TSG-C Overview

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Outline

- 3GPP2 TSG-C
- Specifications
  - Key features in Revision C
  - Key features in Revision D
  - Key features in HRPD (1xEV-DO) Revision A
- Service related specifications
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cdma2000 Layering and Documents

- **C.S0005-x** - Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems
- **C.S0004-x** - Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems
- **C.S0002-x** - Physical Layer Standard for cdma2000 Spread Spectrum Systems
- **C.S0001-x** - Introduction to cdma2000 Spread Spectrum Systems
- **C.S0006-x** - Analog Signaling Standard for cdma2000 Spread Spectrum Systems

-x denotes revision, e.g., 0, A, B,..
Major Enhancements in cdma2000 1x Revision C

• Support of 1x EV-DV Forward Packet Channel (F-PDCH)
  – Fundamentally new mode of operation
  – Shared channel with a peak data rate of 3.1 Mbps

• Changes specific to Layer 3
  – Dynamic T_TDROP
  – Enhanced Authentication (AKA, Message Integrity)
  – Decoupling PLCM from ESN
  – Fast Call Setup
• Pool as much as possible of unused **power** and **Walsh codes** into the Forward Packet Data Channel (F-PDCH)

• Transmission adapts to channel dynamics
1xEV-DV Operational Overview (FL)

(1) Power Controlled Service (e.g. voice, real-time data)

(2) Measure common continuous CDM pilot

(3) Send Back FL PC bits

(3') Broadcast Walsh Space Update as Often as needed

(4) BS allocates power for voice users

(4') BS determines priorities for all rate controlled users and determines which users are to receive data

(5) BS allocates remaining power to rate controlled users

(5') Data and Control Information

(6) Send back Ack/Nak

(6') Send back C/I to 'best' sector

At a conceptual level 1xEV-DO works similarly to the 1xEV-DV rate controlled service except that the feedback is a DRC

(1) Rate Controlled Service (e.g. delay tolerant data)
Major Enhancements in cdma2000 1x Revision D

- Support of 1x EV-DV Reverse Packet Channel
  - One channel per mobile station
  - Mobile station is required to support peak rate of 1.23 Mbps; 1.53 and 1.84 Mbps are optional peak rates
  - Shorter frames
  - Higher capacity
- Smaller forward link packets (212 bits)
- QoS-related features
  - Support for multiple flows per user, and enhancements for QoS
- BCMCS (Broadcast and Multicast Service)
- Changes specific to Layer 3
  - Faster call setup
    - Direct Channel Assignment
    - Reduced SCI Operation
    - Traffic Channel Initialization Enhancements
    - Tracking zone reporting
    - Radio environment reporting
  - Support for MEIDs (Mobile Equipment IDs, ESN replacement)
  - PLCM Enhancements
  - SYNC_ID enhancements
  - Multiple Services Enhancements
1xEV-DV Operational Overview (RL)

1. 1X-EV-DV common carrier BS
2. Transmit voice and pre-revision D data
3. BS determines RL loading
4. BS transmits grants/rate control bits
5. MS transmits data and control information
6. BS sends ACK
2'. MS may send power limit and buffer status
(1) For all users, RL is power controlled by BS
(1) Voice and pre-Revision D data devices
Mobile station may transmit autonomously up to certain rates

At a conceptual level 1xEV-DO Revision A RL works similar to the 1xEV-DV RL
HRPD Layering

- Contained in one document, C.S0024
- Auxiliary broadcast services document, C.S0054

**Table of Protocols**

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Lower 3 HRPD Revision A Layers

Security Protocol, Key Exchange Protocol or DH Key Exchange Protocol,
Authentication Protocol or SHA-1 Authentication Protocol, Default Encryption Protocol or AES Encryption Protocol

Control Channel MAC Protocol or Access Channel MAC Protocol
Enhanced CC MAC Protocol or Enhanced AC MAC Protocol
Enhanced Forward TC MAC Protocol or Enhanced Forward TC MAC Protocol
Subtype 1 Reverse TC MAC Protocol, Subtype 2 Reverse TC MAC Protocol, or Subtype 3 Reverse TC MAC Protocol
(MAC Flows)

Subtype 0 (Legacy) PHY or Subtype 1 PHY or Subtype 2 (Release A) PHY

PHY

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Major Enhancements in HRPD Rev A (1xEV-DO Rev A)

- Support of enhanced reverse link
  - One channel per mobile station
  - Mobile station is required to transmit at 1.84 Mbps peak rate; BS performance specification at 921 kbps and 1.2 Mbps
  - Shorter frames
  - Higher capacity

- Forward link enhancements
  - Higher peak data rate of 3.1 Mbps
  - Smaller packet sizes (128, 256, and 512 bits)
  - Multi-user packets

- Improved slotted mode
  - Shorter slot cycle for reduced activation time
  - Subsynchronous control channel for enhanced standby time

- Enhanced multi-flow packet data application
- Reverse link MAC enhancements for QoS
- Data Source Control (DSC) for seamless cell selection
- Enhanced Generic Attribute Update protocol
TSG-C Voice Services

• **Voice Codecs**
  - **Low Rate** (max rate is 8.55 Kbps)
    - Enhanced Variable Rate Codec (EVRC) C.S0014-A
    - Selectable Mode Vocoder (SMV) C.S0034-0
  - **High Rate** (max rate is 13.3 Kbps)
    - High Rate Speech Codec (13K) C.S0020-A
    - Variable Rate Multimode Wideband (VMR-WB) C.S0052-0
Packet Data Services in C.S0017

- Service Option 33 for generic packet services
- Also support for
  - Async data
  - Fax

Diagram:
- Mobile Station
- External device
  - TE2 MT2
  - Modem
  - BS/PCF
  - PDSN
- Network Layer
  - IP
- Link Layer
  - SLIP or PPP
  - PPP
- Relay Layer
  - Rm Relay Layer
  - Um Link Layer
  - Airlink
- Upper Layer Protocols
Packet Data Services in C.S0017

- Service Option 33 for generic packet services
- Also service options for
  - Async data
  - Fax
• **Messaging / Multimedia**
  - Short Message Service (SMS/EMS) C.S0015-B
  - Multimedia Message Service (MMS) C.S0045-0
  - Multimedia Streaming Service (MSS) – in development C.S0046-0
  - Multimedia File Formats C.S0050-0

• **R-UIM / SIM**
  - Removable User Identity Module (R-UIM) C.S0023-B

• **Over-The-Air Programming (OTA)**
  - OTA Service Provisioning & Parameter Admin. C.S0016-C

• **Geographic Location**
  - Position Determination Service (PDS) C.S0022-A
Preliminary discussions have started in TSG-C on topics for the next revisions of cdma2000 family