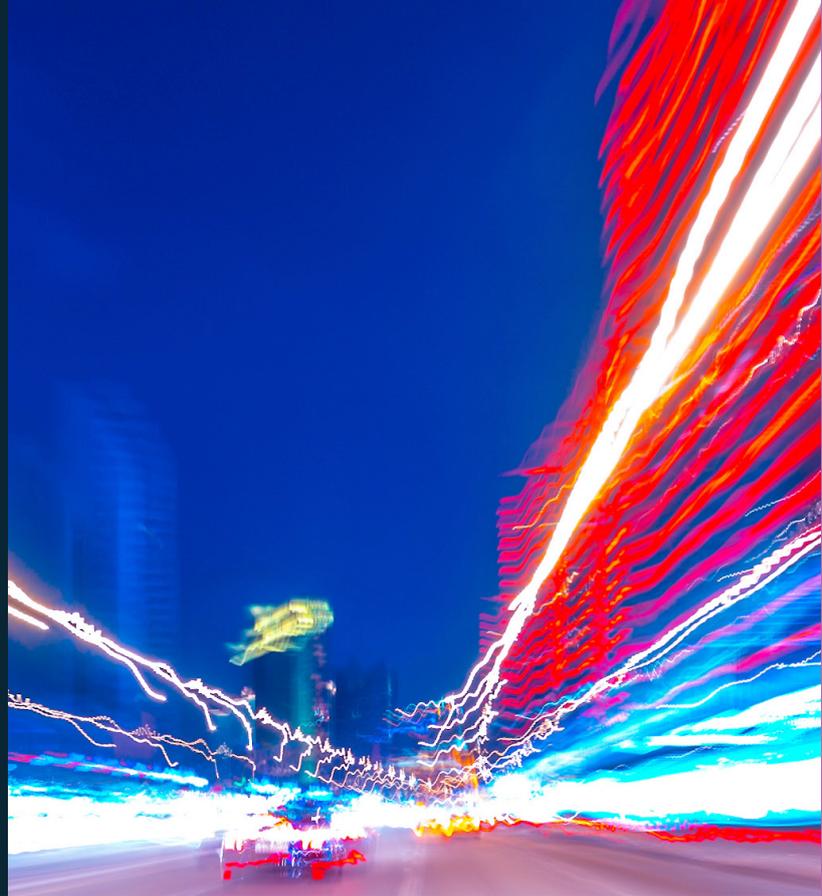




Highly skilled instructor. Very good documentation / material. Intense content.



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# Analyzing VoLTE and VoWiFi

## Course Description

As IMS based VoLTE becomes the prevalent voice service enabler for 4G, this course provides detail on how the VoLTE and often associated VoWiFi network operates. This is achieved through analysis of the network architecture and also key focus on SIP. Example call flows related to VoLTE and VoWiFi will be explored, including IMS, PCC and LTE interaction. The media stream will also be analyzed, with focus on the operation of RTP, the AMR and EVS codecs and also the use of SDP. Finally, interoperation with the PSTN and also mobility scenarios (SR-VCC and ICS) will be explored.

**Prerequisites:** LTE System Engineering, IMS and PCC System Engineering, or equivalent knowledge.

3

Days  
(LiveOnsite)

18

CPD Learning  
Credits



Level: 3  
(Advanced)

This course will contain the following sections:

## 1. Monitoring the VoLTE and IMS Network

Topic areas covered include:

- VoLTE Basic Architectural Requirements:
  - LTE, IMS and PCC.
  - Standardization.
- LTE Access Network:
  - Key nodes - UE, eNB, MME, S-GW, P-GW, HSS.
  - Monitoring the LTE Network.
  - Control and User Plane Protocols.
- IMS Call Control Network:
  - Control and User Plane Protocols.
  - Key nodes - CSCFs, HSS, ATCF, ATGw, SCC AS, TAS.
  - Focus on Session Border Controllers.
  - IMS Deployment Options - Geographic and Physical Consolidation.
  - Monitoring the IMS network.
- PCC Architecture:
  - Key nodes - PCRF, PCEF, SPR, AF, Charging Servers.
  - Gx and Rx Interface.
- End to End VoLTE Architecture.

**Activity:** Using NetX map to discover monitored VoLTE interfaces and protocols.

## 2. SIP Fundamentals for VoLTE

Topic areas covered include:

- SIP Fundamentals:
  - SIP User Agents.
  - SIP Protocol Stack.
- SIP Message Exchange:
  - Request Format.
  - Response Format.
  - Tracking Transactions and Dialogues.
- Routing SIP Messages:
  - SIP Proxies.
  - Via Header.
  - Back to Back User Agents.
  - DNS and SIP Routing.
- SIP Registration:
  - Registration Cancellation.
- Session Establishment:
  - Call Termination.
  - SIP Forking.

