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3RD GENERATION PARTNERSHIP PROJECT 2 "3GPP2"

High-Speed Data Enhancements for cdma2000 1x – Integrated Data and Voice

Stage 1 Requirements

EDITOR

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REVISION HISTORY

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1 PURPOSE

This document outlines the key requirements for the evolution of the cdma2000 1x (current versions of C.S0001 through C.S0005) standard. This document will refer to this evolution as 1x-evolved high-speed integrated data and voice (1xEV-DV). These requirements are defined to drive improvements to the fundamental packet data capabilities and efficiencies of cdma2000 1x systems to better meet the rapidly evolving needs of subscribers. This document is intended as a guide for 3GPP2 TSGs in the development of specifications for high-speed integrated data and voice systems beyond cdma2000 1x services (voice, fax, circuit switched data), to provide increased spectral efficiency and the capability to satisfy customer demand for wireless voice and packet data applications.

2 DOCUMENT SCOPE

The scope of this document is to define requirements for all aspects of 1xEV-DV systems.

3 DEFINITION OF TERMS

- **Asymmetric (data rate) -** A radio and network configuration in which data transmission rates are different in the forward and reverse directions.
- **cdma2000 family of standards, cdma2000 family of specifications -** The set of standards and specifications C.S0001 through C.S0006, its precursors (e.g., TIA/EIA-95-B), 1xEV-DO, and all ancillary standards and specifications.
- **QoS constrained -** A condition in which the quality of service (QoS) parameters for a stream of bits (e.g., delay, jitter, minimum acceptable data rate, etc.) are constrained by the application. This condition includes, but is not limited to, the constraints needed to satisfy voice services.
- **Symmetric (data rate) -** A radio and network configuration in which data transmission rates are the same in the forward and reverse directions.

4 REFERENCES

- **TIA/EIA-95-B** Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System
- **C.S0001** Introduction to cdma2000 Standards for Spread Spectrum Systems
- **C.S0002** Physical Layer Standard for cdma2000 Spread Spectrum Systems
- **C.S0003** Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems
- **C.S0004** Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems
- **C.S0005** Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems
- **C.S0006** Analog Signaling Standard for cdma2000 Spread Spectrum Systems
- **A.S0001** Access Network Interfaces Technical Specification

5 SYSTEM DESCRIPTION

The 1xEV-DV system described by this document is optimized for real time, high-speed packet data services which can operate on the same RF carrier as current cdma2000 1x services.

The system operator expectations for 1xEV-DV systems include the following:

- The 1xEV-DV specification will incorporate all aspects of and be an extension of the existing cdma2000 1x features, functions, applications, and services specified in the cdma2000 Release A and Release B standards. More specifically, the 1xEV-DV specification will maintain all of the voice and packet data capabilities of the cdma2000 1x and 1xEV-DO specifications.
- The 1xEV-DV specification will evolve from cdma2000 by maximizing the re-use of the existing cdma2000 family of standards. While not a formal requirement, the ability to support re-use of existing infrastructure equipment should be provided by the 1xEV-DV specification.

- The 1xEV-DV specification will provide a graceful evolution path from TIA/EIA-95-B and cdma2000 that minimizes impact to terminals and to infrastructure so as to achieve the most economical evolution.
- While not a formal requirement, a goal for the 1xEV-DV specification is to support implementations of 1xEV-DV systems and mobile stations that will result in increased mobile station standby and talk times.

6 REQUIREMENTS

6.1 Core Network

6.1.1 The 1xEV-DV specification shall be compatible with the ANSI-41 core network standard.

6.1.2 The 1xEV-DV specification shall not preclude support for and should be compatible with the GSM MAP core network standard according to the MC MAP specification.

6.2 System Capacity and Information Data Rates

A system which supports 1xEV-DV shall be capable of supporting the following system capacity and information data rates (benchmarks and measurement environments will be defined by the applicable technical evaluation group):

6.2.1 Relative to cdma2000, at least two times the number of concurrent voice calls for a single radio channel, for the same base station antenna configuration and using the same vocoder.

6.2.2 Peak (i.e., maximum instantaneous) data rates when serving only packet data traffic for any user in an outdoor, high speed vehicular environment as follows:

a) At least 2.4 Mbps on the forward bearer channel.

b) At least 1.25 Mbps on the reverse bearer channel.

c) Both the forward and reverse channel requirements must be met simultaneously.

6.2.3 System-wide average data rates per 1.25 MHz radio channel when serving only packet data traffic in a fully loaded system in an outdoor, high speed vehicular environment as follows:

a) At least 600 Kbps on the forward bearer channel.

b) At least 600 Kbps on the reverse bearer channel.

c) Both the forward and reverse channel requirements must be met simultaneously.

6.2.4 Peak (i.e., maximum instantaneous) data rates when serving only packet data traffic for any user in a pedestrian speed environment as follows:

a) At least 2.4 Mbps on the forward bearer channel.

b) At least 2 Mbps on the reverse bearer channel.

c) Both the forward and reverse channel requirements must be met simultaneously.

