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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 Hours Learning (OnlineAnytime)

9 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.

3. **S1AP**
   **Topic areas covered include:**
   - Introduction to S1AP.
   - The E-UTRAN Control Plane:
   - 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.

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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:
  - Stratus.
  - 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:
  - Stratus.
  - NAS Messages.
- EPS Session Management.
- ESM Message Detail:
  - PDN Connectivity Request.
  - Activate Default EPS Bearer Context Request.
  - Activate Dedicated EPS Bearer Context Request.
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