



Wireless Indoor Location - Moving towards a reliable dispatchable location for indoor 9-1-1 calls

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What Does Public Safety Need To Deliver Help To Indoor 9-1-1 Callers?

- Public Safety does not dispatch to an X/Y

39° 41' 11.93" N Latitude

104° 58' 54.72" W Longitude

5M Point Radius Uncertainty

- For Public Safety to effectively dispatch help to an emergency caller a **dispatchable location** is ultimately needed by the first responder to find the caller.
- **Dispatchable Location** – An address, in an acceptable format to public safety, that is of sufficient granularity to find the defined space the caller is within.
 - Example
 - 123 Main street, Apartment 203, Detroit, MI
 - 3345 decker Blvd., Suite 200, Seattle, WA
 - 255 Fremont Street, Blacksburg, VA

Determining A Dispatchable Location

- Existing ways to determine a dispatchable location
 - Reverse Geocoding
 - Adds additional error to X/Y location error
 - May provide misleading location
 - Only as good as the inputs of X/Y input and Base Map data
- New methods to determine a dispatchable location
 - Personal and Enterprise Femto Cells – 150' radius cell site at fixed address
 - Time to Implement: less than 1 year
 - Geo-Relevant Wireless ALI – Match X/Y with nearby associated addresses
 - Time to implement: 1 year
 - Bluetooth Low Energy Beacons with commercial app – Would require user participation
 - Time to implement: 1-2 years
 - Bluetooth Low Energy Beacons and Wifi Beacon with handset integration – Would require standards and handset software changes
 - Time to implement 2-4 years

Note: Times do not include additional variable times that may be needed to integrate into a carriers infrastructure.

Improving X/Y location

- Smartphones and the competition between smartphone OS providers has driven the capabilities of commercial location far beyond the capabilities of existing 9-1-1 location
 - GPS
 - Crowd sources Cell ID location
 - Crowd sourced WiFi location
 - Bluetooth Low Energy (BLE) beacons
 - Mixed sensor intelligent location
 - Magnetometer
 - Accelerometer
 - WiFi
 - BLE
 - GPS
- Competition is driving the “best of breed” into commercial handset location
- Commercial handset based location technology will always be ahead of 9-1-1 location technology
- Tying 9-1-1 location accuracy to the moving bar of commercial handset location rather than a static number would allow 9-1-1 to continually utilize the best possible location information.

Reverse Geocoding Results – Case Study

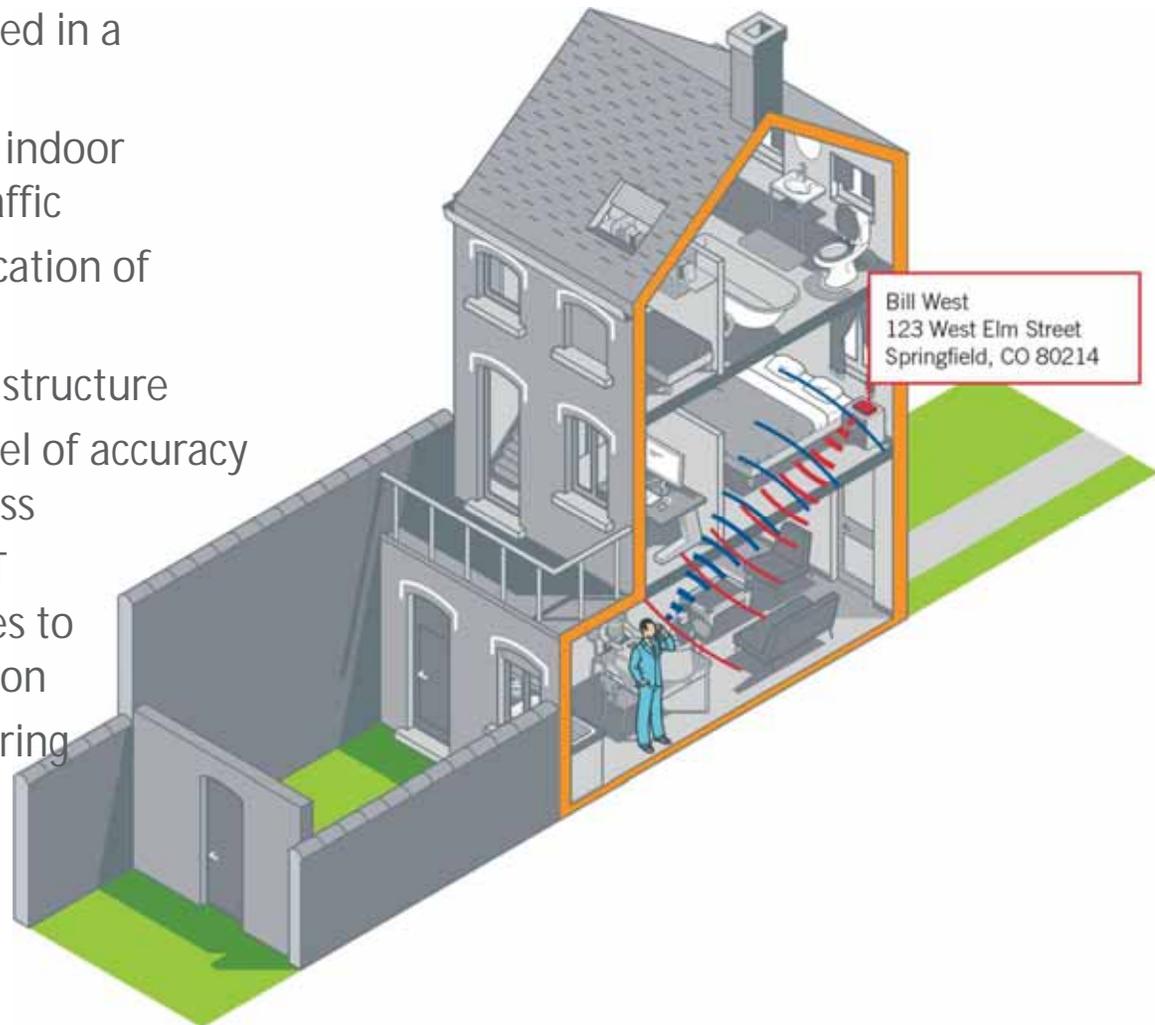
Intrado conducted a study to determine the errors introduced through reverse geocoding from a large sample of simulated 9-1-1 calls made from the center of the primary structures at surveyed addresses. For these simulations, the uncertainty of the X/Y was 0 meters.

