Course ID
TRAFFIC3G
Course Duration
3 days

Course Title
Traffic Engineering Models for 3G Network Design

Related Courses

- Traffic Engineering for Voice and Data Networks (TELETRAF, 2-3 days)
- Wireless Technologies: A Comparative Study (COMPARISON, 2-4 days)
- 1xRTT: Network Architecture, Operation, and Design (1XRTT, 2 days)
- 1xEVDO: Network Architecture, Operation, and Design (EVDO, 3 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)
- HSUPA: Network Architecture, Operation, and Design (HSUPA, 2 days)
- HSDPA: An Advanced Tutorial (HSDPA-ADV, 2 days)
- 3G LTE/4G: The Next Generation Mobile Networks (3GLTE-4G, 2 days)
- Multimedia Applications: IMS, SIP, and VoIP (MULTIMEDIA, 2 days)
- IMS: The Technology, Applications, and Challenges (IMS, 2 days)
- VoIP: Protocols, Design, and Implementation (VOIP, 2-3 days)
- MPLS: Integrated Routing with End-to-End QoS for the Next Generation Networks (MPLS, 2-3 days)
- Mobile IP: An Intensive Tutorial (MOIP, 2 days)
- IP-Based Systems: TCP/IP and Mobile IP (IPSYS, 2-3 days)
- Internetworking with TCP/IP Version 6 (IPV6, 2-3 days)

Aimed At

Those responsible for planning, design, engineering, deployment, business strategy, marketing, and service creation for 3G wireless systems.

Group Size

5-25

Prerequisites

- Traffic Engineering Models for Network Design (TRAFFIC, 3 days)

Prior understanding of the classical traffic engineering techniques which may be acquired by taking the above course, or exposure to probability and statistics, will be helpful. While the standard presentation of the course assumes an Electrical Engineering/Communications background, the presentation style can be modified to suit a different audience as needed.

Course in a Nutshell

Mobile networks are rapidly evolving to a mixed usage model where data will become increasingly more prevalent in the mix of traffic demanded by consumers. With technologies such as 3G, 4G and IMS, and lower costs per unit of capacity for voice traffic, wireless carriers will continue to deploy more sophisticated networks to allow for the seamless interaction between voice and data services, managed by policy-aware networks and technologies.

The understanding of the mix of traffic, how to predict capacity requirements, impact to network policies, spectrum utilization and performance, buffers, quality of service and impacts of and to mobility management will be key principles in unlocking the potential of a 3G/4G and IMS enabled network. This course is an in-depth study of these and related 3G traffic engineering issues.

Customize It!

Let us know your job focus, whether traffic management, capacity planning, quality of service, services design, technology migration strategy, business or growth planning, capital budgeting, or other. We can tailor this course to your needs at little to no extra cost.

If you are a marketer or designer of value added services, we can focus on the types of new services that are enabled by IMS, and how to develop predictive models for margin per application relative to network usage.

We can also customize this course to audiences with network or RF engineering, IT, operations and support, or other orientation.

Learn How To

- Model and predict the impact of network capacity requirements to varying applications and diffusion curves
- List the key differences and impacts to capacity of fractional frequency reuse systems versus Code Division Multiple Access (CDMA/WCDMA) systems and how those differences will impact traffic engineering
- Describe the major components of the mobile network architecture, including signaling, and how they work together
- Describe how different services place different demands on the network and affect the utilization of resources

Course Outline

- Introduction
  - Overview of probabilistic systems
  - Overview of stochastic systems
  - Overview of Monte Carlo simulation
  - Arriving at a deterministic function based on probability
  - Impact to rate of change based on multi-variant inputs

- Telecommunications Traffic
  - Overview of traffic simulation
  - Use of Monte Carlo simulation for telecommunications
  - Cost based routing systems
  - Telecommunications services types and traffic generation
  - Voice call profiles
  - Data call profiles
  - Composite services, combinations and permutations
  - Accounting for static capacity
  - Accounting for impact of mobility to available capacity by services type
- Accounting for Capacity
  - Services and traffic types
  - Diffusion curves and variability of demand
  - Impact to capacity based on services type
  - Quality of service requirements
  - Class of service capabilities in 3G systems
  - Single variable, static dimensioning of capacity
  - Multivariable dimensioning of capacity
  - Impact to capacity driven by mobility for CDMA/WCDMA systems
  - Review of LTE specifications
  - Predictions to the impact of services based QoS to radio network performance and operation
- Modeling
  - Building a traffic simulator
  - Defining probabilities
  - Weighting applications and services
  - Combinations and permutations of various demand profiles
  - Cumulative distribution functions
  - Probability distribution functions
  - Model tuning based on latency
  - Model tuning based on buffer capacity
  - Model tuning based on QoS requirements per application
  - Model tuning based on application weighting
  - Application and use of the Central Limit Theorem to results
  - Applying confidence intervals to results
  - Analyzing results
    - Applying results to radio network capacity planning and engineering
    - Predicting quality of service, coverage holes, and inter/intra Node B load balancing
- Architectural Impacts
  - Review of 3G mobile network
  - Review of IMS based mobile network
  - Discussion of composite services and SCIM functionality in IMS based networks

- Services demand and application loading on a 3G mobile network
- Sensitivity of user profile/demand profile to overall architecture
  - Impact to GGSN/PDSN
  - Impact to IPGW
  - Impact to P-CSCF/I-CSCF
  - Impact to and sizing of Edge routers
  - Impact to back haul
  - Optimization techniques
- Dimensional trade-offs, capacity versus mobility versus probability of time slot availability in 2G, 2.5G, and 3G systems

- Workshops
  - Generation of service demand
  - Calculation of traffic requirements
  - Busy hour dimensioning
  - Monte Carlo simulation
  - Understanding impact to and sensitivity of services model to network dimensioning and quality of service
  - Accounting for mobility per application
  - Scheduling
  - Buffering
  - Latency
  - Quality of Service
  - Further network optimization techniques
  - Further quality of service enhancements

- Wrap-up: Course Recap, Q/A, and Evaluations

How You Will Learn

- A seasoned telecommunications expert/instructor will present this course as an interactive tutorial.
- Along with lecture and interactive activities, we will employ exercises and case studies to help make the content more understandable and practical.
- If you already know something about 3G technologies and traffic engineering, we will build on that, making new ideas easier to learn as well as more job relevant.
- If your background is less technical, we will use meaningful and ingenious examples to aid understanding and application of the technical content.
- You will receive a printed participant book that will help you remember and retain what you learned in class and apply it on your job.

Revised *Apr. 11, 2007*