E911 Phase II Location Accuracy Workshop

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PSAP Interface

- **Wireless Providers cannot 'push' location information to the PSAP**
  - PSAP must request ('pull') location from the ALI Service Provider
  - ALI Service Provider then 'pulls' location from Wireless Provider (GMLC/MPC)
- **Normal Location Process**
  - Initial ALI Bid upon call reception at PSAP (often automated) – typically results in Phase I (Cell ID) location
  - Re-bid approximately 30 seconds into call (can be manual or automated) – typically results in Phase II location estimate
    - Re-bid can be timed from call reception or from previous ALI bid result – whichever is most convenient for the PSAP/CPE vendor
    - Repeat re-bid process ("mid-call location update") as needed

Information Provided Upon PSAP Request

Location Estimate

- Latitude/Longitude estimate of caller (Phase II), or
- Serving Cell/Sector Information (Phase I) – typically in the form of a street address
- Class of Service (COS)
  - "WRLS" – Phase I Result from a Phase I Deployment
  - "WPH1" – Phase I Fallback for a Phase II Deployment
  - "WPH2" – Phase II Result

Uncertainty Estimate

- Provided with each E911 location estimate to all PSAPs requesting this option – allows the calltaker to gauge the quality of the location estimate in real time
- Radius (in meters) of a circle centered at the reported position (latitude/longitude) within which the caller's actual location is expected to fall 90% of the time (where 90% is the associated confidence level)
- Confidence level is suppressed (not transmitted to the PSAP) – per public safety request
- 90% confidence level is recommended by ESIF and public safety

Location Technology Cascade

For an GPS capable handset:

- AGPS
- AGPS/RTT Hybrid
- RTT
- Cell ID

For a non-GPS capable handset:

- UTDOA
- Cell ID – TA
- Cell ID

- Result with lowest uncertainty estimate is returned to the PSAP

Location Technology Trade-Offs

All location technologies have limitations and involve trade-offs between accuracy, yield, and latency – as a matter of physics

- No location technology delivers high accuracy, high yield, and zero latency
- Public Safety has indicated high accuracy is top priority – even if it takes longer to obtain
- As agreed with public safety from the inception of wireless E911 – no other location technology is as timely and reliable as Cell ID for immediately routing 911 calls to the designated PSAP – don't want to delay 911 call routing, even for a few seconds

Radio Access Network Limitations & Opportunities

Legacy radio access networks (pre-LTE) are limited with respect to location performance

LTE opens up new capabilities for improved location:

- Simultaneous positioning methods (crucial for optimal accuracy/yield within fixed latency limit)
- OTDOA integrated into physical layer – synchronized/coordinated positioning reference signals for improved 'hearability'
- Wider bandwidth downlink for high-accuracy TOA measurements
- Carriers are converging on common LTE access technology

Location Technology Improvements

Carriers are independently moving forward with both continuing improvements to existing location technologies and implementation of new location technologies

- AGPS continues to be the “gold standard” for location – accuracy and yield are consistently improving over time
- T-Mobile has committed to support GLONASS satellite functionality (in addition to AGPS) over LTE
  - Higher likelihood for sufficient quantity of satellite measurements (increased yield) and better geometry (increased accuracy)
- T-Mobile has committed to support OTDOA over LTE which holds promise of improved accuracy and yield in many environments and appears to be a good complement to AGPS

Principles For Further Evaluation

- Must be fact-driven based on technical and economic realities – not merely vendor claims (utilize CSRIC Test Bed to sort fact from fiction)
- Must be forward-looking and take into account the unique location capabilities inherent within LTE networks (avoid stranded investments in legacy networks)
- Must ensure technologies capable of meeting FCC requirements are available from multiple sources – to foster a healthy eco-system, long-term support, and continued innovation
- Any new technologies must be commercially available, fully standardized, and cost effective to deploy, operate, and maintain
- Must not favor one particular technology or vendor over another
- Must recognize that new technologies take considerable time to implement – especially if handset modifications are required

➢ **Everyone's goal must be for real improvements – that are both technically and economically feasible**

Next Steps…

- Utilize CSRIC Common Indoor Test Bed process to formally characterize performance of new LTE-based location methods which were unavailable for the first round of testing
  - OTDOA
  - GLONASS
  - WiFi-based Methods?
- Test Bed will also continue to provide invaluable insight into practical and technically sound methods to measure indoor location performance
- Independent vendor claims cannot be relied upon – any location vendors desiring to be considered for future location improvements should commit to participate in the next round of CSRIC tests
- Cooperative processes involving all stake holders are already in place – need to let them work
- Commission should facilitate the continued cooperative evaluations of both technical performance standards and practical indoor assessment methods