

# Cellular Networking Perspectives

Editor: [David.Crowe@cnp-wireless.com](mailto:David.Crowe@cnp-wireless.com)

Vol. 12, No. 6 June, 2003

## In This Issue . . .

### *The Bads on Mobile IP* ..... p. 1

An attempt to determine the reason why Mobile IP has not yet been widely adopted. Is it the lack of support for authentication and billing? Is it performance? Is it a lack of demand for mobility?

### *3GPP TSG SA Update: Service & System Aspects*..... p. 3

The latest information on the 3GPP TSG on Service and System Aspects. This TSG has the most control over the future direction of 3GPP UMTS standards, being responsible for most of the requirements definition and early design.

### *3GPP2 TSG-X (and related SDOs) Wireless Core Network Standards* ..... p. 8

3GPP2 specifications are now produced by TSG-X, but most published specifications are still identified by their old TSG-N or TSG-P name. These standards are still being balloted by the corresponding TIA subcommittees: TR 45.2 and TR-45.6 (which will not be merging).

## Huh?

If there are any acronyms or terms that you are unfamiliar with, check our website glossary, you will probably find them here:

[www.cnp-wireless.com/  
glossary.html](http://www.cnp-wireless.com/glossary.html)

*Next Issue: July 7<sup>th</sup>, 2003*

## The Bads on Mobile IP

Mobile IP seems like a good idea, but it has not been widely implemented. In our **May, 2003** issue we discussed how it worked, but only touched on some of the major barriers to more widespread adoption.

## A Philosophical Diversion

Mobile IP obeys the unwritten Internet protocol philosophy, one that is radically different from the way that most telecommunications protocols were designed. For some applications, such as file transfer, the web and email, this new approach has produced solutions that are far better than competitors from organizations like the ITU. In other cases, such as in packet routing, Internet protocols are more flexible but come with significant reliability and security problems. In yet other application areas, of which Mobile IP may be an example, the philosophy is not successful.

The lack of implementations of Mobile IP means that advances in the Internet, in particular those related to routing, largely ignore it, which makes it even more difficult for the technology to spread.

By comparison with Mobile Application Parts (MAP) for GSM and CDMA2000, Mobile IP only attempts to solve one problem, that of routing. MAPs also integrate considerable support for authenticating the mobile, managing its profile, and ensuring that billing can occur. By running MAP protocols on an SS7 network (which is, by its nature, private and physically secure) security, reliability and performance problems are much easier to manage.

**Figure 1** compares the Telecom and Internet philosophies of protocol design. For each comparison point, it evaluates the impact on Mobile IP.

## AAA - Authentication, Authorization and Accounting

AAA devices are used by Internet protocols to provide authentication and authorization of devices and accounts, and to accumulate accounting data for later billing and settlement between carriers.

Although these functions are an essential part of many mobility applications, integration of Mobile IP with AAA is still in the process of being standardized.

## AAA Registration Keys for Mobile IP.

This Internet draft specifies extensions to Mobile IP registration messages to create security associations between:

- Mobile Node (MN) and Home Agent (HA)
- Mobile Node and Foreign Agent (FA)

These security associations are based on a primary security association established between the MN and the HAAA (Home AAA).

## AAA NAI for Mobile IPv4 Extension.

One of the Mobile IP extensions required to support AAA is to provide the MN and HA with the identity of the appropriate HAAA, particularly if the HA is associated with several such devices. This identity is in the NAI format ('hostname@realm'). The HA also supplies its own address in the same format to the HAAA.

The HAAA stores security data and accumulates packet data accounting information for each associated MN.

## Obtaining IETF Drafts

Mobile IP drafts mentioned below can be obtained from:

[www.ietf.org/ids.by.wg/mobileip.html](http://www.ietf.org/ids.by.wg/mobileip.html)

Individual URLs are not provided because they quickly become invalid.

Editor: David Crowe.  
Accounts: Evelyn Goreham.  
Distribution: Debbie Brandelli.  
Production: Doug Scofield.

*Cellular Networking Perspectives* (issn 1195-3233) is published monthly by Cellular Networking Perspectives Ltd., 2636 Toronto Crescent NW, Calgary AB, T2N 3W1, Canada. Phone: 1-800-633-5514 (+1-403-274-4749) Fax: +1-403-289-6658 Email: [cnp-sales@cnp-wireless.com](mailto:cnp-sales@cnp-wireless.com) Web: [www.cnp-wireless.com](http://www.cnp-wireless.com) Subscriptions: CDN\$350 in Canada (incl. GST), US\$350 in the USA and US\$400 elsewhere. Payment by cheque, bank transfer, American Express, Diners Club, MasterCard or Visa. Delivery: Email or 1st class mail. Back Issues: Single issues are \$40 in the US and Canada and \$45 elsewhere, or in bulk at reduced rates. Discounts: Educational and small businesses: 25% off any order. Copies: Each subscriber is licensed to make up to 10 copies of each issue or back issue. Please call for rates to allow more.

