Telecoms & Tech Academy

COURSE DESCRIPTION
SS7 IN MODERN NETWORKS

Format:
Classroom

Duration:
4 Day

**KNect365
Learning**

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COURSE SUMMARY

HIGHLIGHTS

- **Squarely focused on SS7 as used in modern mobile networks**

- **SS7 Protocol Stack Explained in Detail**

- **3GPP Call Scenarios illustrated and fully explored**

- **Includes full treatment of Architectures, Functional Elements and Procedures**

- **MOBILITY and MAP Procedures Highlighted**

- **CAMEL and the Camel Application Part Explained**

- **Example Procedures used throughout to ensure full understanding**

- **Trace exercises used to reinforce learning**

COURSE SUMMARY

This course explains SS7 and associated signaling systems in depth, as well as the role they play in modern telecommunication networks. It also looks in detail at how SS7 is implemented in an IP environment using the SIGTRAN standards.

The SS7 architecture is first examined, with detailed descriptions of the Message Transfer Part (MTP), Signalling Connection Control Part (SCCP) and the Transaction Capabilities Application Part (TCAP). The role and operation of the various user and application parts are then explained, including the ISDN User Part (ISUP), Intelligent Network Application Part (INAP), Mobile Application Part (MAP), and CAMEL Application Part (CAP). Examples are used throughout to illustrate different call control scenarios, and also to show how services and mobility can be effectively controlled using the relevant SS7 protocols.

The move towards the IP core network is examined in detail by exploring the requirements, operation, and architecture of SS7 over IP, the Softswitch and the UMTS all-IP core network. The implementation of SS7 in IP-based networks using SIGTRAN is also considered in detail – including detailed network architecture, resilience and redundancy issues, use of SCTP and inter working.

To provide a complete picture, the GSM/3G based mobile network is used as an example throughout as this encompasses all major standard scenarios and interface types, including those found in fixed networks.

In addition to SS7 and Sigtran, the Diameter protocol will be explained, the Diameter stack is covered with operational examples, also typical Diameter architectures for reliability and security are shown.

BICC, network capabilities and protocols are also covered in the course, explaining the architecture, protocols and capability set with signaling flows for typical network events .

TRACE ANALYSIS

Exercises are used throughout to illustrate procedures and formatting and to develop the participant's skills and confidence in trouble shooting, maintaining and deploying modern SS7 / SIGTRAN networks.

PRE-REQUISITES

An appreciation of telecommunication core networks would be an advantage.

For maximum benefit, SS7 Traces to be provided by customer 2-weeks prior to course commencement for In-House delivery.

Book online
telecomstechacademy.com

Book over the phone
+44 (0)20 7017 4144

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LEARNING OUTCOMES

COMPETENCY DEVELOPMENT

At the end of the course, the delegate will be able to:

- Recognise different signalling scenarios found in modern telecommunications networks, and identify the network entities involved (including scenarios for Call Control, Mobility Support, Service Support, and Interworking)

- For each defined interface, describe the type and scope of information that may need transferring between the entities, differentiating between circuit-related and non circuit-related signalling

- Explain the role played by each level within the SS7 protocol stack – including MTP Levels 1, 2, and 3, SCCP, and TCAP

- Identify key interfaces on which the different layers of the SS7 protocol stack are used – focusing on its use within modern fixed and GSM based networks

- Describe the role of Call Control protocols in fixed and mobile networks, focusing primarily on the ISDN User Part (ISUP) and its use in GSM/3G

- List the most important information carried within common Call Control Messages (ISUP, TUP etc)

- Draw the procedural diagrams for a range of call control scenarios

- State the main functions, modes of operation, use, and formatting principles for both the Signalling Connection Control Part, and Transaction Capabilities Application Part of SS7

- Identify the different levels of SS7 on each interface of a modern network (using GSM-based systems as the example) – fully understanding its role and operation

- Describe the features and functions of the INAP, MAP and CAMEL protocols, showing where they are used

- Describe clearly the way in which the underlying SS7 network is used to transfer INAP, MAP or CAMEL messages / information flows using MTP, SCCP and TCAP protocols

- Follow the procedures for both service control and mobility scenarios

- Discuss the reasons behind a move to an all IP core network, the advantages and disadvantages, and the effect this may have on both the SS7 protocol architecture, and on the SS7 physical architecture

- Explain the detailed implementation of SS7 in IP-based networks using SIGTRAN – including detailed network architecture, resilience and redundancy issues, use of SCTP and inter-working

- Assess key planning and implementation options when deploying SS7 with SIGTRAN

- Describe the Diameter protocol and feature sets

- Show how SS7 procedures can be replicated in the Diameter environment

- Explain the Diameter architecture including relays and agents functions

- Show how BICC is used in the mobile networks and discuss the basic features capabilities

COURSE CONTENTS

SIGNALLING REQUIREMENTS AND SS7

- Modern Network Architecture – A Brief Overview
- Services and Features of Modern Networks
- Switching In Modern Networks
- Types of Signalling
    - Access / Network / User to User
    - Circuit Related / Non Circuit Related
    - Channel Associated / Common Channel
- Signalling Requirements
- SS7 In Modern Networks - Basics

