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Capabilities Requirements Mapping for cdma2000 Standards

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2 No text.

3

1 INTRODUCTION

This Bulletin has been prepared by TIA Subcommittee TR-45.5 to map the capabilities in TIA standards that have been developed to support cdma2000 Phase 1 operation to the major requirements upon which that development was based. It is intended to furnish guidance to providers of cdma2000 systems in selecting the necessary features to meet their requirements as stated within the sections of TSB2000.

The following TIA/EIA/IS-2000 standards specify capabilities which directly support cdma2000 Phase 1 requirements:

TIA/EIA/IS-2000-2 *Physical Layer Standard for cdma2000 Spread Spectrum Systems*

TIA/EIA/IS-2000-3 *Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems*

TIA/EIA/IS-2000-4 *Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems*

TIA/EIA/IS-2000-5 *Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems*

In addition, TIA/EIA/IS-707-A-1 *Data Service Options for Spread Spectrum Systems – Addendum 1* also defines capabilities supporting a cdma2000 Phase 1 requirement.

1.1 Capability Classifications

For each requirement, capabilities are mapped into one of two classifications:

- The **Essential** classification contains those capabilities without which the requirement is not met.
- The **Discretionary** classification contains those capabilities which enhance how well the requirement is met, but are not essential to meet the requirement.

Neither classification indicates whether the capability is mandatory or optional in the standard that specifies the capability.

1.2 Capability Organization

For each classification, capabilities are organized into 3 groups; this corresponds roughly to the specific TIA/EIA/IS-2000 standards that specify the capability. Capabilities defined in TIA/EIA/IS-707-A-1 are grouped with those specified in TIA/EIA/IS-2000-3. The groupings are:

- The **Physical Layer** grouping contains those capabilities defined in TIA/EIA/IS-2000-2.
- The **RLP/MAC Layer** grouping contains those capabilities defined TIA/EIA/IS-2000-3 and TIA/EIA/IS-707-A-1.
- The **Layer 2/Layer 3 Signaling** grouping contains those capabilities defined in TIA/EIA/IS-2000-4 and TIA/EIA/IS-2000-5.

1 **1.3 Terms**

2 **Control Hold State.** See TIA/EIA/IS-2000-3.

3 **F-DCCH.** Forward Dedicated Control Channel (see TIA/EIA/IS-2000-2).

4 **F-FCH.** Forward Fundamental Channel (see TIA/EIA/IS-2000-2).

5 **F-SCH.** Forward Supplemental Channel (see TIA/EIA/IS-2000-2).

6 **MuxPDU.** Multiplex Sublayer Protocol Data Unit (see TIA/EIA/IS-2000-3).

7 **Orthogonal Transmit Diversity.** See TIA/EIA/IS-2000-2.

8 **Quasi-Orthogonal Function.** See TIA/EIA/IS-2000-2.

9 **Quick Paging Channel.** See TIA/EIA/IS-2000-2.

10 **R-DCCH.** Reverse Dedicated Control Channel (see TIA/EIA/IS-2000-2).

11 **R-FCH.** Reverse Fundamental Channel (see TIA/EIA/IS-2000-2).

12 **R-SCH.** Reverse Supplemental Channel (see TIA/EIA/IS-2000-2).

13 **RC 1.** Radio Configuration 1 (see TIA/EIA/IS-2000-2).

14 **RC 2.** Radio Configuration 2 (see TIA/EIA/IS-2000-2).

15 **RC 3.** Radio Configuration 3 (see TIA/EIA/IS-2000-2).

16 **RC 4.** Radio Configuration 4 (see TIA/EIA/IS-2000-2).

17 **RC 5.** Radio Configuration 5 (see TIA/EIA/IS-2000-2).

18 **SCCH.** Supplemental Code Channel (see TIA/EIA/IS-2000-2).

19 **Short Data Burst.** See TIA/EIA/IS-2000-3.

20 **Suspended State.** See TIA/EIA/IS-2000-3.

2 cdma2000 PHASE 1 REQUIREMENTS

The following sections list requirements upon which cdma2000 Phase 1 development was based. Each section contains a requirement's description and a list of the essential and discretionary capabilities associated with meeting the requirement.

2.1 Capacity

Increasing the realizable channel capacity in existing **cdmaOne**^{TM 1} systems would be of significant benefit to the operator. A per-RF-carrier capacity of approximately twice that available on existing **cdmaOne**TM systems is required.

It is essential that methods be developed to not limit prematurely the maximum supportable number of users per channel in environments where the effects of system noise and in-band interference are more manageable. This is often the case, for example, in fixed wireless installations using high gain directional antennas. In such installations, the number of unique codes available for use in each sector tends to limit the number of customers that can be accommodated rather than the radio channel capacity. To overcome this problem and build in sufficient margin for unforeseen future needs, it is required that a scheme be devised to increase the number of assignable codes in the system.

Table 1 lists the capability mapping for this requirement.

Table 1 Capability Mapping for the Capacity Requirement

Essential Capabilities	
Physical Layer	<ul style="list-style-type: none"> • RC 3 or RC 4 or RC 5 on the F-FCH • RC 3 or RC 4 on the R-FCH.
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	<ul style="list-style-type: none"> • Signaling Support for RC 3, RC 4, RC 5 on the F-FCH (e.g., Service Negotiation, Channel Assignment) • Signaling Support for RC 3, RC 4 on the R-FCH (e.g., Service Negotiation, Channel Assignment)
Discretionary Capabilities	
Physical Layer	<ul style="list-style-type: none"> • Orthogonal Transmit Diversity (OTD) • Quasi-Orthogonal Function (QOF)
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	<ul style="list-style-type: none"> • Signaling Support for OTD • Signaling Support for QOF

¹ cdmaOne is a trade name owned by the CDMA Development Group. This information is given for the convenience of users of the Bulletin and does not constitute an endorsement by TIA of the product named.

