

Cellular Networking Perspectives

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TR46: PCS Civil War

TR-46 was created by the TIA as the standardization counterpart for PCS that TR-45 is for cellular. However, the development of PCS standards currently is more political than technical, unlike cellular standards development where most of the battles have been fought or at least are currently in a truce.

The battle lines in TR-46 are set over which set of standards to use for air interfaces and networking. There are several companies that want to secede from North American standards and use GSM air interface and networking standards. Others would like to build on North American cellular air interface standards and use IS-41 for networking. To make matters more complicated there are other factions that want to:

- Develop standards from scratch.
- Combine the best aspects of GSM and North American Standards.
- Let the marketplace decide (the "Out of Chaos Will Come Order" theory).

The spectrum is illustrated by Bell Atlantic at one end, that strongly supports IS-41 for PCS networking to achieve their goal of inter-operability with other North American telecommunications networks. At the other end of the spectrum one other RBOC and two of the pioneer preference holders stated in September that PCS does not need to be directly inter-operable with other telecommunications networks in North America. Some have even suggested that PCS be a separate and distinct network without even gateways to other networks.

Amid all this controversy, much work is actually being done, although often obscured by the smoke of battle. A document describing PCS features and services (PN-3168) has been released for ballot, and systems requirements work is underway on a standard base

station interface (known as the "A" interface) in TR46.1.

The organization of TR46 is illustrated by a chart on page 4.

IS-53 Revision A, Part IV - Our Perspective on Features

In the first three parts of our series on cellular features we described all of the features slated to be included in IS-53 Revision A. In this issue we examine problems related to the implementation of some or all of these features. In our summary we offer an unusual opinion on the usefulness of the new release of IS-53.

MFJ Restrictions

Restrictions on the cellular subsidiaries of the Regional Bell Operating Companies (RBOC's) have always been a thorn in their side. These restrictions date back to the 1982 Modified Final Judgment (MFJ) of the US Department of Justice that formalized the divestiture of AT&T. Some restrictions, such as the requirement to provide equal access to all inter-exchange carriers, can be seen to benefit subscribers and allow greater industry competition. However, the prohibition discussed below that specifically impacts several cellular features appear to be detrimental to cellular subscribers, the inter-exchange carriers and the RBOC's. But, for now the restrictions are the law, although as Dickens said, sometimes "The law is a ass".

The MFJ restriction that particularly affects features is the prohibition on carrying real-time subscriber status information across a LATA boundary if this information can be used to avoid the setup of an inter-exchange carrier call. In other words, a *Subscriber Busy*

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indication cannot be transferred for a roaming mobile to invoke local Call Forward Busy at the home system. Instead, an inter-exchange carrier call has to be blindly completed, resulting in a long distance call to busy tone. The irony is that the inter-exchange carriers that are fighting to keep MFJ restrictions, actually lose money in this case because the call is never answered.

The same MFJ restriction applies to transferring no-answer status information, although this can be avoided in some cases by continually monitoring for roamer activity and transmitting a *Subscriber Inactive* indication to the home system after a period of inactivity. The home system can then legally invoke Call Forward No-Answer at the home system because a real-time query of mobile status is not needed.

This MFJ restriction will also reduce the utility of Mobile Access Hunting because this feature depends on conditional forwarding to skip over unavailable mobiles in the hunt group. Incoming calls could be connected to busy tone while some mobiles in the hunt group are idle.

Network Bandwidth

Some seemingly innocent new features proposed for IS-53 Rev. A will need a surprisingly large amount of network bandwidth when the subscribing mobile is roaming. A good example is Message Waiting Notification when the option to provide the number of outstanding messages to the mobile is used. This will require an IS-41 transaction on every voice mail message deposited at the home system. Another example of high network bandwidth requirements are the Group Calling features. Both Flexible Alerting and Mobile Access Hunting will require many IS-41 network actions to deliver a single call when some mobiles in the group are roaming. This does not necessarily invalidate these features, it just means that the price charged must be high enough to support these costs, or that the features may be provided without support for roaming.

