LTE Optimisation Workshop

Who Should Attend?

The course is addressed to network engineers involved in the optimisation process.

Course Scope

1. EPS architecture.
   - EPC (MME, P-GW and S-GW).
   - E-UTRAN (eNB).
   - EPS interfaces.
2. LTE protocol architecture.
   - Introduction (protocols, SAPs, OSI model).
   - LTE protocol layer.
   - Strata (NAS, AS).
   - User plane.
   - Control plane.
   - Radio interface structure and DL data flow.
   - 3GPP Technical Specifications for LTE.
3. EPS bearer and QoS.
   - EPS bearer.
   - Quality of Service (QoS concept, QoS classes, QCI, mapping between QCI and QoS).
   - Default and dedicated EPS bearer setup.
4. Drive test coverage analysis.
   - RSPR (RSRP definition, RSRP plot).
   - RSRQ (RSRQ definition, RSRQ plot).
   - CINR (CINR definition, CINR plot).
   - Coverage analysis.
5. Accessibility.
   - Accessibility KPIs.
     - Initial E-RAB establishment success rate.
     - Added E-RAB establishment success rate.
     - Service accessibility.
   - Accessibility procedures.
     - RRC connection establishment.
     - S1 signalling connection establishment.
     - E-RAB establishment.
     - Idle mode behaviour.
     - Cell selection and reselection.
     - Paging.
     - TA update.
     - Random access.
   - Accessibility optimisation.
     - Log-file analysis.
     - System information.

        - RACH parameters.
        - RRC establishment failure.
        - Admission control parameters.
        - Traffic distribution.
6. Retainability.
    - Retainability KPIs.
        - E-RAB retainability per QCI.
        - E-RAB retainability on UE level.
    - Release procedures.
        - E-RAB release.
        - UE context release.
        - Radio link failure.
    - Retainability optimisation.
        - T310.
        - T311.
        - RRC connection reestablishment.
        - Power control.
7. Integrity.
    - Integrity KPIs.
        - E-UTRAN IP throughput for single QCI.
        - E-UTRAN IP latency.
    - Integrity procedures.
        - Scheduling.
        - Link adaptation.
        - Frequency selective scheduling.
        - Power control.
        - MIMO with RI.
    - Integrity optimisation.
        - Log-file transport protocols parameters analysis.
        - CQI analysis.
        - HARQ and BLER analysis.
        - ARQ.
        - P0 and Alpha.
        - MIMO transmission mode.
        - PDCCH dimensioning.
8. Availability.
    - E-UTRAN cell availability KPI.
9. Mobility.
    - E-UTRAN mobility KPI.
        - Handover preparation.
        - Handover execution.
    - Mobility procedures.
        - X2 handover.
        - S1 handover.
        - IRAT handover.
        - CSFB.

        - Event triggered reporting.
    - Mobility optimisation.
        - Handover log-file analysis.
        - A2 event parameters analysis.
        - A3 event parameters analysis.

Course Objectives

The LTE Optimisation Workshop training gives understanding of how the Evolved UTRAN (E-UTRAN) performance is monitored by 3GPP specific Key Performance Indicators (KPIs) and how to optimise the E-UTRAN performance by use of Long Term Evolution (LTE) parameters.

First, the Evolved Packet System (EPS) architecture is presented together with the EPS nodes functions. The LTE protocol architecture is explained, making the distinction between transport and signalling protocols, Access Stratum (AS) and Non-Access Stratum (NAS), User Plane (UP) and Control Plane (CP). The EPS UP and CP protocol stacks are presented with emphasis on the radio interface.

Next, the fundamental concept of the EPS bearer and Quality of Service (QoS) is explained. The default and dedicated EPS bearer setup process and its interworking with Home Subscriber Server (HSS) and Policy and Charging Rules Function (PCRF) nodes is shown.

The training also explains the concept, range and usage of RSPR, RSRQ and SINR for coverage verification, signal strength, and signal quality analysis.

The essential part of the training contains the definition of the KPIs for Accessibility, Retainability, Integrity, Availability, and Mobility together with the Performance Measurement (PM) counters used in the KPIs as defined by the 3GPP. The counters are illustrated in the flow graphs. For better understanding of the KPI formulas, they are calculated with use of an Excel spreadsheet for a sample cell.

The training focuses on explanation of the LTE procedures, functions, and parameters which are used to improve the KPI performance. Live network log-files are analysed for in-depth understanding of the parameters' structure and usage.

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Prerequisites

Successful completion of the LTE Air Interface and LTE Signalling is required.

Training Structure

Four-day training course, equivalent to a 24-hour lecture.

Methodology

Instructor-led training, presentation, and group discussion, including analysis of signalling traces.