2.2 Battery Life

The standby and talk times of current generation **cdmaOne™** handsets are significant parameters. The underlying battery technologies used by **cdmaOne™** and other technologies are fairly similar. It is apparent therefore that, for **cdmaOne™** devices to exceed standby and talk time capabilities of competing system technologies, closer attention must be paid to all other factors influencing battery life. This is in addition to taking advantage of any advances in battery technology.

Although it is known that manufacturer ingenuity in product design (e.g., use of efficient, low voltage/low power circuitry) is a significant factor in handset power consumption, it is also believed that significant improvements in battery life can be achieved through more efficient design of the radio link signaling system and implementation of a faster and more accurate power control algorithm. As the next step in **cdmaOne™** subscriber device evolution, appropriate enhancements must be undertaken to significantly increase the standby time.

Table 2 lists the capability mapping for this requirement.

Table 2 Capability Mapping for the Battery Life (Standby Time) Requirement

Essential Capabilities	
Physical Layer	Quick Paging Channel (F-QPCH)
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	Signaling Support for F-QPCH
Discretionary Capabilities	
Physical Layer	If a DCCH is used, reverse pilot channel gating is necessary
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	If a DCCH is used, signaling support for reverse pilot channel gating is necessary

2.3 Bearer Capability

In order to support 3G data services, it is essential that the bearer capability of cdma2000 systems be expanded beyond what is currently specified in TIA/EIA-95-B. It is strongly desired that near-term systems achieve the IMT-2000 vehicular speed requirement of 144 kbps.

Table 3 lists the capability mapping for this requirement.

Table 3 Capability Mapping for the Bearer Capability Requirement

Essential Capabilities	
Physical Layer	<ul style="list-style-type: none"> • One (1) of (FCH or DCCH) <ul style="list-style-type: none"> – RC 3 or RC 4 on the F-FCH or F-DCCH – RC 3 on the R-FCH or R-DCCH • One (1) SCH <ul style="list-style-type: none"> – RC 3 or RC 4 on the F-SCH – RC 3 on the R-SCH
RLP/MAC Layer	<ul style="list-style-type: none"> • Support for RLP3 (TIA/EIA/IS-707-A-1.10) • Support for 144 kbps Packet Data Service Option (TIA/EIA/IS-707-A-1.11) • Support for MuxPDU Type 3 • Support for multiplex option 0x809 or 0x811 or 0x821 or 0x905 or 0x909 or 0x911 or 0x921
Layer 2/Layer 3 Signaling	<ul style="list-style-type: none"> • Signaling Support for RC 3, RC 4 on F-FCH, F-DCCH, or F-SCH (e.g., Service Negotiation, Channel Assignment) • Signaling Support for RC 3 on R-FCH, R-DCCH, or R-SCH (e.g., Service Negotiation, Channel Assignment) • Signaling support for Supplemental Channel Request Message • Signaling support for Extended Supplemental Channel Assignment Message
Discretionary Capabilities	
Physical Layer	5 ms frames on the FCH or DCCH
RLP/MAC Layer	<ul style="list-style-type: none"> • Support for Control Hold and Suspended States • Support for Short Data Burst (SDB)
Layer 2/Layer 3 Signaling	<ul style="list-style-type: none"> • Signaling support for mini messages (5 ms) • Signaling support for Control Hold and Suspended States • Signaling Support for SDB

2.4 Handoff

Handoff overhead is still an item of concern to service providers, as this increases overall infrastructure costs. The TIA/EIA-95-B hard handoff searching and handoff failure recovery procedures are expected to enhance hard handoffs. The TIA/EIA-95-B soft handoff algorithm is expected to reduce this handoff overhead. Nevertheless, further effort must be expended to improve handoff operations so as to minimize the amount of system resources required to support handoffs.

Table 4 lists the capability mapping for this requirement.

Table 4 Capability Mapping for the Handoff Requirement

Essential Capabilities	
Physical Layer	none
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	none
Discretionary Capabilities	
Physical Layer	Interfrequency Hard Handoff Improvements
RLP/MAC Layer	none
Layer 2/Layer 3 Signaling	Signaling Support for Hard Handoff Improvements

2.5 Backward Compatibility

As the above enhancements are evolutionary in nature, complete backward compatibility with existing **cdmaOne™** infrastructure and handset must be maintained. More specifically, any changes made to **cdmaOne™** system specifications and any enhancements to base station and mobile station designs should ensure that they will permit co-existence of current and enhanced mobile stations on the same RF carrier, in a manner completely transparent to users. It is expected that a mixed mode RF carrier with both current and enhanced mobile stations will not achieve the same high level of capacity as a single mode channel serving only enhanced mobile stations.

Table 5 lists the capability mapping for this requirement.

Table 5 Capability Mapping for the Backward Compatibility Requirement

Essential Capabilities	
Physical Layer	RC 1 or RC 2 on F/R-FCH
RLP/MAC Layer	<ul style="list-style-type: none"> • Support for TIA/EIA-95-B Multiplex Sublayer • Support for Multiplex Option 1 • Support for Multiplex Option 2 if RC 2 supported
Layer 2/Layer 3 Signaling	Signaling Support for TIA/EIA-95-B
Discretionary Capabilities	
Physical Layer	Support for SCCH
RLP/MAC Layer	Support for multiplex options 3 through 16
Layer 2/Layer 3 Signaling	<ul style="list-style-type: none"> • Support for Supplemental Channel Request Message • Support for Supplemental Channel Assignment Message