**Figure 1: The Difference between Telecom and Internet Protocol Philosophies, and their Impact on Mobile IP (MIP)**

Philosophy	Telecom	Internet	Consequence for Mobile IP
Action Stimulus	Designed into the messaging for the protocol.	Extensive use of polling, retransmissions and time-outs.	The FA does not know when the mobile has moved, and so cannot forward packets that arrived during the lengthy handoff to a new system.
Compatibility	"I guess we should have thought about that."		The need to maintain backwards compatibility means that some newer capabilities cannot be counted on, increasing the complexity of implementations.
Efficiency	"Count every octet"	"Bytes are free".	Some aspects of Mobile IP (particularly handoff and the registration process) are sluggish, even with the greater bandwidth that is usually available in the Internet.
Future Directions	"What future?"	"What past?"	Lack of consideration of previous mobility solutions (i.e. MAP) led to a simplistic (one operation) solution. Adding the required functionality after the fact is difficult.
Layering	Layers are overlapping or integrated.	Clear separation of layers.	Mobile IP routing has serious problems with VPNs, NATS and Firewalls, because it cannot touch the IP routing layer.
Network Functionality	Intended for one type of traffic (voice, signaling or data).	Used for all traffic types.	Mobile IP signaling is mixed with a variety of data traffic, and therefore may be delayed or discarded.
Network Security	Physical	Algorithmic	A security association has to be established with the Home Agent (and another with the AAA, and so on). This adds delay and complexity.
Protocol Functionality	More than will ever be needed (or used).	One function.	Mobile IP, at most, solves the packet routing problem. It does not provide much assistance validating the mobile, determining its service profile nor with facilitating billing. Extensions to the protocol are now being developed to address some of these issues.
Reliability	Built into network.	Added by application.	Applications have to compensate for message loss by timeouts and retransmissions, which also delays the average time to complete an operation.
Signaling QoS	As good as the network (as long as SMS user traffic is off-loaded).	Affected by other types of traffic.	Mobile IP signaling traffic suffers from low QoS because it is mixed with all other user traffic (including Mobile IP packets being diverted). This can be somewhat mitigated by the use of additional protocols such as RSVP or DiffServ.
Terminating Services	Built in.	Simulated by client polling.	Few Internet client applications rely on terminating services, minimizing the advantages of Mobile IP over PPP or DHCP.

## Security

### Mobile IPv4 Challenge/Response

**Extensions.** This draft adds support for the PPP Challenge Handshake Authentication Protocol (CHAP) into Mobile IP. This requires that the foreign system broadcast a frequently changing numerical challenge in agent advertisements. The FA will also need to have access to an individual secret for an MN from the HAAA. This key distribution problem is not addressed by this draft.

## Firewalls, VPN and Pesky NATs

**VPN Traversal.** Mobile IP cannot currently be used in conjunction with VPNs, as both play games with IP addresses, and the rules of the games are incompatible. One draft (MIPv4 VPN Traversal Problem Statement) describes some of the problems that have been identified:

- IPsec (used to encrypt VPN traffic) encrypts data that the FA needs to examine, but the FA does not have a security association allowing decryption.
- IPsec is required if the HA is behind a firewall (e.g. corporate intranet).
- The VPN tunnel has to be re-negotiated every time the mobile moves to a new system.

Another draft (Mobile IPv4 Traversal Across IPsec-based VPN Gateways) does describe a solution. The MN first detects whether it is outside its corporate network, and if it is, registers with an HA outside the firewall, establishes the IPsec VPN connection, and then registers the VPN-tunnel inner address with an HA inside the firewall. Unfortunately, although this solution can work, it requires more equipment, significant complexity in the MN client software, more setup overhead, and increases the size of all packets.

## Protocol Enhancements

Some parts of Mobile IP were simply deficient, and have needed to be enhanced by new protocol extensions, which are still only drafts.

**Registration Revocation.** This draft specifies a new Registration Revocation transaction in the Mobile IP protocol which allows an HA to erase registration information in the FA, making for more accurate billing and allowing the FA to more efficiently manage resources assigned to each roaming MN.

### Localized Mobility Management.

Binding updates can take more than 100 milliseconds, resulting in many lost packets as the MN establishes an association with an FA in a new system. There is no solution to this problem yet, but an Internet draft (Localized Mobility Management Requirements) has identified requirements for one. It may rely on intermediate agents able to accept packets directed to a mobile's care-of address for a longer period of time without rebinding, by providing addresses that are valid in a number of related foreign systems.

## Conclusions

Perhaps the fundamental problem with Mobile IP is not really a problem at all, and it is not the fault of the protocol designers. Mobile IP simply does not provide a big advantage over protocols for nomadicity because Internet client protocols simply assume terminating services are not available. Obtaining a temporary IP address through PPP or DHCP, and forcing the mobile to initiate all sessions, works with most Internet client applications designed in this way.

The demand for terminating services is growing, however, as more Fixed Internet connections are 'always on', and as the distinction between servers and clients diminishes. Applications would rely on having a terminating address. However, it is not clear how quickly such applications will become essential for mobile devices (as opposed to being 'nice to have if it wasn't so difficult to get them').

Flawless support of Mobile IP is not yet possible and, when it is, will come at considerable cost. Because of its high cost and relatively small benefit, adoption of Mobile IP will probably continue to grow slowly.

## 3GPP TSG SA Update: Service & System Aspects

The 3GPP Technical Specification Group for Service and System Aspects (TSG SA) is responsible for the overall architecture and service capabilities of systems based on 3GPP specifications, including responsibility for cross-TSG coordination.

**3GPP Evolution.** Some progress was made on Technical Report 21.902, which describes the "Evolution of 3GPP Systems". The main achievement was the definition of several "Focus Areas", which will be refined by e-mail discussions. One of the most contentious points was the accurate definition of 'medium term' and 'long term', but no consensus was achieved.

**IPv4 or IPv6?** The SA plenary considered a proposal from MMO2 (a UK operator) to introduce an IPv4-based IMS (IP Multimedia Subsystem). The current working assumption is that IMS will exclusively use IPv6. MMO2 asked TSG SA to revalidate this assumption, given the current lack of widespread migration to IPv6 and the lack of progress to date within 3GPP regarding the specification of interworking between IMS and IPv4-based SIP applications. SA concluded that present work on interworking should be continued, and potentially, should be enforced, particularly in SA WG2 and CN WG3. If these groups conclude that interworking is not reasonably possible with the present assumption on IPv6, then they should report back to next SA plenary.

### 'Early' User Equipment Handling.

There is still no decision on how to maintain compatibility with 'early' User Equipment (UE). A choice must soon be made by TSG RAN between a solution relying on a bitmap of UE faults and another one based on the IMEI Software Version. The chair reported that a vote might have to take place at their next meeting if no consensus can be reached. It was agreed that SA WG2 should assist by providing RAN and other TSGs with an analysis of the architectural impact of the two choices.

