



**SQUARETEK**

# **TRAINING CATALOG 2009**



## Signalling and intelligent network

### Advanced SS7 (8 days)

SRI01

- 📖 MTP : functional description of MTP 1, 2 et 3 layers, architecture and messages, data transfer, management procedures, SS7oATM, application exercises
- 📖 SCCP : functional description, architecture and messages, data transfer, management procedures, application exercises
- 📖 TCAP : functional description, architecture and messages, procedures, application exercise
- 📖 INAP : introduction to intelligent network, INAP operations
- 📖 ISUP : functional description, architecture, messages, signalling procedures, application exercise
- 📖 BICC : introduction, functional description, differences with ISUP
- 📖 SIGTRAN : introduction to SS7oIP, functional description of layers (architecture, messages and procedures)

prerequisite : none

who should attend? : engineers and technicians involved in operating and maintenance of PSTN, GSM and IN networks

### SS7 in new generation networks (3 days)

SRI02

- 📖 SS7 over ATM
- 📖 Introduction to ATM, functional description of MTP3-b, SSCF and SSCOP
- 📖 SS7 over IP : SIGTRAN functional description (architecture, messages and procedures)
- 📖 Introduction to UMTS signalling : UMTS architecture description and signalling protocols (RANAP, NBAP, ALCAP, ...)

prerequisite : knowledge in SS7, SRI01 course recommended

who should attend? : engineers and technicians involved in a 3G mobile project

### Intelligent network and its evolutions (5 days)

SRI03

- 📖 Principles : introduction, network architecture, service logic, the conceptual model, basic call process
- 📖 SS7 architecture as a support of the intelligent network : MTP2 and 3, SCCP, TCAP
- 📖 INAP
- 📖 Intelligent network evolutions :
  - \* from CS-1 to CS-2
  - \* Internet and intelligent network : SIP, PINT, SPIRITS
  - \* intelligent network for voice over IP and value-added services : Parlay, Jain, OSA
  - \* GSM and intelligent network : CAMEL from phase 1 to phase 3
- 📖 Number portability : implementation scenarios

prerequisite : basic knowledge in protocols and network architectures

who should attend? : engineers and technicians involved in operating and maintenance of PSTN, GSM and IN networks



## Signalling of mobile networks

### Signalling of GSM networks (8 days)

SRM01

- 📄 SS7 lower layers : MTP (functional description of MTP 1, 2 and 3, primitives and services, application exercise), SCCP (primitives, messages and parameters, scenarios, addressing and routing procedures)
- 📄 TCAP : architecture, services and primitives, messages and procedures, scenarios
- 📄 INAP : CS-1 architecture, service logic, the conceptual model, basic call process (BCSM), INAP architecture and its operations through scenarios, introduction to CS-2
- 📄 ISUP : signalling methods and procedures, basic call and supplementary services, procedures and messages, application exercise
- 📄 BSSAP : A interface, BSSMAP, BSSOMAP, DTAP, BSSAP evolutions : BSSAP+, BSSAP-LE for LBS services
- 📄 MAP : network entities and core network interfaces supporting MAP, required SS7 services, procedures and operations : common services, mobility management, call handling, supplementary services, SMS, PDP context, O&M
- 📄 CAMEL : services, CAMEL phases 1, 2 and 3 : functional architecture, basic call process (BCSM) and detection points, service scenarios, USSD and GPRS functionalities support

prerequisite : knowledge in GSM networks, IMB01 course recommended

who should attend? : engineers and technicians involved in operating and maintenance of GSM and IN networks

