Working Group #1: NG911

Report & Update

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CSRIC Working Group 1: 4 Tasks

Text to 911

✔ • Recommendations for including enhanced caller location information in text messages to 911

✔ • Recommend best practices, including testing and trialing, operational procedures, and security requirements, that wireless carriers, Public Safety Answering Points (PSAPs), and third party service providers should follow in provisioning PSAP requests for text-to-911 service.

⭐ **Location Accuracy and Testing for Voice-over-LTE Networks**

• Recommendations for key performance indicators (KPIs) and testing as part of recommended maintenance testing

✔ Specifications for a permanent entity to administer **Indoor Location Accuracy Test Bed**

Working Group #1 Members

Full Working Group: 70+ Members

Subgroup 1: (30+ members) Text to 911
Subgroup 2: (40+ members) Location Accuracy and Testing for Voice-over-LTE
Networks
⭐**Subgroup 3:** (30+ members) Specifications for Indoor Location Accuracy Test Bed ⭐

(Members joined more than 1 subgroup.)

Members represent:
- Carriers
- Public Safety/911
- Local/State/Federal Government
- National Professional Organizations – for carriers and public safety
- Location Information Technology Companies
- Public Safety Consultant Companies

Working Group #1 Methodology

- Subgroups utilized use of case studies, SME discussions, conference calls, and in-person meetings

- Each subgroup has established its own schedule of conference calls, with its own task and deadline in mind.

- Subgroup chairs also participated with WG#1 Co-Chairs in monthly conference calls to coordinate efforts and share experiences.

- Co-Chairs participated in monthly Steering Committee calls

- The deadlines for delivery of final WG#1 reports were established, working backwards from quarterly CSRIC meeting dates.

WG#1 Task 1 Subtask 3: Objective

Description: Location Accuracy and Testing for VoLTE

Chair: Jenny Hansen   **Editor: Terri Brooks**

CSRIC III recommendations in the WG3 March 2012 Report included certain key performance indicators (KPIs) and the different types of empirical testing as part of the recommended maintenance testing every two years.

Deliverable(s):

1. The Working Group will examine whether those recommendations still apply for network-based carriers reconfiguring to Voice over LTE (VoLTE) platforms.

2. They will examine any necessary changes in the testing recommendations and recommend cost efficient measures to meet the current location accuracy parameters in 20.18.

3. Also, the Working Group will examine the capabilities of VoLTE reconfigured networks to provide enhanced location capabilities and consider methodologies to resolve the differences in opinions on location performance and "yield" referred to in Part 7 of the March 2012 Report.

(Deadline: September 2014)

This Report Documents...

- The impact VoLTE implementation will have on carriers' ability to comply with existing wireless E9-1-1 location accuracy levels.

- Carriers transitioning from second generation ("2G")/third generation ("3G") networks to VoLTE networks, and generating and delivering location information to Public Safety Answering Points ("PSAPs") during the period when they are operating both legacy and VoLTE networks.

  – Additionally, the impact, if any, that simultaneous operation of both networks during the transition will have on carriers' overall wireless location accuracy performance.

1. The subgroup team members sought clarification on their task from FCC.

2. FCC provided clarification in the form of nine questions.

3. The subgroup formed responses to the specific questions posed by the FCC…

Question #1:

What impact will VoLTE implementation have on carriers' ability to comply with existing E9-1-1 location accuracy requirements?

Answer #1:

The high level conclusion is that VoLTE will have no deleterious impact on the ability of operators to meet the E9-1-1 location accuracy levels that currently apply to CMRS; in fact, Section 5.2 suggests that somewhat better location performance can be expected from VoLTE when the network is fully deployed and optimized.

Question #2:

How will VoLTE differ from the technologies used to generate and deliver E9-1-1 location information in legacy 2G/3G networks?

Answer #2:

- Location information is generated by very similar components and technologies in 2G/3G and 4G networks.

- The same location technologies can be supported in all generations (2G/3G/4G).