### Extended Tandem Free Operation

**(eTFO).** The advantages of this new feature are still being debated, particularly by comparison to enhancements to Transcoder Free Operation (TrFO). There was support both *for* developing eTFO (primary supporter: Nortel) and *against* (Lucent, Siemens, and Alcatel). More discussion will take place at SA WG2, to try to provide a decision at the next SA meeting.

**Release 6 Schedule.** SA examined possible dates for freezing Release 6. A decision about dates around the end of 2003 and early 2004 will be taken at the next meeting, on the basis of the progress made in the meantime and based on the estimated completion dates from the Working Groups.

**Leadership.** Although this was election time, there were no changes in the TSG SA officers. Existing chair Niels Peter Skov Andersen (Motorola) and vice chairs Gary Jones (T-Mobile) and Hiroshi Nakamura (NTT DoCoMo) were re-elected.

## TSG SA WG 1 (Service)

3GPP TSG SA Working Group 1 (SA1) defines 3G services and features. The group sets high level requirements for the overall system, providing this in a Stage 1 description. This work includes: Definition of service and feature requirements; a framework for services; specification of services (stage 1); specification of service capabilities (stage 1); and identification of technical and operational issues to meet market requirements and also charging and accounting requirements.

At the most recent meeting, the WG concentrated on the Release 6 Work Items for IMS (IP Multimedia System) and Multimedia Messaging (MMS).

The newly elected chair is Michel Zarri of T-Mobile. Vice-chairs are Tommi Kokkola of Nokia and Randolph Wohlert of Southwestern Bell.

## TSG SA WG2 (Architecture)

3GPP TSG SA Working Group 2 (SA2) defines the Stage 2 network description for the 3GPP network. Based on service requirements from SA1, SA2 identifies the main functions and entities of the network, describes how they are linked to each other and what information they exchange. The output of SA WG2 is used by the groups defining the precise format of messages in Stage 3. The only exception is that Stage 2 for the Radio Access Network is defined by TSG RAN. SA2 must have a system-wide view in order to best determine how new functions integrate with existing network entities.

An election was held during the 1Q03 meeting. The new working group chair is Magnus Olsson of Ericsson. Vice-chairs are Akishige Noda of Fujitsu and Alexander Milinski of Siemens.

**Table 1: 3GPP TSG SA Working Group 1 Service Specification Update**

Document	Title	Status
tbd	Priority Multimedia Service	New work item.
TR 21.905	Vocabulary for 3GPP Specifications	Rel 5 and Rel 6 versions being revised.
TS 22.011	Service Accessibility	Rel 6 version being published.
TS 22.060	General Packet Radio Service (GPRS); Service Description; Stage 1	Rel 5 version being revised. Rel 6 version being published.
TS 22.071	Location Services (LCS); Service Description; Stage 1	Rel 6 version being revised.
TS 22.078	Customised Applications for Mobile Network Enhanced Logic (CAMEL); Stage 1	Rel 5 and Rel 6 versions being revised.
TS 22.101	Service Aspects; Service Principles	
TS 22.105	Services and Service Capabilities	Rel 6 version being revised.
TS 22.115	Charging and Billing	Rel 6 version being published.
TS 22.129	Handover Requirements between UTRAN and GERAN or other Radio Systems	Rel 6 version being published.
TS 22.140	Multimedia Messaging Service (MMS); Stage 1	Rel 6 version being revised.
TS 22.141	Presence Service; Stage 1	
TS 22.146	Multimedia Broadcast/Multicast Service; Stage 1	
TS 22.174	Push Service; Service Aspects; Stage 1	
TS 22.228	Service Requirements for the Internet Protocol (IP) Multimedia Core Network Subsystem; Stage 1	
TS 22.233	Transparent End-to-End Packet-Switched Streaming Service	
TS 22.240	Generic User Profile (GUP); Stage 1	
TS 22.242	Digital Rights Management (DRM); Stage 1	Rel 6 version being revised.
TS 22.243	Speech Recognition Framework for Automated Voice Services; Stage 1	
TS 22.340	IMS Messaging	
TR 22.800	IMS Subscription and Access Scenarios	Version 1.0.0 submitted for information.
TR 22.950	Priority Service Feasibility Study	Rel 6 version being revised.
TR 22.951	Service Aspects and Requirements for Network Sharing	

**Table 2: 3GPP TSG SA Working Group 2 Architecture Specification Update**

Document	Title	Status
tbd	WID for Network Sharing; Stage 2	New work items.
tbd	WID: PS domain and IM CN Subsystem Support for IMS Emergency Sessions	
TS 23.002	Network Architecture	Rel 4, Rel 5 and Rel 6 versions being revised.
TS 23.032	Universal Geographical Area Description (GAD)	Rel 5 version being published.
TS 23.060	GPRS; Stage 2	Rel 5 version being revised.
TS 23.107	QoS Concept and Architecture	
TS 23.141	Presence Service; Architecture and Functional Description	Rel 6 version being revised.
TS 23.195	Early UE handling	Version 1.0.0 submitted for information.
TS 23.207	End-to-End QoS Concept and Architecture	Rel 5 version being revised.
TS 23.221	Architectural Requirements	Rel 6 version being published.
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2	Rel 5 and Rel 6 versions being revised.
TS 23.240	3GPP Generic User Profile – Architecture; Stage 2	Version 1.0.0 submitted for information.
TS 23.271	Functional Stage 2 Description of LCS	Rel 5 and Rel 6 versions being revised.
TR 23.895	Provision of UE-specific Behavior Information to Network Entities	Rel 6 version being revised.

## TSG SA WG3 (Security)

3GPP TSG SA Working Group 3 (SA3) is responsible for the security of the 3GPP system, performing analyses of potential security threats to the system, considering the new threats introduced by IP-based

services and systems, and setting the security requirements for the overall 3GPP system.

