

GSM Centric SS7/C7 and Mobile Application Part (MAP) Training

OVERVIEW

In fixed line telecommunications systems, the location of the calling and called parties is derived from the numbering scheme adopted in the network. However in wireless systems the situation is different because a subscriber can roam across the coverage areas, which in the case of GSM/DCS are multiple countries typically. For incoming mobile calls there is no direct translation between the number of the mobile handset and the location of the customer. Procedures are therefore required to determine the location of a called customer on a real-time basis to allow delivery of incoming calls.

MAP provides core cellular network functionality - for example the functionality to route calls to and from mobile subscriber or messaging be it **Short Message Service (SMS)**, **Enhanced Messaging Service (EMS)** or **Multimedia Messaging Service (MMS)**. The US version is known as **ANSI41-MAP**. The international version is known as **GSM-MAP**.

PREREQUISITES

The course assumes that the delegates are familiar with signalling system #7 (C7/SS7) and basic telecommunication concepts. It is recommended that previous attendance at the 5-Day SS7/C7 to Binary Level (course code SS7-B) have been made, although this is not compulsory.

TRAINING METHOD

- # Lectures
- # Exercises
- # Demonstrations

COURSE DETAILS

- # Duration: **Two Days**
- # Language: English
- # Documentation: English
- # Participants: Generally class of five on a public course

WHO SHOULD ATTEND

Those requiring a general outline of the Network Switching Subsystem (NSS) and the signalling protocols that operate over its interfaces.

CONTACT

Lee S Dryburgh

Lead author of **Signalling System No. 7 (SS7/C7): Protocol, Architecture, and Services**.

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LEARNING OUTCOMES

- # Knowledge of C7/SS7 Architecture Including Signaling Points and Links
- # Understand signalling and its importance in cellular networks
- # Know what the components of the C7 network are and what their function is
- # Understand Point Code structure and how Point Code routing is used in GSM
- # Know how the role of SCCP and TCAP in relation to MAP
- # Explain SCCP addressing methods including Global Title Translation and associated parameters
- # Know the SCCP and TCAP messages and parameters used by MAP and their function
- # Recognise the C7 protocols used in GSM and identify their functions
- # Understand the PLMN Architecture
- # Be familiar with GSM network interfaces and signalling protocols
- # Know what C7 protocol stack is at each GSM NSS component and what C7 protocol is used on each GSM interface
- # Know what numbering identifiers are used in GSM
- # Explain common sequence flows such as those for mobile originated calls as well as mobile terminated calls
- # Understand how MAP performs its functions
- # Understand MAP procedures
- # Know all Phase 2 MAP operations and their functions

PRESENTER DETAILS

The course is delivered by **Lee S Dryburgh**, lead author of **Signalling System No. 7 (SS7/C7): Protocol, Architecture, and Services**.

HIGHLIGHTS FROM HIS CAREER INCLUDE:

- # Graduated in Computer Science then specialised in **signalling** for nearly a decade, with the main emphasis on the protocol used in 99% of networks - **signalling system #7 (SS7)**.
- # Was a **SS7/C7** software engineer covering virtually every SS7/C7 layer/applications - **MAP, TCAP, SCCP, INAP, ISUP, MTP, IS-41, BSSAP** and standards **ETSI, ANSI, Bellcore** and **ITU**. For example he wrote the software decode for the **Chinese INAP**. He worked as a software engineer for both the **acceSS7** and **HP3900** platforms.
 - Was a protocol software engineer responsible for a proprietary **telecommunications protocol system** involving communications between transactions terminals out in the field and a central **UNIX** host.
 - Played a leading role in achieving **national SS7/C7 certifications** for a switch and a softswitch produced by a major Internet equipment manufacturer.
 - Performed switch installations as well as post installation **SS7 testing**.
 - Performed **SS7/C7** testing for many variants including **Swedish ISUP, UK ISUP, NUP/IUP** and **Russian ISUP** in addition to the more common **ITU** and **ANSI** protocols.
 - Performed testing against one of the world's most complex **Intelligent Network (IN)** platforms, certifying the **SCCP** and **TCAP** SS7/C7 protocols.
 - Has unique knowledge of SS7/C7 Security aspects and provides consulting on signalling security issues largely to parties involved in VoIP and 3G implementations.
- # Since the **initial 3G rollouts** in 2001 has provided hands on **2/2.5** and **3G** support and later service

additions as well as 3GPP lead architecture changes. Such support has included [SS7](#), [SIP](#), [H.323](#), [CODECs/transcoding](#) and [softswitch](#) management.

