Wireless Location Accuracy

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A change in the wireless E9-1-1 Paradigm

1994

- 24 Million Wireless Subscribers
- 8% Wireless Penetration
- Very few wireless only households
- 55K Wireless 9-1-1 Calls (1997)
- Majority of 9-1-1 calls from landline phones
- Very few wireless 9-1-1 calls from indoors
- Cell sites typically covered miles
- Primarily used outside
- No commercial location technology

2014

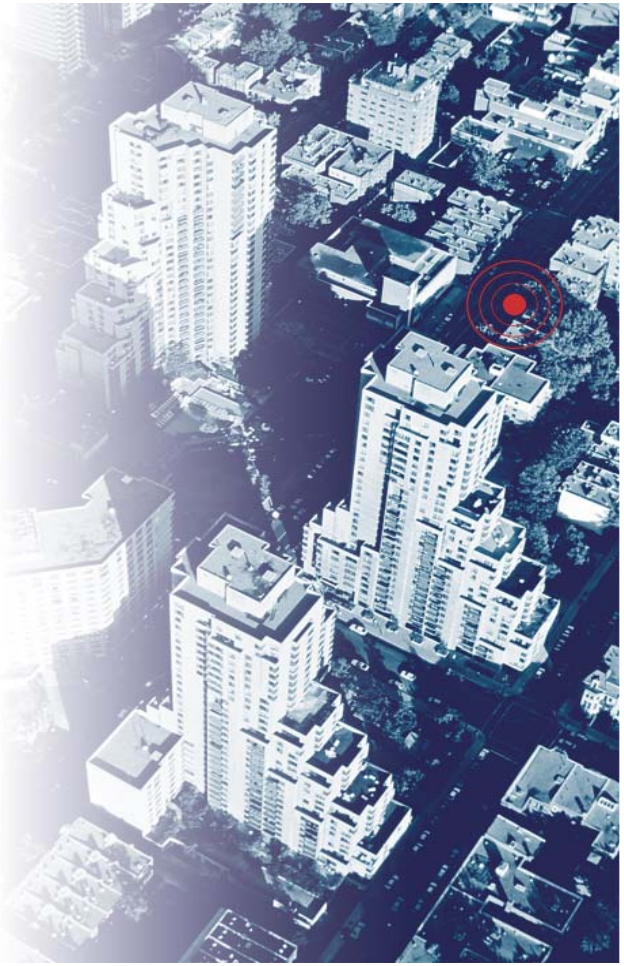
- >326 Million Wireless Subscribers
- >101% Wireless Penetration
- >38% Wireless only households
- >400,000 Wireless 9-1-1 calls
- >50% of 9-1-1 calls are made from wireless devices.
- >50% of wireless 9-1-1 calls are placed from indoors. (Urban areas such as San Francisco and Boston)
- Small cells with 100’ radius
- Used everywhere
- Explosive growth of commercial location technologies

Note: Based upon CTIA wireless quick facts and NENA 9-1-1 call data and statements from PSAPs

What location is needed by first responders

Provide First Responders with the location of Emergency callers to effectively respond in a time critical situation with limited support from the caller.

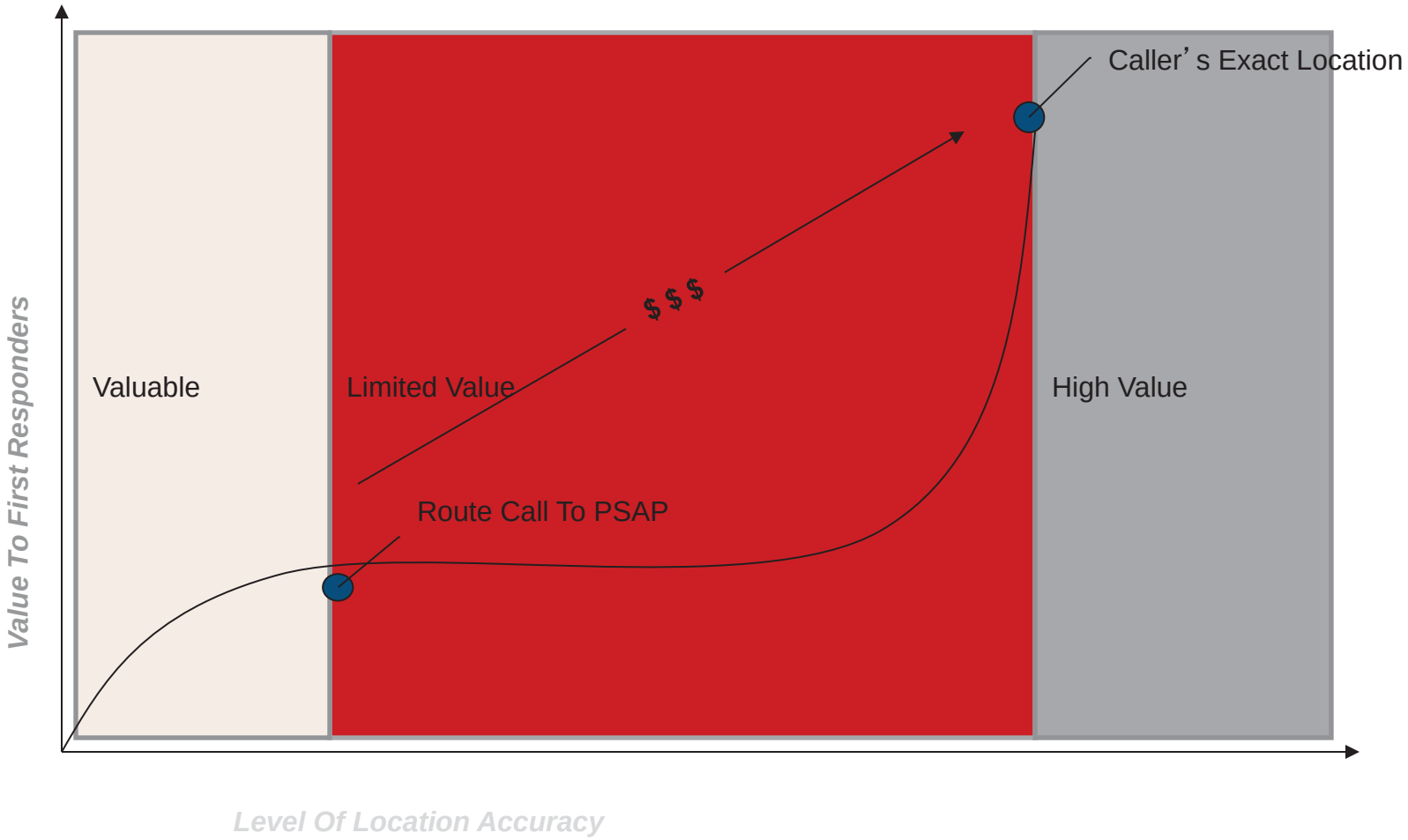
- Outdoors – Latitude / Longitude / Uncertainty
- Indoors – Dispatchable Address