Results:

- Centerline Data – Typical county base map
 - Rural – 98% Of the time, wrong address was returned
 - Suburban – 98% Of the time, wrong address was returned
 - Urban – 79% Of the time, wrong address was returned
- Commercial Data – Best combined sources
 - Rural – 62% Of the time, wrong address was returned
 - Suburban – 63% Of the time, wrong address was returned
 - Urban – 15% Of the time, wrong address was returned

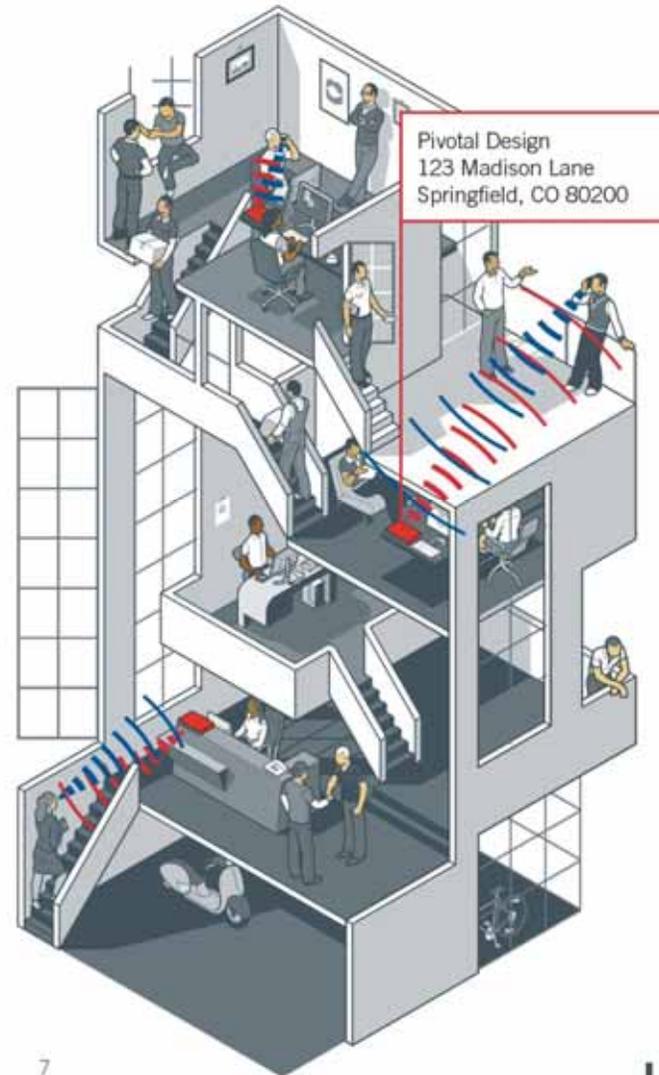
Residential Femto Cells

- Personal cell sites installed in a subscribers house
- Carrier offer to increase indoor coverage and offload traffic
- Contain GPS to verify location of device
- Typically cover inside of structure
- Can provide wireline level of accuracy with dispatchable address
- Can be done TODAY BUT requires delivery changes to utilize address information
- Some carriers are delivering address today



