

Course ID  
**E911-3G4G**  
Course Duration  
**2 days**

Course Title  
**4G LTE & UMTS/HSPA Location Based Services  
to Support E911 Requirements**

**Related  
Courses**

- Positioning and Location Workshop (POLOC, 3 days)
- Advanced Workshop on Positioning and Location (ADVPL, 2 days)
- IP, Location and Geo-Location Technologies for Law Enforcement, Intelligence, and Public Safety (IPGEOLOC, 2-3 days)
- Voice Communications and Technologies for 911 Call Takers, Supervisors, and Trainers (VOICE-911, 2-3 days)
- VoIP for 911 Administrators, Managers, Directors, and Regulators (VOIP-911, 2-3 days)
- 911 for IP Professionals (911-IP, 2-3 days)
- Communications Assistance to Law Enforcement Act (CALEA): Technologies and Compliance for TDM and Packet Voice Services (CALEA, 2-3 days)

**Aimed At**

This course is aimed at those charged with implementing E911 requirements in a 4G LTE and/or UMTS/HSPA environment.

**Group Size**

5-25

**Prerequisites**

Understanding of UMTS/HSPA and LTE such as might be acquired from the following courses or from work experience:

- UMTS-FDD: Network Architecture, Operation, and Design (UMTS-FDD, 2 days)
- HSDPA: Network Architecture, Operation, and Design (HSDPA, 2 days)
- HSUPA: Network Architecture, Operation, and Design (HSUPA, 2 days)
- LTE: A Comprehensive Tutorial (LTE-CT, 3 days)

**Course  
in a Nutshell**

This course provides a comprehensive study of 4G LTE and UMTS/HSPA Location Based Services (LBS) in support of the E911 requirements.

After a brief review of the pertinent aspects of the LTE technology, we will discuss the FCC E911 requirements for VoIP along with the LTE support of VoIP. We will then proceed to a detailed look at the LTE Positioning Protocol (LPP), LPP transport, LPP procedures, and LTE positioning methods. We will conclude with a performance comparison of LPPs amongst each other and with E911 requirements.

**Customize It!**

This course can be lengthened or shortened as required. It can also be modified to cover the positioning methods or topics of interest to you.

## Course Outline

- **LTE Summary:** A brief overview of 4G LTE PHY Layer, frame structure, Layer 1 and Layer 2 signaling, and LTE EPC and EPC Architecture
- **LTE Support of Voice over IP:** A summary of the various protocols proposed to support Voice over IP (VoIP) on 4G LTE networks. The main focus would be on VoIP over LTE or VOLTE.
- **FCC E-911 Requirement for VoIP:** This Section outlines the E911 positioning accuracy requirements FCC has defined for supporting VoIP.
- **LTE Positioning Protocols - LPP:** LPP is a Signaling Protocol used point-to-point between a location server and a target device (UE) in order to position the target device or to transfer assistance data using position-related measurements obtained by one or more reference sources.
- **LPP Transport:** LPP requires reliable, in sequence delivery of LPP messages from the underlying transport layers. This section describes the transport capabilities that are available within LPP.
- **LPP Procedures:** Enables the transfer of capabilities from the target device to the server. Capabilities in this context refer to positioning and protocol capabilities related to LPP and the positioning methods supported by LPP.
- **LTE Positioning Methods:** The positioning of UEs is a service provided by the RAN to enable the network to support location services. UE positioning is a technology based on measuring radio signals to determine the geographic position and/or velocity of the UE. For LTE, three positioning methods have been specified:
  - Network-assisted GNSS methods; A-GNSS (Assisted Global Navigation Satellite System)
  - Enhanced cell ID method.
  - Downlink positioning; OTDOA (Observed Time Difference Of Arrival)
- **Performance Comparison of LPPs with Each Other and with E-911 Requirements:** Compares the performance metrics of each positioning methods in LTE with FCC E911 requirements
- **Wrap-up:** Course recap, discussion, and participant evaluation of the course.

## How You Will Learn

- An expert on 3G/4G location technologies will teach this course in interactive lecture format with examples, exercises, and group discussion to help you understand and apply the course content to your situation.
- If you already know something about the 3G/4G or location technologies, we will build on that knowledge base. We'll compare and contrast what's familiar with what's new, making the new ideas easier to learn as well as more relevant.
- If your background is less technical, we will use examples and analogies to simplify the complex subject matter.
- You will receive a printed Participant Handbook which will help you remember and retain what you learned in class and apply it on your job.

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