Course ID
WIMAX-C3DC
Course Duration
3 days

Course Title
WIMAX: A Comprehensive Three Day Course

Related Courses

- Principles of OFDM and MIMO (OM, 3 days)
- WiMAX and Mobile WiMAX: An Advanced Tutorial Including 802.16e (WIMAX-TECH, 3 days)
- WiMAX/Mobile WiMAX (802.16/16e) Radio Planning and Optimization: A Comprehensive Workshop (WIMAX5D, 5 days)
- LTE: Technology, Business, and Competitive Landscape (LTE-BIZ, 2 days)
- LTE: A Comprehensive Tutorial (LTE-CT, 3 days)
- LTE: A Comprehensive Three Day Course (LTE-C3DC)

Aimed At

This course is aimed at technical professionals who are familiar with 2G, 3G, and/or other 4G (such as LTE) wireless technologies and desire a comprehensive overview of the WIMAX technology.

Group Size

5-25

Prerequisites

Familiarity with 2G/3G technologies or LTE.

Course in a Nutshell

The course begins with a review of the 3G cellular systems, modulation techniques, RF propagation channel modeling issues, performance improvement techniques, and multipath mitigation methods. This is followed by a detailed discussion of the principle of OFDM, IEEE 802.16 physical layer, and WiMAX signaling. The course concludes with a study of the network architecture, mobility use cases, system performance issues, and a link budget example.

Customize It!

We can customize this course to suit the needs of audiences such as hardware designers, application developers, service designers, sales engineers, marketing/sales personnel, radio planners, and persons involved in defense and homeland security applications relating to WiMAX.

Course Outline

- **Overview of 3G Cellular Systems**
  - CDMA2000, WCDMA, HSPA, 1xEV-DV
  - Migration paths (key influencing factors)
  - Network architecture overview
  - Available theoretical data rates
- **Review of Modulation Schemes**
  - Complex envelope representation of signals and sub-systems

- BPSK, QPSK, 16-QAM, 64-QAM
- Modulation scheme migration path
- BER performance comparison
- Discussion of the impact on Tx and Rx implementations
- SNR and Eb/No definitions

- **Propagation Channel Modeling**
  - AWGN
  - Rayleigh/Ricean fading (mechanisms governing this phenomenon)
  - Delay spread and concept of frequency selectivity (indoors vs. outdoors)
  - Lognormal fading
  - Path loss models
  - Measured path loss comparisons (indoors vs. outdoors)
- **Performance Improvement Methods**
  - FEC (convolutional, turbo, LDPC) codes
  - Encoding principles (block processing, trellis, etc.)
  - Decoding principles (Viterbi Algorithm, MAP, etc.)
  - Receive antenna diversity (switched, MRC and optimal combining)
  - Transmit Antenna diversity (STBC, TxAA, MIMO)
- **Multipath Mitigation**
  - Presentation how different standards resolve multipath
  - TDMA vs. CDMA vs. OFDMA solutions
  - Discussion of throughput vs. data rate
- **OFDM Principles**
  - Transmission and modulation (sub-carrier, IFFT, S/P, etc.)
  - Sub-carrier discussion
  - Reception and demodulation (FFT, P/S, etc.)
  - Purpose of the Cyclic Prefix (CP)
  - Comparison to 3GPP LTE (uplink and downlink)
  - Signal processing discussion
  - OFDM receiver (channel estimation, etc.)
  - MIMO (channel capacity, MAP decisions, MMSE equalization, etc.)
- **IEEE 802.16 Physical Layer**
  - HARQ (comparisons to HSDPA and LTE)
  - Discussion of the uplink channels
  - Adaptive modulation and coding
  - TDD and FDD principles (benefits of both will be discussed)
  - Discussion of the downlink channels
  - Bandwidth tradeoff s and Options
- **WiMax Signaling Discussions**
  - Layer 1, Layer 2 and Layer 3 overview
  - Higher layer signaling
  - MAC functionality
  - Security architecture (authentication, integrity, etc.)
- **System Analysis**

- Network architecture
- Mobility use cases (handoffs, idle mode, etc.)
- System performance
- Operating frequency bands available
- Link budget examples (discussion of important parameters to optimize)

- **Wrap-up: Course Recap and Discussion**

How You Will Learn

- A highly qualified engineer/instructor, well-versed in a number of 4G and 3G wireless technologies, will present this course in an interactive lecture format.
- Along with the lecture, we will employ discussion, group activities, and case studies to help you understand the major points.
- If you already know something about 3G/4G technologies, we will build on that knowledge base. We'll compare and contrast what's already known to you with what's new, making the new material easier to learn.
- If your background is less technical, we will use appropriate examples and analogies to convey the complex subject matter in understandable terms.
- You will receive a printed Participant Handbook which will help you remember and retain what you learned in class and use it on the job.

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