Telecoms & Tech Academy

COURSE DESCRIPTION

UMTS INFRASTRUCTURE & OPERATION (WITH HSPA)

Format: Classroom
Duration: 4 Days
COURSE SUMMARY

HIGHLIGHTS
- Excellent technical grounding in UMTS networks - W-CDMA, Access, Core & Service Delivery
- Highly focused and in-depth training from the experts - including relevant updates from Ovum’s extensive research team
- PACE enabled training to maximise competency development - see inside
- Trainers and programme directors that are experts, industry experienced, and highly accomplished training professionals

"The course was very insightful and the lessons learnt from the course will be very relevant to the telecoms industry"

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COURSE SUMMARY

Designed to give a thorough technical understanding of the Architecture, Protocols and Operation of the Universal Mobile Telecommunication System (UMTS), this course explains the concepts and implementation of the network in detail. Presented in a clear concise format, the course explores the technology in a logical format, including the Radio Access Network, Core Network, and the required underlying systems. The protocols are examined in-depth, with appropriate emphasis on the expanding role of IP and associated protocols in the modern mobile network. Signalling flows are used where necessary to illustrate the operation and procedures.

HSPA is examined in detail, including the way in which W-CDMA and associated radio channels are organized in order to realise the expected increased performance. Other topics include the implementation of signalling (both SS7 and the IMS/SIP protocols), security, and service delivery procedures.

Each training session is thoroughly reviewed to aid understanding, and with the aid of the trainer, delegates are asked to complete a network map showing how the interfaces, protocols, and each part of the architecture fit together in the overall system.

OUTCOMES & COMPETENCY DEVELOPMENT

Participants will develop or be able to:
- Outline the overall UMTS architecture, explaining the role of each element of the User Equipment, UTRAN, and Core Network
- Describe the function and operation of each UMTS Radio Access and Core Network elements
- Relate protocols to the relevant interfaces, describing the basic requirements and principles associated with each interface
- Explain the basic operation of the air interface, describing the capabilities, advantages, requirements and operation of the W-CDMA system applied to UMTS, together with the basic protocol structure and resulting impact on services
- State the transport protocols to be adopted at each point in the network and appreciate the reasons why those protocols have been chosen for standardisation
- Recognise and follow UMTS basic procedures, relating each phase in a procedure to the relevant UMTS or transport network protocol operation
- Thoroughly understand the requirement for IP in Modern Mobile networks, identifying its role, advantages, disadvantages, and general operation
- Identify the Signalling Protocols used on each major interface, and where relevant illustrate the migration to an underlying IP signalling infrastructure (SIGTRAN)
- Recognise the different addressing and numbering schemes used in UMTS
- Discuss with confidence, some of the issues related to implementing UMTS networks. Appreciate, also, the possible migration strategies towards the next generation of mobile network
- Identify key features of HSxPA and how UMTS is modified in order to enhance performance

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training@telecomsacademy.com
## Evolution to 3G and UMTS Services

- Standardisation, ITU/IMT2000, ETSI and 3GPP
- UMTS Bearers
- UMTS Teleservices, Service Capabilities and Supplementary Services
- Multimedia Services
- Role of IN/CAMEL and toolkits
- IMT2000 spectrum

## UMTS Architecture

- Assumptions for Network Standardisation
- Overall UMTS Architecture
- Modes of Access – Overall Characteristics (FDD, TDD, HSDPA, HSUPA)
- Elements of the Use Equipment (UE)
- Elements of the UMTS Terrestrial Radio Access Network (UTRAN)
- Elements of the Core Network (CN)
- Interfacing With Other Systems

## THE RADIO INTERFACE

- W-CDMA Access Methods – Frequency Division Duplex and Time Division Duplex CDMA
- Direct Sequence CDMA – Operation (Spreading / Despreading)
- The use of Channelisation and Scrambling Codes for UMTS
- Power Control and Handovers
- UMTS Air Interface Channels and Protocols
  - Use Of Channels
  - The Use Of Protocols – Overview
- The General Protocol Model (Non Access and Access Stratum / User and Control Planes)
- Non Access Protocols
- Access Protocols – Overall Aims
- Radio Resource Control (RRC)
- Radio Link Control (RLC) and Media