SS7 FUNCTIONS, ARCHITECTURE AND THE MESSAGE TRANSFER PART

- SS7 as the Network
- SS7 Use Cases
- Signalling Scenarios
    - For Call Control – Same Network, Internetwork (National), International
    - For Mobility – GSM and UMTS
    - Advanced Service Support – Intelligent Networks and CAMEL
- The SS7 Protocol Architecture
- The SS7 Physical Architecture
    - SS7 Physical Entities
    - Signalling Routes
    - Signalling Links
- The Message Transfer Part of SS7
    - MTP Signalling Point
    - MTP Signalling Transfer Point
- Signalling Message Handling
- Signalling Network Management
- Level 1
    - The Physical Layer
- Level 2
    - Signalling Links
    - Signalling Units
- Level 3
    - The Network Layer
- Routing & Addressing
- Signalling Link Selection & Circuit Identification
- Formats and Messages

CALL CONTROL AND THE ISDN USER PART

- Routing and Switching in the Core Network
- Call Control Protocols Compared
- Basic Call Scenarios
- The ISDN Concept
- The ISDN User Part Functions
    - Operation, Including Message Sequences
    - Messages and Formats
    - Use of ISUP in Mobile Networks
    - Use of ISUP with Intelligent Networks
    - ISUP and DSS1

NON CIRCUIT-RELATED SIGNALLING - SCCP

- Non Circuit-Related Signalling – The Requirements
    - Signalling Connection Control Part - Routing Signalling Messages Across Networks
    - Transaction Capabilities Application Part - Controlling the Transaction
- The Signalling Connection Control Part (SCCP)
    - SCCP Architecture SCCP Functions
    - Services & Operation
    - Connection Oriented
    - Connectionless
    - Messages & Formats
    - Signalling Point Relay SCCP and Advanced Applications

NON CIRCUIT-RELATED SIGNALLING - TCAP

- The Transaction Capabilities Application Part (TCAP)
- TCAP Functions and Services
    - TCAP Architecture
- The Component Sub Layer (CSL)
- The Transaction Sub Layer (TSL)
- Operation
    - Components (Formats)
    - Transactions (Including Messages and Formats)
    - Example

SS7 IN USE – GSM & MAP

- Use of SS7 in modern networks
    - Interfaces and Connections
- Use in GSM based Networks
- The GSM / UMTS Architecture – Basic View
- Interfaces and Messages
- Basic GSM and UMTS Operation (Call Control, Mobility, and Service Support)
- The Mobile Application Part (MAP)
- The Use of SS7 in Support Of Mobile Networks
    - Example Procedures and the Use of SS7 Protocols—MAP, TCAP, SCCP, MTP

SS7 IN USE – INAP

- The Intelligent Network Concept
- The Standard IN Architecture
- The Intelligent Network Application Part (INAP) and Messages
- The Use of SS7 in Support Of Intelligent Networks
- Example Procedures and the Use of SS7 Protocols - INAP, TCAP, SCCP, and MTP

SS7 IN USE – CAP

- The Role of CAMEL
- The Modified Mobile Architecture - Incorporating CAMEL into GSM and UMTS
- The CAMEL Application Part (CAP) and Messages
- The Use of SS7 in Support Of Intelligent Networks
    - Example Procedures and the Use of SS7 Protocols -
- CAP, TCAP, SCCP, MTP
- ANNEX: CAP Procedures explored, including Pre-Paid Scenarios

COURSE CONTENTS

THE EVOLVING NETWORK – SS7 OVER IP

- Why use IP Protocols
- Evolving the Switch
- The Softswitch concept
- The All-IP Network
- The IP Multimedia Subsystem
- SS7 and IP – Requirements
- SS7 over IP Architecture
- SIP, and ISUP / SIP Conversion / SIP Bridging
- SS7 Transport Options
- SIGTRAN
- SCTP Explained
- Services Provided by MTP3 User Adaptation Layer (M3UA)
- SS7 and IP Example Configurations
- Bearer Control Protocol (BICC)
- Megaco and H.248
- IPBCP

SIGTRAN NETWORK – OPERATION AND DESIGN

- Overview of Control Plane Design
- SS7 over IP (SIGTRAN)
- Failover Procedures
- Recommended Site and Network Structure
- Recommended Redundancy Options
- IP Connectivity
- SIGTRAN Network Design Scenarios
- SIGTRAN Design with Different Network Indictors (NI)
- Communication Between IP-SEP and SS7-SEP
- Associated Signaling Modes
- Signaling Calculation Model
- Signaling link calculation
- Link Loads

BICC

- Architecture
  - Network Model
  - Protocol Model
- Supported Capabilities
- Message s and Formats
- Identities and Addresses
- Procedures
  - Outgoing set-up
  - Incoming set-up
- BICC Interworking—ISUP
  - Call set-up flows

DIAMETER PROTOCOL

- IPv4 / IPv6 Parameters
- The Diameter protocol
- Diameter Message Formats and Parameters
- Identities
- Commands and and Attribute Value Pairs
- Diameter routing
- Diameter in use
  - Authorization of Users and Services
  - Authentication of Users and Network
  - Session Control
  - Charging
- Example Messages
- Diameter in the PCC Architecture
- Diameter / TCP
- Diameter / SCTP
  - SCTP Operation
  - Security
  - Redundancy

OUR TRAINING SERVICES

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Our training programmes are delivered worldwide as part of the training and development plans of many operators, vendors, and service providers. The programmes cover a wide range of competency development requirements.

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Business training tailored to the telecoms industry, ranging from the intensive 5-day Telecoms Mini MBA to specialist leadership and marketing training.

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We would be happy to discuss extending accreditation to tailored ATMS or programmes based on our Distance Learning modules. Although accreditation is specific to these programmes, the work we do with the University of Derby enable us to develop and apply best practice across our portfolio.

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