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High-Speed Data Enhancements for cdma2000 1x – Data Only

Stage 1 Requirements

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1 PURPOSE

This document outlines the key operator 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 data only (1xEV-DO). 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 wireless operators in the implementation of high-speed data-only systems beyond cdma2000 1x, to provide increased spectral efficiency and the capability to satisfy customer demand for wireless packet data applications.

2 DOCUMENT SCOPE

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

3 REFERENCES

- **TIA/EIA/IS-95** Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System
- **TIA/EIA/IS-95-A** Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System
- **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
- **A.S0001** Access Network Interfaces Technical Specification

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4 SYSTEM DESCRIPTION

The system described by this document is optimized for non-real time, high-speed packet data services and in which the high-speed packet data service operates on a separate, data-only channel (1xEV-DO). If the subscriber invokes voice or another real-time service, the system should use a cdma2000 1x voice/data channel, as is currently defined by the reference specifications. This operation should be transparent to the user.

It is desirable to have a graceful evolution from TIA/EIA/IS-95-A, TIA/EIA-95-B, and cdma2000 that minimizes impact to terminals and to infrastructure so as to achieve the most economical evolution

5 REQUIREMENTS

5.1 Core Network

It shall be possible to perform handoffs between the 1xEV-DO systems and systems that are based on the 3GPP2 network specifications. It should be possible to perform handoffs between the 1xEV-DO systems and systems that are based on the GSM-MAP network specifications.

5.2 Information Data Rates

The 1xEV-DO specification shall enable a range of information data rates suitable for high-speed packet data applications as specified in the following table.

Table 1 – Information Data Rate Requirements

	1xEV-DO	
	Forward Link	**Reverse Link**
Vehicular Peak Data Rate[1]	1.25 Mbps	144 kbps
Vehicular Average Data Rate[2]	600 kbps	144 kbps
Fixed/Pedestrian Data Rate[3]	2 Mbps	144 kbps

1. "Vehicular Peak Data Rate" is defined as the maximum instantaneous information data rate available to any given user in a high-speed handoff mobile application.

2. "Vehicular Average Data Rate" is defined as the system-wide average information data rate available per sector in a fully-loaded system with all users moving at vehicular speed.

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3. "Fixed/Pedestrian Data Rate" is defined as the information data rate available to any given user either fixed or moving at pedestrian speed.

The objective of the 1xEV-DO specification is to provide the largest practical number of users to run high-speed packet data applications. It is desirable that the specification be scalable to wider bandwidth channels in the future (e.g. 3x 1.25MHz channel).

5.3 General Requirements

The 1xEV-DO specification shall enable:

- High-speed, non-real-time, packet data capability;
- Interoperability (including handoff) with cdma2000 1x channels for packet services;
- Deployment in all frequency bands where cellular and PCS systems are deployed;
- Asymmetric data rates;
- Always–on Capability (e.g., no need to go through dial-in, and no user action required, for PDSN log-on process);
- Use of existing TIA/EIA/IS-95-A, TIA/EIA-95-B, and cdma2000 antennas, active, smart, and directional antennas for specific applications; and
- Use of traffic balancing mechanisms for all 1xEV-DO frequency channels.

5.4 Radio Environment

The coverage for 1xEV-DO shall align closely with IS-95 and cdma2000 1x. The objective of the coverage requirements is to ensure that operators can use existing cell/sector configurations without cell splitting. The purpose is to deploy 1xEV-DO on existing BTS equipment, which can operate a number of RF channel, including a mix of IS-95, cdma2000 1x, and 1xEV-DO. Out-of-band-emissions for 1xEV-DO shall comply with equivalent requirements for cdma2000 1x systems.

1xEV-DO shall support both mobile and fixed users.

5.5 Interoperability Specification Support

The 1xEV-DO air interface shall be developed so that it can operate with a RAN designed to Interoperability Specification [A.S0001]. In addtion, the 1xEV-DO specification shall be supported by an open Radio Access Network based on evolutions of the Interoperability Specification A.S0001.

5.6 Authentication Support

It shall be possible for the 1xEV-DO RAN to determine an authenticated mobile terminal identifier for a hybrid 1xEV-DO/IS-2000 device. It shall be possible for this identifier to be common with a mobile station identifier that is also authenticated by IS-2000 for the same hybrid device (e.g., IMSI). (Note: This identifier can be used to permit the IS-2000 RAN and 1xEV-DO RAN to coordinate the operation of hybrid devices.)

It shall be possible for the 1xEV-DO RAN to deny an AT (Access Terminal) access to any dedicated RAN resources (i.e., resources which support the transfer of user data to or from the PDSN) until after the AT's mobile station identity has been authenticated. It shall also be possible to preclude any end-user IP data traffic from being exchanged until after the AT's mobile station identity has been authenticated. (Note: The term "dedicated RAN resources" does not include power and rate control.)

It shall be possible to minimize the time that is required to authenticate a hybrid device on the 1xEV-DO system in order to minimize the amount of time that an invalid device can consume system resources.

It shall be possible to minimize the total transmission power that is required to authenticate a hybrid device on the 1xEV-DO system in order to minimize the interference that an invalid device can impose on the RAN.