### Signalling of CDMA 2000 networks (5 days)

SRM02

- 📄 SS7 lower layers : MTP (functional description of MTP 1, 2 and 3 layers, primitives and services, application exercise), SCCP (primitives, messages and parameters, scenarios, addressing and routing procedures)
- 📄 TCAP : architecture, services and primitives, messages and procedures, scenarios
- 📄 L3 signalling in cdma2000 access network : architecture for cdma2000-1x, interfaces, evolution to cdma2000-evdo, signalling BSAP on A1/A1p interface : required MTP/SCCP services, procedures and messages through scenarios of call setup, supplementary services, SMS, handoff, location update and circuit management
- 📄 Core network signalling MAP ANSI-41 : messages and procedures. Scenarios of call handling, supplementary services, SMS, location update, inter-system handoff, fault recovery, OAM (circuit management, test and reset of resources)
- 📄 Wireless Intelligent Network : call and service logic, incoming call for phase 1, phase 2 prepaid services (outgoing call, SMS-MO, location update), phase 3 services : FAM (tracking MS), LBC (location-based charging), LBIS (other LBS services), ECR (enhanced call routing)

prerequisite : basic knowledge in CDMA2000 networks

who should attend? : engineers and technicians involved in operating and maintenance of CDMA2000-1x networks



## Tracing SS7 traffic (5 days)

SRM03

- 📄 Fundamentals in protocols, SS7 network architecture, MTP1, MTP2, MTP3 (routing, network management), SS7oATM
- 📄 SCCP : messages and formats, connection setup in connection and connectionless modes, network node management
- 📄 BSSAP : architecture, messages, call handling and handover scenarios, main parameters
- 📄 TCAP : architecture, class of service, TC components, transaction sublayer, primitives and components, parameters and formats, MAP/TCAP scenarios
- 📄 INAP : architecture, INAP operations, service examples, introduction to CAMEL
- 📄 ISUP : messages, main parameters, message coding, main parameter format, basic call handling procedures
- 📄 Testing methods : defining a test scenario using formal tools SDL, ASN.1, MSC charts, implementing a test scenario : monitoring, emulation, simulation with K12xx equipments

prerequisite : basic knowledge in protocols and communication networks

who should attend? : technical staff involved in network operating and maintenance

## High rate network transport technologies

### ATM (7 days)

THD01

- 📄 Introduction to ATM : ATM cell, ITU-T reference model, class of service, routing, control procedures
- 📄 Signalling : addressing, routing hierarchy and signalling
- 📄 ATM physical layer : interfaces (UNI, private UNI)

prerequisite : none

who should attend? : engineers and technicians involved in network engineering, operating and maintenance

### SDH (3 days)

THD02

- 📄 Layered model, SDH components and network topology
- 📄 Transport module and virtual containers
- 📄 PDH and ATM over SDH : multiplexing principle
- 📄 SDH hierarchy : pointers, reaching upper throughput levels
- 📄 Reliability techniques in SDH networks
- 📄 Synchronisation
- 📄 TMN over SDH
- 📄 Evolution : VCAT, LCAS, GFP and OTN

prerequisite : knowledge in plesiochronous digital hierarchy

who should attend? : engineers and technicians in transmission



## Engineering mobile networks

### GSM introduction (2 days)

IMB01

- 📄 Introduction : the European standard and the other norms, services, bearers
- 📄 Fundamentals of wireless mobile communications : radio propagation, the cellular concept, mobility-related procedures (location update, registration, handover, roaming)
- 📄 Network elements : functional description with emphasis on BSS
- 📄 From voice to radio interface : voice encoding, interleaving, modulation, burst formatting
- 📄 L3 protocols : RR/CC/MM, application parts (AP)

prerequisite : none

who should attend? : engineers and technicians involved in GSM network engineering, operating and maintenance

### GSM radio interface (3 days)

IMB02

- 📄 Fundamentals of radio propagation
- 📄 Logical channels
- 📄 Burst formats
- 📄 The transmission chain
- 📄 Signalling : SYSINFO messages
- 📄 Procedures on radio interface

prerequisite : knowledge in GSM networks, IMB01 course recommended

who should attend? : engineers and technicians involved in GSM engineering, operating and maintenance

