Cellular
Networking
Perspectives

In This Issue . . .

Packet Data Needs a MAP

The use of packet data in 2.5G and 3G systems is steadily increasing. In most cases it is still associated with terminals mostly used for voice. One of the problems with this is that packet data sessions are not 'always on' but must be initiated by a mobile.

This makes packet data services 'originate only'. This is less of a restriction than with voice because many internet services have been designed to operate in this mode. Some, like web access, are true originating services, always initiated by the terminal. Others, like email clients, are two-way services. Such a client may poll the server regularly, rather than having the email server 'push' mail to the client. This introduces an additional latency (up to the polling interval) but is acceptable for non-real-time services and works reasonably well when the client is used for both sending and receiving data.

There are few true mobile-terminated data services in use, probably due to the absence of efficient termination. One example that is a pure terminating service is Location Services (LCS) in cases when an application outside the mobile is requesting the mobile's position. Unlike email, although location services can be initiated from either end, rarely will they be required at the same time from both ends. This mobile-terminated location service cannot be turned into a mobile-originated location service (at least not without horrible efficiency problems).

Cellular packet data is currently an ancillary service. It is not always active and therefore cannot be used for signaling not originated by the MS. If another entity wants to communicate with the MS and there is no active packet data session, then using the non-existent packet data session to tell the mobile to establish a packet data session is a quest for a perpetual motion machine!

Mobiles could be 'always on', but this would mean that an IP address was always assigned, as well as other resources associated with packet data sessions. This would have to be for all mobiles, even for those that will never (if we could predict the future) use packet data services, over the life of the phone.

The kludge: SMS

Today's solution to the packet data termination problem is to send a short message (SMS) to an MS to tell it to initiate a packet data session, providing it basic information about the service (e.g. a domain name to assist with the service). Functionally this works. Efficiency is the problem.

SMS is not a real-time service and the huge (and growing) volume of text messages results in many buffering delays. This delays the start of positioning, decreasing the value of the location returned.

Why No Better Solution?

There is no better solution today because of the belief that the packet data system and legacy Mobile Application Part (MAP, e.g. ANSI-41) can exist largely in parallel with little coordination and communication.

A few years, back it was thought that the 'All-IP' network would already have taken over from the current 'circuit switched' network. However, a 'flash cut' from the current network to the next generation is not possible, so the transition is more gradual. As many have discovered in world affairs, infiltrating a government is a much cheaper and more effective means of taking over than an all out assault. This implies that there should be a great deal of coordination between the old and the new, not an artificial barrier.

Delays in the transition from telecom to 'All IP' stem not only from interoperability challenges, but also from the high reliability of the existing SS7 network. While putting all voice, data and signaling on one IP-based network definitely saves money and provides higher overall bandwidth, it does not necessarily provide the isochronous transmission characteristics required for voice ('a late packet is worse than a dead packet') nor the near-instantaneous knowledge of network status that is provided by SS7.

A concrete example is the HLR – the subscriber information database in wireless networks today. A simple model is that the AAA for IP-oriented services is a separate entity, implying that eventually a new protocol will be required between the AAA and HLR. A different approach is to consider the 'HLR' and 'AAA' as just a set of interfaces. The same network 'box' could be both an 'HLR' and an 'AAA', making communications between them purely internal.

The HSS concept of 3GPP is a step in the right direction, but does not formalize the understanding that the AAA and HLR are just different interfaces to the same entity meaning that there is no data that the HLR has that the AAA cannot access and vice-versa.

To start with, this combined device might be more HLR than AAA, but over time, more and more use would be made of the AAA functionality and, eventually, the HLR functionality would no longer be required. Physically, this would mean that less and less information would enter over the SS7/MAP links and more over the IP links.

One of the benefits of integration is that the same authentication material can be used for all telecom services, whether IP or not. Keys do have to be kept independent, but that can be done while using the same root key material. This approach avoids the need for separate provisioning of keys within the network and within the mobile. Re-keying (e.g. an 'SSD Update' using CAVE) can be performed with less risk of locking out some services, because only two network elements will be critically involved. More information can be derived algorithmically (i.e. by calculation) rather than by being provisioned.