An election was held during the 1Q03 meeting. The new chair is Michael Walker of Vodafone. Vice-chairs are Valtteri Niemi of Nokia and Michael Marcovici of Lucent.

Several essential changes were approved to ensure that the Lawful Interception requirements are met. The CRs were against TS 33.108.

**Table 3: 3GPP TSG SA Working Group 3 Security Specification Update**

Document	Title	Status
tbd	Lawful Interception in the 3GPP Rel 6 Architecture	New work item.
tbd	WID: Network Domain Security; Authentication Framework (NDS/AF)	
TS 33.108	3G Security; Handover Interface for Lawful Interception	Rel 5 and Rel 6 versions being revised.
TS 33.203	3G Security; Access Security for IP-Based Services	Rel 5 version being revised.
TS 33.210	3G Security; Network Domain Security; IP Network Layer Security	Rel 5 and Rel 6 versions being revised.

## TSG SA WG4 (Codec)

3GPP TSG SA Working Group 4 (SA4) specifies speech, audio, video, and multimedia codecs (coders/de-coders), in both circuit-switched and packet-switched environments. Other topics within the mandate of SA4 are: Quality evaluation,

end-to-end performance, and interoperability aspects with existing mobile and fixed networks (from the codec point of view).

At the January 2003 meeting, an *ad hoc* group was established for detailed work on the Extended AMR-WB codec for Rel 6, chaired by Imre Varga of Siemens.

An election was held during the 1Q03 meeting. The new working group chair is Kari Jarvinen of Nokia. The vice-chair is Tomoyuki Ohya of NTT DoCoMo.

**Table 4: 3GPP TSG SA Working Group 4 Codec Specification Update**

Document	Title	Status
TS 26.073	ANSI-C Code for the Adaptive Multi Rate (AMR) Speech Codec	Rel 5 version being revised.
TS 26.093	Mandatory Speech Codec Speech Processing Functions Adaptive Multi-Rate (AMR) Speech Codec; Source Controlled Rate Operation	Rel 6 version being published.
TS 26.102	Mandatory Speech Codec; Adaptive Multi-Rate (AMR) Speech Codec; Interface to Iu, Uu and Nb	Rel 99, Rel 4 and Rel 5 versions being revised.
TS 26.104	ANSI-C Code for the Floating-Point AMR Speech Codec	
TS 26.173	ANSI-C Code for the Adaptive Multi Rate (AMR) Wideband Speech Codec	Rel 5 version being revised.
TS 26.204	ANSI-C code for the Floating-Point Adaptive Multi-Rate Wideband (AMR-WB) Speech Codec	
TS 26.234	Transparent End-to-End Packet Switched Streaming Service (PSS); Protocols and Codecs	
TS 26.236	Packet Switched Conversational Multimedia Applications; Transport Protocols	Rel 99, Rel 4 and Rel 5 versions being revised.
TR 26.911	Codec(s) for Circuit Switched Multimedia Telephony Service; Terminal Implementor's Guide	

## TSG SA WG5 (Telecom Management)

3GPP TSG SA Working Group 5 (SA5) defines the requirements and framework for management of the UMTS system, producing the architecture descriptions of the telecommunication management network (TMN) and coordinating all related work across TSGs.

SA5 cooperates with the Open Mobile Alliance (OMA) Requirements Group on User Equipment Management (UEM).

## Meetings

The most recent plenary meeting of TSG SA was held on March 17<sup>th</sup> – 20<sup>th</sup> 2003 in Birmingham, UK. Future meetings will be held: June 9<sup>th</sup> – 12<sup>th</sup> 2003 in Hammenlinna, Finland; September 22<sup>th</sup> – 25<sup>th</sup> 2003 in Berlin, Germany; and December 15<sup>th</sup> – 18<sup>th</sup> 2003 in Hawaii, USA. For more details, consult:

[www.3gpp.org/Meetings/meetings.htm](http://www.3gpp.org/Meetings/meetings.htm)

**Table 5: 3GPP TSG SA Working Group 5 Telecom Management Specification Update**

Document	Title	Status
TS 32.015	Charging and Billing: 3G Call and Event Data for the Packet Switched (PS) Domain	Rel 99 version being revised.
TS 32.101	3G Telecom Management: Principles and High Level Requirements	Rel 5 version being revised.
TS 32.102	3G Telecom Management Architecture	Rel 4 and Rel 5 versions being revised.
TS 32.111-2	Fault Management; Part 2: Alarm Integration Reference Point: Information Service	
TS 32.111-3	Telecommunication Management: Fault Management; Part 3: Alarm Integration Reference Point: CORBA Solution Set	
TS 32.111-4	Telecommunication Management: Fault Management; Part 4: Alarm Integration Reference Point: CMIP Solution Set	
TS 32.140	Telecommunication Management: Services Operations Management: Subscription Management Requirements.	Rel 6 version being published.
TS 32.141	Telecommunication Management: Services Operations Management: Subscription Management Architecture	Version 1.0.0 was submitted for information.
TS 32.200	Telecommunication Management: Charging Management: Charging Principles	Rel 4 and Rel 5 versions being revised.
TS 32.205	Charging Management: Charging Data Description for the Circuit Switched (CS) Domain	
TS 32.215	Charging Management: 3G Charging Data Description for the Packet Switched (PS) Domain	Rel 5 version being revised.
TS 32.225	Charging Data Description for IP Multimedia Subsystem	Rel 4 and Rel 5 versions being revised.
TS 32.235	Charging Management: Charging Data Description for Application Services	
TS 32.303	Configuration Management (CM): Notification Integration Reference Point (IRP): CORBA Solution Set	
TS 32.403	Performance Management (PM): Performance Measurements - UMTS and Combined UMTS/GSM	
TS 32.421	Subscriber and Equipment Trace: Trace Concept and Requirements	Rel 6 version being revised.
TS 32.602	Configuration Management (CM): Basic Configuration Management Integration Reference Point (IRP): Information Service	Rel 5 version being revised.
TS 32.603	Configuration Management (CM); Basic Configuration Management Integration Reference Point (IRP): CORBA Solution Set	
TS 32.613	3G Configuration Management: Bulk CM IRP: CORBA Solution Set	
TS 32.623	Telecommunication Management: Generic Network Resources Integration Reference Point (IRP): CORBA Solution Set	Rel 4 and Rel 5 versions being revised.
TS 32.632	3G Configuration Management: Core Network Resources IRP: Network Resource Model	
TS 32.661	3G Configuration Management: Kernel Configuration Management IRP: Requirements	Rel 6 version being published.
TS 32.662	Configuration Management (CM): Kernel CM information Service	
TS 32.663	Configuration Management (CM): Kernel CM Integration Reference Point (IRP): CORBA Solution Set	Rel 5 version being revised. Rel 6 version being published.
TS 32.664	Configuration Management (CM): Kernel CM Integration Reference Point (IRP): Common Management Information Protocol (CMIP) Solution Set	Rel 6 version being published.
TS 32.673	Configuration Management (CM): State Management Integration Reference Point (IRP): CORBA Solution Set	Rel 5 version being revised.
TS 52.402	Telecommunication Management: Performance Management (PM); Performance Measurements - GSM	Rel 5 version being published.