### GSM dimensioning (2 days)

IMB03

- 📄 BTS and BSC dimensioning : basics, bts dimensioning, bsc dimensioning, exercises
- 📄 Signalling link dimensioning in NSS : dimensioning the MSC CPU, MSC-HLR, MSC-EIR, MSC-VMS, MSC-SMS and MSC-billing links

prerequisite : basic knowledge in GSM, IMB02 course recommended

who should attend? : engineering and technicians involved in GSM planning and engineering



## GSM optimisation (3 days)

IMB04

- 📖 Optimising the BSS : introduction to BSS parameters, optimising terrestrial links, radio procedures
- 📖 Introduction to monitoring and optimisation at OMC : monitoring, QoS parameters and their evaluation, capacity optimisation. Case studies

prerequisite : knowledge in GSM, IMB02 course recommended

who should attend? : engineers involved in traffic management, optimisation, QoS control in GSM networks

## GPRS introduction (3 days)

IMB05

- 📖 Introduction : evolution of GSM network phase 2+ for data transmission
- 📖 GPRS : principles, radio resource handling, QoS profile, network architecture and interfaces, functional architecture
- 📖 Protocols : user and control plan description
- 📖 The radio interface : physical channels, GSM/GPRS channel allocation, radio block, coding schemes, logical channels, GPRS multiframes
- 📖 Procedures : GPRS identifiers, service activation, MM states, packet data transmission, attach, PDP context activation and MO data transfer scenarios
- 📖 EGPRS : EDGE principles, modulation, channel coding, radio link supervision

prerequisite : basic knowledge in 2G mobile networks, IMB01 course recommended

who should attend? : staff involved in GPRS network operating and maintenance

## Advanced GPRS/EGPRS access network (5 days)

IMB06

- 📖 Introduction : architecture, interfaces, GPRS/E-GPRS protocol stack , QoS classes
- 📖 Air interface : logical channels, multiframe structure, GPRS-E-GPRS coding schemes, link adaptation, RLC/MAC and LLC layers, GMM/SM : states, procedures, main message parameters, SNDCP : functionalities, transmission modes, IP : functionalities and datagram, TCP and UDP : functionalities and header format
- 📖 EGPRS Abis interface : PCM physical characteristics, PCU frame, Abis dynamic allocation
- 📖 EGPRS Gb interface : physical aspects, addressing and FR link supervision, NS: addressing, control PDUs, BSSGP : addressing, BVC management, paging procedure, BSSGP PDUs
- 📖 GPRS/EGPRS signalling scenarios: attach/detach, authentication, uplink and downlink TBF, PS paging, PDP context activation/deactivation, location update

prerequisite : basic knowledge in GSM/GPRS, IMB05 course recommended

who should attend? : engineers and technicians involved in GPRS network engineering, operating and maintenance



## GPRS core network signalling (5 days)

IMB07

- 📄 Introduction : protocol stack, user and control plans
- 📄 GMM : role of GMM context, mobility states, registration, security and location update procedures, message parameters and formats
- 📄 PDP context : functionalities of session context, PDP states, context activation, modification and deactivation, formats of session management messages
- 📄 LLC : functional architecture, LLC frame, XID parameter negotiation, procedures, message format
- 📄 BSSGP : service model, primitives, addressing, procedures : data transfer, GMM support, circuit management over Gb, packet flow control on Gb, PDUs
- 📄 SNDCP : functionalities, data transfer in ACK and NACK modes, XID parameter negotiation, PDU format
- 📄 GTP : functions, GTP tunnels, procedures : route management, tunnel management, mobility management, data transfer, fault detection, GTP control and T-PDU message format
- 📄 BSSAP+ : states associating VLR-SGSN, Gs interface procedures, message format, location update, alert scenarios
- 📄 MAP : interfaces, required SS7 services, common services, TCAP utilization, specific MAP procedures, scenarios (security, context activation, SMS) and message format

prerequisite : basic knowledge in 2G mobile networks, IMB05 course recommended

who should attend? : technical staff involved in GPRS network operating and maintenance