When 'Push' Comes to Shove

A better approach to push services would be to stop the pretence that packet data can be performed without the ANSI-41 network. SMS is an ANSI-41 function. Instead of relying on this kludge, why not design a better 'push' message?

Any push service needs to traverse the HLR, MSC and Base Station before reaching the MS. This eliminates Message Centers, and any SMS inter-working (e.g. via SMPP). It also ensures that these messages cannot be generated from outside the telecom network, adding additional security.

Interworking between the two kinds of MAP in existence today – GSM and ANSI-41 – must be considered. This can be handled by using the IIF, where GSM/ANSI-41 interworking exists. If the messages were designed with some degree of cooperation between the two worlds, interworking would be quite simple.

The contents of an SMS are invisible to entities within the network, in most cases, but a Push service could be designed to provide visibility. This would further assist the integration of the two networks. If the response to the Push message includes the currently active IP address, for example, the HLR could then reroute Push messages over the IP network when it knew that a packet data session was active.

A more advanced capability would be to integrate the Mobile IP 'Home Agent' with the HLR/AAA, maintaining continuous knowledge of the current IP address associated with every mobile, and allowing the Serving System to re-initiate a packet data session whenever data is received for that address. A 'Push' request would then only be necessary after an MS moves to a new system (to establish a new IP address) or after the MS IP address is withdrawn (due to prolonged inactivity).

3GPP TSG T (Terminal) Update

3GPP TSG Terminals (TSG T) specifies logical and physical terminal interfaces, capabilities (such as execution environments), performance requirements and testing. It does not cover the radio aspects of terminals which are the responsibility of TSG RAN, nor does it cover speech and multimedia codecs, the responsibility of TSG SA4.

The big news is that TSG T will cease to exist in March 2005. At that time its three working groups will be reallocated:

• T1 will move to TSG RAN.

• T2 and T3 will be merged with TSG CN to become part of TSG CN&T (Core Network and Terminal).

TSG T has completed most of its work on Rel 6, except for work on testing, which always follows the main specification development. Consequently, User Equipment (UE) testing is still ongoing for Rel 99, Rel 4 and for Rel 5.

TSG T Working Group 1:
Mobile Terminal Conformance Testing

3GPP TSG T Working Group 1 (T1) specifies UE (terminal) conformance testing based on requirements from RAN4 for radio tests, and from RAN2 and CN1 for the signalling and protocols tests. T1 is organized into two subgroups that study RF tests and Signalling tests.

Work on the Radio Resource Management (RRM) Background Analysis TR 34.902 was expected to be completed by the end of 2004 to expedite validation and approval by the Global Certification Forum (GCF).

Radio Frequency tests in TS 34.121 and TS 34.122 are also nearly complete, except for the RRM section of the latter, on which no progress has been made.

The Rel 5.2 signaling tests in TS 34.108 have been published. This version includes Radio Access Bearer configurations to support High Speed Downlink Packet Access (HSDPA). All tests for Rel 99 and Rel 4 are now included, so separate versions of this specification will no longer be maintained.

Other areas where efforts are being concentrated are in HSDPA radio frequency and protocol tests, and also in Assisted GPS testing for UE-based and UE-assisted modes, to support emergency calling and commercial location services.

Table 1:   3GPP TSG T1 (Mobile Terminal Conformance Testing) Specification Update

Document	Title	Status
tbd	General Changes to TS 34.121 and TS 34.122 for Rel 6	New Work Items
	Terminal Conformance Specification of Radio Transmission and Reception for Introduction in the UMT-850 MHz Band	
	Difference and Corresponding Effect Analysis between FDD and 1.28 Mcps TDD in the Radio Access Stratum Protocol Aspects	
TS 34.108	Common Test Environments for User Equipment (UE) Conformance Testing	Rel 5 being revised.

