

LTE-Advanced Training, Long Term Evolution Advanced

LTE-Advanced Training

LTE-Advanced training provides a technical overview of LTE-Advanced including motivation, major new key features such as carrier aggregation, enhanced advanced antenna techniques for the DL/ UL, relay repeaters, and coordinated multipoint (CoMP) transmission and reception, requirements, network architecture, security, coverage, performance, required enhancements in LTE and migration strategies for LTE-Advanced deployment.

LTE-Advanced provides higher bitrates in a cost efficient way and, at the same time, completely fulfill the requirements set by ITU for IMT Advanced, also referred to as 4G.

4G LTE or LTE-Advanced was specified initially in Release 10 of the 3GPP standard in 2010.

LTE-Advanced supports wider frequency bandwidths (40MHz or more). Carrier aggregation was introduced in Release 10 to allow combining multiple pipelines together to create a larger single pipeline (provide backward compatibility with LTE). This is very similar to 802.11n and 802.11ac/ad or concept of channel bonding for wireline broadband networks.

LTE-Advanced LTE Training course provides a technical overview of LTE-Advanced, describing the features such . In summary, this course provides a technical overview of R10 and beyond.

What is LTE-Advanced?

4G LTE-Advanced refers to the evolved version of LTE that is developed by 3GPP to meet or exceed the requirements of the International Telecommunication Union (ITU) for a true fourth generation radio-communication standard known as IMT-Advanced.

LTE-Advanced is a further evolution of LTE, an OFDMA-based technology, specified in Release 8 and 9, which is supported by a tremendous ecosystem of manufacturers and operators worldwide, and has already proven itself to be the global next generation technology.

In November 2010, the ITU (International Telecommunication Union) ratified LTE-Advanced as IMT-Advanced.

Higher capacity is the main focus In LTE-Advanced:

- Increased peak data rate, DL 3 Gbps, UL 1.5 Gbps
- Higher spectral efficiency, from a maximum of 16bps/Hz in R8 to 30 bps/Hz in R10
- Increased number of simultaneously active subscribers

- Improved performance at cell edges, e.g. for DL 2×2 MIMO at least 2.40 bps/Hz/cell.

The main new functionalities introduced in LTE-Advanced are Carrier Aggregation (CA), enhanced use of multi-antenna techniques and support for Relay Nodes (RN).

3GPP developed the following capabilities for LTE-Advanced with specifications functionally frozen for Release 11 in September 2012:

- Wider bandwidth support for up to 100 MHz via aggregation of 20 MHz blocks (Carrier Aggregation)
- Uplink MIMO (two transmit antennas in the device)
- Higher order downlink MIMO of up to 8 by 8 in Release 10
- Coordinated Multipoint Transmission (CoMP) with two proposed approaches: coordinated scheduling and/or beamforming, and joint processing/transmission in Release 11
- Heterogeneous network (Het-net) support including enhanced Inter-Cell Interference Coordination (eICIC)
- Relay

Who Should Attend

Engineers, network planners, network designers, product managers, project managers, program managers, testers, R&D, UE manufacturers, tool vendors, operators, semiconductor professionals and anyone else who need to understand LTE-Advanced or 4G LTE landscape.

Objectives

Upon completion of the LTE-Advanced Training Course, the attendees will be able to

- Describe concepts behind ITU for IMT Advanced, also referred to as true 4G
- List and describe major key features in LTE-Advanced
- List LTE-Advanced network architecture and components
- Describe LTE-Advanced OTA interface and services
- List the requirements, performance, testing and security targets for LTE-Advanced
- Identify enhancement requirements for LTE systems to support LTE-Advanced features
- Explore migration strategies for LTE-Advanced implementation and deployment
- List the performance targets for IMT-Advanced and LTE-Advanced
- Summarize architectural enhancements relative to Release 8
- Describe the key features of Release 10 LTE-Advanced
- Explain the key features of LTE-Advanced beyond Release 10
- Identify the enhancements required in an LTE network to migrate to LTE-Advanced
- Give examples of deployment scenarios for LTE-Advanced including heterogeneous networks (HetNets)

Outline

Overview of LTE-Advanced

- What is LTE-Advanced?

- Backward compatibility with LTE
- LTE-Advanced features
- IMT-Advanced and LTE-Advanced
- Evolution from Release LTE 8/9 to Release 10/11/12 LTE-Advanced (4G LTE)
- Spectrum Allocation
- Carrier Aggregation
- Overview of LTE-Advanced services and features
- Over-the-air provisioning (OTA) in LTE-Advanced
- Simplified View of an OTA Provisioning Architecture

LTE-Advanced Network Architecture

- LTE Advanced Features and Performance (R10, R11 and beyond)
- Release 10/11 Architecture
- LTE Advanced Relays
- Enhanced HeNB in Release 10 and beyond
- Self-Organizing Networks (SON) in Release 9/10/11/12

LTE-Advanced Enhancements

- Release 10 Air Interface Enhancements
- Carrier aggregation in LTE-Advanced
- Scheduling for Component Carriers
- Enhanced multiple antenna techniques for DL and UL
- Coordinated and Distributed MIMO
- SON enhancements
- LTE-Advanced Release 11 and Beyond
- Coordinated multipoint (CoMP) transmission and reception
- Heterogeneous networks (HetNets) and eICIC
- Interference cancellation
- Overall System Latency Enhancements

Self-Organizing Networks and Heterogeneous Networks in LTE-Advanced

- SON Architectures SON Framework and Management Model and Interfaces
- Self-configuration (S1/X2)
- Self-Optimization (ANR)
- Mobility Load Balancing
- Mobility Robustness Optimization
- HeNB Architecture
- HeNB Gateway Functionality

- HeNB Access Control
- Closed Subscriber Group management
- HeNB Identification
- LTE-Advanced Coverage Enhancement using Relay Nodes
- Range Expansion
- PDCCH Control Channel Robustness
- Enhanced Inter-cell Interference Coordination (eICIC)
- Almost Blank Subframes and CSI Measurement Restrictions
- Enhanced PDCCH Control Channel to support Beam Forming

Concepts behind Carrier Aggregation and Enhanced MIMO

- What is Carrier Aggregation (CA)?
- Uplink Multiple Timing Advance for Carrier Aggregation Rel.11
- Uplink Carrier Aggregation and Multi-Cluster Transmission
- Simultaneous Uplink Control Channel Transmission
- Enhanced Downlink Spatial Multiplexing with 8x8 SU-MIMO
- Enhanced Downlink Multi-User MIMO and Beamforming
- Dedicated Reference Symbol Structure for LTE-A MIMO
- Uplink Multi Antenna Transmission
- Coordinated multipoint transmission and reception (CoMP)
- Cooperative Base Stations and Remote Radio Heads
- CoMP modes: joint processing, coordinates beam forming & scheduling
- CoMP Resource Management and Signaling Procedures

LTE Advanced Operational Procedures

- Network Acquisition and Attach in LTE-Advanced
- Power-up system acquisition
- Random access
- Attach
- Cell reselection and handover
- Idle to connected transition
- Dormant to active transition
- Initial Attach and EPS Bearer Activation
- Mobility in LTE Advanced
- Cell Reselection and Handover
- DTX/DRX in LTE Advanced
- Handover to WiFi for offloading IP traffic

