MPIRICAL

Innovating Telecoms Training

📹 Watch our course intro video.

LTE Protocols

Course Description

If you are involved in the troubleshooting of LTE networks, you will appreciate that having a good understanding of the protocols is critical. This course therefore sets out to provide a detailed explanation of the LTE protocols that can be found within the E-UTRA, E-UTRAN and EPC. Furthermore, to enhance the explanations, the course incorporates real use cases and examples through the use of Mpirical's NetX virtual network analyzer.

Prerequisites: LTE System Engineering, or equivalent knowledge.

9	9	💡
Hours Learning (OnlineAnytime)	**CPD Learning Credits**	**Level: 3 (Advanced)**

This course will contain the following sections:

1. RRC

Topic areas covered include:

- Introduction to RRC:
    - Air Interface Protocol Stack.
    - RRC States.
    - RRC Connection.

- E-UTRA Radio Bearers:
    - Signalling Radio Bearers:
        - SRB.
    - Dedicated Radio Bearers:
        - DRB.

- System Information:
    - SI Messages:
        - MIB, SIB1, System Information Types.

- RRC Connection Reconfiguration.

- LTE Mobility:
    - E-UTRA Measurements.
    - LTE Events.
    - Handover Process.
    - Inter-RAT Mobility.

2. X2AP

Topic areas covered include:

- Introduction to X2AP.

- Architecture of the X2 Application Part:
    - Functions of the X2 Application Protocol.

- X2 Procedures:
    - X2 Basic Mobility Procedures - Handover Preparation.
    - SN Status Transfer.

X2AP (cont.)

- UE Context Release.
- 3Handover Cancel.
- X2 Load Indication.
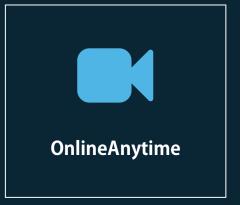- X2 Resource Status Reporting.
- X2 Setup.
- X2 eNB Configuration.

3. S1AP

Topic areas covered include:

- Introduction to S1AP.

- The E-UTRAN Control Plane:
    - E-UTRAN Protocol Specifications.

- The E-UTRAN S1 Application Protocol.

- S1 Functions and Procedures.

- Example S1 Procedures:
    - NAS Transport.
    - Initial Context Setup.
    - E-RAB Establishment.
    - S1 Setup.
    - eNB and MME Configuration Update.
    - Handover.
    - Path Switch.
    - Status Transfer.
    - UE Context Release.
    - Reset.
    - S1 Trace Procedures.
    - Location Reporting Control.
    - Overload.
    - Paging.

9

Hours Learning
(OnlineAnytime)

9

CPD Learning Credits

OnlineAnytime

4. GTP

Topic areas covered include:

- GTP Fundamentals.

- GTPv1-U:
    - GTPv1-U Header.
    - GTPv1-U Procedures.

- GTPv2-C:
    - GTPv2-C Header.
    - GTPv2 Message Format.

5. Diameter

Topic areas covered include:

- Diameter Protocol and Architecture:
    - Transporting Diameter Signalling.
    - 3GPP Diameter Interfaces.
    - Diameter Routing Agent:
        - DRA Specifics.

- Diameter Base Protocol & AVPs:
    - Command Codes.
    - Example Message - CCR and CCA.

- Diameter Routing and Roaming.

6. SGsAP

Topic areas covered include:

- Introduction to SGsAP:
    - Circuit Switched Fallback;
        - CSFB Operation.

- SGsAP Fundamentals:
    - SGsAP Protocol Stack.
    - SGsAP States.
    - SGsAP Message Set.

- Examining SGsAP:
    - Combined Attach.
    - Mobile Terminated Call Procedure.
    - CSFB MT SMS Procedure.
    - Combined TA/LA Update.
    - CSFB Network Detach.

7. NAS EMM

Topic areas covered include:

- Introduction to NAS EMM:
    - Stratums.
    - NAS Messages.

- EMM and ECM States:
    - EPS Mobility Management States.
    - EPS Connection Management States.

- NAS EMM Capabilities.

- NAS EMM and the EPS Attach:
    - Attach Request.
    - Identity Request.
    - Authentication Request and Response.
    - Security Context Initiation.
    - Attach Accept.
    - Attach Complete.

8. NAS ESM

Topic areas covered include:

- Introduction to NAS ESM:
    - Stratums.
    - NAS Messages.
    -
- EPS Session Management.

- ESM Message Detail:
    - PDN Connectivity Request.
    - Activate Default EPS Bearer Context Request.
    - Activate Dedicated EPS Bearer Context Request.

**Watch a Sample
Video Online**

Managed Learning Services

As part of our managed learning service we can offer you and your organisation a full range of services including:

mpirical.com/about-us/managed-learning-services

- Bespoke content and courseware development
- Product specific training packages, including product updates
- Dedicated trainers to understand your products and training requirements
- Managed training delivery services – administrative aspects including scheduling and liaison
- Customizable learning management system
- Traditional classroom, virtual classroom or video based online learning options

NetX

The Mpirical Network Visualisation Solution: **NetX Bringing Telecoms to Life!**
Imagine the benefits of having an entire mobile network available from your desktop.

- Where you can view a complete network map.
- Watch call flows across the network.
- Investigate network procedures.

NetX does this... and even more with our NetX customization options!
NetX is not just a learning aid, it is a valuable resource in the day to day activities of any telecoms professional and has been spotlighted as such by the 3GPP.

Explore NetX further at www.mpirical.com/netx