

Course ID
TRAFFIC
Course Duration
3 days

Course Title
TRAFFIC: Traffic Engineering Models for Network Design

Related Courses

- Traffic Engineering Models for 3G Network Design (TRAFFIC3G, 2 days)
- Traffic Engineering for Voice and Data Networks (TELETRAF, 2-3 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)
- EGPRS Engineering: Designing and Optimizing a GPRS/EGPRS Network (EGPRS, 2 days)
- iDEN™: Network Architecture, Operation, and Design (IDEN, 4 days)
- cdmaOne/IS95 (IS95, 2 days)
- 1xRTT: Network Architecture, Operation, and Design (1XRTT, 2 days)
- UMTS-FDD: Network Architecture, Operation, and Design (UMTS-FDD, 3 days)
- HSDPA: Network Architecture, Operation, and Design (HSDPA, 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

If you are involved with telecommunications planning, design, optimization, traffic engineering, deployment, business strategy, marketing, or services creation and can benefit from an intensive tutorial on traffic engineering, this course can help provide that.

Group Size

5-25

Prerequisites

While there are no specific course prerequisites, prior exposure to telecommunications traffic issues and some background in probability and statistics will be helpful.

Course in a Nutshell

Good traffic engineering is not only an essential element of a network's initial design but also critical to its smooth, ongoing operation. The job of the engineer responsible for traffic on a mobile network has recently become more important as well as more complex. Traffic is growing faster on mobile networks than on traditional, land line, fixed infrastructure networks. This growth in mobility traffic is paralleled by the increasing growth and diversity of mobility based data applications and services along with a continuously changing subscribers' services profile. And, of course, any analysis of traffic over radio channels must also account for the radio related impacts to capacity which can be dynamic in nature.

In this course, you will study traffic engineering from multiple angles including an overview of the various RF modulation techniques popular in commercial networks today, and how those modulation techniques impact available capacity. Emphasis is placed on understanding the correct methodology to use for a particular service and achieving the highest level of utilization and efficiency without sacrificing the quality of service. The course will not only arm you with a good understanding of when to employ the appropriate Erlang or other traffic model, it will also give you a new level of sophistication in ensuring the quality of service (QoS) for your subscribers while maximizing the utility of our network .

Customize It!

For little to no added cost, we can tailor this course to the topics and challenges that are pertinent to your job. For instance:

- *If you are a network engineer with a mobile or fixed wireless operator, we can focus on the areas of interest to you, whether planning, growth, capital budgeting, operations, or other.*
- *If you are you an RF engineer who would like to "fill in the holes" in your knowledge of networks, we can present an overview of the state-of-the-art of mobility networks and how traffic engineering plays a key role in the evolution towards policy based networks.*
- *If you are in marketing and interested in value-added services, we can highlight the types of new services that are enabled by 2.5G and 3G and how capacity and quality-of-service (QoS) tradeoffs become key in developing a marketing and applications strategy.*
- *If you are a manager or executive concerned with technology and migration strategy, we can emphasize the economic impact of the evolving technologies as related to traffic and capacity management.*

Learn How To

- Effectively apply Erlang B, Extended Erlang B, and Erlang C to the solution of mobile traffic engineering problems.
- List the key differences and impacts to capacity of fractional frequency reuse systems versus CDMA or WCDMA systems and how those differences affect traffic engineering.
- Describe the major components of the mobile network architecture, including signaling, and how they work together.

- Describe how different services place different impacts on the network and utilization of resources.

Course Outline

- Getting Started: Apparatus and Issues of Traffic Engineering
 - Overview of probabilistic systems
 - Overview of stochastic systems
 - Telecommunications services types and traffic generation
 - Voice call profiles
 - Data call profiles
 - Accounting for static capacity
 - Accounting for mobility
- Models and Techniques of Traffic Engineering
 - Traffic information, sources of data
 - Analysis of data
 - Calculation of Erlang B
 - Use of Erlang B
 - Calculation of Extended Erlang B
 - Use of Extended Erlang B
 - Use of Extended Erlang B in radio resource sharing
 - Calculation of Erlang C
 - Use of Erlang C
 - Use of Erlang C in data services
 - Static dimensioning
- Mobility Overview
 - Mobile network overview
 - BTS/Node B
 - BSC/RNC
 - Switching
 - Signalling
 - Mobility call flows
 - Resource allocation
 - Set up and tear down
 - Synchronicity
 - Codecs used and accounting for codec variability
 - Transcoder free operations (TrFO) and impact to capacity engineering
 - Remote Transcoder Operation (RTO) and impact to capacity engineering
- Mobility Traffic Engineering for GSM
 - Mobility for GSM systems
 - Predicting mobility requirements
 - Accounting for mobility impact in GSM systems
 - Impact of capacity in GSM systems
 - Advanced capacity management techniques in GSM systems

- Radio network load balancing
 - BSC load balancing
 - Propagation delay budgets
 - Codecs used throughout GSM systems
 - 2.5G data on GSM systems
 - Timeslot allocation between voice and data
 - Timers for BTS hand over
 - Timers for inter-BSC hand over
 - Timers for inter-MSC hand over
 - Dimensional trade-offs, capacity versus mobility versus probability of time slot availability
- Mobility Traffic Engineering for CDMA/WCDMA systems
 - Accounting for mobility impact in CDMA/WCDMA systems
 - Impact of capacity in CDMA/WCDMA systems
 - Impact of traffic to capacity in CDMA/WCDMA systems
 - Impact of interference to capacity and performance
 - Radio network load balancing
 - BSC/RNC load balancing
 - Soft hand offs
 - Hard hand offs
 - Soft hand off boundaries
 - Timers for BSC hand over
 - Timers for BSC/RNC hand over
 - Timers for inter-MSC hand over
 - Impact of 1xRTT data to CDMA2000 systems
 - Impact of data on UMTS systems
 - Impact of HSDPA data on W-CDMA systems
 - Call handover procedure between GSM and UMTS systems
 - Load balancing between GSM/UMTS systems
- Workshops
 - Generation of service demand
 - Calculation of traffic requirements
 - Busy hour dimensioning
 - Use of Erlang tables
 - Applicability of Erlang tables to services mix
 - Resource sharing
 - Load balancing
 - Network optimization techniques
- Advanced Traffic Topics and Course Wrap-up
 - Quality of service in 3G networks
 - Services requirements for quality of services
 - Quality of service methods and techniques in 3G
 - Predicting impacts of 3G data applications to resource utilization
 - Predicting impacts of 3G data applications to availability capacity
 - Scheduling and buffering

- Synchronization
- Q/A and Evaluations

How You Will Learn

- You will be taught by a seasoned instructor with subject matter expertise in traffic, voice/data networks, mobility, and services.
- The course will be presented lecture/practice style with plenty of interaction, activities, and exercises.
- If you already know something about the topic, whether from the RF, network, or some other angle, we will build on that. This will make the new material both easier to learn and more job relevant.
- If your background is less technical, we will rely on appropriate examples and analogies instead of the mathematics to make the important points.
- The course includes a printed participant handbook which will serve as a refresher and a reference following the class.

Revised

Apr. 10, 2007