IS-41 Support

Many IS-53 Rev. A features require some modifications to IS-41 to support roaming. This automatically delays the full implementation of these features by many months, as implementation will

have to await the completion of IS-41 Rev. C, balloting and publication delays, vendor development delays and lab and field trial periods. This delay will occur even if just a simple indication of feature activity has to be transferred in the subscriber profile from the HLR to the visited system.

Changes resulting from new IS-53 Rev. A features constitute the largest amount of unfinished work in the development of IS-41 Revision C.

Calling Number Identification

Calling Number Identification is currently not available to most cellular systems for incoming PSTN calls. Systems that want to get this information will have to either upgrade their PSTN connections to SS7, or use the more limited information available in the recently published TIA IS-93 standard. IS-93 adds ANI (Automatic Number Identification) to analog trunk signaling procedures (i.e. MF tones). While ANI information can be used, it is actually billing information and in some cases, such as third number billing, does not identify the calling number.

A larger problem with Calling Number Identification is that it identifies telephone equipment and not a person. This hardly facilitates 'personal' communications! Obvious situations when calling number identification information will be useless are in calls from payphones and hotel phones. The impact of this on subscribers to a Calling Number Identification Presentation service is not fatal, but it is hard to imagine Selective Call Acceptance being widely used if it results in the automatic rejection of all calls from payphones and hotel rooms.

Coordination of Terminals

Group Calling features, both Flexible Alerting and Mobile Access Hunting, require an unprecedented degree of coordination between terminals of different types and between terminals inside and outside their home serving area. This creates significant technical hurdles to make the features work reasonably smoothly. Even then, subscribers to these features may need to discipline themselves to avoid actions (such as leaving a phone powered on and unattended) that may result in the irregularities in these features becoming painfully obvious to their callers.

Back Issues Available

Back issues are available from July, 1992 to the present. Articles in recent issues are:

May, 1993

IS-41 Rev. A Status Report. IS-41 Rev. B Status. NovAtel. DMH. IS-41 Enables Innovation. TR45.2 Project Status.

June, 1993

Wireless Terminal Location Management, Part I. Brace for the Standards Flood. TR-45.2 Working Group Report.

July, 1993

ITN Named CTIA Backbone IS-41 Network Provider. New TIA Standardization Efforts Loom. Wireless Terminal Location Management, Part II. TR-45.2 Grows More Tentacles. TR-45.2 Continues to Pump Standards Out. IS-41 Rev. B Trial Update. IS-41 Rev. A Implementation Status.

August, 1993

Bellcore Relinquishes Control of the NANP. Smart Cards, Dumb Phones? A+ Interface Looks for a Home. Wireless Terminal Location Management Part III - Lessons for PCS. TR45.2 Standards Update. Goldilocks and the Three IS-41 Addressing Types. Status of IS-41 Rev. B Implementation.

October, 1993

FCC Allocates PCS Frequencies•IS-53 Revision A, Part I - Cellular Feature Overload•TR-45.2 Standards Update•Taking MINs to the Max - Problems with International Roaming•TIA TR-45.2 Project Status Report.

November, 1993

IS-41 Rev. A Compatibility Guidelines•IS-93: Timely or Time Bomb?•IS-53 Revision A, Part II - More Cellular Features•TR-45.2 Standards Update•Status of IS-41 Rev. B Implementation.

December, 1993

IS-53 Revision A, Part III - The Last of the Features(?)•Summary of Features to be Included in TIA IS-53 Revision A•Structure of TIA Mobile & Personal Communications Committees•Status of IS-41 Rev. A Implementation.

The price of a back issue is, by mail or fax is:

CDN\$25 Canada
US\$25 United States
US\$30 Other Countries

User Interface Model

The user interface model implicit in IS-53 is a major roadblock to acceptance of its features in our view. The model, based on dialing multi-digit strings and receiving a tone or announcement in return is outdated. The user interface model currently in vogue is based on a voice response unit that can lead each caller through a complex procedure step by step using single digits entered by the user for commands and responses.

