Course ID
LTE-CORE
Course Duration
5 days

Course Title
LTE Core Network

Related Courses

- LTE: A Comprehensive Tutorial (3 day(s), LTE-CT)
- LTE: A Comprehensive Three Day Course (LTE-C3DC, 3 days)
- LTE/SAE Fundamentals (LTE-FUND, 3 days)
- LTE Radio Access (LTE-RADIO, 2 days)
- LTE/SAE Next Generation Network Transport (LTE-SAE-NGN, 3 days)
- LTE and IMS: Technologies and How They Interwork (LTE-IMS, 4 days)
- IMS: The Technology, Applications, and Challenges (IMS, 2 days)
- CAMEL for Intelligent Network (CAMEL, 3 days)
- Everything over IP (EoIP): Data, Voice, Video, Signaling and Telemetry over IPv4/IPv6 Networks (EOIP, 5 days)
- VoIP: Protocols, Design, and Implementation (VOIP, 2-3 days)
- MPLS: Technology, Engineering, Applications, and QoS (MPLS10, 2-4 days)
- SONET/SDH: Principles and Design (SONET/SDH, 2 days)
- DWDM Principles and Design: An Advanced Tutorial (DWDM, 2-3 days)

Aimed At

This course is aimed at a technical audience and is suitable for personnel at all levels from technician through manager who are involved in implementing LTE/SAE core network technologies or who wish to keep up with future generation network technologies.

Group Size

5-25

Prerequisites

Those wishing to take this course should have a basic knowledge of UMTS, HSPA, and LTE.

Course in a Nutshell

LTE is a fourth generation mobile communication technology standardized by the 3GPP which enables support for broadband connectivity to mobile devices, permitting the delivery of demanding multimedia information to any device, anywhere, anytime. In support of this, changes to the core network are also defined as System Architecture Evolution (SAE), providing an all-IP bearer platform for delivery of services.

This course will provide you with a comprehensive understanding of the development, design, and capabilities of SAE. The course will begin with a review of UMTS and HSPA evolution and the architecture of LTE/SAE. An in-depth study of the SAE core entities and their functionality, the interfaces and the protocols used over those interfaces follows. Signaling and NAS procedures, interworking scenarios, and services are described. The focus of the course then shifts to transport options for the deployment of LTE/SAE as a next generation network infrastructure. Carrier-class MPLS is described in detail. The course finishes by examining transport options for access, backhaul and core network.

Customize It!

This course is designed to focus on evolved packet core network aspects including core transport options. It can be customized to include related topics (see Related Courses) or topics of particular relevance to your needs.

Learn How To

- Describe the architectural structure of SAE and entity functionality
- State the protocols used over the EPC interfaces
- Describe procedures and signaling for bearer setup and release
- Describe the relationship between EPC and IMS service delivery
- Consider migration to SAE within your network
- Describe carrier-class MPLS operations
- Consider which transport options are valid within your network

Course Outline

- Review of the 3GPP UMTS and HSPA Evolution
  - UMTS architectural components
  - Migration to all-IP packet mode
  - HSDPA, HSUPA, HSPA+
  - The LTE approach
- LTE Access Network
  - Evolved NodeB (eNodeB)
  - Interfaces: X2, S1
  - Implementation of the interfaces
  - Backhaul options
- LTE Core Network
  - Why change the UMTS core?
  - Major change items
  - EPC entities and functionality
    - Mobility management entity
    - Serving gateway
    - Packet data network gateway
    - Home Subscriber Server (HSS)
    - Interfaces
    - Bearers and signaling
    - Protocol stacks
  - Additional interfaces and entities for interworking
- IP Multimedia System (IMS)
  - IMS structure
  - IMS components and functionality
  - Public and private identities
  - SIP
  - Session control
  - QoS and policy control
  - Example session procedures
- EPC Interfaces, Protocols and Signaling
  - S-series interfaces defined by 3GPP
  - S1-U interface and protocol stack
  - S1AP interface and protocol stack
  - S1AP services and functions
  - S1AP procedures
  - Bearer management
  - Context management
  - Handover signaling
  - GTPv2-C protocol stack
  - GTPv2-C format and message structure
  - Path management
  - Tunnel management
  - Mobility management

- Where and how other S-series interfaces are used
- Protocols used over other S-series interfaces
  - Diameter, GRE, PMIP

- Non-Access Stratum Signaling
  - NAS states and transitions
  - NAS security
  - Integrity protection
  - NAS protocols
  - Evolved Mobility Management (EMM) signaling
  - Evolved Session Management (ESM) signaling
  - ESM, EMM Procedure examples

- Interworking Features of SAE
  - Interworking with UMTS and earlier 3GPP networks
  - Interworking with WLANs
  - Interworking with trusted non-3GPP networks (CDMA)
  - Handovers
  - Signaling message flows for interworking scenarios
  - Handling voice

- Services
  - The role of OMA
  - The role of CAMEL
  - PoC
  - Presence
  - MBMS

- NGN Transport Architecture
  - Components of NGN transport
  - Pre-NGN services
  - New services
  - OSI layering

- MPLS
  - MPLS: What it is, its benefits, and where to use it
  - Layer 2 switching vs Layer 3 routing
  - Principles of label switching:
    - Terminology, components, label distribution
  - Label switched paths: Establishment, operation, tunneling
  - Label distribution methods
  - Label assignment methods: Independent, ordered
  - Impact of different label retention methods
  - LDP, CR-LDP, RSVP, PIM
  - Carrier-class MPLS
  - MPLS-TE
  - Traffic protection

- VPLS, H-VPLS

- Physical Medium Technologies for NGN Transport
  - SDH
  - Ethernet, Carrier grade Ethernet: Metro Ethernet
  - CWDM, DWDM
  - PONs
  - Fiber to the premises

- SDH and Next Generation SDH
  - Review of SONET and SDH
  - Concatenation
  - Can existing SDH be used in NGN transport?
  - GFP
  - Virtual concatenation
  - LCAS
  - Circuit Emulation Services

- Fiber Transport
  - NGN requirements
  - Transmitters and receivers
  - Wavelength considerations
  - WDM, CWDM, DWDM
  - FTTx options
  - PONs: APON, BPON, GPON, EPON
  - Transition to Ethernet-based systems
  - IEEE 802.3
  - Optical Ethernet options
  - EFM
  - Gigabit, 10G and 100G Ethernet
  - IEEE 802.1Q VLANs, Q-in-Q, MAC-in-MAC
  - Aggregation and protection options

- Pseudo Wire Emulation
  - Traditional carrier services
  - Carrier services across an NGN
  - PWE3 structure and requirements
  - Encapsulation methods:
    - FR, PPP, ATM, Ethernet over MPLS
  - Examples of PWE3 emulation

- Wrap-up
  - Course recap and Q/A
  - Evaluations

How You Will Learn

- A seasoned instructor, well versed in 3G/4G and NextGen technologies, will present this course in interactive lecture format.
- Along with the lecture, we will use exercises/case studies to enrich the instruction and drive home the key points.
- If you already know something about the technology, we will build on that. 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 meaningful and ingenious 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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