



Working Group 4C

Technical Options for E9-1-1 Location Accuracy

March 14, 2011

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- Examine E9-1-1/Public Safety location technologies in use today
- Identify current performance and other limitations for use in NG9-1-1/Public Safety applications
- Evaluate
 - Industry standards direction for location and the ability to use location for next generation services and applications;
 - Emerging location technologies, including combining multiple technologies to improve location accuracy;
 - The timing of when such technologies could be available;
 - Security issues and vulnerabilities around future location technologies;
 - Interactions with existing technologies and any backwards compatibility issues;
 - Opportunities to apply next generation location technologies to current networks;
 - Impacts to user equipment, networks, agencies, etc. for deployment of future E9-1-1/Public Safety location accuracy technologies;
 - Barriers to deploying these technologies.

Background Considerations for Working Group 4C

- Transition from wireline to mobile wireless telephony
 - Population is moving away from landline service and relying solely on mobile telephony devices
 - Larger percentage of E9-1-1 calls are being made via mobile telephony
 - Larger percentage of E9-1-1 calls are being made from environments which present challenges to currently deployed location technologies
- Services initially targeted for Static or Nomadic usage, which have now become mobile or being used differently than originally intended
 - Examples include VoIP applications that were deployed initially for home use, but later became available as software clients for PCs and mobile devices
 - Services may now use self-registered location methods no longer appropriate for a mobile or even a nomadic environment
 - The obvious solution is to deploy automatic location methods for these new services, however that is not a straightforward or simple process
 - Will require the support of a large ecosystem of hardware, software, and service providers, many of whom have not needed to consider providing location before
- Public expectation is that any service can contact 9-1-1, and that location will be known and provided regardless of service type

Service Types/Applications Requiring 9-1-1 Location Information

- Single Wire-line Connection With Fixed/Static Location
- Multiple Wire-line Connections With Static Location
 - PBX or MLTS
 - Centrex
- Individual VoIP Connections with Registered Location (Static or Nomadic)
 - Voice Service Over Broadband (VoBB) with Registered Static Location
 - Nomadic Voice Service Over Broadband (VoBB)
- Over-the-Top Voice Service Over Broadband
 - Static or Nomadic Voice Service Over Broadband
 - Over-the-Top Mobile VoIP
- Commercial Mobile Radio Service (CMRS)
 - Circuit Switched Voice in CMRS
 - CMRS Managed IMS Based VoIP

Service Types/Applications Requiring 9-1-1 Location Information (continued)

- Femtocells
- Unlicensed Mobile Access (UMA)
- Vehicular Telematics for Emergency Services
- Machine-to-Machine (M2M)
- Telecommunication Relay Service (TRS) and Private Call Centers
- Satellite Service
- Emerging Service Types
 - Non-Voice Centric (NVC) Emergency Services

Currently Deployed Location Technologies

- GPS, including Assisted GPS
- Uplink Time Difference of Arrival (U-TDOA)
- RF Pattern Matching Methods
- Downlink Time Difference of Arrival (D-TDOA) (Advanced Forward Link Trilateration (A-FLT) for CDMA)
- Cell ID
- Enhanced Cell ID (ECID)

Emerging Location Technologies

- Wireless Beacon (WiFi-based)
- Wireless Beacon (Bluetooth-based)
- Wireless Beacon (Proprietary with User Equipment (UE) transmitter beacons)
- Wireless Beacon (Proprietary with Metropolitan transmitter beacons and UE receivers)
- Location using DTV transmitters
- Hybrid Location Combinations

Additional Associated Topics

- Reference Database Accuracy for 9-1-1 Calls
 - Geographic information System (GIS) Synchronization
- Security and Vulnerabilities for Future Location Technologies
 - IP network security concerns apply
 - Privacy and protection of customer location data (spoofing)
- Standards Development Organization Activity
 - Influenced by high number of SDOs
 - Overlapping efforts and gaps
- Empirical Data Study Review
 - California Routing on Empirical Data Project (RED)