TSG T Working Group 2:
Mobile Terminal Services & Capabilities

3GPP TSG T Working Group 2 (T2) specifies the Services and Capabilities to be delivered by 3GPP Terminal Equipment and ensure that terminals meet 3GPP objectives. It is responsible for Terminal-based Applications, Terminal Features and Terminal Interfaces. T2 is organized into 3 subgroups:

1. SWG1 – MExE.
2. SWG2 – UE Capabilitiies and Interface.
3. SWG3 – Messaging.

SWG2 – UE Interfaces and Capabilities. Two CRs related to AT (modem) commands and other matters were approved for the Rel 6 version of TS 27.007. This corrected one AT command and added four new commands to support logical channels.

SWG3 – Messaging. A lot of work was related to Multimedia Messaging. 11 CRs to the Rel 6 version of TS 23.140 were approved, including several functional enhancements, such as:

• Application Addressing ID,
• Additional Digital Rights Management (DRM) requirements for Relay/Server,
• Clarification to WAP and IP-based MMI,
• Status text in the MM1 delivery report,
• Content Adaptation,
• Clarification of MM4 delivery report forwarding,
• MM4 responses to Relay/Server,
• MM4 Multiple Recipients,
• MM4 Valued Added Service (VAS) Identification and
• Deletion of the Mapping table from the MM7 Submit Request to the MM4 Forward Request because this mapping is not recommended by other parts of TS 23.140.

T2 requested to delay functional freezing (i.e. stopping the addition of new functionality) in the Rel 6 version of TS 23.140 to complete the following outstanding items:

- High Probability of Completion.
- TS 29.140 Stage 3 MM10 Protocol.
- Lack of input on IMS Deferred Messaging (SIP addressing) and Multiple Relay/Servers.

Even with these delays, support for security and privacy enhancements such as end-to-end security, terminal security and prevention of Spam will not be completed for Rel 6.

Seven CRs were approved for Rel 4, Rel 5 and Rel 6 SMS including:

- TS 23.038 and TS 23.040 Message Waiting Indication.
- TS 23.040 Enhanced Voice Mail Indication Mailbox number priority.

One CR was approved on the applicability of Enhanced Voice Mail Information for the Rel 6 Cell Broadcast Service (CBS) in TS 23.038.

Table 2: 3GPP TSG T2 (Mobile Terminal Services & Capabilities) Specification Update

Document	Title	Status
TS 23.038	Alphabets and Language-Specific Information	Rel 4, Rel 5 and Rel 6 being revised.
TS 23.040	Technical realization of the Short Message Service (SMS)	
TS 23.140	Multimedia Messaging Service (MMS); Functional Description; Stage 2	Rel 6 being revised.

TSG T Working Group 3: SIM/USIM

3GPP TSG T Working Group 3 (T3) specifies the 2G SIM and 3G USIM, with the exception of the security algorithms, which are developed by SA3. It also maintains specifications and test cases for the 3G USIM, and its interface with the Mobile Terminal.

T3 will no longer maintain Rel 98 and earlier release specifications. It also has concluded that GSM-only Rel 99 and Rel 4 UEs are permitted to support a USIM.

T3 is still considering whether there can be more than one Terminal Profile per card session.

Several functional enhancements were approved for TS 31.102. Among them are the supports of Multimedia Broadcast and Multicast Service (MBMS) Security, Multimedia Message storage on the card, Storage of WLAN fast re-authentication information, and alignment with requirements regarding transferring Unstructured Supplementary Service Data (USSD) usage.

The TS 31.111 USIM Application Toolkit (USAT) was enhanced by adding MMS Management and the ability to transfer USSD message to the SIM.

Table 3: 3GPP TSG T3 (SIM/USIM) Specification Update

Document	Title	Status
TS 31.048	Test Specification for TS 23.048 (Security Mechanisms for the (U)SIM Application Toolkit; Stage 2)	Rel 5 available.
TS 31.101	UICC-Terminal Interface; Physical and Logical Characteristics	Rel 6 being revised.
TS 31.102	Characteristics of the USIM Application	Rel 5 and Rel 6 being revised.
TS 31.111	USIM Application Toolkit (USAT)	Rel 99, Rel 4, Rel 5 and Rel 6 being revised.
TS 31.213	Test specification for (U)SIM API for Java Card ™	Delayed until March 2005.