**Activity:** Identify the format and key parameters of SIP.

## 3. VoLTE Registration

Topic areas covered include:

- IMS Identities:
  - Private and Public User Identities.
  - Temporary Identities.
  - Globally Routable User agent URI.
  - Public Service Identity.

3

Days  
(LiveOnsite)

18

CPD Learning  
Credits



LiveOnsite

## VoLTE Registration (cont.)

- IMS Registration Analysis - Initial Registration:
  - LTE Network Specifics.
- IMS Registration Analysis - Initial Registration:
  - Initial Registration Request (UE to P-CSCF).
  - Forwarding the REGISTER (P-CSCF to I-CSCF).
  - S-CSCF Selection.
- Receipt of the Initial Registration (S-CSCF).
- IMS Registration Security:
  - Authentication Mechanisms.
  - Authentication Vector Acquisition.
  - Authentication Challenge.
- Reregistration and Subscriber Profile Acquisition:
  - Second Register.
  - Authentication and Subscriber Profile Acquisition.
- Registration Acceptance:
  - Security Association Establishment.
  - Third Party Registration.
  - Registration Failures.
- Registration Event Subscription.
- Service Configuration (Ut Interface).

**Activity:** NetX based analysis of the IMS Registration procedure.

## 4. VoLTE Media

### Topic areas covered include:

- VoLTE Media - Codecs:
  - Adaptive Multi Rate Codec.
  - Enhanced Voice Services Codec.
  - MOS Comparison (AMR, WB AMR, EVS).
- VoLTE Media - RTP Transport:
  - Real time Transport Control Protocol.
  - Port Usage for RTP/RTCP.
- Describing the Media Stream - SDP:
  - SDP Offer and Answer.
  - Breakdown of VoLTE Media Attributes.
- AS Bandwidth Overhead Reference.

**Activity:** NetX based analysis of SDP Offer and Answer.

## 5. VoLTE Call Procedures

### Topic areas covered include:

- High Level SIP Signalling Flow:
  - Understanding the IMS Signalling Flow.
- VoLTE to VoLTE Call Establishment.
- Delivering the SDP Offer:
  - SIP INVITE Composition.
  - Media Anchoring (Calling Party).
  - Application Servers (Calling Party).
  - Routing the SIP Signalling to the Called Party.
  - Application Servers (Called Party).
  - Media Anchoring (Called Party).
- Delivering the SDP Answer:
  - 183 Session Progress.
  - Dedicated Bearer Establishment.
  - Bidirectional Media.
- PRACK, Preconditions and Acceptance:
  - Provisional Response Acknowledgement.
  - Meeting Preconditions.
  - Alerting and Call Acceptance.
  - Session Timers.
- VoLTE Call Termination:
  - Media Path Removal.
  - Dedicated EPS Bearer Deletion.

**Activity:** NetX based detailed analysis of a VoLTE to VoLTE call flow.

## 5. VoLTE Service Features

### Topic areas covered include:

- VoLTE Supplementary Services:
  - Example - OIR.
  - Example - CDIV.
- Additional IMS Functions:
  - Multimedia Resource Function.
  - Early Media.
- IMS Messaging Services:
  - Support for SMS.
  - OMA Converged IP Messaging.
- IMS Video Calling (GSMA IR.94).

## 6. VoLTE Breakout Procedures

### Topic areas covered include:

- Supporting Legacy Voice Through the Migration to VoLTE.
- Focus on the MGCF and IM-MGW:
  - Media Gateway Control Function.
  - IMS Media Gateway.
  - H.248 Protocol.
- E.164 to SIP Mapping (ENUM).
- IMS to PSTN CS Procedures.
- PSTN to IMS CS Procedures.
- Emergency Services:
  - Emergency Call Solutions.
  - Support for Emergency Services in the IMS.

**Activity:** NetX based analysis of a VoLTE to PSTN call flow.

## 7. ICS and SRVCC

### Topic areas covered include:

- IMS Service Centralization and Continuity.
- IMS Service Centralization:
  - MSC-S Enhanced for ICS.
  - MSC-S Not Enhanced for ICS.
  - Example Call Establishment (Mobile Originated).
  - Example Call Establishment (Mobile Terminated).
  - Voice Service Considerations.
- Single Radio Voice Call Continuity:
  - Support for SRVCC.
  - SRVCC Evolution.
  - VoLTE SRVCC Call Procedure (Pre Release 10).
- SRVCC with ATCF Enhancements:
  - Registration Procedure Utilizing an ATCF.
  - Access Transfer Procedure Using the ATCF (PS to CS).

**Activity:** NetX analysis of an SR-VCC procedure.

## 8. VoWi-Fi

### Topic areas covered include:

- VoWi-Fi Architecture.
- VoWi-Fi Call Flow Example.
- Mobility Scenarios.

**Activity:** NetX based analysis of IMS registration and call establishment via Wi-Fi, including mobility scenarios (Wi-Fi to 4G and vice versa).



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