6.2.5 Peak (i.e., maximum instantaneous) data rates when serving only packet data traffic for any user in a stationary indoor environment as follows:

a) At least 2.4 Mbps on the forward bearer channel.

b) At least 2 Mbps on the reverse bearer channel.

c) Both the forward and reverse channel requirements must be met simultaneously.

In addition:

6.2.6 A system which supports 1xEV-DV shall be capable of, when operating in a radio channel that is restricted to supporting only packet data services that are not QoS constrained:

a) Providing a peak (i.e., maximum instantaneous) data rate for any similarly located user that is greater than or equal to the peak data rate provided by any system which supports the 1xEV-DO specifications.

b) Providing a system-wide average data rate per 1.25 MHz radio channel in a fully loaded system that is greater than or equal to the system wide average data rate per 1.25 MHz radio channel provided by any system that supports the 1xEV-DO specifications.

6.2.7 For all requirements listed herein, both symmetric (for data rates up to the peak reverse bearer channel data rate) and asymmetric modes shall be supported.

6.2.8 1xEV-DV shall operate with 3x radio configurations. In this case, the performance requirements (peak and system wide) shall be scaled in a manner that is appropriate as determined by the technical standards development groups.

6.3 General Requirements

The 1xEV-DV specification shall enable the following:

6.3.1 Network adaptation of data transmission speeds and other operating parameters to maximize system capacity, while satisfying QoS constraints, for a given mix of RF conditions and system workload. The definition of QoS constraints is beyond the scope of this document.

6.3.2 Any combination of traffic types with varying QoS-constraints including voice, video, and data on a single radio channel.

6.3.3 A segregation of traffic types with varying QoS-constraints including voice, video, and data onto separate radio channels.

6.3.4 Handoff of voice and data services between a 1xEV-DV radio channel and another radio channel that are operating in accordance with the cdma2000 family of specifications. This requirement applies whenever the two radio channels support an equivalent data or voice service, although there may be differences in QoS or data rate when the two radio channels offer different capabilities. The 1xEV-DV specification shall not mandate that a mobile station that supports 1xEV-DValso support 1xEV-DO. However, if a mobile station does support both 1xEV-DV and 1xEV-DO, then the mobile station shall support handoff of commonly supported data services between the 1xEV-DO and 1xEV-DV radio channels.

6.3.5 Multiple, concurrent packet data sessions per user.

6.3.6 Support of functionality equivalent to existing voice and packet data services.

6.3.7 Voice quality that meets or exceeds the voice quality of cdma2000 systems.

6.3.8 Meeting all system capacity, information date rate, and radio environment requirements herein using existing base station antennas. Novel and cost-effective antenna solutions internal to the mobile equipment are not precluded.

6.3.9 Support of existing cdma2000 vocoders.

In addition:

6.3.10 1xEV-DV shall not preclude the support of GSM full-rate and AMR vocoders.

6.4 Radio Environment

6.4.1 The 1xEV-DV specification shall support the capabilities necessary to deploy 1xEV-DV systems with a coverage that exceeds the coverage of previous members of the cdma2000 family of standards using the same location of base stations, the same transmit power, the same base station antennas, and mobile station antennas with similar gains for a given date rate.

6.4.2 Out of band emissions for 1xEV-DV systems shall comply with equivalent requirements for cdma2000 1x systems.

6.4.3 A system, which supports 1xEV-DV, shall be capable of supporting both mobile and fixed mobile stations.

6.5 Compatibility

6.5.1 The 1xEV-DV specification shall permit a radio channel that supports 1xEV-DV to provide service to mobile stations that conform to the set of standards and specifications C.S0001 through C.S0006, its precursors (e.g., TIA/EIA-95-B), and all ancillary standards and specifications, and may permit a radio channel that supports 1xEV-DV to provide service to mobile stations that conform to 1xEV-DO.

The 1xEV-DV specification shall define a Backward Compatible Class of mobile devices. A mobile station that is included in the Backward Compatible Class shall support the set of standards and specifications C.S0001 through C.S0006, its precursors (e.g., TIA/EIA-95-B), and all

ancillary standards and specifications, and may support 1xEV-DO. This specification shall also permit mobiles that are not included in the Backward Compatible Class.

Where the version of specification of the mobile and the base station differ, the services provided will be consistent with the level of quality associated with the limiting element.

6.5.2 A system which supports 1xEV-DV shall be compatible with IS-2000 chip rate and band plan, and which also must support existing frame lengths; however, this requirement does not preclude the addition of new frame lengths.

6.5.3 The 1xEV-DV specification shall permit implementations, in accordance with the specification, that utilize existing antenna configurations from systems that conform to previous cdma2000 family specifications.

6.6 Interoperability

6.6.1 The 1xEV-DV specification shall be supported by an open Radio Access Network based on an evolution of the Interoperability Specification A.S0001.