Meeting Schedule

The most recent plenary meeting of TSG T was held from Sept 8th – 10th 2004 in Palm Springs, USA. Future meetings are scheduled for:

- December 8th – 10th 2004 in Athens, Greece.
- March 9th – 11th 2005 in Tokyo, Japan. This will probably be the last meeting of TSG T. Working Groups will continue, but will be renamed.

T1 meetings. January 31st – February 4th 2005 in Bangalore, India; April 25th – 29th 2005 in Europe; August 22nd – 26th 2005 in Berlin, Germany; October 24th – 28th 2005 in Vancouver, Canada.

T2 meetings. February 21st – 25th 2005 in Sophia Antipolis, France.

T3 meetings. February 8th – 11th 2005 in Barcelona, Spain; April 26th – 29th 2005 in Cancun, Mexico; August 9th – 12th 2005 in Dublin, Ireland.

3GPP2 TSG-S
Service and
System Aspects

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Editor: David.Crowe@cnp-wireless.com   Last published April, 2004

Note: 1.   S.S – TSG-X Specification; S.R – TSG-S Report; S.P – TSG-S Project.
        2.   Bold Type indicates a modification since the previous publication of this information.
        3.   Published 3GPP2 specifications will be available at: http://www.3gpp2.org/Public_html/specs/index.cfm

3GPP2 TSG-S – Service and System Aspects – Specifications

Specification	Description	Status
S.S0028	OAM&P for cdma2000 (3GPP Delta Specification)	Published 07/01
S.S0028-Av2	OAM&P for cdma2000 (3GPP R4 Delta Specification)	Published 02/03
S.S0028v3	OAM&P for cdma2000 (3GPP Delta Specification)	Published 03/02
S.S0053	Common Cryptographic Algorithms	Published 01/02
S.S0054	Interface Specification for S.S0053	Published 01/02
S.S0055	Enhanced Cryptographic Algorithms (ESA/ESP)	Published 01/02
S.S0055-A	Enhanced Cryptographic Algorithms (ESA/ESP)	Published 11/03
S.S0078	Common Security Algorithms	Published 04/03
S.S0078-A	**Common Security Algorithms**	**Published 05/01**
S.S0083	**Broadcast-Multicast (BCMCS) Security Framework**	**Published 09/04**
S.S0093	cdma2000 Network Performance Measurement Types	Published 12/03
S.S0093	**cdma2000 Network Performance Measurement Types**	**Published 12/03**

3GPP2 TSG-S – Service and System Aspects – Reports

Report	Description	Status
S.R0003	3GPP2 System Capability Guide	Published 01/00
S.R0003-A	3GPP2 System Capability Guide	Published 07/01
S.R0004	Service Implementation Guide	Published 01/00
S.R0005	Network Reference Model	Rescinded
S.R0005-A	Network Reference Model	Published 12/99
S.R0005-B	Network Reference Model	Published 05/01
S.R0006	Wireless Features Description	Published 12/99
S.R0007	Stage 1 for User Selective Call Forwarding (USCF)	Published 12/99
S.R0008	Stage 1 for Answer Hold (AH)	Published 12/99
S.R0009	Stage 1 for User Identity Module (UIM)	Published 12/99
S.R0010	Stage 1 for Preferred Language Enhancement	Published 12/99
S.R0011	Stage 1 for Advice of Charge	Published 12/99
S.R0012	Stage 1 for Rejection of Undesired Annoying Calls	Published 12/99
S.R0013	Stage 1 for Global Emergency Call Origination (GECO)	Published 12/99

