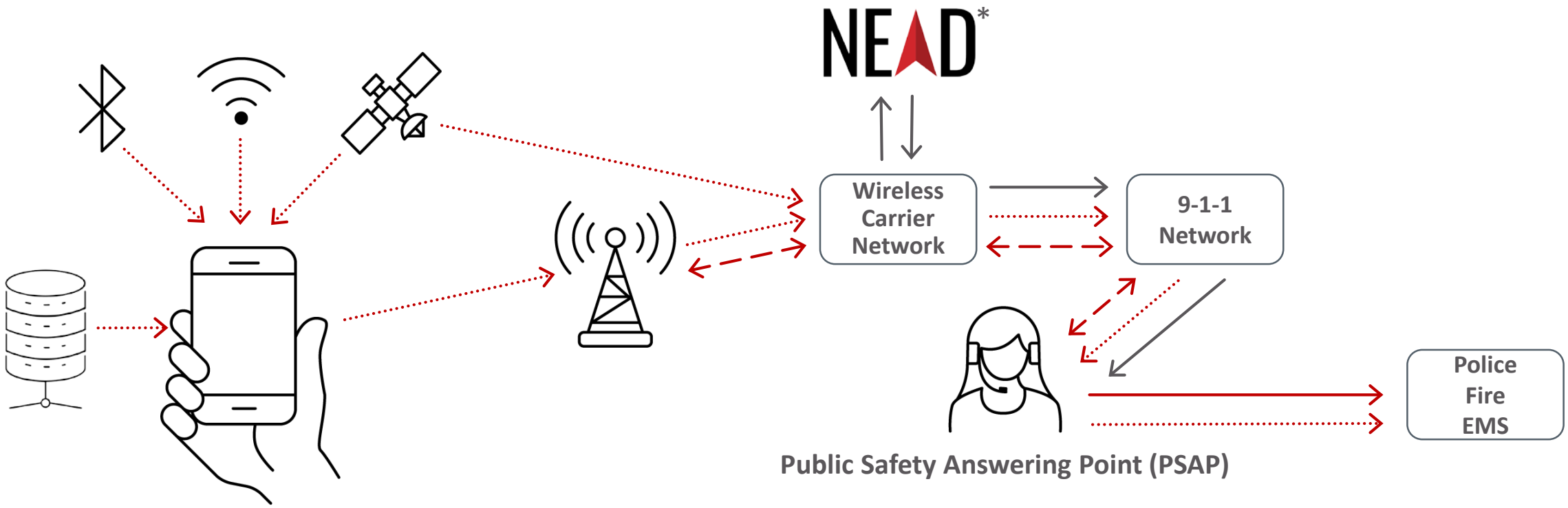
ctia™ Everything Wireless™

Wireless 9-1-1 Location Accuracy

January 2019

An Overview of Wireless 9-1-1 Location Accuracy



Key: Handset/Network DL PSAP Re-Bid

*In Testing and Integration (Not Live)

Conceptual Only (Not Technical)

Progress Towards Enhancing Wireless 9-1-1 Location Accuracy

- Test Bed
  - Horizontal: Device-Based Hybrid; Assisted GPS
  - Vertical: Z-Axis; Dispatchable Location
  - Regions: Atlanta, GA, San Francisco, CA and Chicago, IL (Stage Z Only)
  - Morphologies per Region: Dense Urban, Urban, Suburban, Rural

- National Emergency Address Database
  - Privacy & Security Plan (FCC Approved 2017)
  - Reference Point Provisioning On-Going (>17M Today)
  - NEAD "Go Live" to Support DL Solutions (TBA)