Conclusions and Recommendations Summary

- Establish an E9-1-1 Technical Advisory Group (ETAG) to address specific location technology issues for 9-1-1
 - Significant complexity and evolving nature of location issues
 - Interested stakeholders have championed ETAG approach for several years
 - Best and most constructive path towards improved E9-1-1 accuracy
 - Include representatives from all sectors of the industry, including public safety, carriers, and technology vendors
 - Work cooperatively and expeditiously to enhance location accuracy and to improve the manner in which location accuracy is measured
 - Validate the feasibility and capabilities of emerging E9-1-1 location accuracy technologies in a standardized, real-world test environment
 - Study how to improve location accuracy in challenging environments, including indoor settings, urban canyons, high-rises, rural environments and areas of heavy forestation or mountainous terrain etc.
- Ensure policy balances continual refinement of location accuracy with cost-benefit trade-offs and needs of public safety and other stakeholders, so that resources dedicated to 9-1-1 issues are appropriately allocated

Conclusions and Recommendations Summary

- Do not mandate specific location technologies, but promote additional research and development of a variety of technologies through the ETAG
 - Mandating a specific technology could prevent carriers, access network operators, and service providers from implementing 9-1-1 location solutions that fully leverage their unique network characteristics and could stunt future competition between 9-1-1 solution vendors
- Provide leadership to ensure all standards impacting 9-1-1 location accuracy provide for civic address or geodetic locations to be sent to PSAPs as appropriate for the service type involved
- APCO and NENA have previously advocated for federal and state Multi-Line Telephone Service (MLTS) legislation, but it has not been widely adopted. The FCC should support national MLTS legislation to provide consistent requirements for equipment manufacturers and MLTS installations
 - Until a national mandate is adopted, states should be encouraged to adopt MLTS legislation

Conclusions and Recommendations Summary

- Actively engage discussion on how to implement 9-1-1 auto-location for nomadic VoIP services
 - Auto-location is a significant issue for multiple service types
 - Utilize the ETAG to examine and provide guidance for the development and implementation of 9-1-1 auto-location capabilities in a fully end-to-end IP environment.
- Consider extending E9-1-1 and location obligations to providers of over-the-top VoIP applications that are not subject to Interconnected VoIP regulations
 - In addition, require education of the public to specify limitations of such over-the-top VoIP 9-1-1 applications
 - To the extent that 9-1-1 requirements are extended to these services and new technical challenges are presented, consider referral to the ETAG
- Clarify if the existing wireless 9-1-1 rules will apply to CMRS managed IMS based VoIP services

Conclusions and Recommendations Summary

- Distinct location accuracy standards for IMS services should not be established
 - Instead, location technologies available in the access provider network should continue to be used, independent of whether or not IMS is utilized as the transport core technology
 - The ETAG should partner with the existing standards working groups to continue to test and evaluate these technologies
- Clarify how femtocells and Unlicensed Mobile Access (UMA) devices should be treated for the purpose of 9-1-1
 - Guide development of a standardized set of location data that can be easily interpreted by PSAPs
 - Do not impose any additional obligations on femtocell carriers until these location standards are addressed
 - Continue to study emerging femtocell technologies in the ETAG

Conclusions and Recommendations Summary

- Provide leadership to ensure all providers, including new entrants, have appropriate access to MSAG data in order to incorporate it into their business processes, especially in validation of customer-provided location information
 - Access should apply to possible future equivalent elements such as the Location Information Server (LIS) and the Location Validation Function (LVF)
- Noting that the next generation emergency service requirements are focused on emerging IP based non-voice-centric emergency service requests, standards work should be completed as soon as possible and regulatory guidelines should be established for how Emerging Service types are integrated with the 9-1-1 system

Conclusions and Recommendations Summary

- While the thrust of Working Group 4C has been in the area of technology, it must be reaffirmed that despite all the existing and future advances in capabilities of providing access to and location for calls to 9-1-1, a key component of the system is the human factor. The need for basic, recurring and timely informational training for all participants in the delivery of public safety communications is critical. Support for technical as well as operational and training standards will be key to moving forward into a much more complicated and diverse system called NG9-1-1.
- NG9-1-1 will be a major change to the 9-1-1 service and adoption of these new requirements will take several years. Experience suggests that unless there is consensus among government agencies at the local, state and federal levels, as well as carriers, vendors and other service providers, NG9-1-1 implementation for many PSAPs may be protracted.