S.R0014	Stage 1 for Tandem Free Operation (TFO)	Published 12/99
S.R0015	Stage 1 for ISDN Interworking	Published 12/99
S.R0016	Stage 1 for Automatic Call Gapping	Published 12/00
S.R0017	3G WIreless Network Management System High Level Requirements	Published 12/99
S.R0018	Stage 1 for Prepaid Charging	Published 12/99
S.R0019	Stage 1 for Location Based Services	Published 10/00
S.R0021	Stage 1 for Video Streaming Service	Published 08/00
S.R0021-0	Stage 1 for Multimedia Streaming Service	Published 04/02
S.R0022	Stage 1 for Video Conferencing	Published 08/00
S.R0023	Stage 1 for High Speed Data Enhancements for cdma2000 (DO)	Published 12/00
S.R0024	Stage 1 for Wireless Local Loop	Published 10/00
S.R0025	Stage 1 for Wireless Payphone	Published 10/00
S.R0026	Stage 1 for High Speed Data Enhancements for cdma2000 Integrated Data/Voice (DV)	Published 11/00
S.R0027	Stage 1 for Personal Mobility	Published 12/00
S.R0029	Stage 1 for Access Control Based on Call Type	Published 10/00
S.R0030-0	Stage 1 for Broadcast/Multicast Service (BCMCS)	Published 08/01
S.R0030-A	Stage 1 for Broadcast/Multicast Service (BCMCS)	Published 02/04
S.R0032	Stage 1 for Enhanced Subscriber Authentication (ESA) and Privacy (ESP)	Published 12/00
S.R0033	Stage 1 for Realm Configured Packet Data Session Dormancy Timer	Published 12/01
S.R0034	UIMID Manufacturer's Code Assignment Guidelines and Procedures	Published 05/01
S.R0034	UIMID Manufacturer's Code Assignment Guidelines and Procedures	Published 08/02
S.R0035	Stage 1 for Quality of Service (QoS) Requirements	Rescinded
S.R0037v2	IP Network Architecture	Published 05/02
S.R0037v3	IP Network Architecture	Published 09/03
S.R0038	3GPP2 Evolution. For internal use only.	Completed 04/02
S.R0038v1	3GPP2 Evolution	Completed 03/04
S.R0038v2	3GPP2 Evolution	Development
S.R0048	MEID Stage 1	Published 05/01
S.R0048-A	MEID Stage 1	Published 09/03
S.R0048-Av2	**MEID Stage 1**	**Published 05/04**
S.R0048-Av3	**MEID Stage 1**	**Published 10/04**
S.R0051	Stage 1 for Enhanced Message Service (EMS)	Published 07/01
S.R0052	Alpha System Release Guide	Published 01/04
S.R0057	System Requirements for IP-Based Service Architecture	Published 07/02
S.R0058	System Requirements for IP Multimedia Domain	Published 04/03
S.R0059	System Requirements for Legacy MS Domain (LMSD) Step 1	Published 05/02
S.R0060	Stage 1 for Removable UIM (R-UIM)/Mobile Equipment (ME) Interface Testing	Published 03/02
S.R0061	Wireless Immediate Messaging	Published 10/02
S.R0062	Presence for Wireless Systems	Published 10/02
S.R0064	Multimedia Messaging Services (MMS)	Published 10/02
S.R0065	System Requirements for Fast Call Setup	Published 04/02
S.R0066	Stage 1 for IP-Based Location Services (LCS)	Published 04/03
S.R0068	Stage 1 for Link Layer Assisted Robust Header Compression (LLA ROHC)	Published 06/02
S.R0069	Stage 1 for Header Stripping and Generation	Published 03/02
S.R0070	Work Item, Stage 1 and System Requirements Process Guidelines	Published 05/02
S.R0070-A	Work Item, Stage 1 and System Requirements Process Guidelines	In press
S.R0071	Stage 1 for Legacy System Packet Data Surveillance	Published 04/02
S.R0072	Stage 1 for All-IP Packet Data Surveillance	Published 04/02
S.R0073	Stage 1 for Internet Over-the-Air Handset Configuration Management (IOTA)	Published 07/02
S.R0074	Stage 1 for File Format for Multimedia Services (FFMS)	Published 04/03