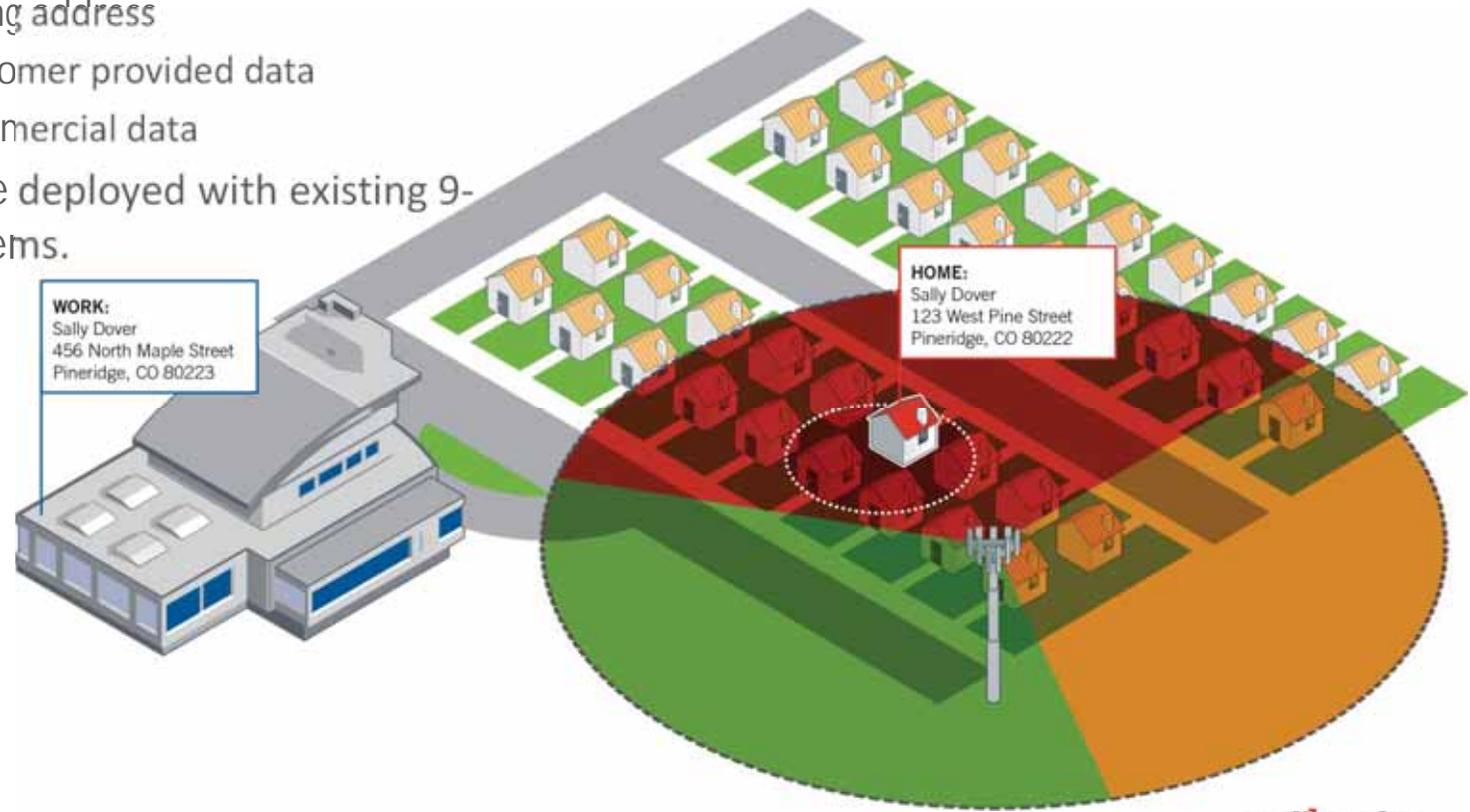
Enterprise Femto Cells

- Similar to Residential Femtocells but installed by Carrier or Enterprise and provides coverage to all users
- Carriers planning on deploying 100's of thousands for coverage and capacity
- Often cover definable indoor spaces
 - Offices
 - Public Spaces
- Can provide wireline level of accuracy with dispatchable address
- Can be done TODAY but requires delivery changes to utilize address information