- In a VoLTE 4G network, the content of the Phase II location estimate delivered to the PSAP includes the same position, confidence, and uncertainty parameters used in 2G/3G networks for technologies that directly generate geographic (i.e., XY) location.

- In a VoLTE 4G network, the Phase I cell site civic address will continue to be delivered in the same textual format as in 2G/3G systems. Small cells deployed indoors will provide better Phase I location accuracy than outdoor macro cells.

Question #3:

Can VoLTE provide location accuracy that meets the Commission's current rules and benchmarks as they apply to E9-1-1 location accuracy?

Answer #3:

- LTE-based location methods provide more flexibility, and in some cases, better accuracy is expected relative to current 2G/3G-based methods.

- VoLTE-based location is expected to meet the accuracy levels of the current CMRS outdoor location Phase II requirements for E9-1-1.

Question #4:

Can VoLTE networks and the location technologies that will be used in such networks achieve increases in location accuracy and yield, and decreases in latency compared to 2G and 3G networks?

Answer #4:

- A-GPS/A-GNSS
  - LTE is not expected to significantly improve Time to First Fix ("TTFF") as compared to 2G/3G. This is because the TTFF will be dominated by GNSS location determination time.
  - A-GPS yield, accuracy and TTFF may modestly improve in synchronous LTE networks as compared with asynchronous GSM/UMTS networks, since the finer time accuracy (1.5 – 5 uSec) speeds the acquisition of the GPS signals. In a Synchronous LTE Network, GPS is used to synchronize the eNBs.
  - A-GNSS (e.g., GPS & GLONASS) is expected to roll out concomitantly with LTE, which will allow more satellite vehicles to be used in the location calculations.

Answer #4, con't.

- OTDOA
  - LTE OTDOA is expected to give improved performance (accuracy and yield) compared to CDMA AFLT.

- Small Cell
  - Small cell deployments are more likely to happen in LTE, due to spectrum allocations in the 3.5 GHz band and rapid increases in wireless data consumption. This could lead to a more accurate Phase I location for small cells with small coverage areas, which in some cases may be accurate enough for first responder dispatching.

Question #5:

➡ Are all VoLTE deployments the same in terms of their ability to support E9-1-1 location determination?

➡ Can the Commission expect the same level of location accuracy performance across networks deploying VoLTE or will carrier performance differ?

Answer #5:

- It is reasonable for the Commission to generally expect the same level of location performance across various carrier networks deploying VoLTE.

- Location performance for VoLTE in comparable topologies is generally expected to be quite similar across different carrier networks.

- Different vendor implementations are not expected to result in significant differences in location performance, assuming similar field conditions and deployment parameters.

- Specific location technologies currently planned and announced for use for VoLTE E9-1-1 include:
  - » A-GPS
  - » A-GLONASS
  - » OTDOA

Question #6:

What location technologies could potentially be deployed for VoLTE?

Answer #6:

- UTDOA
  - TE UTDOA accuracy should be comparable to or better than UTDOA performance in 3G while maintaining the lower latency of 2G, depending on the assigned periodicity and bandwidth of the Sounding Reference Signal ("SRS") configuration.

- Wi-Fi
  - Location methods for Wi-Fi for VoLTE have been standardized.
    - Wi-Fi for position calculation has been standardized in Secure User Plane ("SUPL") 2.0
    - Wi-Fi support for control plane UE-Assisted call flows is standardized only for LTE in the LPPe protocol.
    - Wi-Fi measurements could be reported along with OTDOA and A-GNSS measurements.

Answer #6, con't.

- Terrestrial Beacon System (TBS)
  - Terrestrial Beacon Systems are one of the newer positioning techniques that are under consideration to augment the existing positioning methods.

Question #7:

→ How will carriers transitioning from 2G/3G networks to VoLTE networks generate and deliver location information to PSAPs during the period when they are operating both legacy and VoLTE networks?

→ What impact, if any, will simultaneous operation of both networks during the transition have on carriers' overall location accuracy performance?