S.R0075	System Requirements for Accounting and Auditing for All-IP	Published 04/03
S.R0079	**End-to-End Quality of Service**	**Published 06/04**
S.R0080	Stage 1 for cdma200 Wideband Speech Codec	Published 02/03
S.R0082	Enhanced Packet Data Air Interface Security	Published 09/03
S.R0083	Broadcast/Multicast Service Security Framework	Published 11/03
S.R0083-A	**Broadcast/Multicast Service Security Framework (TIA-1053)**	**Published 01/05**
S.R0084	Stage 1 for Prepaid Packet Data	Published 09/03
S.R0086	IMS Security Framework	Published 02/04
S.R0086-A	**IMS Security Framework**	**Published 07/04**
S.R0087	**Stage 1 for 3GPP2 – WLAN Interworking**	**Published 08/04**
S.R0088	Global Wireless Equipment Numbering Administration Procedures	Replaced by SC.R4001
S.R0089	Mobile Equipment Identifier (MEID) Assignment Guidelines and Procedures	Replaced by SC.R4002
S.R0090	**Stage 1 for Network Initiated Data Session (NIDS)**	**Published 07/04**
S.R0092	**System Requirements for LMSD Step 2**	**Published 04/04**
S.R0095	**Stage 1 for Support for ISIM on UICC**	**Published 07/04**
S.R0096	**Stage 1 for Transcoder Free Operation (TrFO)**	**Published 04/04**
S.R0103	**Stage 1 for Network Firewall Configuration and Control (NFCC)**	**Published 05/01**
S.R0104	**HRPD Network Access Authentication for a Hybrid Access Terminal (HAT) with a R-UIM**	**Published 11/04**
S.R0105	**Stage 1 for Hot-lining Service for Packet Data**	**Published 01/05**

3GPP2 TSG-S – Service and System Aspects – Projects

Project	Description	Status
S.P0030	BCMCS Stage 1	Development
S.P0067	Enhanced Call Recovery	Released
S.P0079	Quality of Service (QoS)	Development
S.P0090	Stage 1 for Network Initiated Data Session (NIDS)	Ballot
S.P0094	Rm Interface Enhancements Stage 1	Development
S.P0095	Support of ISIM on UICC Stage 1	Development
S.P0096	TrFO (Transcoder Free Operation)	Development
S.P0099	Publication Numbering Guidelines	Forwarded to SC
S.P0102	Release Planning Guidelines	Development

TIA TR-45.4/3GPP2 TSG-A

Radio Access Network

Interface Standards

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Perspectives

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Note: 1.   IS- Interim Standard, TSB- Telecommunications Systems Bulletin, PN- Project Number, SP- ANSI Standards Proposal,
            A.Pxxxx - TSG-A project, A.Rxxxx - TSG-A report, A.Sxxxx - TSG-A specification. Due to space considerations projects of the
            format PN-3-xxxx are shown without the "-3" (which means 'TIA').
        2.   Bold Type indicates a modification since the previous publication of this information.
        3.   Published TIA standards can be obtained from TIA at www.tiaonline.org/standards/search_n_order.cfm.

3GPP2 TSG-A Projects (P.xxxx), Specifications (S.xxxx) and Reports (R.xxxx)