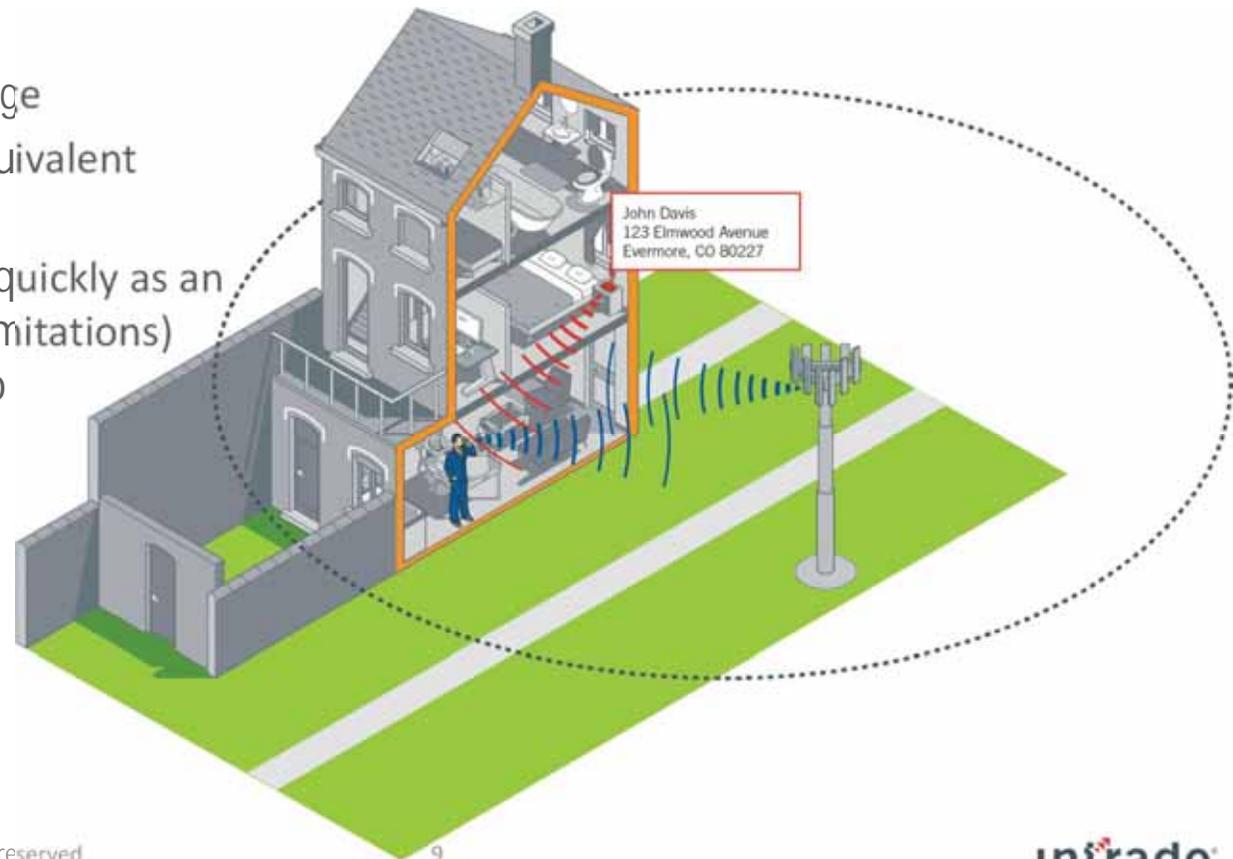
Geo-Relevant Wireless ALI

- Only provide addresses associated with emergency caller
- Associated user addresses are cross referenced with 9-1-1 location.
- Multiple possible data sources
 - Billing address
 - Customer provided data
 - Commercial data
- Could be deployed with existing 9-1-1 systems.



Beacons

- Bluetooth Low Energy and WiFi
- Developed for commercial applications
- Integrated into Apple iOS and Android
- Very low cost
- Very low power usage
- Provide wireline equivalent 1 address location
- Could be deployed quickly as an application (with limitations) then integrated into handset through standards.



Commercial Handset Based Location

- Why can Starbucks locate me but 9-1-1 can not!
- Commercial location uses additional technologies beyond Cell and GPS
 - WiFi
 - Beacons
 - Barometer
 - Multi sensor
- 9-1-1 could leverage commercial to improve indoor X/Y/Z location
- Very low cost
- Could use API built into smart phones today
- Provides 9-1-1 access to new location technologies as they are deployed for commercial location purposes.
- 9-1-1 location could be used to verify commercial location is not spoofed
- Commercial location technology will probably always be ahead of 9-1-1 location technology
- Could be deployed quickly as as application (with limitations) then integrated into handset through standards.



PSAP Changes needed

- Simplify and add consistency to what is sent to a PSAP.
 - Pass X / Y / Uncertainty and Dispatchable address
 - Pass X / Y / Uncertainty
- Set confidence to industry standard value of 90%
- Differentiation between Phase 1 and Phase 2 to determine location accuracy no longer makes sense. Pass X / Y / Uncertainty
- Need to enhance systems to understand Z

Questions

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