

Signalling in EPC/LTE

“Signalling in EPC/LTE” course focuses on signalling between EPS/LTE nodes within GPRS Tunnelling Protocol (GTP) based Evolved Packet Core (EPC)* network. During the course protocols and signalling procedures on S1, S3, S4, S5/S8, S6a, S6c, S9, S10, S11, S12, S13, SGs, SGd, Sv and optionally X2 interfaces are presented in details. The course also describes overview of EPS architecture and system wide signalling procedures, including EPC – E-UTRAN interworking.

Target audience

The course is intended for experienced network engineers, network tuning staff, EPC protocol stack developers, and anyone with network experience, who needs deep technical knowledge on functionality of EPC.

Training contents*

- **Introduction**
(EPS/LTE network structure, identity numbers, interfaces and protocol stacks, geographical network structure, EPS bearers and QoS, MME in pool),
- **Traffic Cases**
(EMM, ECM and RRC states, attach procedure, TA update, UE/network triggered service request, S1 release procedure, dedicated bearer activation, UE requested bearer resource allocation, handover, intersystem handover, Idle mode Signalling Reduction – ISR, CS FallBack – CSFB, SMS over SGs, SMS in MME),
- **Security**
(user identity confidentiality, entity authentication, ciphering & integrity protection, key-change-on-the-fly, periodic local authentication, E-UTRAN – UTRAN/GERAN interworking including SRVCC),
- **NAS Signalling**
 - EPS Mobility Management (EMM)
(coordination between EMM and GMM, coordination between EMM and MM, establishment of the NAS signalling connection, routing of initial NAS messages, release of the NAS signalling connection, GUTI reallocation, authentication, security mode control, identification, EMM information procedure, attach for EPS services, combined attach for EPS and non-EPS services, detach, normal and periodic TA updating, combined TA/LA updating, service request, extended service request, paging, transport of NAS messages, generic transport of NAS messages),
 - EPS Session Management (ESM)
(coordination between ESM and SM, ESM and EMM coordination for ISR, IP address allocation, address handling for ESM procedures, default EPS bearer context activation, dedicated EPS bearer context activation, EPS bearer context modification, EPS bearer context deactivation, UE requested PDN connectivity, UE requested PDN disconnect, UE requested bearer resource allocation, UE requested bearer resource modification, ESM information request procedure, notification procedure).
- **Stream Control Transmission Protocol (SCTP)**
(SCTP packet, chunk structure, security, multihoming, association establishment, transmission of data, cumulative and selective acknowledgement, retransmission, stream concept, sequence control, shutdown and abort procedures),
- **GPRS Tunnelling Protocol – User Plane (GTP-U)**
(tunnelling, handling of sequence numbers, header format, path management messages),

- **S1 Application Part (S1AP)**

(SCTP as S1AP bearer, E-RAB setup/modification/release, NAS transport, initial context setup, context modification/release; intra LTE, inter RAT and SRVCC handover: signalling sequences, transparent containers, direct/indirect forwarding, resource allocation, handover notification, path switch, handover cancellation, eNB status transfer; paging; management procedures: reset, error indication, S1 setup, eNB/MME configuration update, overload; UE capability info indication, trace procedures, location reporting procedures),

- **X2 Application Part (X2AP) – optional**

(SCTP as X2AP bearer, handover: signalling sequences, path switch, data forwarding, status transfer, UE context release, handover cancellation; load indication, error indication, X2 setup, reset, eNB configuration update, resource status reporting, mobility settings change, radio link failure indication, handover report),

- **Diameter base protocol**

(Diameter system basic components, transaction and session, Diameter agents, addressing and identification, routing, Diameter peers, message processing, error handling),

- **Diameter based MME interfaces**

(S6a interface procedures: location management, subscriber data handling, authentication, fault recovery, notification procedures, S13 interface procedures: IMEI check, EPC – IMS/VoLTE/RCS interworking - T-ADS procedure),

- **GTPv2-C**

(Initial Attach and UE requested PDN connectivity, P/S-GW selection, PDP type selection and PDN address allocation, TA Update, Handover, UE triggered Service Request, Network triggered Service Request, S1 release procedure, Dedicated bearer activation, interworking with GIBA),

- **(v)SR-VCC**

(EPC – IMS/VoLTE/RCS interworking for SR-VCC handover, Sv interface procedures: PS to CS and CS to PS handover, vSR-VCC),

- **CSFB, SMSoSGs and SMS in MME**

(SGs, SGd and S6c interfaces, combined EPS/IMSI attach and TA/LA update, EPS/IMSI detach, MM information transfer, TMSI reallocation, CS paging, CS service request, CS service reject, NAS message tunnelling, fault recovery, SMS in MME).

Prerequisites

The participants should have attended “LTE/EPS Technology” course or should have the equivalent knowledge.

Training method

Lectures and theoretical exercises.

Duration

4 days

Level

Advanced (*The training does not cover PMIP based EPC specific procedures)