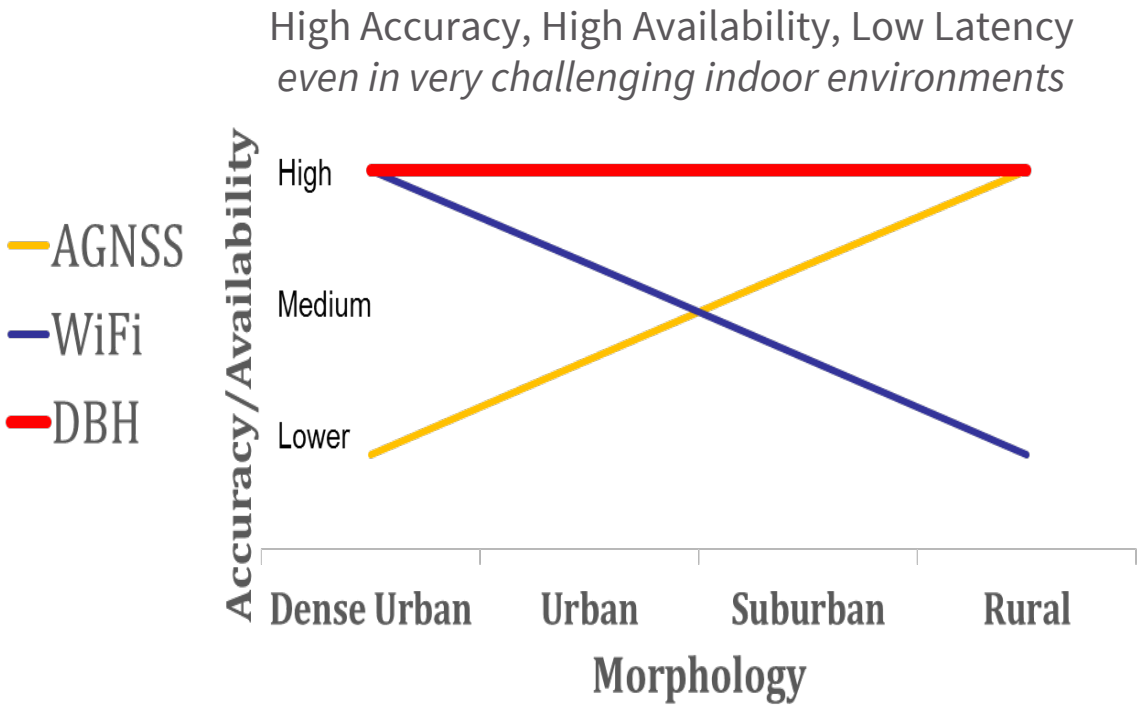
FCC 2015 Rules
(applies to all wireless 9-1-1 calls)

Horizontal
x,y within 50 Meters **or**
Dispatchable Location

40% (2017)
50% (2018)
70% (2020)
80% (2021)

Vertical
NEAD (RPs Equal to 25% of Population) **or**
Z-Axis (80% of Population Covered)
Top 25 CMAs (2021)
Top 50 CMAs (2023)

What is Device Based Hybrid?



For Illustration Purposes Only
(Not Technical)

- Aligns 9-1-1 location technology with commercial location technologies
  - Same as ride-sharing or map applications
  - *Why can Uber find me but 9-1-1 can't? A: 9-1-1 Can!*
- May utilize available handset sensors
  - Gyroscopes, Accelerometers, Magnetometers, Barometer
- Massive crowdsourced Wi-Fi databases
  - Wi-Fi positioning databases managed by Handset OS Providers
- Handset provides measurements to wireless provider's network
  - Combines two very powerful positioning methods (A-GPS/Wi-Fi)
  - Complementary across morphologies
  - In some cases, supplemental data solutions send device-based info (only) direct to PSAP

Nationwide Wireless Providers Support DBH

- DBH Benefits
  - Aligns with commercial location tools
  - Nationwide coverage
  - Widespread adoption among existing consumer devices (e.g., Android & iOS)
  - Eases integration for PSAPs
- AT&T, Sprint, T-Mobile and Verizon support DBH by YE18

"[T]oday the largest wireless carriers announced that they are rolling out device-based hybrid location technology, which marks another step on the road to making sure that 911 operators will know a caller's location."

– FCC Commissioner Jessica Rosenworcel

"We applaud the wireless industry, device manufactures, and software engineers for coming together to enable these life-saving advances in location technology."

– NENA CEO Brian Fontes

"Committing to provide Public Safety with an accurate 9-1-1 location is a HUGE deal."

- Chuck Spalding, NextGen News, *Accurate 9-1-1 Caller Location: Coming to a Screen Near You* (Sept. 8, 2018)

Z Axis Update

Stage Z Test Report (2018) - Barometric Pressure Sensors within Mobile Handsets

Observations: Compensated barometric pressure sensor altitude information is highly complex with many variables; Performance varies significantly among solutions, handset biases and indoor calling environment

Conclusion: A Z-axis metric that can be consistently replicated in a live 9-1-1 calling environment with only two technology vendors participating in this round of Z-axis testing, under somewhat artificial conditions, is challenging.

Wireless Provider Perspective

Stage Z validated ± 5 m vertical accuracy metric.

Recognize public safety seeks a more aggressive metric.

"While further testing remains necessary to validate the accuracy of vertical location technology solutions across regions, morphologies, weather conditions and devices, CTIA and nationwide wireless providers believe that certainty as to the Z-Axis metric in the near term from the FCC may help advance the development process necessary to meet the 2021 and 2023 vertical location accuracy benchmarks in the *Fourth Report & Order.*"

- CTIA Ex Parte Letter to FCC, Dec. 19, 2018

On-Going Efforts to Enhance 9-1-1 Location Accuracy

- Multiple positioning methods are used to provide location in diverse environments
  - Multiple methods with intelligent combining/selection are key
- Significant location improvements (accuracy, availability, latency) already seen in indoor environments – with more to come in the near-future
  - New location methods are being added to enhance (not replace) existing methods
- Collaboration continues to work best for improving 9-1-1.