## THE UMTS TERRESTRIAL RADIO ACCESS NETWORK (UTRAN)

- Requirements Of The UTRAN
- UTRAN Nodes And Their Functionality
  - Node B
  - Controlling Radio Network Controller
  - Serving Radio Network Controller
- Drift Radio Network Controller
- General Interface Structure
- The UTRAN Interfaces
  - Uu, Iu (Iub, Iur)
- Radio Resource Control (RRC) In The UTRAN
  - Idle Mode
  - Dedicated Mode
- Transfer Of Logical and Transport Channels Through The UTRAN
- Connection Establishment
- Soft Handover and Macro Diversity
- Transmission within The UTRAN

## Core Network Architecture and Protocols

- Circuit Switched and Packet Switched Domains
- Circuit Switched Domain
  - Core Network Elements and Functions
  - Interfaces and Associated Protocols
  - Basic Functions of Relevant Protocols
- Packet Switched Domain
  - Core Network Elements and Functions
  - Interfaces and Associated Protocols
  - Basic Functions of Relevant Protocols
- Service Delivery Concept
- Service Delivery Architecture
- Service Delivery Platforms
- Core Network to UE Protocols
- The purpose of IN and CAMEL – Brief Overview (accessing services in home network)
- Transport Protocols
- Transmission in the Core Network

## IP in the Mobile Network

- The Requirements
- Mobile Networks and IP Evolution
- The General Packet Radio Service
- The GPRS Core Network
  - Architecture and Network Elements
  - GPRS Support Nodes
  - The GPRS Context
  - Servers (DHCP/Radius)
- GPRS Access
- Best Effort Services
- Streaming/Advanced Media Support
- Quality of Service – DiffServ, IntServ and RSVP
- E.164 numbering scheme & ENUM Protocol
- Evolution to 3G UMTS
- The IP Multimedia Subsystem (IMS)
  - IMS Architecture
  - Session Initiation Protocol (SIP)
    - SIP Messages
    - SIP and SDP
    - Provision of QoS
  - IMS Signalling Examples
    - SIP and Quality of Service Issues
    - Push to Talk over Cellular (PoC)
    - IP in the Radio Access Network
    - Support for IPv6

## COURSE CONTENTS
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SECURITY AND AAA
- Security Considerations
- Types of Network Attacks
- Transport Layer Security (TLS)
- Wireless Transport Layer Security (WTLS)
- IPSec (IP Security)
- Secure Connections and Virtual Private Networks
- Internet Key Exchange (IKE)
- Public Key Infrastructure (PKI)
- Radius (Authentication, Authorization and Accounting)
- Diameter AAA
- Managing the Network

HIGH SPEED PACKET ACCESS (HSPA)
- Mobile Broadband
  - Radio Interface Evolution
  - HSPA
    - Benefits
    - Features of HSDPA & HSUPA
    - Data Rate Evolution
    - Services
    - Deploying HSPA
  - HSDPA
    - HS-DSCH
    - Modulation & Link Adaptation
    - Fast Scheduling
    - HARQ
  - HSUPA
    - Multi-Code
    - TTI
    - HARQ
    - Resource Scheduling & Fast Scheduling
  - HSPA+
    - Higher Order Modulation
    - MIMO
    - Continuous Packet Connectivity
- Header Compression
- IP on the RAN interfaces
- Quality of Service in the Radio Access Network
- Use of ATM in the Radio access Network
- Integrating Wireless LAN into the Network

OVERALL UMTS PROCEDURES AND TECHNIQUES
- Identities and Addressing
- Idle mode procedures
- Connected mode procedures
- Handover
- Location services (LCS)
- Security
- UMTS-GSM intersystem operation

EVOLVING THE UMTS NETWORK
- UMTS – The Fully Evolved Network
- Identifying The Areas For Evolution
- Options For The Air Interface And Radio Access Network
- Alternative Access Types
- Options For The Core Network
- Open Service Access and Other APIs
- Interworking Issues

SS7 FUNCTIONS, ARCHITECTURE AND THE MESSAGE TRANSFER PART
- SS7 as the Network Signalling System
- Signalling Scenarios
  - For Call Control
  - For Mobility – GSM and UMTS
  - Intelligent Networks and CAMEL
- The SS7 Physical Architecture
- The SS7 Protocol Architecture
- The SS7 Physical Entities
- Signalling Routes
- Signalling Links
- The Message Transfer Part of SS7
- Level 1, Level 2, Level 3
- Formats and Messages
- Routing and Switching in the Core Network
- Example Basic Call Scenarios
- The ISDN Concept
- The ISDN User Part
- Messages and Formats
- Use of ISUP