- # Has been working in [Next-Generation Network \(NGN\)](#) environments since first rollouts in 2004.
 - Wrote and performed [SS7 to SIP interworking](#) tests.
 - Dealt with signalling issues such as [SIP/H.323/SS7 interworking](#) for PSTN calls.
 - Tested [3G services](#) such as video calling and location based services which require such [signalling interworking](#).
 - Managed [softswitches](#) and [media gateways](#) since 2004.
 - Played a leading role in [BICC/ISUP/SIP interworking](#) verification for a [softswitch](#) produced by a major telecoms equipment vendor.
 - He is currently authoring another book on [next generation](#) signalling systems including [NGN protocol interworking with SS7/C7](#).
- # Has spent 7+ years delivering signalling related training on an international basis. He currently provides training in [SS7](#), [C7](#), [INAP](#), [CAMEL](#), [MAP](#) ([GSM](#) and [ANSI-41](#)), [SIGTRAN](#) ([M3UA](#), [M2UA](#), [SUA](#), [M2PA](#)), [H.323](#), [SIP](#), [P2P SIP](#), [NGNs](#) as well as issues related to the future of telephony.
- # He is working on an Engineering Doctorate in conjunction with the University College of London (UCL) mapping out the [future of telephony](#) and trying to [foresee killer applications and required protocols](#).
- # He is a member of The Institution of British Telecommunications Engineers (IBTE), The Professional Contractors Group (PCG), The Federation of Telecommunications Engineers of the European Community (FITCE), The British Computer Society (BCS), The Institution of Electrical Engineers (IEE) and The Institute of Electronic and Electrical Engineers (IEEE).

COURSE CONTENTS

DAY 1 GSM CENTRIC C7 OVERVIEW

DAY 2 GSM-NSS SPECIFIC SIGNALLING

DAY 1 GSM CENTRIC C7 OVERVIEW

- # What is Signaling?
- # Signalling System #7 Network Elements
 - Service Switching Point (SSP)
 - Signal Transfer Point (STP)
 - Service Control Point (SCP)
 - Links and Linksets Explained
 - Link Set Types Explained
 - Routesets Explained
 - Associated and Quasi-Associated Signalling
 - Route And Routesets
 - Link Types
 - Plain Flavour Stack
- # Signalling System #7 Overview
- # Signalling System #7 Protocol Architecture
 - Message Transfer Part 1 (MTP 1)
 - E1 and TDM Hierarchy
 - Message Transfer Part 2 (MTP 2)
 - MTP2 Overhead and Functions
 - SUs and SU Formats
 - SUs Generated by Layer
 - Message Transfer Part 3 (MTP 3)
 - MTP3 Overhead and Functions
 - SIO and Subfields
 - C7 Network Hierarchy
 - The ITU Routing Label Shown
 - ITU Point Code Format Explained
 - National Point Codes Explained
 - ANSI Routing Label Shown
 - ISDN User Part (ISUP)
 - ISUP Messages
 - Call setups/clear downs shown

- Signalling Connection Control Part (SCCP)
 - Capabilities
 - Overhead
 - GSM-MSC Stack
 - Architecture
 - Protocol Classes
 - Message Structure
 - Messages
 - Addressing
 - DPC+SSN Routing
 - ITU and GSM Subsystems
 - Global Title Routing
 - MTP Addressing in GSM
 - GT Addressing in GSM
 - MAP SCCP Addressing
 - CgPA and CdPA Parameters
 - Inter and Intra PLMN Addressing
 - CgPA and CdPA Decode
 - Subsystem Management
 - C7 and Cellular Protocol Standards Bodies
 - Tutorial #1
- IMEI, IMSI, TMSI, MSISDN
 - Protocol Stack by GSM Node Type
 - Interfaces A-H
 - MSC Protocols
 - Mobile Application Part (MAP)
- Introduction to GSM-MAP
- Operation Encapsulation
- MAP SCCP Addressing Outcomes
- C7 Protocols on GSM Interfaces
- Example MAP Operations on GSM Interfaces
 - B-D Interfaces
 - E-H Interfaces
- MAP Procedures
 - Common Services
 - Mobility
 - Operations and Maintenance
 - Call Handling
 - Supplementary Services
 - Short Message Service
- MAP Operations
 - B-Interface
 - C-Interface
 - D-Interface
 - E-Interface
 - F-Interface
 - G-Interface
 - H-Interface

DAY 2 GSM-NSS SPECIFIC SIGNALLING

- # Transaction Capabilities Application Part (TCAP)
 - Users and Services
 - Addressing
 - Internal Structure
 - Message Format
 - Component Sublayer
 - Transaction Sublayer
 - Messages used in GSM
 - MAP and TCAP
 - GSM Network Components
 - OSS, NSS, BSS
 - MS, SIM, BTS, BSC, MSC, HLR, VLR, EIR
 - GSM Identifiers
- Communication Between MAP and its Users
- Local Operation Codes for MAP
- Communication Between Application, MAP and TCAP
 - Tutorial #2
 - Practical Session
 - Analysis of MAP traffic
 - Practical Exercises