Increasing location accuracy for wireless 9-1-1 calls

- GPS for outdoor accuracy is extremely accurate and is still the gold standard
- There is no single new magic location technology that locates people more accurately in all situations but rather a combination of technologies can help.
- A new location technology deployed solely for 9-1-1 is not cost effective but rather 9-1-1 should leverage existing technologies used for commercial purposes
- Existing data sources could be used, along with existing 9-1-1 location data, to help first responders more easily locate emergency callers effectively increasing location accuracy.
- A valid dispatchable address is the most effective way for a first responder to locate an emergency caller indoors.

Value of location accuracy



Delivering an address for indoor 9-1-1 calls

Provide First Responders with the location of Emergency callers to effectively respond in a time critical situation with limited support from the caller. For an indoor 9-1-1 call, that is an address.

- An address is the most accurate form of location telling the first responder what door the emergency caller is behind.
- It is very difficult to dispatch to an X/Y/Z
- X/Y locations can help in validating an address
- Z (AGL) is much more difficult to determine than X/Y but could help in validating an address further
- Reverse Geocoding is not the answer without highly accurate base maps and location data. It often provides misleading data.

Methods of determining an address for Indoor wireless 9-1-1 calls

- Reverse Geocoding
- Femtocells
- Small Indoor Cells
- Associated Addresses

Reverse Geocoding

Reverse Geocoding is the process of taking a Latitude and Longitude and converting it to an address

Advantages

- Works in most locations across country
- Is used my most PSAPs in their mapping systems

Challenges

- Addresses are only as good as the base map data
- House addresses are often based upon ranges along a segment and can provide wrong address
- Cul-de-sacs are very difficult to determine often provide wrong address
- Rural addresses often are not reverse geocoded accurately
- High density areas are very problematic in determining correct address
- Multi-family structures are difficult to determine correct address
- Can only reliably provide a nearby address not a dispatchable address

Methods of determining an address for Indoor wireless 9-1-1 calls

- Reverse Geocoding
- Femtocells
- Small Indoor Cells
- Associated Addresses

Technologies to increase indoor location accuracy

- Commercial location services
- Commercial beacons

What is needed to utilize addresses

- Change delivery to PSAP that focuses on two use cases for all mobile call types independent of RF or location technology.
  - Latitude / Longitude (outdoors) – Use as primary location
  - Dispatchable Address (indoors) – Use as primary location
- Allowing the idea that passing a valid dispatchable address increases the ability to find a wireless caller thereby increasing the overall accuracy of a wireless location.

Conclusion

- Increasing wireless location accuracy for 9-1-1 is not valuable unless it helps first responders find the emergency caller.
- There is no magic technology out there today that could dramatically increase the accuracy of X/Y locations.
- It is more cost effective and efficient for 9-1-1 to utilize existing commercial location technologies than to deploy a new location technologies exclusively for 9-1-1.
- 9-1-1 calls from indoors are quickly becoming the majority of wireless 9-1-1 calls, particularly in dense urban areas, as people replace their landline phones with wireless phones.
- Dispatchable addresses are the most effective way for first responders to find indoor wireless callers and provide them help.
- Wireless carriers should be able to use the delivery of dispatchable addresses to PSAPs as a component in the computation of overall 9-1-1 location accuracy.