HSUPA Fundamentals

HSUPA (High Speed Uplink Packet Access) is a packet-based data service in W-CDMA uplink. HSDPA (High Speed Downlink Packet Access) and HSUPA (High Speed Uplink Packet Access) offer breakthrough data speeds, theoretically up to 14.4 Mbps in downlink and up to 5.8 Mbps in uplink respectively.

HSUPA (High Speed Uplink Packet Access) extends the uplink capability, providing peak uplink data rates of 5.76Mbps (up from typically 384kbps maximum in today's networks) and reduced data latency.

Who Should Attend

Radio design engineers, 3G applications developers, radio network planners, system architect and designer, programmers, system engineers, and technical managers.

Objectives

HSUPA fundamentals training course provides you with a comprehensive technical foundation in HSUPA analysis, design, implementation and testing (RF and MAC layers applied to mobile device, Node B (BS) and RNC)

Outline

INTRODUCTION

- UMTS Network Architecture Model
- Network components (RNC, Node B)
- Air Interface and UTRAN Enhancements
- Why Enhanced Uplink in UMTS
- Capabilities and challenges of HSUPA and Rel 6

DCH Setup Mechanisms

- Uplink/Downlink Synchronization
- Transport Format Combination Selection in the UE
- RNC controlled scheduling: DRAC and TFCS Restriction

What is HSUPA (High Speed Uplink Packet Access)?

- Adaptive Modulation and Coding
- Fast scheduling function at Node B
- Incremental redundancy Ã¢â‚¬â€œ Hybrid ARQ
- Node B Resource managements
- Enhanced Uplink for UTRA FDD

- HSUPA Network Architecture
- HSUPA Impact to UTRAN Protocols
- HSUPA Physical Layer
- HSUPA Performance
- HSUPA Data rates and Capacity
- HSUDPA Network Dimensioning
- Overview of HSUPA Layer 3 Signaling and Messages

Overview of Techniques Considered to Support Enhanced Uplink

- Scheduling
- NodeB controlled scheduling, AMC
- Node B Controlled Rate Scheduling by Fast TFCS Restriction Control
- Method for Node B Controlled Time and Rate Scheduling
- Scheduling in Soft Handover
- Node B Controlled Rate Scheduling by Persistence Control
- Brief Overview of Different Scheduling Strategies
- Hybrid ARQ
- Transport Channel Processing
- Associated Signaling
- Operation in Soft Handover
- Fast DCH Setup Mechanisms
- Reducing Uplink/Downlink Synchronization Time
- Shorter Frame Size for Improved QoS
- Signaling to support the enhancements
- Miscellaneous enhancements
- Support for enhanced channel estimation

Physical Layer Structure Alternatives for Enhanced Uplink DCH

- Enhanced Uplink Dedicated Channel (E-DCH) and Enhanced DPCCH
- Downlink Grant Channels and HARQ Channel
- Fractional DL DPCCH Relationship to existing transport channels
- TTI length vs. HARQ physical channel structure
- Multiplexing alternatives in general
- Multiplexing alternatives in detail
- E-DCH timing

Overall Architecture of Enhanced Uplink DCH

- Protocol architecture

- Transport channel attributes
- Basic physical structure
- UL Physical layer model
- DL Physical layer model

HSUPA MAC Architecture

- General Principle
- MAC multiplexing
- Reordering entity
- MAC architecture Ã¢â‚¬â€œ UE side
- MAC architecture Ã¢â‚¬â€œ UTRAN side
- Overall architecture
- Details of MAC-d
- Details of MAC-c/sh
- Details of MAC-hs
- Details of MAC-es
- Details of MAC-e

HARQ Protocol

- General Principle
- Error handling
- Uplink Signalling
- Downlink Signalling

Node B controlled scheduling

- General Principle
- UE scheduling operation
- Uplink Signalling
- Downlink Signalling

QoS Control

- TFC and E-TFC selection
- Setting of Power offset attributes of MAC-d flows

Signalling Parameters

- Uplink signalling parameters
- Transport block size
- Downlink signalling parameters

Evaluation of Techniques for Enhanced Uplink

- Scheduling: NodeB controlled scheduling, AMC
- Complexity Evaluation: UE and RNS impacts
- Downlink Signaling
- Uplink Signaling
- Hybrid ARQ
- Performance Evaluation
- Complexity Evaluation
- Fast DCH Setup Mechanisms
- Complexity Evaluation: UE and RNS impacts
- Shorter Frame Size for Improved QoS
- Compatibility of the enhancements with existing releases
- Compatibility at the edge of coverage
- Legacy UE
- Link budget
- DL capacity
- Design re-use

Impacts to the Radio Interface Protocol Architecture

- HSUPA Protocol Model
- New MAC functionality
- Introduction of an enhanced uplink dedicated transport channel (E-DCH)
- HARQ functionality
- Reordering entity
- TFC selection
- RLC
- RRC
- Impacts to Iub/Iur Protocols
- Impacts on Iub/Iur Application Protocols
- Impacts on Frame Protocol over Iub/Iur
- Mobility procedures
- Mobility and Power Control
- Mobility and Handover enhancements
- Power control strategy for E-DCH

HSUPA Operations

- End-to-End Call Scenario
- Packet data call setup using HSDPA and HSUPA channels
- UE capabilities and E-DCH assignment

- Uplink grant operations of Node B
- Adaptive coding and modulation
- Hybrid ARQ at Node B

Multimedia Broadcast Multicast Service (MBMS)

- MBMS system architecture
- MBMS operations