

Course ID WIMAX-TECH Course Duration 3 days	Course Title WiMAX and Mobile WiMAX: An Advanced Tutorial Including 802.16e
Related Courses	 RF Propagation Models, Fading Characteristics, and Link Budget (RFPROP, 3 days) Wireless Technologies: A Comparative Study (COMPARISON, 2-4 days) GSM: Network Architecture, Operation, and Design (GSM-I, 5 days) GPRS: Network Architecture, Operation, and Design (GPRS, 3 days) EDGE: Network Architecture, Operation, and Design (EDGE, 2 days) iDEN[™]: Network Architecture, Operation, and Design (IDEN, 4 days) cdmaOne/IS95: Network Architecture, Operation, and Design (IS95, 2 days) 1xRTT: Network Architecture, Operation, and Design (IXRTT, 2 days) 1xEVDO: Network Architecture, Operation, and Design (EVDO, 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) 3G LTE/4G: The Next Generation Mobile Networks (3GLTE-4G, 2 days)
Aimed At	Are you an experienced engineer with background in a contemporary wireless technology such as GSM, cdmaOne, 1xRTT, or UMTS who needs a solid technical tutorial on WiMAX? If so, this course is for you.
Group Size	5-25
Prerequisites	 Wireless Network Structure, Operation, and Technologies (WIRELESSNET, 3 days) At least one year experience in the field of communication engineering, fixed or wireless telephony, IT, or related fields.
Course In a Nutshell	As 3G and 3xxG systems get deployed worldwide, the development of competitive technologies that promise additional capabilities and services at more attractive costs is also underway. WiMAX is a major contender in this arena. This course will help you build a solid understanding of the capabilities, strengths, and limitations of WiMAX, including Mobile WiMAX, as an alternative solution for broadband wireless services. Following a brief regulatory and historical perspective, we will focus on the two biggest challenges faced by the mobile communications channel and how they are addressed in representative technologies. We'll discuss the pros and cons of the various solution approaches to the issues presented by WiMAX. We'll also discuss the optional implementation of OFDMA in conjunction with CDMA and the benefits/challenges that it presents. This will pave the way for an intensive study of how WiMAX works and the details of its physical as well as MAC layers. We will conclude the course with a detailed



comparison of WIMAX vis-à-vis WiFi and the evolving 3G/4G technologies as well as some of the business issues related to the WiMAX deployment. In short, you will learn all important aspects of WiMAX in sufficient depth to allow you to make sound engineering judgments.

Customize It! We can customize this course to your job requirements, whether network design or optimization, technology evaluation or strategy, equipment or application design, marketing or sales, or operations support. While the standard presentation of this course assumes an engineering or other technical background, versions of this course aimed at less technical audiences are also available. We perform most course customization at no added cost.

Course Outline

- Overview of WiMAX and the IEEE 802.16 Standard
 - Regulatory environment and worldwide spectrum allocations
 - o Licensed versus unlicensed bands of operation
 - The IEEE 802 series of standards
 - Evolution of IEEE 802.16 to 802.16e
 - WiMAX network architecture and protocol stacks
- WiMAX versus WiFi: A Comparative Look
 - o 802.11 standards evolution
 - WiFi overview and air interface features
 - Features common to WiFi and WiMAX
 - WiFi versus WiMAX: Benefits and challenges
- If WiMAX Is the Solution, What Is the Problem?
 - Mobile communications channel's biggest challenge: fading and delay spread
 - How is fading dealt with in the TDMA systems?
 - The GSM paradigm
 - How is fading dealt with in the CDMA systems?
 - How does spreading/despreading affect fading?
 - Spreading/despreading in cdmaOne (IS-95)
 - Spreading/despreading in cdma2000
 - Spreading/despreading in UMTS
 - A different approach to solving the problem
 - Orthogonal Frequency Division Multiplexing (OFDM)
 - OFDM as a multiple access technique: Orthogonal Frequency Division Multiple Access (OFDMA)
 - WiMAX and OFDMA
 - OFDM in conjunction with CDMA: Best of both worlds
 - Second biggest challenge: Propagation and associated attenuation
 - Fundamentals of link budget analysis and propagation modeling
 - Impact on network planning and design
 - Capacity considerations vis-à-vis network planning/design
- WiMAX/IEEE 802.16 Physical Layer



- o OFDMA frame structure
- OFDMA subcarrier allocations
- OFDMA ranging and handover
- Transmit diversity, space-time coding, and multiple-input-multipleoutput (MIMO) operation
- Channel coding
 - Convolutional codes
 - Turbo codes
 - Low Density Parity Check (LDPC) codes
- o Adaptive modulation schemes and link adaptation
- Hybrid ARQ (HARQ) and Incremental Redundancy (IR)
- Power control mechanisms
- WiMAX/IEEE 802.16 MAC Layer
 - MAC structure and MAC PDU formats
 - o MAC scheduling
 - o Network entry and initialization
 - o Idle mode processes
 - Cell selection
 - Paging structures
 - Location area updates
 - QoS service classes
 - Sleep mode processes
 - MAC layer handover procedures
 - o MAC multicast and broadcast services
- WiMAX/IEEE 802.16e: An Overview of the Mobile WiMAX System
- WiMAX/IEEE 802.16e: The Physical Layer
 - Reviewing the OFDMA basics
 - o OFDMA symbol structure and sub-channelization
 - o Scalable OFDMA
 - TDD frame structure
- WiMAX/IEEE 802.16e: The MAC Layer
 - QoS support
 - MAC scheduler
 - o Mobility management
 - Power management
 - Handoff
 - o Security
- Advanced Features of Mobile WiMAX
 - Smart antenna technologies
 - Fractional frequency reuse
 - Multicast and broadcast service
- Mobile WiMAX System Performance Evaluation
- Mobile WiMAX System Parameters



- Mobile WiMAX Link Budget
- WiMAX End-to-End Network Architecture
- Business Issues and Considerations
 - Mobile WiMAX applications
 - Mobile WiMAX spectrum considerations
 - Roadmap for WiMAX products
- Mobile WiMAX versus 3G: A Comparative Look
- Evolution to 3G Systems and Beyond
 - Overview of 1xEVDO
 - o Overview of HSDPA/HSUPA
 - o 3G LTE, 4G
- Comparing Mobile WiMAX, 1xEVDO, and HSPA
 - Common features
 - Adaptive modulation and coding
 - Hybrid ARQ
 - Fast scheduling
 - Bandwidth efficient handoff
 - o Advantages of Mobile WiMAX
 - Tolerance to multipath and self-interference
 - Scalable channel bandwidth
 - Orthogonal uplink multiple access
 - Spectral efficient TDD
 - Frequency selective scheduling
 - Fractional frequency reuse
 - QoS
 - Advanced antenna technology
- Wrap-up: Course Recap, Q/A, and Evaluations

How You Will Learn

- We will teach this course in interactive lecture format, with plenty of opportunities for discussion of your specific issues.
- You will be taught by someone who combines excellent teaching skills with expertise in WiMAX, 3G, CDMA, OFDM, and other wireless technologies.
- Along with lecture, we will use exercises and other activities to add practicality and enrichment to the class.
- If you already know something about WiMAX or other wireless technologies, we will build on that to make the new material easier to master as well as more job relevant.
- If you are a nontechnical professional, we will rely on appropriate examples and analogies to make the subject easier to follow and understand.

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