# 3GPP2 TSG-X (and related SDOs) Wireless Core Network Standards

## Cellular Networking Perspectives

Editor: [David.Crowe@cnp-wireless.com](mailto:David.Crowe@cnp-wireless.com)

Last published September, 2002

Note: 1. IS- Interim Standard, TSB- Telecommunications Systems Bulletin, PN- Project Number, SP- ANSI Standards Proposal.  
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](http://www.tiaonline.org/standards/search_n_order.cfm).

### 3GPP2 TSG-X Core Network Technical Specification Group - Reports

Standard	Description	Status
X.R0001	TSG-X Detailed Working Procedures	Development

### 3GPP2 TSG-X Core Network Technical Specification Group - Projects

Standard	Description	Status
X.P0001	CDMA Packet Data Service Rev-1	See TIA/EIA/IS-880-A
X.P0002	LS Authentication/Privacy/Security And Enhancements	See TIA/EIA/IS-881
X.P0003	TIA/EIA-41-D Network Enhancements to Support CDMA SIM Roaming to GSM	See TIA/EIA/IS-868
X.P0004	TIA/EIA-41-E Integration	See TIA/EIA-41-E
X.P0005	TIA/EIA-41-F Integration	See TIA/EIA-41-F
X.P0006	TIA/EIA-41 Enhanced Security Services (ESA/AKA)	See TIA/EIA-41-D
X.P0007	TIA/EIA-41 Enhancements for Secure Mode OTASP and OTAPA	See TIA/EIA-906
X.P0008	TIA/EIA-41 Support for the Mobile Equipment Identity (MEID)	See TIA-928
X.P0009	WIN Location-based Services Phase III	See IS-843
X.P0010	WIN Pre-Paid Charging Enhancements	See TIA/EIA/IS-826-A
X.P0011	TIA/EIA-836 Enhancements	See TIA/EIA-835-C
X.P0013	IP Core Network - Multimedia Domain	See TIA/EIA/IS-873
X.P0014	Wireless Radio Telecommunications Intersystem Non-Signaling Data Communication DMH (Data Message Handler)	See TIA-124-E
X.P0015	Accounting and Auditing All-IP System Requirements	See S.P0075
X.P0016	Multimedia Message Services	See TIA-934
X.P0017	Open Service Access (OSA): Application Programming Interface	See TIA-937
X.P0018	LMSD Step 2 (IP Bearer)	
X.P0019	Broadcast/Multicast Services (BCMCS)	

X.Pxxxx	Subscribed Rate for Packet Data
X.Pxxxx	Enhanced Message Service
X.Pxxxx	IP-based Service Architecture
X.Pxxxx	Prepaid Service Support for HRPD
X.Pxxxx	Internet Over-the-Air Handset Configuration
X.Pxxxx	File and Media Format for Multimedia Services
X.Pxxxx	Common Security Algorithms
X.Pxxxx	1xEV-DV Capabilities
X.Pxxxx	Wireless Applications Management
X.Pxxxx	IP Broadcast and IP Multicast
X.Pxxxx	Multimedia Streaming
X.Pxxxx	Network Initiated Data Session
X.Pxxxx	Enhanced Call Recovery
X.Pxxxx	Enhanced Packet Data Air Interface Security
X.Pxxxx	Wideband Speech Codec for CDMA2000 Systems
X.Pxxxx	Security Framework for Data Services via HRPD
X.Pxxxx	IP-based Location Services (LCS)
X.Pxxxx	Standardized Packet Data Performance Testing
X.Pxxxx	Wireless Local Area Network (WLAN) Interworking with CDMA2000
X.Pxxxx	Voice Over IP (VoIP)
X.Pxxxx	End to End QoS
X.Pxxxx	Diameter Base Protocol Support

### 3GPP2 TSG-N Specifications (N.Sxxxx)

Specification	Description	Status
N.S0003	User Identity Module (UIM)	Published 04/01
N.S0004	WIN Phase II	See IS-848
N.S0005	Intersystem Operations	See TIA/EIA-41-E
N.S0006	PCS Multi-band Operations	See TSB76
N.S0007	DCCH (Digital Control Channel for TDMA)	See IS-730
N.S0008	Circuit Mode Services	See IS-735
N.S0009	IMSI Support in TIA/EIA-41	See IS-751
N.S0010	Advanced CDMA Features	See IS-735
N.S0011	OTASP and OTAPA	See IS-725-A
N.S0012	Calling Name Presentation (CNAP) and Restriction (CNAR)	See IS-764
N.S0013	WIN Phase I	See IS-771
N.S0014	Authentication Enhancements	See IS-778
N.S0015	TIA/EIA-41-D Miscellaneous Enhancements	Development
N.S0016	TIA/EIA-41-D Internationalization	See IS-807
N.S0017	International Implementations of Systems Compliant with TIA/EIA-41	See TSB29-C
N.S0017-A	International Implementations of Systems Compliant with TIA/EIA-41	See TSB29-D
N.S0018	Prepaid Charging (WIN Phase II)	See IS-826
N.S0019	Intersystem Link Protocol (ISLP)	See IS-728
N.S0020	Segmentation and Reassembly	See IS-812
N.S0021	User Selective Call Forwarding	See IS-838
N.S0022	Answer Hold	See IS-837
N.S0023	Automatic Code Gapping (ACG)	See IS-786
N.S0024	MDN-based Message Centers (MC)	See IS-841
N.S0025	Roamer Database Verification	See IS-847