## Going towards the third generation of mobile networks (4 days)

IMB08

- 📄 GPRS : architecture, procedures and messages on interfaces
- 📄 Introduction to EDGE : Air interface evolution, GERAN architecture
- 📄 Introduction to UMTS : architecture, services and protocol stack
- 📄 IP Multimedia Subsystem

prerequisite : knowledge in GSM, IMB01 course recommended

who should attend? : any person who needs an overview on migration from GSM to 3rd generation networks



## New generation networks and architectures

### Next Generation Networks (8 days)

RNG01

- 📄 Introduction to NGN : economical considerations, network architecture, protocols
- 📄 ATM : main principles, AAL, traffic management, routing, signalling, control procedures
- 📄 IP : main characteristics, addressing, ARP, ICMP, routing, IP over ATM, Ipv6
- 📄 MPLS : the model, MPLS network components, traffic engineering and QoS, label switching, RSVP, evolution towards GMPLS
- 📄 Emerging access technologies : voice over DSL, Metro Ethernet, WiFi, WiMax, optical infrastructure
- 📄 Other aspects : quality of service management, network management
- 📄 Voice and services over IP : basic principles, voice over IP in a corporate environment, voice specificities, H.323, SIP, H.248 / Megaco, SIGTRAN, IMS
- 📄 NGN services : OSA / Parlay model, web services, service examples, terminal evolution
- 📄 Migration strategies to NGN : scenarios, examples

prerequisite : basic knowledge in protocols and network architectures

who should attend? : any person involved in migrating networks to next generation

### Voice over IP (3 days)

RNG02

- 📄 Basics on IP telephony : corporate voice over IP, VoIP scenarios, challenges, required criteria for voice traffic, audio codecs
- 📄 H.323 : network entities, H.323 protocol stack, functionalities
- 📄 SIP : applications, network entities, operating in proxy and redirect modes, main messages and extensions, SDP, comparison with H.323
- 📄 H.248/Megaco : network architecture, terminating end and context notions, Megaco (main messages and descriptors), operation scenario
- 📄 Bearer Independent Call Control : functional architecture, protocol model, messages
- 📄 SIGTRAN : standardization, protocol model, network architecture, SCTP, M2xA, M3UA, SUA, evolution
- 📄 IP multimedia subsystem : features supported, identity management, functional architecture (CSCFs, BGCF, MGCF, SBCs, gateways with legacy, NASS, RACS), HSS, application servers, interworking with legacy services (CAMEL, ISUP/BICC), IMS call flows, SIP extensions for IMS, migration scenario

prerequisite : basic knowledge in packet switching technologies

who should attend? : any person involved in migrating networks to next generation



- 📄 Introduction: roadmap, IMS features, service model, identity management
- 📄 Functional architecture: application, control and transport planes; Call Session Control Functions, Multimedia Resource Functions, Breakout Gateway Control Function, Media Gateway Controller Function, gateways with legacy networks, interconnection scenarios, transport control subsystems (Network attachment, resource admission control), Home Subscriber Server and application servers
- 📄 Interworking with legacy services: interaction with CAMEL, interworking with ISUP/BICC
- 📄 IMS protocols: control -SIP, H.248, Diameter, and user data- RTP/RTCP
- 📄 IMS charging: online and offline charging, charging reference points, charging scenarios, charging-related information (IMS charging identifier, correlation with GPRS information)
- 📄 IMS message flows: IMS-to-IMS call, IMS-to-PSTN call, registration
- 📄 SIP extensions for IMS
- 📄 Steps from GSM towards IMS: IMS centralized services and CS IMS combinational services (combination of a CS call with IMS services)

prerequisite : basic knowledge in packet switching technologies

who should attend? : any person involved in migrating networks to next generation



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