

GSM

Signaling & Protocol Analysis

(RAN & Mobile Station)

Course Duration:

- 2 Days

Course Description:

- This course addresses engineers and technicians who need to understand the GSM Protocol stack in detail.
- Starting with a precise explanation of the OSI reference model, the course is later on concentrating on illustrating the functions of the various interfaces in the GSM network.
- A chapter “Error Analysis in GSM”, focusing on the needs of troubleshooting engineers and technicians, is also included.

As in all INACON courses we integrated several interactive exercises for a perfect learning experience.

Pre-Requisites:

- Good understanding of GSM network architecture

Course Target:

- The student will be enabled to understand all important protocols of the GSM network and the related GSM signaling procedures.

Some of your questions that will be answered:

- What is the OSI reference model and how does it work?
- How does the SCCP message format look like and which SCCP messages exist?
- When and why are SCCP connection-less or connection-oriented services used by higher layers?
- Which GSM network elements and interfaces exist and how does the GSM protocol stack look like?
- Which protocol stack is used on the Abis interface and how does LAPD work?

Who should attend this class?

- Operations staff of GSM network equipment
- Engineers who have to implement and to upgrade GSM hardware and software
- Everybody who requires a detailed understanding of GSM signaling procedures

Table of Contents:

The OSI Reference Model

- Introduction
- Concepts and Terminology
- Details and Functions of the 7 OSI Layers

The SS7-Protocol Stack

- **MTP 1 – 3** / FISU / LSSU / MSU / Message Structure and Format / Addressing (OCP + DCP) / FSN & BSN / Automatic Network Management / Link Establishment (SLTM / SLTA) / Error Recognition and Correction.
- **SCCP** / Message Structure and Format / Connection-oriented ? Connection-less / SLR + DLR / End-to-End Routing ? Global Title / Virtual Connections
- **The ITU-T Specifications (Q.700 – Q.704 / Q.711 – Q.714 / Q.771 – Q.773)** / Where can I find ...? / How to ...?

Generic GSM Processes

- **The Data Processing Chain** / Transcoding => Channel Coding => Interleaving => Ciphering => Burst Generation => Modulation / DTX and DRX
- **Network Architecture in GSM** / HLR / VLR / EIR / MSC / BSC / BTS / TRAU
- **Overview of the GSM Protocol Stack** / Call Control (CC) / Mobility Management (MM) / Radio Resource Management (RR) / Link Access Protocol for the D-Channel, modified (LAPDm) / LAPD / GSM 08.58 / (Message Transfer Part) MTP 1, 2, 3 / Signaling Connection Control Part (SCCP), TCAP and MAP (Transfer Capabilities Application Part and Mobile Application Part)

The Abis Interface

- **Typical BTS Configurations** / (STAR / Chain / Loop) Impact on Channel Mapping
- **Typical Channel Configurations on the Abis Interface**

- **Protocol Stack on the Abis Interface** / (D-Channel / LAPD / TRXM / CCM / RLM 7 DCM)
 - **Layer 2 => The LAPD Protocol** / Message Formats / LAPD Modulo 8 <=> LAPD Modulo 128 / SAPI-Values / C/R-bit / N(S) and N(R) / Layer 2 Link Establishment
 - **Layer 3 => GSM 08.58** / Message Format / Hex- => Dec. Conversions
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The Air-Interface

- **Logical and Physical Channels (BCCH, SDCCH, TCH, SACH, FACCH, ...)** / Frame Hierarchy / 26-Multiframe / 51-Multiframe
 - **Layer 2 => The LAPDm Protocol** / Message Formats / LAPD => LAPDm / A, B and Bbis Format
 - **Layer 3 => GSM 04.08** / PD / TI / SSN / Message Formats / Messages for RR, MM and CC / Hex- => Dec. Conversions
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The A-Interface and Error Analysis in GSM

- **Channel Configuration**
 - **The Protocol Stack on the A-Interface**
 - **BSSAP, BSSMAP and DTAP** / Message Structure and Format
 - **Layer 3 => GSM 08.08** / Message Formats / Manual Decoding Exercises (Sample Messages and Parameters)
 - **Failure Analysis and Information Interpretation**
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Selected Scenarios (Theory)

- **The Mobile Terminating Call Scenario** / (within the BSS / within the NSS)
- **The Inter-MSC-Handover Scenario** / (within the BSS / within the NSS)