Course ID
GSM-I
Course Duration
5 days

Course Title
GSM: Network Architecture, Operation, and Design

Related Courses

- Wireless Network Structure, Operation, and Technologies (WIRELESSNET, 3 days)
- Wireless Technologies: A Comparative Study (COMPARISON, 2-4 days)
- GSM: Optimization and Advanced Features (GSM-A, 2 days)
- iDEN™: Network Architecture, Operation, and Design (IDEN, 4 days)
- Direct Sequence Spread Spectrum Techniques and CDMA-based Technologies (CDMA, 2 days)
- cdmaOne/IS95(IS95, 2 days)
- UMTS-FDD: Network Architecture, Operation, and Design (UMTS-FDD, 3 days)
- UMTS-TDD: Network Architecture, Operation, and Design (UMTS-TDD, 2 days)
- HSDPA: Network Architecture, Operation, and Design (HSDPA, 2 days)
- 1xRTT: Network Architecture, Operation, and Design (1XRTT, 2 days)
- 1xEVDO: Network Architecture, Operation, and Design (EVDO, 2 days)

Aimed At

Those with some prior GSM experience who wish to study GSM in depth. The standard presentation of this course assumes a bachelor of science in Electrical Engineering, Mathematics, Physics, or a related subject along with an appropriate background in communications engineering.

Group Size

5-25

Prerequisites

- At least one year experience in the design of a wireless network using GSM, or our introductory course on GSM, GSM: A Technology Overview (GSM-B, 1 day)
- Knowledge of the wireless network structure and operation, RF propagation and fading issues, and link budget analysis.

Course In a Nutshell

The Global System for Mobile communications (GSM) is the world's dominant wireless technology. It's no exaggeration to state that all wireless technologies that have come since GSM have been impacted by it, at least in a conceptual way. How does GSM solve the multitude of problems that need to be solved to provide simultaneous services to a large number of mobiles over a large geographical area? This question, simply stated, forms the agenda of this intensive five-day course.

Upon course completion, you will be able to identify the components of a GSM network and the protocols that allow them to communicate with each other. You will be in a position to critically evaluate and compare solutions to specific problems within the rules set forth by GSM. While GSM is a complex system, rich in details, the course will allow you to understand the GSM structures and

articulate their interactions. This, in turn, will enable you to identify good design and optimization strategies as well as performance problems and solution approaches.

Customize It!

Customize this course to your specific needs at little-to-no additional cost. We offer distinct versions of this course tailored for audiences such as:

- Network design and optimization engineers
- Equipment or application designers
- Less technical audiences such as managers, executives, business planners, sales and marketing specialists, and operations and support personnel

Combine this course with its natural sequel, GSM: Optimization and Advanced Features (GSM-A, 2 days). Ask us about the "combo" discount.

Course Outline

- GSM Network Architecture and System Overview
  - GSM architecture: Original, current, and evolving
  - Key core network features of GSM, incuding Signaling System Number 7 (SS7)
  - GSM core network evolutionary path
  - Key aspects of GSM's air interface

- GSM TDMA Structures on the RF Carrier
  - Time slots and their structure within the frame
  - Frame structures and framing hierarchy: Frames, multiframes, superframes, and hyperframe
  - Physical channels and their properties
  - Uplink versus downlink timing alignment

- Logical Channels and Their Relationship to the RF Carriers and Resource Allocation/Logical Channel Optimization Issues
  - Broadcast Control Channel (BCCH)
  - Frequency Correction Channel (FCCH)
  - Synchronization Channel (SCH)
  - Common Control Channels (CCCH)
  - Stand-alone Dedicated Control Channel (SDCCH)
  - Traffic Channels (TCH), full rate, half rate, and other data-carrying traffic channels
  - Associated Control Channels (ACCH)

- Mapping of Logical Channels to Physical Channels, Burst Structures, and Optimization of Mapping Schemes
  - The 26-frame multiframe and its structure: Optimization options
  - The 51-frame multiframe and its structure: Optimization options
  - Burst structures, usage, and operation
    - Normal burst: Structure and usage
    - Frequency correction burst: Structure and usage

- Synchronization burst: Structure and usage
- Random access burst: Structure and usage
- Dummy burst: Structure and usage

- The End-to-End Digital Path: An Overview before the GSM Specifics Can Be Discussed
  - Overview of speech coding
  - Overview of error control coding, including error correction and error detection
  - Overview of modulation techniques, leading up to the GSM modulation technique

- GSM Speech Coding
  - Full rate vocoder
  - Enhanced full rate vocoder
  - Half rate vocoder
  - Adaptive, multirate codec and voice quality performance optimization

- GSM Error Control Coding
  - Voice traffic channel coding (error correction and error detection)
  - Data traffic channel coding options and optimization issues/limitations
  - Summary of strengths and weaknesses of the error control strategies used in GSM

- Gaussian, Minimum Shift Keying (GMSK): The Digital Modulation Scheme Used in GSM
  - Why not BPSK, or QPSK, or something similar
  - What's unique about GMSK and its properties
  - GMSK versus frequency correction burst

- Call Establishment Procedures and Algorithms
  - Idle mode procedures, including details, parameters, etc of the camping algorithm
  - Cell selection/reselection procedures and parameters, including C1 and C2
  - Random Access channel (RACH) procedures and parameters
  - Dedicated mode procedures, including measurements, BSIC identification, handovers, and system optimization considerations
  - SDCCH structures, parameters, and resource allocation optimization

- Layer 2 and Layer 3 Message Structures
  - Information Elements (IE) and their functionality
  - Layer 3 message structures and issues
  - Layer 3 to layer 2 interfaces
  - Layer 2 messages, associated structures, and mapping to layer 1

- Evolutionary Path of GSM
  - Overview and motivation for HSCSD
  - Overview and motivation for GPRS
  - Overview and motivation for EDGE
  - Overview and motivation for CAMEL
  - Overview and motivation for 3G/WCDMA/UMTS/UTRA

- Course Recap and Conclusions

How You Will Learn

- You will learn in interactive lecture format from an instructor who's among the most knowledgeable and dynamic in the industry.
- Along with lecture, we use exercises, puzzles, case studies, and interesting group activities to enrich the instruction and drive home the essential points.
- If you already know something about the technology, we will build on that. We'll compare and contrast what's familiar with what's new, making new ideas easier to learn as well as more relevant.
- If your background is less technical, we will use meaningful and ingenious examples and analogies to simplify the complex subject matter.
- The participant handbooks will provide you with a structure to which you can add the information and insight provided in real-time, turning it into a valuable reference resource you can take back to your job.

Revised *May 8, 2006*