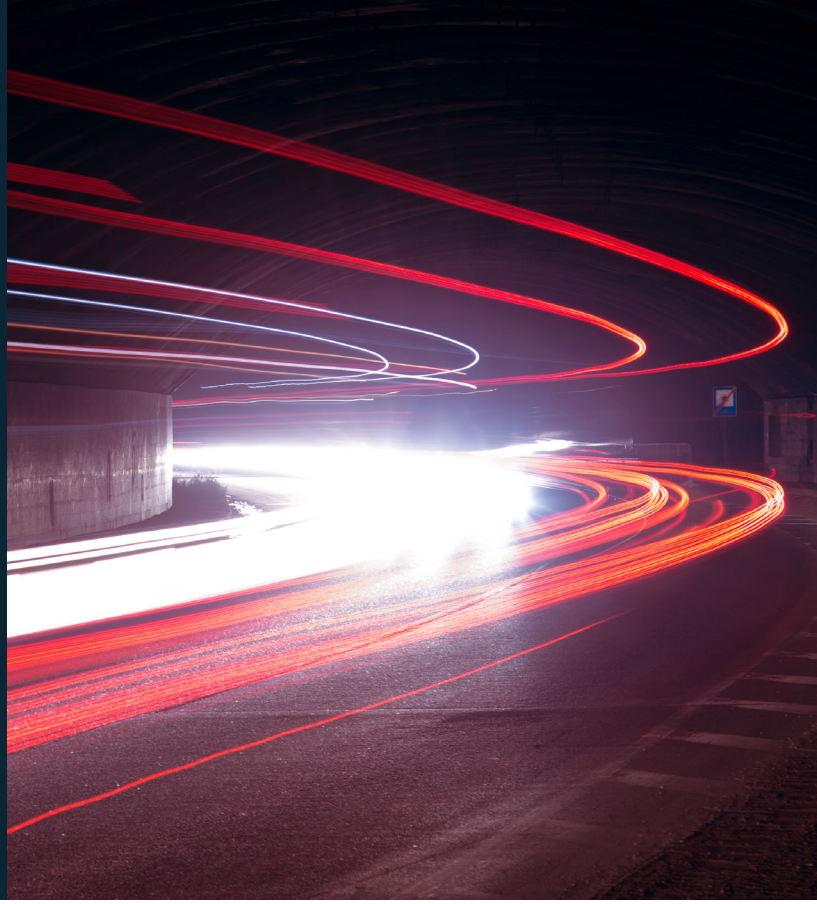
MPIRICAL
Innovating Telecoms Training



> Instructor is very knowledgeable and knows how to quickly adapt to students' needs.

Watch our course intro video.

Analyzing the UTRAN

Course Description

This course is a deep dive into the details of the 3G UTRAN, starting with the key interfaces and protocols involved. The use of IP transport in the UTRAN is also explored, along with the composition of the air interface in terms of the different channel types used. Focus is then turned to the Node B, detailing the setup, configuration and synchronization aspects of the platform. After analysis of the various UMTS connection states, the course will examine both circuit and packet switched operation, before concluding with a breakdown of mobility related procedures.

Prerequisites: UMTS System Engineering

3	18	
Days (LiveOnsite, LiveOnline)	**CPD Learning Credits**	**Level: 3 (Advanced)**

This course will contain the following sections:

1. UTRAN Interfaces

Topic areas covered include:

- The 3GPP Specifications.
- UTRAN Architecture:
  - UTRAN:
    - RNC, Node B, UE.
  - Transport Network.
- UTRAN Interfaces:
  - IuCS
  - IuPS.
  - Iub.
  - Iur.
- Cell Broadcast and Multicast Interfaces and Architecture.

Activity: Using NetX map to discover the UTRAN interfaces and protocols.

2. IP Operation in the UTRAN

Topic areas covered include:

- Carrying Signalling over IP:
  - Sigtran:
    - SCTP.
    - User Adaptation Layers.
- Circuit Emulation:
  - IP / MPLS.
- HSDPA and IP traffic over Ethernet and MPLS.
- Challenges:
  - QoS.
  - Capacity Planning.
  - Timing.