A reasonable question is whether it is even desirable to standardize the user interface for features, or whether carriers really want the user interface to help differentiate their services from those of their competitors.

Summary

It is unlikely that the more exotic features in IS-53 Revision A will ever be implemented and marketed to cellular subscribers. Yet, paradoxically, this does not mean that the effort to update IS-53 will be wasted. IS-53 Rev. A can be seen as a requirements document for IS-41 Rev. C capabilities. As Figure 1 shows, once these capabilities have been provided in IS-41, custom and proprietary features can be provided that incorporate the best parts of IS-53 features in a more integrated whole, and using a more sophisticated user interface.

Integrated features are already available from vendors such as Access Line and EBS. EBS, for example, has developed a feature called Who's Calling?™ that records the name of the caller in

TR-45.2 Standards Update

Recent developments in cellular inter-system standardization are highlighted by the publication of TSB-64 on Wideband Spread Spectrum (i.e. CDMA) Intersystem Operations. In other news, the Mobile Border System Problems TSB, recently assigned the identification TSB-65, has been approved for a second ballot.

The status of the major outstanding TR-45.2 projects follows:

IS-41 Rev. A Compatibility (TSB-55, SP-3063) • Procedures to allow IS-41 Rev. A implementations to be forward-compatible with Rev. B. Due to one technically substantive changes made based on ballot comments, this TSB is **out for a 'Default' Ballot** which allows comment only on this single change.

IS-41 Rev. B Test Plan (TSB-42, SP-2978) • An application level test plan for IS-41 Rev. B, IS-53 Rev. 0 and TSB-51 has been developed by WG II Task Group 2. This document is **out for ballot as TSB-42**.

Border Cell TSB (SP-2910) • The draft document to resolve several problems that occur on the border of cellular systems has been forwarded to the TIA **for second ballot**.

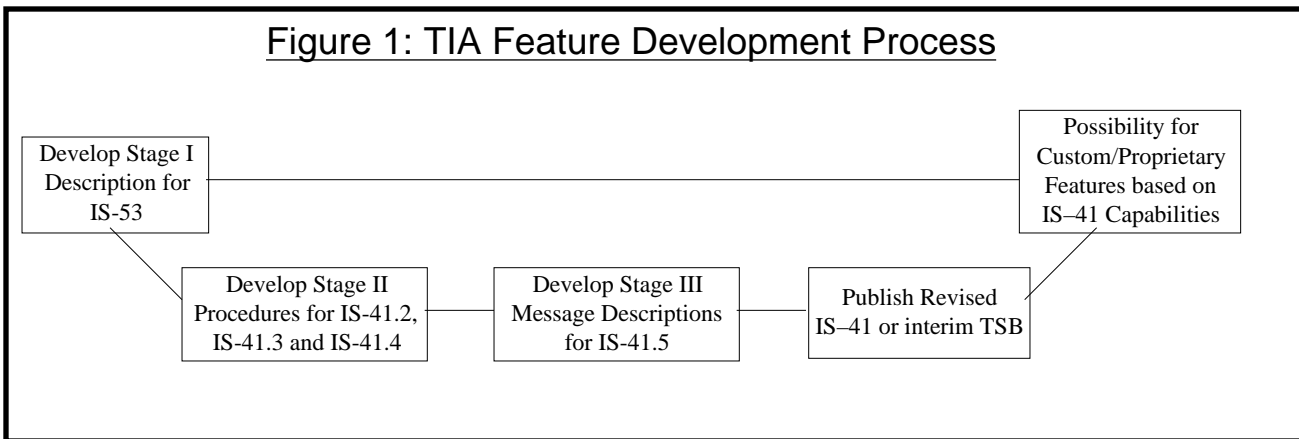
IS-41 Rev. B Technical Notes (TSB-41, PN-2985) • Will resolve several ambiguities in IS-41 Rev. B that have been detected as incompatibilities between different implementations of IS-41 Rev. A. This document may be approved for ballot in January.

