



## E911 WIRELESS LOCATION ACCURACY

October 10, 2014

# Agenda

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- Dispatchable Location
- Wide-Area Radio Technologies Will Not Provide Dispatchable Location
- Horizontal Location Technologies
- Indoor Location – Z-Axis
- Limitations at PSAPs
- Dispatchable Location Infrastructure and Ecosystem
- OTDOA and A-GNSS
- Conclusion

# Dispatchable Location

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**Dispatchable location for wireless E911 is the ultimate goal for Public Safety, wireless carriers and the FCC.**

- Location data similar to wireline 911 calls:
  - Street address
  - Unit or floor number for multi-tenant and multi-story buildings
- Leverage greater number of stakeholders, such as:
  - First Responders
  - Local Governments
  - Insurance Companies
  - Building Owners
  - Location Database Aggregators
  - Wireless Carriers

# Wide-Area Radio Technologies Will Not Provide Dispatchable Location

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**Reliance on wide-area radio technologies will never lead to a dispatchable location for wireless E911 calls.**

- Horizontal technologies cannot meet 50 meter indoor accuracy proposals and have substantial implementation timeframes.
- Lack of maturity for vertical accuracy technologies.
- Issues with reverse geocoding that lead to inaccurate location information for PSAPs.
- Rules need to be forward looking, global standards development work essentially closed for 2G and 3G.

# Horizontal Location Technologies

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**Even if technologies existed to meet 50m indoors 67-80% of the time, they would require long implementation lead times and not result in a dispatchable location.**

- Wide-Area Terrestrial beacons:
  - Requires significant standards development.
  - Requires overlay network builds of sufficient density.
  - Requires handset turnover.
- U-TDOA:
  - Requires extensive equipment deployment.
  - Not compatible with evolving 3G/4G RAN designs.
- RF Pattern Matching:
  - Poor Accuracy.
  - Requires extensive, on-going calibration.
  - Accuracy degrades as height above ground level increases.
- No technology has demonstrated 50m accuracy for 67-80% of calls in all indoor environments in open, transparent, independently administered testing.

# Indoor Location – Z-Axis

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**According to the Dennis Roberson declaration, it is premature to impose z-axis for the following reasons:**

- Technologies are insufficiently mature.
- Further testing required:
  - Open, transparent and independently administered.
  - Real world conditions:
    - Variety of building types and pressure differentials
    - Variations in weather conditions
    - Presence of factors associated with indoor emergencies, e.g., fire and smoke
    - Handset integration
- Proposed wide-area radio network solutions would require handset turnover and significant network modifications.
- Need to address translation of raw pressure data into actionable altitude information.

# Limitations at PSAPs

**Even if wireless carriers can provide highly accurate location estimates, there are limitations at the PSAPs that will not enable accurate, dispatchable location.**

- Technology Issues
  - Reverse geocoding leads to significant errors in providing correct, dispatchable locations.
  - Intrado study found for technology used most by PSAPs:
    - In urban morphologies, street and house number matched 21% of the time.
    - For rural and suburban locations, street and house number matched only 2% of the time.
  - Intrado also concluded that even premium reverse geocoding technology still led to “significant mismatches.”
  - 3GPP standards for vertical location displayed via Universal Graphic Area Description do not plot altitude but instead return a ellipse around X/Y.
- Many PSAPs lack sufficient funding to:
  - Upgrade CAD mapping technology to account for z-axis.
  - Implement more sophisticated reverse geocoding technologies to improve results.
- **Given all these factors associated with horizontal estimates, z-axis and PSAP limitations, there are no near term wide-area radio network solutions.**

# Dispatchable Location Infrastructure and Ecosystem

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**Technology and infrastructure exists today, is developed and continues to expand, making a dispatchable location solution viable.**

- Leverage existing infrastructure
  - WiFi Access Points
  - Bluetooth Low Energy Beacons
  - Small Cells:
    - Femtocells
    - Picocells
  - Other cLBS technologies
- Ecosystem Developed
  - Commercial/Crowdsourced WiFi Access Databases
  - Cisco-TCS
  - Smarter Socket
  - General Electric
  - Philips

# OTDOA and A-GNSS

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**In the near term carriers are not standing still and are implementing technologies to provide improvements to X/Y location estimates.**

- LTE can run simultaneous positioning methods yielding multiple location estimates within a given time allotment.
- OTDOA integrated into physical layer –synchronized/ coordinated positioning reference signals for improved “hearability”.
- Wider bandwidth downlink for high-accuracy measurements.
- The addition of GLONASS means a higher likelihood for sufficient quantity of satellite measurements (increased yield) and better geometry (increased accuracy).
- Carriers are converging on common LTE access technology.

# Conclusion

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- A dispatchable location solution has the potential to deliver a real, viable solution with measureable results more quickly to a broad swath of the US population than wide-area radio technologies.
- Wide-area radio networks will never provide accurate, dispatchable locations.
- Only a solution that leverages cLBS and expands the circle of 911 stakeholders will achieve what Public Safety wants and citizens deserve, a dispatchable location for wireless E911 calls.
- Carriers continue to make meaningful improvements to location technologies.