HSDPA Fundamentals

High Speed Downlink Packet Access (HSDPA) is a packet-based data service in W-CDMA downlink with data transmission up to 8-10 Mbps (and 20 Mbps for MIMO systems) over a 5MHz bandwidth in WCDMA downlink. HSDPA implementations includes Adaptive Modulation and Coding (AMC), Multiple-Input Multiple-Output (MIMO), Hybrid Automatic Request (HARQ), fast cell search, and advanced receiver design.

HSDPA is based on W-CDMA evolution and is standardized as an element of the 3GPP Release 5 WCDMA specification, and is in fact the key new feature in this latest release. It is a backward-compatible extension of the basic UMTS Rel'99 specifications that supports voice, mixed voice/data and real-time services, all on a single carrier. It is designed to provide impressive benefits over the basic UMTS standard:

- Up to three times the spectral efficiency
- Triple the data throughput, on average
- 8 Mbps improvement in peak data rates (10 vs. 2 Mbps)
- Fewer end-to-end delays

Who Should Attend

This course is designed to provide a general overview for strategic or technical managers, consultants, communications professionals, software engineers, system engineers, network professionals, marketing and sales professional, IT professionals, and others who plan on using, evaluating or working with UMTS and HSDPA networks, applications and services

Objectives

This course provides you with a comprehensive business and technical foundation in HSDPA migration paths, services and applications development. It offers an overview of the High Speed Downlink Packet Access (HSDPA) technology. HSDPA enhances the packet data services provided in W-CDMA (UMTS) by increasing the data throughput and reducing unwanted delays and it allows carriers to increase downlink throughput over W-CDMA links

Outline

Introduction

- UMTS network architecture
- Core network architecture model
- Radio network components (RNC, Node B)
- UMTS Interfaces and protocols
- Evolution from W-CDMA to HSDPA

HSDPA principals

- The capacity, quality and cost/performance advantages of HSDPA
- HSDPA important new technological
- HSDPA's distributed architecture
- Low delay link adaptation
- Fast physical layer (L1) retransmission
- Combining and link adaptation techniques
- Scheduling for the downlink packet data operation at the base station
- Higher-order modulation
- HSDPA Performance
- Significant performance improvements
- Achieving higher theoretical peak rates
- QPSK modulation and 16-QAM

Key HSDPA Technologies

- Adaptive modulation and coding (AMC)
- Fast Scheduling
- Hybrid automatic repeat request (HARQ)
- Fast PHY Re-Transmissions
- Channel Quality Feedback
- High-Speed Downlink Shared Channel (HS-DSCH)

High-speed downlink shared channel (HS-DSCH)

- Basic structure of HS-DSCH
- Protocol structure
- Basic physical structure
- HS-DSCH Characteristics
- DL HS-DSCH Physical layer model
- FDD Downlink Physical layer Model
- TDD Downlink Physical layer model
- UL Physical layer model
- HS-DSCH physical-layer structure in the code domain

MAC architecture

- HS-DSCH MAC architecture – UE side
- Overall architecture
- Details of MAC-d
- Details of MAC-c/sh
- Details of MAC-hs

- HS-DSCH MAC architecture – UTRAN side
- Details of MAC-c/sh
- Details of MAC-hs

HARQ protocols

- Signalling
- Uplink and Downlink
- Error handling
- Signaling parameters
- Downlink signaling parameters
- UE identification
- Transport Block Sizes
- Channelization codes
- HS-PDSCH configuration
- HARQ information
- Measurement feedback rate
- HS-PDSCH power offset
- HS-SCCH Cyclic Sequence Number (HCSN)
- Uplink signaling parameters
- Measurement report

High Speed Downlink Packet Access: Iub/Iur protocol

- Impacts on Iub Interface - General Aspects
- Impacts on Iub/Iur Control Plane Protocols
- HSDPA Signaling Requirements (Comparison between DSCH and HS-DSCH)
- Impacts on NBAP Procedures
- Example of HS-DSCH Configuration and Capacity Allocation
- Examples of HS-DSCH Mobility Procedures
- Impacts on Iub Interface User Plane Protocols
- Transport Bearer Options
- QoS Aspects
- Security Aspects
- TDD versus FDD Aspects
- Backwards Compatibility

Mobility procedures

- Serving HS-DSCH cell change
- Serving HS-DSCH cell change mechanisms

- Intra-Node B synchronized serving HS-DSCH cell change
- Inter-Node B synchronized serving HS-DSCH cell change during hard handover
- Inter-Node B synchronies serving HS-DSCH cell change after active set update (radio link addition)
- Resource management