N.S0026	Near Real-Time Call Detail/Billing Record Transfer	See TIA/EIA-124
N.S0027	Enhanced International Dialing, Calling Number Identification, Callback and Calling Party Category Identification	See IS-875
N.S0028	CDMA IP Network Requirements and Architecture Model	See IS-884
N.S0029	Inter-System Operations for Roaming and Mobility	See TIA/EIA-41-F
N.S0030	Enhanced Security Services based on AKA	See PN-4393
N.S0032	Mobile Application Part, Revision F	See TIA/EIA-41-F
N.S0033	Addendum 2 for Enhanced Emergency Services Phase II	See J-STD-036-A
N.S0034	Emergency Services beyond US FCC Mandate	See PN-4288
N.S0035	Lawfully Authorized Electronic Surveillance	See J-STD-025-A
N.S0036	Semi-Realtime Call Detail and Billing Record Transport	See TIA/EIA-124-C
N.S0038	Secure Mode OTASP and OTAPA	See TIA-906

### 3GPP2 TSG-N Projects (N.Pxxxx)

Project	Description	Status
N.P0009	CDMA Packet Data Service, Phase I	See IS-880
N.P0010	CDMA Packet Data Service, Phase I	See PN-4755
N.P0011	WIN Location Based Services	See IS-843
N.P0013	Location Services	See IS-881
N.P0019-A	Enhancements to VLR Roamer Database Verification	See IS-847-A
N.P0020	IP-based Data Transfer Services	Project cancelled
N.P0021	WIN ACG Enhancements	See IS-786-A
N.P0022	WIN Prepaid Charging Enhancements	See IS-826-A
N.P0023	IP Core Network - Legacy MS Domain (LMSD)	See IS-872
N.P0024	IP Core Network - Multimedia Domain (MMD)	See IS-873
N.P0025	CDMA SIM roaming to GSM	See IS-868
N.P0026	IIF Enhancements for Two-Way CDMA SIM Roaming to GSM	See PN-4926
N.P0027	IIF Enhancements for One-way CDMA SIM Roaming to GSM	See PN-4927
N.P0029	TIA/EIA-41-E Integration	See TIA/EIA-41-E
N.P0032	TIA/EIA-41-F Integration	See TIA/EIA-41-F
N.P0033	Emergency Services Phase II	See J-STD-036-A
N.P0034	Emergency Services beyond US FCC mandate	See PN-4288
N.P0037	Uniform Dialing Plan	See TIA/EIA-660-A
N.P0038	Secure mode OTASP and OTAPA	See TIA-906
N.P0039	Accounting and Auditing System Requirements	See PN-xxxx
N.P0040	Wireless Priority Service (WPS)	See TIA-917

### 3GPP2 TSG-P Specifications (P.Sxxxx)

Specification	Description	Status
P.S0001	Wireless IP Network based on IETF Protocols (same as IS-835)	See IS-835
P.S0001-A	Wireless IP Network Standard	Published 08/00
P.S0001-A-1	Addendum to P.S0001-A	Published 01/01
P.S0001-Av3	Wireless IP Network Standard	See IS-835-A
P.S0001-B	Wireless IP Network Standard	See IS-835-B

## 3GPP2 TSG-P Reports (P.Rxxxx)

Report	Description	Status
P.R0001	Wireless IP Network Architecture based on IETF Protocols	Published 08/00

## TIA TR-45.2 ANSI Standards and Annexes

ANSI Std.	Description	Status
J-STD-025	ANSI version of J-STD-025	Published 12/00
TIA/EIA-41-D	Intersystem Operations	Published 12/97
TIA/EIA-93-A	Ai and Di Interfaces Standard (including 9-1-1 Phase I: Cell/Sector Location)	Published 11/98
TIA/EIA-93-B	Ai and Di Interfaces Standard (including JIP and 9-1-1 Phase II location)	Published 07/01
TIA/EIA-124-B	Cellular Inter-System Non-Signaling Data Communications	Published 06/99
TIA/EIA-124-C	Support for WIN and CIBERNET NSDP-B-and-S protocol	Published 09/00
TIA/EIA-124-D	Further enhancements to call detail and billing records	Published 12/01
TIA/EIA-660	Cellular Dialing Plan (formerly IS-52)	Published 07/96 Rescinded
TIA/EIA-664	Cellular Feature Descriptions (formerly IS-53)	Published 06/96
TIA/EIA-664-A	Cellular Features Stage I Description	Published 12/00
<b>TIA/EIA-664-B</b>	<b>Addition of part 804 (enhanced security)</b>	<b>Ballot 07/03</b>