Answer #7:

- The scope of these questions is specifically referring to carrier-deployed VoLTE for an LTE Radio Access Network ("RAN"), using an IMS Core Network ("CN") for the transport of VoLTE calls across the network.

- The expectation is that initial location accuracy will be as good, if not better, compared to legacy 2G/3G networks. Performance improvements over time are expected as the location technologies in 4G are optimized.

- It is expected that in the early stages of 4G network deployments, carriers will be deploying E9-1-1 location technologies that are similar to current solutions available on their 2G/3G networks; namely, A-GPS supplemented by a network-based location technology for areas where GPS is challenged.

Answer #7, con't.

- Without knowing each specific carrier's network implementation and transition plans, it is unlikely that the operations of one network (2G/3G) will impact the operations of the other network (4G) as they are separate network architectures.

- Some of the E9-1-1 Phase II location technologies being deployed on 4G networks (e.g. OTDOA) are new and are only now in their initial deployment by some carriers being implemented on completely new network infrastructures.

Question #8:

Does the transition to VoLTE require any modifications to current carrier testing procedures for determining compliance to the Commission's location accuracy requirements under Section 20.18?

Answer #8:

- Where the same location technologies are used, carrier testing procedures should not change, but new location technologies may require different testing methods.

- With the proliferation of small cells and indoor-specific technologies, there may be an increased reliance on the use of representative testing (e.g., a common indoor test bed).

__Question #9:__

Should prior CSRIC recommendations regarding location testing (e.g., CSRIC III WG3 recommendations regarding testing by network-based carriers every two years) apply to carriers reconfiguring to VoLTE platforms?

Answer #9:

- CSRIC III WG3 produced reports on both outdoor and indoor wireless location performance and testing. Those recommendations continue to be applicable as carriers reconfigure to VoLTE. Where the location technology is the same and no significant changes to field conditions or deployment options have occurred, there should be no need to repeat testing.

Conclusions

- It is not anticipated that modifications to existing outdoor carrier testing methods or procedures would be required due to the introduction of VoLTE. If specific indoor requirements are adopted in the future, then we anticipate that different testing methodologies would be required, such as testing in representative indoor environments. It is premature to speculate on specifics of indoor test procedures in advance of specific indoor requirements.

- The FCC should continue to support the recommendations of CSRIC III WG3. As summarized in the"Final Report – Outdoor Location Accuracy" (March 14, 2012) section 5.4.2 "Proposed Maintenance Approach", the goal of maintenance testing is to identify a method that verifies continued optimal performance of E9-1-1 location systems at the local level.

Recommendations of CSRIC III

- Key performance indicators (KPIs) should be routinely monitored to help identify instances where system performance has degraded (relative to baseline compliance tests) and further testing and system improvements are needed at the local level.

- Enhancements to location technology should be validated in representative environments, to ensure equivalent or improved performance. An example of this would be the introduction of OTDOA for VoLTE.

- Spot-checking using empirical field-testing should be conducted on an as needed basis, for example, as determined by KPI monitoring or legitimate performance concerns from a PSAP.

- Empirical data for maintenance testing may be collected incrementally over time.

- Any significant deviations from expected prior performance levels should result in careful investigation and re-testing of the applicable test area.

- These alternative maintenance testing methods replace the need for full compliance testing every two years.

- All legitimate performance inquiries from a County/PSAP or other public safety entity shall be properly investigated with full cooperation from the wireless service provider, and any issues resolved in a timely manner.

CSRIC IV Recommendation

The FCC should expect, over time, location performance with VoLTE to be slightly better or equivalent to 2G and 3G performance.

- Location expectations should be validated via a formal testing process in a VoLTE scenario.
  - Ideally this would encompass outdoor and indoor environments, with both individual and hybrid location methods being validated.

Comments Received

- Working Group 1, Subgroup 3 received multiple, detailed questions on draft report from the FCC.

- All of these questions were addressed, and the final report includes content specifically included to answer the questions posed.

Questions?