Subscriber Features (IS-53 Rev. A, PN-2977) • Baseline text for most new features has been accepted, and the goal is to accept the remainder in January. Even so, **publication is unlikely before 2Q'94**.

IS-41 Revision C (PN-2991) • A baseline draft of this major revision to IS-41 is being developed, but much text remains to be written. The scheduled publication date of December, 1993 has obviously been missed. **Publication is unlikely before 3Q'94**.

Cellular Dialing Plan (IS-52, PN-3166) • IS-52 requires major revisions, yet the purpose of the document is not clear. Recognizing this, TR-45.2 is discussing whether to revise, scale down or abandon this document.

Figure 1: TIA Feature Development Process



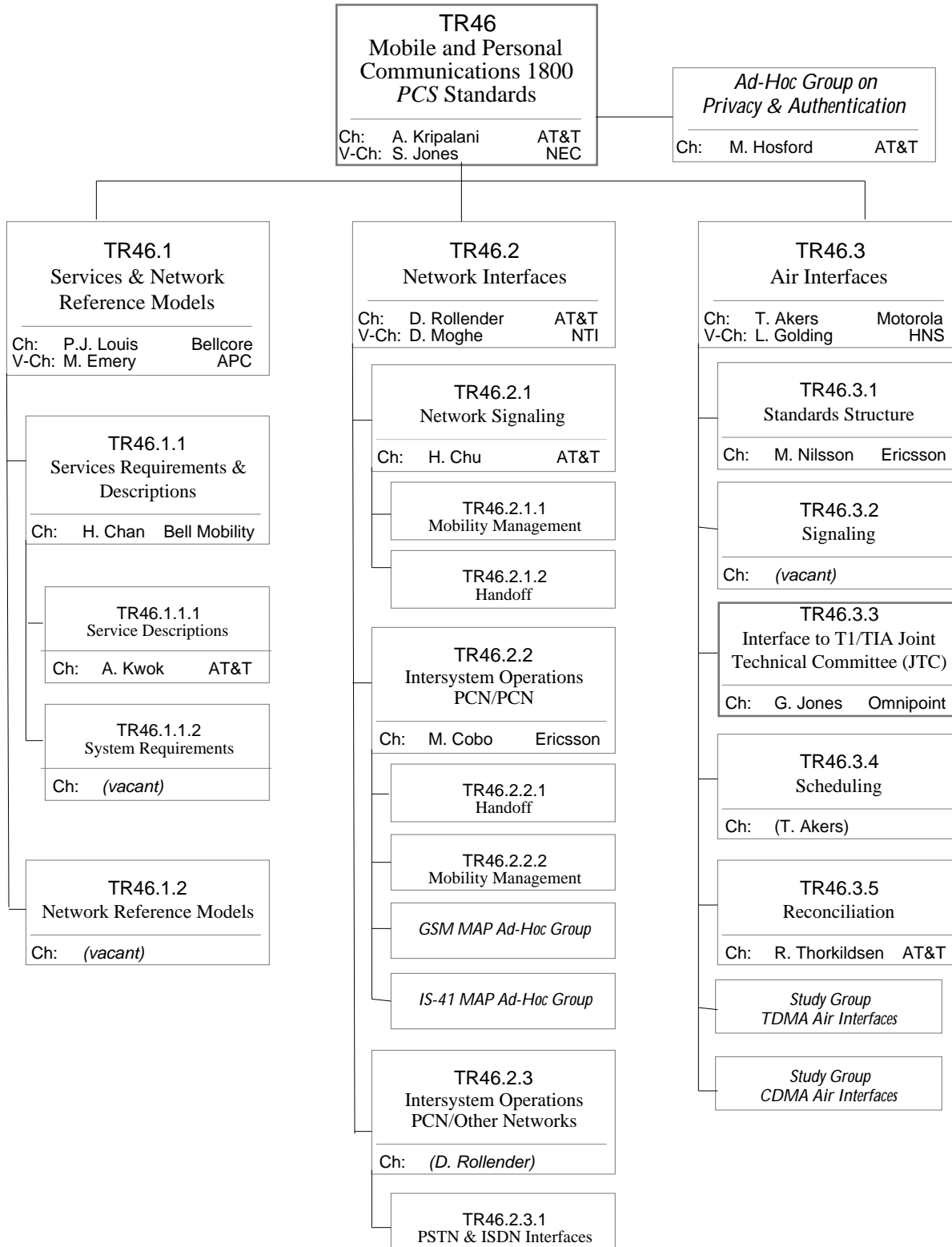
their own voice and plays it to the cellular subscriber to whom the call is destined, to enable them to decide whether to accept the call or have it redirected to voice mail. Two shortcuts can be supported, automatic identification (Selective Call Acceptance) and password identification (Password Call Acceptance), resulting in a more flexible and user-friendly feature than the raw IS-53 features provide, alone or together.