## TIA TR-45.2 Published Standards

Standard	Description	Status
J-STD-025-A	CALEA Surveillance Support (joint with ATIS T1) including FCC Report and Order Requirements	Published 05/00
J-STD-034	Enhanced Wireless 9-1-1, Phase I: Identify Mobile and Cell/Sector Location	Published 12/97
J-STD-036	Enhanced 9-1-1 (E911), Phase II (125 m. location accuracy)	Published 08/00
J-STD-036-1	Corrected and Enhanced Emergency Services with Support for SMS, Inter-System Handoff and SAMPS	Published 12/00
J-STD-036-A	Enhanced 9-1-1 (E911), Phase II (125 m. location accuracy)	Published 06/02
<b>J-STD-036-A-1</b>	<b>Addendum to Support Interim Position for Routing Emergency Calls More Accurately</b>	<b>Published 03/03</b>
IS-725-A	IS-725 enhanced to include Over-the-air Parameter Administration (OTAPA)	Published 07/99
IS-771	WIN (Wireless Intelligent Network) Phase I: voice controlled services and call screening	Published 07/99
IS-771-1	WIN Phase I addendum	Published 08/01
IS-778	Authentication Enhancements	Published 03/99
IS-786	Automatic Code Gapping (ACG) Overload Control	Published 11/00
IS-807	Internationalization of TIA/EIA-41	Published 08/99
IS-807-1	Updates global title translation types in IS-807	Published 03/00
IS-808	User Identification Module (R-UIM) for use in 3G systems	Published 12/00
IS-812	TIA/EIA-41 Message Segmentation (to overcome SS7 network packet size limitations)	Published 08/99
IS-824	Broadcast/Multicast Short Message Service (BTTC)	Published 11/99
IS-826	WIN Phase II: Prepaid calling	Published 08/00
IS-837	Answer Hold (AH)	Published 07/00
IS-838	User Selective Call Forwarding (USCF)	Published 08/00
IS-841	MDN Based Message Centers	Published 09/00

IS-847	VLR Roamer Database Verification (RDV)	Published 03/01
IS-847-A	RDV, allowing MDN range verification and query of nodes other than VLR	Published 07/02
IS-848	WIN Phase II: Enhanced Charging Services (Premium Rate Charging, Wireless Freephone)	Published 12/00
<b>IS-872</b>	<b>IP Core Network Support for Legacy Mobiles (LMSD) - Step 1</b>	<b>Published 12/02</b>
IS-875	Network Based Enhancements for International Dialing, Calling Number ID and Callback	Published 05/01
<b>IS-880</b>	<b>Intersystem Support for CDMA Packet Data, Phase I</b>	<b>Published 07/02</b>
TIA-728	Inter-System Link Protocol (ISLP). Supports data calls after inter-MSC handoff.	Published 04/98
TIA-730	TIA/EIA-41 Support for IS-136 DCCH (TDMA digital control channel)	Published 08/97
TIA-735	TIA/EIA-41 Support for CDMA (Network directed system selection (NDSS) and Temporary MS Identifiers (TMSI))	Published 02/98
TIA-737	TIA/EIA-41 Support for Circuit Switched Data Services for CDMA and TDMA Terminals	Published 04/98
TIA-751	TIA/EIA-41 support for International Mobile Station Identity (E.212 IMSI)	Published 02/98
TIA-756-A	Wireless Number Portability (WNP), Phase II (MDN/MIN separation to allow porting to or from wireless phone numbers)	Published 12/98
<b>TIA-756-A-1</b>	<b>Allow emergency numbers to be portable</b>	<b>Published 09/02</b>
TIA-764	Calling Name Presentation/Restriction	Published 06/98

## TIA TR-45.2 Telecommunications Systems Bulletins (TSBs)

TSB	Description	Status
<b>TSB29-E</b>	<b>TSB-29 revision with SID block assignments removed</b>	<b>Published 12/02</b>
TSB56-A	Application Level Testing for IS-41 Rev. B, IS-53 Rev. 0 and TSB-51	Published 06/94
TSB76	PCS Multi-Band Support	Published 09/96
TSB114	Broadcast of Emergency Alert Messages to Wireless Phones (EAS)	Published 12/99
TSB124	Support for WIN Prepaid (IS-826)	Published 10/00

## TIA TR-45.2 Projects Being Balloted

Standard	Project	Description	Status
J-STD-025-A	SP-4464-UG R1	Upgrade to ANSI [ballot extended to January, 2003]	In press
<b>TIA/EIA-41-D-AD1</b>	<b>PN-3588-AD1</b>	<b>Addendum to TIA/EIA-41-D</b>	<b>Published 04/02</b>
TIA/EIA-41-E	PN-3590-RV5	Intersystem Operations, including TSB76, IS-730, 735, 737, 751, 756-A, 764, 771, 778, 807, 812, J-STD-034, N.S0015	Re-ballot 06/03
<b>IS-880-A</b>	<b>PN-4720-RV1</b>	<b>Intersystem Support for CDMA Packet Data, Phase II</b>	<b>Development</b>
<b>TIA-756-A-2</b>	<b>PN-4186-AD2</b>	<b>Allow TLDNs to be pooled</b>	<b>Development</b>
<b>TIA-756-B</b>	<b>PN-4186-AD1</b>	<b>Number Pooling Enhancements</b>	<b>Development</b>

## TIA TR-45.2 Developing Projects

Standard	Project	Description	Status
J-STD-025-B	PN-4465-RV1	Surveillance of Packet Data Communications (Wireline and Wireless)	Development

