The Underlying Problem With 9-1-1: Rescuers Can't Help Citizens If They Can't Locate Them

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Most 9-1-1 map data is flawed across the country. It's inaccurate and outdated – missing new streets, closed roads and sometimes whole new developments. It frustrates first responders who have to double-back on roads searching for an address that's out of numerical order. It can be life-threatening to citizens who need assistance, yet their location cannot be identified quickly or with spot-on precision.

Case in point: In Minneapolis-St. Paul and in the State of Texas, 85 percent of supporting 9-1-1 address data was found to have some degree of error, according to a 2011 report from the Communications Security, Reliability and Interoperability Council. In addition, a review of 50 recent data validation reports from across the country uncovered errors or omissions in more than 70 percent of 9-1-1 datasets. This means the vast majority of citizens in these areas may not be located quickly – or perhaps at all –when they are in need of emergency services.

It doesn't have to be that way.

Ohio recognized this troubling problem with 9-1-1 mapping and developed a solution that has been hailed as a best practice by the U.S. Department of Transportation in its 2011 Transportation for the Nation strategic plan. It's called the Location Based Response System (LBRS) and it is saving lives as well as taxpayer dollars every day in the Buckeye State.

Increasing Map Accuracy

What makes Ohio's 9-1-1 map data so impressive is the field verification – versus traditional geocoding along street centerlines with address ranges – that goes into developing it. Without physically driving each and every highway, state route, county road, municipal street and neighborhood cul-de-sac to verify existing data, maps cannot be truly accurate. What may look like a side road in an aerial photograph, for example, may turn out to be a drainage ditch or gated lane when checked at street level during field verification.

Field verification allows for precise plotting of residential and commercial structures to within +/- 1 meter, making note of address anomalies, and assigning individual address points to each apartment, condo unit, strip mall storefront and trailer within mobile home parks (typically 8 percent of all address points). Address points are also assigned to popular landmarks and points of interest within a jurisdiction where emergencies may occur, such as a public park or pool, that don't have a known or posted address. Having this level of detailed, accurate map information at dispatchers' fingertips adds greater confidence, speed and life-saving potential to 9-1-1 response. It also lays the necessary groundwork for complying with Next Generation 9-1-1 (NG9-1-1) efforts.

Jurisdictions that continue to rely on street centerlines with address ranges for their 9-1-1 map data should consider the following:

- Approximately 20 percent of address ranges differ from the Master Street Address Guide (MSAG) to what is actually at street level.
- Actual addresses don't conform to conventional addressing standards at least 50 percent of the time – and that's a conservative estimate.
- Typically, between 3 percent and 5 percent of all addresses are outliers or anomalies.

Almost 10 years ago, Ohio began building a better map from the ground up, in hopes of alleviating many of these problems. The results have been phenomenal. Field-verified and regularly maintained LBRS map data has been found to be better than 99.7 percent accurate. That's a far cry from the 20 percent reliability some Ohio counties were experiencing in their datasets prior to LBRS.

Reducing Errors and Confusion

Map data stored in LBRS is designed to meet the vastly different needs of state, county and municipal governments across Ohio. Having all government entities within a county, and the vast majority of counties across the state, using LBRS data has helped eliminate inconsistencies, minimize confusion, remove redundancy and improve accuracy.

In one Ohio county, for example, errors were found in 4,236 records – or 37 percent of the county's data – when it was field verified. Similar error rates can be found across the United States. In an analysis of more than 1.5 million road centerlines from more than 30 "typical" Public Safety Answering Points (PSAPs), discrepancies were found in more than 30 percent of data when comparing Geographic Information Systems (GIS) data to Master Street Address Guides (MSAG). The most common discrepancies are detailed in the following chart:
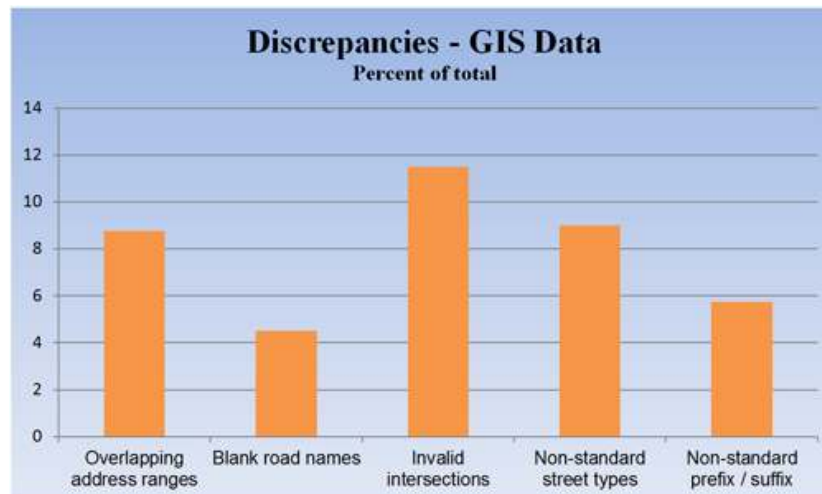
LBRS, with its field verified data, eliminates such discrepancies and has removed the guesswork involving roads with multiple names or non-intuitive access points. It can even help dispatch emergency response to wireless calls with spot-on precision.

