One of the most novel, but underappreciated, aspects of next generation 9-1-1 (NG9-1-1) systems is the way in which the systems handle the data that identifies callers' locations and routes calls to the best public safety answering point (PSAP) for a response. NG9-1-1 turns the traditional data handling concept on its head. NG9-1-1 attaches addresses or coordinates in the beginning of the call process, rather than sorting through a database to find the location at the receiving end, in the dispatcher's call center.

This process reversal means very large changes are in store for geographic information system (GIS) data, the conventional automatic location identification (ALI) databases and the emergency network's master street address guide (MSAG).

The new way of handling data is made possible by a change in the placement of GIS data. Until now, an emergency call has arrived at a PSAP, where it must dip into an ALI database to match the caller's phone number with a name, address and community. The data is then sent to the MSAG to determine the emergency service number in the field that represents the appropriate police, fire and ambulance combination for the location of the caller. Finally, through GIS, the address is displayed as a point on an electronic map in front of the dispatcher to help locate the caller.

GIS Plays a Larger Role at the First Stage of a NG9-1-1 Call

With NG9-1-1, however, GIS data is applied at the first stage of a call, instead of the final stage. The system assigns a street address or latitude and longitude coordinates at the very beginning stages of a call. That information is then carried all the way through the routing process. This change is possible in NG9-1-1 because all service providers—telephone companies, Internet service providers, voice-over-IP providers, wireless services and others—will be required to maintain the addresses of their customers in each company's own database on a location information server (LIS).

The Role of the Location Information Server

When a customer subscribes to a company's phone service, that company must validate the address using the Location Validation Function before it is entered as a record in the LIS. The changes are being developed through the technical standards committees and are taking into consideration the modifications that the LVF function will require. The NENA i3 documentation has been the catalyst for these discussions and provides the framework for how the routing of the information will occur.

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Emergency centers will need to prioritize how they plan to handle conventional versus non-conventional communications, such as video and text, and establish policies and procedures to handle them.

NG9-1-1 and LIS also resolve location confusion from voice over internet protocol (VoIP) calls whereby a person can be placing a VoIP call from a mobile device but the call is delivered to a 9-1-1 based on the the home address that was registered at the time of service initiation. For example, a call may be routed from the caller's home when he or she actually is attending a business meeting or vacationing in another city. The NG9-1-1 network will operate with the functions as identified in i3 that will allow for legacy, mobile and VoIP calls to capture their location within the accessed network to place the call from the mobile device's current location and then route the call.

Another important change in call handling with NG9-1-1 systems is that all calls will be routed through a state or regional emergency services IP network (ESInet). There the call data is processed by an emergency call routing function (ECRF) database server, which stores precise location data and—by communicating with yet another server that uses Location to Service Translation (LoST) protocol—determines the best PSAP to which the call should be routed. By sending the call first to the area-wide ESInet, the system ensures compatibility for calls from a wide variety of devices—handsets, wireless, computers, text messages and other sources.

With an entire new set of databases, servers and acronyms, NG9-1-1 phases the current ALI and MSAG technology out. Addresses now will be pre-validated through LIS, and calls will arrive at the PSAP with a civic address or coordinate attached. At that point the GIS data in the ECRF will be used to route the call.

Advanced Use of Digital Data in NG9-1-1

NG9-1-1 technology developers are currently working on methods to identify locations for unconventional communications—for example, text messages, video and wireless calls made outdoors where no LIS validation service is available. Solutions are focused on providing a coordinate "tag" to the wireless call, the SMS message or the cell-phone photo. The tag would travel with the call stream and would supply a reference to a location on the ground. In these instances, an incoming call would arrive with an address and coordinate at the same time and might have a text message embedded in the data string. Emergency centers will need to determine how such calls should be prioritized over the data lines. Should voice take precedence over text? Should video – a very large file – have a higher or lower priority than a phone call or text? Additionally, emergency call centers have to establish policies and procedures to properly respond to these newly available forms of communication.

HIGHLIGHTS

The four key considerations for operating a successful NG9-1-1 system from a data standpoint are:

1.) Precision

2.) Data maintenance

3.) Technical standards

4.) Governance and policies

Four Considerations for NG9-1-1 Data

The changeover to a digital system that is data-driven from beginning to end will require changes in priorities for the way public safety departments manage and store location data. Four areas will be particular focal points for operating a successful NG9-1-1 system:

1. **Precision**. Developing data that is sufficiently accurate to pinpoint a caller's location within standard tolerances is essential. That means that GIS data across the nation must be even more precise than the data that most PSAPs are using today. Many agencies use road center lines to plot street locations and then employ geo-coding to interpolate an address within a string of address numbers. The center lines, building addresses and jurisdictional boundaries that are used as guides for deciding where calls should be routed must be highly accurate and complete in the GIS database. Otherwise, a call may be routed to the wrong PSAP or emergency services entities. Nearby jurisdictions must cooperate in reviewing the boundaries on their existing GIS maps to make certain they correspond to actual locations on the ground.