Standard	Title	Status
A.R0003	Abis interface technical report for CDMA2000 systems. Refer to A.S0003	Completed 12/99
A.R0006	Study of IP-based RAN architecture for CDMA2000	Completed 07/01
A.R0011	Report on issues identified with IOS v4.1	Completed 08/02
A.R0011-A	**Report on issues identified with IOS v4.3 that impact v4.1 and v4.2**	**Completed 01/05**
A.S0001	**Interoperability specification (IOS) for CDMA2000**	**Published 06/00**
A.S0001-A	**Interoperability specification (IOS) for CDMA2000 (IOS v4.1.1)**	**Published 06/01**
A.S0003	BTS-BSC interoperability (Abis interface) for CDMA2000	Published 03/00
A.S0003-A	BTS-BSC (Abis) interface for CDMA2000	Published 07/01
A.S0004	**CDMA/TDMA Tandem Free Operation - Refer to TIA/EIA-829**	**Published 01/01**
A.S0004-A	CDMA/TDMA Tandem Free Operation - Refer to TIA/EIA-895	Published 03/02
A.S0004-B	CDMA Tandem Free Operations. Refer to TIA/EIA-895-A	Published 08/02
A.S0006	**IOS for Hybrid MS/Access Terminal (HA) Authentication using CAVE**	**Published 01/05**
A.S0007	HRPD Interoperability specification (IOS) for CDMA2000 (Phase 1). Refer to TIA-878	Published 11/01
A.S0007-A	HRPD IOS (Phase 2). Session Control/Mobility Management in PCF. Refer to TIA-1878	Published 05/03
A.S0008	HRPD IOS. Refer to TIA-878-1	Published 05/03
A.S0011~17	Interoperability specification (IOS) for CDMA2000. In 7 parts (see below)	See TIA-2001-B
A.S0011	Part 1 - Overview	
A.S0012	Part 2 - Transport	
A.S0013	Part 3 - Features	
A.S0014	Part 4 - A1, A2, A5 interfaces	
A.S0015	Part 5 - A3, A7 interfaces	
A.S0016	Part 6 - A8, A9 interfaces	
A.S0017	Part 7 - A10, A11 interfaces	
A.S0011~17-A	Interoperability specifications (IOS v4.3) for CDMA2000 in 7 parts	Published 10/03
A.S0011~17-B	**Interoperability specifications (IOS v4.3.1) for CDMA2000 in 7 parts**	**Published 06/04**
A.S0011~17-C	**IOS v5.0 in 7 Parts**	**Ballot**
A.S0019	**IOS for BCMCS**	**Published 01/05**

TR-45.4 Projects and Standards

Standard	Project	Title	Status
TIA/EIA-828	SP-4604	Abis interface specification for CDMA2000	Published 12/01
TIA/EIA-829	PN-4683	Tandem Free Operation (bypasses intermediate vocoders in mobile-to-mobile calls with compatible vocoders)	Published 08/01
TIA/EIA-895	SP-0030	CDMA Tandem Free Operation	Published 03/02
IS-658	PN-4374	Data Services Interworking Function Interface (e.g.modempool). This version developed by TR-45.5	Published 07/96
IS-658-1	PN-4385	Extends the ability to perform interface status exchange at times other than call setup	Published 02/99
TIA-878	PN-0009	HRPD interoperability specification (IOS) for CDMA2000 "A" interface	Published 12/01
TIA-878-1	PN-0009-AD1-A	Addendum to HRPD IOS	Published 05/03
TIA-878-A	**PN-0009-A**	**IOS Supporting HRPD**	**Development**
TIA-895-A	SP-0030-RV1	CDMA Tandem Free Operation	Published 10/02
TIA-1070	**PN-0198**	**Hybrid MS/AT (HAT) Authentication**	**In press**
TIA-1878	PN-0091	IOS for high rate packet data (HRPD) - Alternative architecture	Published 08/03
TIA-1878-A	**PN-0091**	**IOS for high rate packet data (HRPD) - Alternative architecture**	**Development**
TSB-80		IS-634-0 Addendum (corrections, SMS, subrate voice frame format)	Published 11/96
TSB-104		PCS Service Description (now IS-104 in committee TR-46)	Published 06/94
IS-2001	PN-4545	CDMA2000 Access Network Interface ("A" Interface) based on 3GPP2 TSG-A IOS V4.0	Published 12/00
IS-2001-1	PN-4545-AD1	Errata sheet for IS-2001	Published 05/01
IS-2001-A	PN-4545-RV1	CDMA2000 Access Network Interface based on IOS v4.1	Published 08/01
TIA-2001-B	SP-4545-RV2	CDMA2000 Access Network Interface based on IOS v4.2	Published 05/02
TIA-2001-C	**SP-4545-RV3**	**CDMA2000 Access Network Interface based on IOS v4.3**	**Published 12/03**
TIA-2001-D		**CDMA2000 Access Network Interface based on IOS v5.0**	**Ballot**
IS-634-0	PN-3296	MSC-BS "A" Interface Standard	Published 12/95
IS-634-A	PN-3539	MSC-BS Interface, including support for IS-95-A, EIA/TIA-553-A, IS-41-C, SMS, data and frame relay	Published 10/98
TIA/EIA-634-B	SP-4277	ANSI version of IS-634-A	Published 04/99