Preparing for NG9-1-1

As mentioned previously, Ohio's LBRS has given the state a head start on complying with NG9-1-1 efforts. NG9-1-1 requires a single, unambiguous, site-specific civic address to be matched to 9-1-1 calls – including those coming from apartment complexes, office buildings and mobile home parks. Using a single address for an office building, for example, will no longer be good enough. Every individual suite will need to have a specific address. It does little good to send emergency responders to a common address where there may be 50 to 100 – or even more -- suites.

While getting to this level of detail may sound cumbersome, having more precise map data will greatly improve the ability of first responders to locate callers – or devices that generate 9-1-1 calls. After all, with NG9-1-1, requests for emergency assistance don't have to come from a land line or cell phone. They can come from a sensor sending data of

smoke and high heat in a building, or a personal medical device that is triggered by heart attack symptoms, or even a telematics signal from an overturned tractor. That's why, in NG9-1-1, the location of these devices will need to be pre-validated against the local 9-1-1's GIS data in advance of any emergency call. This will allow calls to be automatically routed to the proper PSAP. It sounds complicated, but every NG9-1-1 system will need to be able to handle this more sophisticated level of emergency communication – and having highly accurate GIS data at its base is paramount to its success.

Capturing More Data & Saving More Dollars

Creating address points from existing data may seem faster and easier than field-verifying data, but it can lead to widespread inaccuracies. Consider how addresses evolve. Perhaps the county engineer initially assigned addresses in the 1950s when the county was moving away from the rural route system. That same data may have been used again in the 1970s by the tax assessor to populate the county's computer-aided mass appraisal system. Then, several years later, that outdated but widely accessible data may be what 9-1-1 obtains to build its database. Just because all databases match each other doesn't mean they are up-to-date or correct.

In one Ohio county, field verification found 20 percent of rural addresses to have location errors of at least a quarter of a mile. Ten percent had location errors of at least a half-mile, and 5 percent had location errors of a mile or more. That is a frightening premise both for first responders and for those in need of emergency services.

In another Ohio county, field-verified LBRS data identified 20 percent more roadway segments and 13 percent more road intersections than the Ohio Department of Transportation (ODOT) did with its roadway inventory. LBRS also identified 164,250 address points in that same county, where ODOT did not identify any.

Having more detailed map data across the board not only helps 9-1-1 response, but aids state transportation officials in identifying high-crash locations. This carries both a safety and monetary benefit. First, it allows for better crash analysis and preventative measures – such as guardrails, no passing zones or better signage – to be added in an effort to curb additional crashes at those locations. Secondly, it helps Ohio get its fair share of federal safety dollars to finance such improvements and make roadways safer. If Ohio had been able to locate and analyze all the crashes throughout the state in 2002 (the year before the first pilot of LBRS was launched), there was a potential for an additional $24 million in federal funds to come to Ohio, according to a safety analysis performed by the state.

Eliminating Redundancy & Expenses

Another way LBRS is saving money – as well as lives – in Ohio is by eliminating the need for various government entities to independently build their own maps for their own needs. In 2000, local governments in Ohio along with electric and gas utilities were spending an estimated $80 million to $100 million on digital mapping activities.

County engineers, assessors and city officials were spending tax dollars independently of each other to develop property and roadway maps of the same areas to their own specifications. County 9-1-1 coordinators were spending tax money to buy commercial datasets to route emergency vehicles. Additional tax dollars were being spent by the Ohio Department of Transportation to maintain the State's Roadway Inventory. Even the U.S. Census Bureau was spending taxpayer money to develop its own version of the local roadway network. The duplication of effort was extensive -- and expensive!

With LBRS data now available and accessible to all levels of government, redundant mapping – and spending on such endeavors – has been greatly reduced. In addition, government personnel are not wasting time searching for accurate map data since LBRS is widely accessible to all.

LBRS provides a bridge between local jurisdictions, counties, state agencies and the federal government. It makes sharing data between these entities easier because all levels of government are now speaking the same language and looking at the same datasets. Having such a unified foundation for map data has been instrumental in breaking down jurisdictional boundaries, eliminating redundancy, saving tax dollars and enhancing services to all Ohio citizens. Most importantly, it is saving lives every day.

Lives should never be in jeopardy because emergency responders can't locate those in need of help. Yet most 9-1-1 maps – even those perceived as good – may actually be hindering response times. Don't let that happen in your community. Get your map data field verified. The lives of your citizens depend on it.

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