   The addition of neighborhoods and commercial developments can result in the extension of address ranges for a given road or even changes in the name of the road and must be updated accurately. Also new constructed paths for roadways that are widened or routed through and around new developments must be added to the datasets and collected using accurate methods such as GPS units. PSAPs, 9-1-1 directors and safety officers should work together to be certain all addressing information and jurisdictional boundaries are up to date in the GIS.

2. **Data maintenance**. As a result of community growth, address information can become outdated more rapidly than many agencies realize. It must be updated and maintained regularly in each community and then delivered to the ECRF database server for the area's ESInet. The ECRF stores the precise location data that will be used to determine the most appropriate routing of each 9-1-1 call. If that data is not current, the entire routing process can break down.

   When data is maintained properly, it protects citizens and community agencies in a number of ways:

   - Call centers minimize the risk of incorrectly routing responders, which could lead to life-threatening delays. In NG 9-1-1, incorrect or incomplete data can lead to misrouting of calls to the correct PSAP or emergency services.

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NENA's requirements should be employed to ensure data standardization across PSAPs.

- Dispatchers receiving calls reflected in an accurate GIS map need to ask fewer questions to locate the caller's position. Conversely, if the caller's position shows up on the GIS display in a location that is distant from where the caller claims to be, the result can be a long series of questions to resolve the issue and a longer-than-desirable response time.
- Up-to-date information on streets and structures helps provide a solid ground reference for responders. Accurate GIS data, with precise spatial references, can show dispatchers that a caller is next to a newly constructed school or in the middle of a brand-new housing development.

3. **Technical standards**. Every ESInet will be an intrinsic part of the operations of a large number of PSAPs, safety agencies, counties and other municipalities. Each of these partners in the network must be using standardized data that it can be integrated into the ECRF. This includes everything from a common way to express numbers to a standardized way of completing information fields when entering addresses. National Emergency Number Association (NENA) requirements should be employed in developing these standards locally. For instance, NENA specifies that a street name such as "East Market Avenue" be entered and stored in three individual fields: "E," "Market" and "Ave" If a county or town stores that name in two fields, such as "E Market" and "Ave," the ECRF may not recognize the name of the street. Again, the jurisdictions within an ESInet must work together to set standards and verify their deployment.
4. **Governance and policies**. How data is maintained, the establishment of workflow processes, and the assignment of new addresses are determined by individual jurisdictions based on their own policies. Agencies must ensure that their staff members are familiar with and abide by those policies daily. Other initial policies that must be set in place include decisions on how frequently information should be updated in the GIS database and who will be responsible for implementing the updates. These policies can become problematic when, for example, addresses in smaller communities are assigned by a planning department without GIS, and the street names and numbers are not coordinated with those in adjacent communities. Policies can be established to delegate responsibility for address assignments to a larger entity with NG9-1-1 in place.

   Governance relates to the individuals who set, administer and monitor these policies. Often an existing local or regional authority can assume these tasks. In other instances, a new body may need to be formed. Ensure that all stakeholders in the NG9-1-1 system

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Keeping data accurate, maintained and current is an indispensable aspect of an NG9-1-1 program.

are represented in the governance structure and that data storage, maintenance and retrieval policies are incorporated into the group's oversight responsibilities.

The Next Generation from FE/Kimball

FE/Kimball has been designing, consulting on and overseeing the development of 9-1-1 emergency systems and networks for more than half a century, and we have developed and implemented comprehensive GIS data technology and collection methodologies for more than 20 years. As a result, we have earned special credentials in responding to the call for NG9-1-1 from states and municipalities across the nation. We have played an instrumental role in helping agencies create policies and procedures, evaluate hardware and vendors, design networks, and develop and maintain data as communities move along the path toward NG9-1-1.

In our role of supporting major metro areas and multi-county regional networks, FE/Kimball works with clients to implement the following initial steps for establishing the next generation of 9-1-1 services:

1. Examine current data to see the maps and other location information that the communities that will participate in the ESInet already have developed.
2. Develop a roadmap to move jurisdictions from where they are today to where they want to be as part of an NG9-1-1 network.
3. Synchronize the GIS data with ALI and MSAG databases to ensure that the GIS mapping is as accurate as possible, and employ NENA standards to resolve discrepancies.
4. Work with surrounding jurisdictions to update boundary maps and create a GIS layer of precise address points.
5. Update the GIS database with information on new roads and structures to surpass NENA's goal of 98 percent accuracy.
6. Draft a maintenance plan and policies to address maintenance either with the municipality's own staff or through outsourced L.R. Kimball experts.
7. Implement FE/Kimball GIS software solutions to with effective and efficient data maintenance.

Keeping data and data maintenance accurate, efficient and current is an indispensible aspect of a successful NG9-1-1 program. We are eager to help prepare your roadmap to a smooth and productive implementation. FE/Kimball is America's first responder for NG9-1-1. Please call on us at www.lrkimball.com.

FE/Kimball

Established in 1953, FE/Kimball is among the nation's leading professional service companies offering its clients architectural and structural design services, civil and environmental engineering expertise, communications technology solutions and consulting. With a focus on targeted results, expertly managed, FE/Kimball is committed to offering its diverse public and private-sector clients a tailored approach designed to meet their needs and budget requirements.