THE EVOLVING SIGNALLING NETWORK
- SS7 and IP Protocols
- Evolving the Switch
- The Softswitch concept
- SIGTRAN
- SCTP
- Open Services Architecture

SIGNALLING AND PROCEDURES
- Non Circuit-Related Signalling – The Requirements
  - Signalling Connection Control
- Part - Routing Signalling Messages Across Networks
  - Transaction Capabilities
  - Application Part - Controlling the Transaction
  - The Signalling Connection Control Part (SCCP)
  - SCCP Architecture
  - SCCP Functions and Services
  - The Transaction Capabilities Application Part (TCAP)
  - TCAP Functions and Services
  - TCAP Architecture
  - The Mobile Application Part (MAP)
  - The Use of SS7 in Support Of Mobile Networks
  - Example Procedures and the Use of SS7 Protocols— MAP, TCAP, SCCP, and MTP
  - The Modified Mobile Architecture - Incorporating CAMEL into GSM and UMTS
  - The CAMEL Application Part (CAP)
  - SS7 in Support Of CAMEL/Intelligent Networks
  - Procedures and the Use of SS7 Protocols— CAP, TCAP, SCCP, and MTP
  - The Mobile Application Part (MAP)
  - The Use of SS7 in Support Of Mobile Networks
  - Example Procedures and the Use of SS7 Protocols— MAP, TCAP, SCCP, and MTP

STREAMING AND CONTENT DELIVERY
- WAP and Access to Content
- Access to Messaging Servers
OUR TRAINING SERVICES

TELECOMS ACADEMY STRUCTURE

Our training programmes are delivered worldwide as part of the training and development plans of many operators, vendors, and service providers. The programmes cover a wide range of competency development requirements.

To ensure we meet the training needs of the industry as effectively as possible, we operate three schools:

School of Telecoms Management
Business training tailored to the telecoms industry, ranging from the intensive 5-day Telecoms Mini MBA to specialist leadership and marketing training.

School of Advanced Communication Technologies
Covering a multitude of technologies, these courses range from overviews aimed at nontechnical staff to in-depth engineering training.

Distance Learning
Our comprehensive suite of Distance Learning programmes provide an excellent opportunity to expand knowledge and build confidence.

OUR TRAINERS

We only use trainers and programme directors that satisfy the following three criteria:

- Experts in their field
- High level of industry experience
- Expert facilitators and training professionals.

All our trainers have undergone a rigorous election process and are subject to continuous monitoring and evaluation. Each trainer is accredited for specific courses or topic areas. Whether engineers or business experts, all our trainers are required to continue their own development within their specialist areas, and to broaden their industry view of trends, best practice and technology.

This is achieved by our on-going work with many tier 1 operators and vendors, and by full exposure to Ovum research and KNect 365 TMT worldwide events.

UNIVERSITY ACCREDITATION

Some of our programmes have been accredited by the University of Derby Corporate, an UK-based university highly acclaimed in the area of employer engagement. They are at the forefront of the drive to integrate highly focused industry-led training with the academic rigor and quality control of university-based education. Our comprehensive Advanced Telecoms Management Series have been accredited postgraduate level, with our extensive suite of Distance Learning at undergraduate level.

We would be happy to discuss extending accreditation to tailored ATMS or programmes based on our Distance Learning modules. Although accreditation is specific to these programmes, the work we do with the University of Derby enable us to develop and apply best practice across our portfolio.

CUSTOMISED IN-HOUSE TRAINING

Telecoms Academy has worked with countless companies to deliver customised training programmes. We take time to understand your requirements, you’ll work with our specialist training team to ensure that we deliver your perfect training programme for your business.

A customised training programme from Telecoms Academy ensures you get a course that precisely matches your organisation’s needs, presented by a first-rate training organisation, with access to all the latest industry research and analysis.

Why choose in-house training from Telecoms Academy?

- Content can be customised to focus on the issues you want – work with us to develop the training course to match the exact needs.
- Unique industry research – from Ovum’s team of industry leading analysts
- Expert trainers – our team of versatile trainers have the knowledge and experience to deliver a highly effective learning experience
- The most efficient way to train your staff – at the time and location to minimise disruption
- Flexible delivery options – with a range of instructor led, distance learning and virtual classroom formats available you can build a blended solution to maximise training effectiveness over the long term
- Pre- and post-course assessment – can be included in programmes to measure competencies and check on the required progress.

Contact us to discuss how we can build your perfect programme.