<b>J-STD-025-C</b>	<b>PN-4465-RV2</b>	<b>Addition of CGVoP</b>	<b>Development</b>
<b>J-STD-036-B</b>	<b>PN-3890-RV2</b>	<b>Enhanced 9-1-1 (E911) Revisions to Incorporate Field Experience</b>	<b>Development</b>
TIA/EIA-41-F	PN-3590-RV6	Intersystem Operations, including IS-786, 808, 824, 826, 837, 838, 841, 847, 848, 880, J-STD-036	Development
TIA/EIA-124-E	PN-xxxx	Further enhancements to call detail and billing records, including support for location services and IP-based telephony	Development
<b>TIA/EIA-660-A</b>	<b>PN-3544-RV1</b>	<b>Cellular Dialing Plan</b>	<b>Project cancelled</b>
IS-843	PN-4818	WIN Phase III: Location Based Services	Development
IS-847-A-1	PN-4785-RV1	Erratum to correct error code handling tables	Development
IS-868	PN-4925	SIM roaming from TIA/EIA-41 (CDMA) to GSM	Development
<b>IS-873</b>	<b>PN-4935</b>	<b>IP Core Network Support for Multimedia Terminals (MMD). Parts 00, 02, 03 (Stage 2), 05/06 (Cx Ifc),</b>	<b>Ballot 06/03</b>
IS-881	PN-4747	Location Service Enhancements, Including Security	Development
IS-884	PN-0013	CDMA IP Requirements and Network Architecture	Being Withdrawn 09/02
TIA-906	PN-0045	Secure Mode Over-the-Air Service Provisioning (OTASP) and Parameter Administration (OTAPA)	Development
TIA-917	PN-0054	Wireless Priority Service	Development
<b>TIA-934-000</b>	<b>PN-0085</b>	<b>Multimedia Messaging Service (MMS) Overview</b>	<b>Published 05/03</b>
<b>TIA-934-200</b>	<b>PN-0085</b>	<b>MMS Stage-2, Functional Description</b>	<b>Published 05/03</b>
<b>TIA-934-310</b>	<b>PN-0085</b>	<b>MMS MM1 Interface Stage-3 using OMA/WAP</b>	<b>Published 05/03</b>
<b>TIA-934-311</b>	<b>PN-0085</b>	<b>MMS MM1 Interface Stage-3 using M-IMAP for Message Submission and Retrieval</b>	<b>Published 05/03</b>
<b>TIA-934-340</b>	<b>PN-0085</b>	<b>MMS MM4 Interface Stage-3 Inter-carrier Interworking</b>	<b>Published 05/03</b>
<b>TIA-934-370</b>	<b>PN-0085</b>	<b>MMS MM7 Interface. VASP Interworking Stage-3</b>	<b>Published 05/03</b>
<b>TIA-935</b>	<b>PN-0086</b>	<b>Circuit Call (e.g. voice) Precedence over CDMA Packet Data</b>	<b>Development</b>
<b>TIA-937</b>	<b>PN-0088</b>	<b>Open Service Access (OSA): Application Programming Interface (API)</b>	<b>In press</b>
	PN-4288	Enhanced Emergency Services (E9-1-1), Phase III: Optional features beyond FCC mandate	On hold
	PN-4393	Enhanced Security (authentication and encryption) for TIA/EIA-41 (ESA/AKA)	Development
	PN-4755	Intersystem support for 3G packet data, including simultaneous voice and data	Project cancelled
	PN-4926	TIA/EIA-41/CDMA roaming to a GSM network [being reviewed by TR-46.3]	Completed
	PN-4927	Interworking and interoperability (IIF) enhancements to support IS-868 [being reviewed by TR-46.3]	Completed

## TIA TR-45.2 Superseded Specifications

Standard	Description	Status
J-STD-025	CALEA surveillance support (joint with ATIS T1) - Interim Standard	Published 12/97 Rescinded 05/01
J-STD-025-1	Addendum to J-STD-025	Published 07/00 Rescinded 05/01
J-STD-025-2	Addendum to J-STD-025	Published 07/00 Rescinded 05/01

IS-41-C	Cellular Radio Telecommunications Intersystem Operations	Published 02/96
IS-52-A	Uniform Dialing Procedures for use in Cellular Radiotelephone Systems	Published 03/95
IS-53-A	Cellular Features Description	Published 04/95
IS-725	IS-41 support for Over-the-air Service Provisioning (OTASP)	Published 09/97
IS-756	Wireless Number Portability (WNP), Phase I (database query)	Published 04/98
TSB29-A	International Implementation of Cellular Systems Compliant with TIA-553	Rescinded
TSB29-B	International Implementation of Wireless Systems	Rescinded
TSB29-B.1	TSB-29-B addendum including IFAST#6 updates (11/97)	Rescinded
TSB29-B.2	TSB-29-B addendum, including IFAST #7 updates (02/98)	Rescinded
TSB29-C	International Implementations of Wireless Systems	Published 09/99 Rescinded 12/00
TSB29-C-1	Addendum to International Implementations of Wireless Systems	Published 12/99 Rescinded 12/00
TSB29-D	TSB-29 revision with IFAST-assigned IRM codes removed	Published 12/00
TSB41	Technical Notes for IS-41 Revision B	Published 11/94
TSB51	Inter-System Authentication, Signaling Message Encryption and Voice Privacy	Published 05/93
TSB55	IS-41 Rev. A/B Forward Compatibility ("Tech Notes")	Published 05/94
TSB64	Wideband Spread Spectrum Intersystem Operations	Published 02/94
TSB65	Border Cell Problems	Replaced by TIA/EIA-41-D

## TIA TR-45.6 3G Packet Data Standards

Standard	Description	Status
IS-835	CDMA2000 Wireless IP Network Standard	Published 12/00
IS-835-1	Addendum to IS-835	Replaced by IS-835-A
IS-835-A	CDMA2000 Wireless IP Network Standard	Published 05/01
<b>IS-835-B</b>	<b>Supports IPv6, Dynamic Home Agent, QoS and Push Services</b>	<b>Published 09/02</b>
<b>IS-835-C</b>	<b>CDMA2000 Wireless IP Network Standard</b>	<b>Ballot 06/03</b>
<b>TIA-930</b>	<b>Legacy Mobile Station Domain (LMSD) Step 1 for CDMA2000 (IP-based call setup)</b>	<b>Published 01/03</b>
TSB115	CDMA2000 Wireless IP Architecture based on IETF Protocols	Published 12/00

## TIA TR-45.6 CDPD - Cellular Digital Packet Data

Standard	Description	Status
TIA/EIA-732	Revisions to CDPD and Upgrade to ANSI	Published 06/01
<b>IS-732</b>	<b>Cellular Digital Packet Data (CDPD) - multiple parts</b>	<b>Published 12/97</b> <b>Rescinded</b>
TSB87	CDPD support services (Directory, Authentication, DNS, Testing, Identifiers, Numbering)	Published 12/97