



Z-axis data provides precise emergency response location information

Local governments must take action
to enable this new capability

Presented by Lumen and GeoComm

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Introduction

Three major wireless carriers certified they now meet the FCC requirements to provide Z-axis location information. That capability is accurate within three meters above or below the handset for 80% of wireless E9-1-1 calls made from capable devices in each of the top 25 cellular market areas.

The technology to produce Z-axis information, however, has arrived well ahead of the data that makes it operationally useful. There is a complex sequence of events that exist outside of the PSAP that are necessary to deliver Z-axis. Those pieces of the solution include device manufacturers, Public Safety vendors, and most importantly architectural diagrams for new and existing building inventory. Only when these parts come together will the vision of the FCC in reduced dispatch times be achieved.



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Technology

Public Safety Answering Points (PSAPs) receive Z-axis information in Height Above Ellipsoid (HAE) format that is essentially a height above ground measurement at a certain GPS location, the rawest of raw data. What does that mean to first responders arriving at a multi-story building?

In the vast majority of cases, the Z-axis data is produced, but it does not map to anything. HAE data is not usable without translating the data into location information that can be relayed by a dispatcher to first responders. That operational data would include not only height above ground, but also street address with additional elements like floor numbering and, ideally, an apartment or office number. This can only be accomplished using locally acquired data about the buildings in a city correlated with the HAE data and delivered in an actionable format to the dispatcher.

Unlike the transition to NG9-1-1 in general, this is not a technology problem per se. It is only addressable through local governance. Without this building-specific correlation with HAE data, responders may be dispatched to the wrong floor, consuming the dispatcher's time to narrow down the caller's elevation, and increasing the overall time to respond to an emergency situation.

Environment

The built environment is different in each city and vertical space is different in many ways that can obscure the value of raw Z-axis data. The numbering system in one building may be quite different from the building next door. Assumptions about height above street level may bear no correspondence to the floors listed in the elevator. As a simple example, some hotels adhere to the traditional omission of a formal 13th floor, going from 12 to 14. Others have left that convention behind. Beyond floor number, rooms on a given floor might not be numbered sequentially or differing floors might follow different numbering schemes. One building might have a mezzanine level, while another might have a two-story mezzanine.

Cities have digital maps of their 2D space. Mapping this vertical space is the missing piece for the most effective emergency response systems. NG9-1-1 systems can deliver a lot of data – providing that data already exists. Mapping vertical urban spaces can only be done through local governance.

For new construction, building codes can be written so developers are required to provide building maps that correlate to Z-axis data provided by cellphones. For existing buildings, mapping projects must be mandated and there may be some cost sharing between local government and private entities. Processes for updating those maps as the vertical spaces evolve and building ownership changes must be put in place.

Emergency response can drive the impetus for this effort, and there are benefits to this effort beyond 9-1-1 services. In cities that have undergone this effort, surveyors, visitors to the city, as well as construction projects gain value from knowing what's under, adjacent and above a given location.

Operations

For PSAP operators and first responders, operational considerations must be ironed out before and after these vertical maps exist. Prior to the mapping of a city's vertical space, how does a dispatcher interact with first responders? Do they stay on the line with first responders as they attempt to interpret the height above ground data as it applies to a given building, working together to narrow down the exact location inside? That helps the first responder, but it ties up dispatcher bandwidth at the PSAP. That might be a reasonable tradeoff, but it should be done consciously as a matter of policy.

Likewise, after these Z-axis maps exist, what happens operationally? A dispatcher might still stay on the line. Or, the entire dataset could be transferred to the first responders and the dispatcher drops off to take new calls. There is a time burden to be born in these scenarios. Who bears it? The PSAP or the first responders?

What does the ultimate map look like when technology and data come together? It can come together in different ways such as:

- Fully 3D digital twins: Ideally, the dispatcher would be able to see a 3D rendering of the building that has already converged all the data sources and pinpointed where the call is coming from. Additional features can include zooming through the building virtually, mapping access routes and other useful attributes.
- 2D floor-aware indoor maps: A graphical representation of the building interior that is rendered in enough detail that it can act as a guide for first responders.
- Textual dispatchable address translations with no visual map: These would give text descriptions (e.g., 601 West Saint Germain Street, Floor 2, Room 202) with any additional information that is in the database. This might be the easiest form of information to send directly to responders even if it is not as rich as other treatments.





Conclusion

Z-axis data is now available in certain situations. However, it has limited utility if cities do not map their vertical urban space, supplying the critical details of the buildings that first responders will actually navigate in an emergency.

The gap can only be filled at the local level. PSAP operators and city governance must take action to turn Z-axis data into real tools to enhance public safety.

The problem already exists. Speak with your technology solutions partner or GIS partner to develop a plan to solve it.

To start the conversation, please visit:

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