3. Logical and Transport Channels

Topic areas covered include:

- UMTS Air Interface Architecture:
  - The Non Access Stratum.
  - The Access Stratum.
- Logical Channel Architecture:
  - Logical Channels - Control:
    - DCCH, PCCH, DCCH, CCCH.
  - Logical Channels - Traffic:
    - DTCH, CTCH.
- Transport Channel Architecture:
  - Transport Channels:
    - RACH, BCH, PCH, FACH, DCH.
- Transport Channel Formatting:
  - Transport Blocks.
  - TTI (Transmission Time Interval).
  - Transport Formats:
    - TFCI, CTFC.
- Air Interface Physical Layer:
  - Physical Layer Functions.
  - Frame Structure.
- Downlink Physical Channels:
  - SCH, CPICH, P-CCPCH, S-CCPCH, PICH, AICH, DPCH, DPCCH and DPDCH.
- Uplink Physical Channels:
  - DPCH, DPCCH, DPDCH and PRACH.
- Channel Mapping:
  - FDD Channel Mapping.
  - TDD Channel Mapping.

3
Days
(LiveOnsite, LiveOnline)

18
CPD Learning Credits

LiveOnsite, LiveOnline

4. Node B Setup Procedures

Topic areas covered include:

- Node B Requirements:
  - Cell States.
  - Node B Ports.
- Key Procedures:
  - Cell Setup Procedure:
  - System Information Update Procedure.
  - Common Transport Channel Setup.
  - Idle State Procedures and Paging.
  - Cell Broadcast Service.
- Synchronization:
  - Node B Synchronization.
  - Cell Synchronization.

5. Connected State Procedures

Topic areas covered include:

- Connection Identities:
  - s-RNTI , u-RNTI , c-RNTI, d-RNTI.
- Location Updating.
- RRC Connection Procedure:
  - Message Transfer.
- Iub Procedures:
  - RRC Connection Establishment with DCH Establishment.
  - RRC Connection Establishment with RACH/ FACH Establishment.
- Radio Bearers in UMTS:
  - Signalling Radio Bearers:
    - SRB.
  - Radio Access Bearers:
    - RAB and DRB.
- RRC Procedures:
  - Connection Management.
  - Bearer Control.
  - Mobility and Measurement.

6. Circuit Switched Operation

Topic areas covered include:

- Location Updating:
  - RRC and RANAP procedures:
    - Messages and Key Identities.

Circuit Switched Operation (cont.)

- Call Procedures:
  - Mobile Originated Call.
  - Mobile Terminated Call.
- Iu-CS Interface:
  - Signalling Establishment.
  - Connectionless Signalling.
- Speech and Data Transfer:
  - RAB Sub-flows:
    - RAB Sub-flow Combination Indicator.
- Iu User Plane Protocol:
  - Transparent Mode.
  - Support Mode for predefined SDU size.
- Iub and Iur Interfaces:
  - Transport Channel Timing.
  - Receiving Window.

Activity: NetX based analysis of RANAP Circuit Switched procedures.

7. Packet Switched Operation

Topic areas covered include:

- Attach and Routing Area Updates Procedures:
  - Attach Procedure.
  - Mobility Procedures.
- GPRS Session:
  - PDP Context.
  - Secondary PDP Context Activation.
- Iu-PS Interface:
  - SCCP Signalling
  - RANAP Signalling.
  - Data Transfer.
  - RAB Assignment.
  - Data Volume Reporting.
  - Packet Data Convergence Protocol.
- Iub and Iur Interfaces:
  - Dedicated Channel Operation:
    - DCH, DPDCH and DPCCH.
  - Common Channel Operation:
    - Cell_FACH, Cell_PCH and URA_PCH.

Activity: NetX based analysis of RANAP Packet Switched procedures.

8. Mobility

Topic areas covered include:

- Connected State Mobility:
  - Cell_DCH, Cell_FACH, Cell_PCH and URA_PCH.
- Soft Handover:
  - Measurement Reports:
    - Measurements, Mobile Measurements and Dedicated Node B Measurements.
  - Radio Link Setup.
  - Radio Link Deletion.
- Common Channel and Paging Sub-states:
  - Cell Update Procedure.
  - URA Update Procedure.
  - Hard Handover.
  - Inter-Frequency Handover Triggers.
- Circuit Switched Relocation:
  - Inter-MSC Relocation.
  - Inter-System Relocation.
- Packet Switched Relocation:
  - Inter-SGSN Relocation.

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