International Applications (TSB-29 Rev. B, PN-3173) • TR-45.2 and other TR-45 subcommittees are still studying the viability of extending the mobile identification (MIN) from 10 to 15 digits, and other problems with international use of AMPS cellular.

Online Call Record Transfer (IS-124 Rev. A, PN-3293) • TR-45.2 recently opened this new project number to revise the just published "DMH" standard for the online transfer of call records for billing, fraud and other purposes.

Structure of TIA Committee TR46: Mobile & Personal Communications 1800 MHz "PCS" Standards

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Superseded Interim Standards and TSBs

IS/TSB	Title	Published
IS-41-0	Cellular Radiotelecommunications Inter-System Operations	02/88
IS-41-A	Cellular Radiotelecommunications Inter-System Operations	01/91
TSB-27	IS-41 Rev. 0 Application Notes (never published, date is when released to WG I)	07/89

Published Interim Standards

IS	Title	WG	Published
IS-41-B	Cellular Radiotelecommunications Inter-System Operations	I	12/91
IS-52	Cellular Subscriber Dialing Plan and Service Codes	V	11/89
IS-53-0	Cellular Features Description	V	09/91
IS-124	Cellular Inter-System Non-Signaling Data Communications	IV	09/93
IS-93	Ai and Di Interfaces Standard (PSTN/MSC)	VII	10/93

Published Telecommunications Systems Bulletins (TSBs)

TSB	Title	WG	Published
TSB-29-A	International Implementation of Cellular Systems Compliant with TIA-553	VI	09/92
TSB-51	Inter-System Authentication, Signaling Message Encryption and Voice Privacy	I	02/93
TSB-56	Application Level Testing for IS-41 Rev. A, IS-53 Rev. 0	II	03/93
TSB-64	Wideband Spread Spectrum Intersystem Operations	I	(in progress)

Projects in Ballot Process (SP = Standards Proposal Number)

SP	Title	Editor	WG	IS/TSB
2910	Mobile Border System Problems	David Crowe	I	TSB-65
2978	Application Level Test Plan (IS-41-B, IS-53-0, TSB-51)	David Crowe	II	TSB-42
3063	IS-41 Rev. A/B Forward Compatibility	Charles Ishman	I	TSB-55

Active TR45.2 Projects (PN = TIA Project Number)

PN	Title	Editor	WG	IS/TSB
2977	Cellular Features Description (Rev. A)	Terry Watts	V	IS-53-A
2985	Technical Notes for IS-41 Revision B	Arzu Çalis	I	TSB-41
2991	Cellular Radio Telecommunications Intersystem Operations	Terry Watts	I	IS-41-C
3166	Uniform Dialing Procedures for use in Cellular Radiotelephone Systems	Steve Jones	VII	IS-52-A
3173	International Implementation of Cellular Radiotelephone Systems Compliant with ANSI/EIA/TIA-553	Steve Jones	VI	TSB-29-B
3293	Cellular Inter-System Non-Signaling Data Communications	Kirk Carlson	IV	IS-124-A