



# Cellular Networking Perspectives

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## ***The Case of the Missing Newsletter ... Solved!***

You may have been noticed that you did not receive the September, 1993 issue of this newsletter. As explained in an obscure corner of the October issue, September was skipped to align publication with the beginning of the month. All subscriptions were extended by one month to compensate for the missing issue◊

## ***IS-41 Rev. A Compatibility Guidelines - A Step to Rev. B Implementation***

The publication of TSB-55, *IS-41 Rev. A Forward Compatibility Rules* will mark the completion of one of two important steps toward implementation of IS-41 Rev. B. Because IS-41 Rev. A exists in a network, unlike Rev. 0 which only existed in a point-to-point environment, IS-41 Rev. B must be able to enter the network gradually, implying compatibility with Rev. A. Unfortunately, IS-41 Rev. A did not contain the guidelines necessary to ensure this. Some implementations are known to be incompatible with Rev. B.

The basic problem is simple, IS-41 implementations must not reject new data in IS-41 messages that they otherwise understand, so they can work with future revisions. The IS-41 packaging mechanism (TCAP) makes this possible, but does not guarantee it. TSB-55 addresses this and related problems in IS-41 Rev. A implementations due to overly enthusiastic verification of incoming messages. All IS-41 Rev. A implementations should incorporate the recommendations of this TSB when it is published (expected in November or December).

The other half of the compatibility puzzle is the IS-41 Rev. B Technical Notes TSB which, as our TR-45.2 status report indicates, is still a long way from completion.

Compatibility problems are a symptom of a clash with good software practices that encourage thorough checking of all incoming data. There is a fine balance between inadequate checking which increases the frequency of system failures and overly enthusiastic checking which increases the likelihood of compatibility problems.◊

## ***IS-93: Timely or Time Bomb?***

The interface between MSCs and the PSTN has not previously been a hotbed of innovation or controversy, but after using Bellcore document TR-00145 since 1986, the publication of TIA IS-93 may change the industry in more than just information carried over this interface.

The only major technical difference between IS-93 and Bellcore TR-00145 is the symmetry of the interface, which now allows MSCs to receive calling number identification information (ANI) as well as send it. Politically, however, IS-93 reflects the desire of cellular carriers to be on the same level as Local Exchange Carriers in the telephone network. By asserting control over the interface (by standardizing it in a cellular standards group) and by gaining greater control over billing, IS-93 could call into question the whole system of access charges that Local Exchange Carriers currently charge to cellular and inter-exchange carriers to enter their network, but that they do not pay themselves.◊

### **Comments Welcome**

We welcome comments on the contents and format of this newsletter, suggestions for future topics, corrections or additional information.

## IS-53 Revision A, Part II - More Cellular Features

The October issue of *Cellular Networking Perspectives* discussed some of the features to be included in IS-53 Revision A. Part II would have completed this part of the discussion if TR-45.2 had not added four new features during the past month. Part III will complete our description of each IS-53 Rev. A feature (assuming that TR45.2 keeps its October promise to stop adding new features) and the final part of this series will discuss some broader issues relating to features, and to IS-53 Revision A in particular.

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### Calling Number Identification

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Calling Number Identification features build on the not yet available ability of cellular switches to identify the caller on incoming calls. There are several problems with these features:

- Calling number information is currently not available to most cellular carriers, because the PSTN interface specifications generally follow Bellcore TR-000145, which does not allow this information to be transmitted. This problem can only be alleviated if cellular carriers can persuade local exchange carriers to implement the TIA Ai-Di interface standard (IS-93) which has not yet even been published.
- Calling numbers generally identify terminals, and not people. Services will not work well with callers that often use hotel phones or pay-phones.
- The 13 million existing analog phones cannot display the calling number. This could be turned into a benefit if it is used as a way to market digital cellular.

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### Calling Number Identification Presentation

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This feature allows a subscriber to view the calling number on a terminal before the call is answered. The subscriber can use this information to decide to ignore the call, or simply to better prepare for the specific caller. The subscriber has to choose between the display of two numbers; the network verified number that may not identify the calling party or the calling party entered number that may not be a valid telephone number for the called party to use to return the call. An enhanced version of this feature

allows the display of both numbers for true power users.

A problem with this feature is its potential to reduce income for carriers. If the feature is used a lot, incoming calls can be rejected without being answered, and therefore without generating any revenue. On the other hand, if the feature is priced too high, to compensate for these lost calls, it may not generate enough subscription income to pay for the required switch enhancements.

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### Calling Number Identification Restriction

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For every spy there is a counter-spy. For every person receiving calls that wants callers identified, there is a caller that wants to be anonymous. The CNIR feature allows anonymity, but it is not designed to be easy or cheap. If restricting your identification was easy, features based on calling number identification would lose their value. Telephone companies would like to provide a free, but inconvenient feature to disable identification on a single call, and an extra cost feature to disable identification permanently. Both variants of this feature are provided in IS-53 Revision A.

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### Selective Call Acceptance

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Selective Call Acceptance allows a cellular system to do the filtering of incoming calls for a subscriber. The price of this intelligence is a very complicated feature for the subscriber to initially set up and maintain. The features requires a list of numbers that calls will be accepted from, which can be edited through very cumbersome procedures from a cellular handset.

This feature will, unavoidably, reject calls from people on the list using a phone that is not on the list. This has stimulated the addition of another feature to IS-53 Rev. A that will require the entry of a password by the caller, allowing calls to be accepted from any phone, although requiring more work by the caller. This feature will be discussed in the next part of this series.

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## Group Calling

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Group calling features allow a group of phones, not necessarily all of them cellular phones, to act as a pool to receive incoming calls. The two group calling feature variants differ in whether they attempt to terminate to all phones at once (Flexible Alerting) or whether they try one at a time (Mobile Access Hunting). Both features use the concept of a *Pilot Directory Number* which may be different from the directory numbers in the group of phones. This allows each phone to retain a unique identity for originations and normal terminations, and also allows the group of phones to have special profile information associated with the pilot number.

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### Flexible Alerting (Extension Phone Service)

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This feature allows a varied group of phones to act somewhat like a line of extension phones in a home. Complications arise, however, because the phones are not on the same line, and it is difficult to coordinate their actions seamlessly, particularly when some phones are roaming.

Incoming calls result in all phones being alerted in parallel (cellular phones will first have to be paged). The first phone to be answered will receive the call and all others will stop ringing. When used by a single person the variant of this feature that marks the entire group busy at this point is appropriate (and call waiting will be directed to the single busy terminal). If

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a group of people desire this feature then the group can continue to receive incoming calls until all are busy and call waiting will not apply.

As an aside, do not feel badly if you are unable to connect the name of this feature with its functions. The name refers to the ability to alert several phones at the same time. Multiple Alerting might be a better name.

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## Mobile Access Hunting

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Mobile Access Hunting allows incoming calls to be directed to the first available terminal in a group. Termination will be attempted to any single idle phone in the group, with retries in case a phone is not answered, or does not respond to a page. This feature will probably work best with digital terminals that announce their unavailability when they are powered off through a Power Down Registration, and with people who are disciplined enough to power off their phone, or enable a redirection or blocking feature when they do not wish to participate in the group. Otherwise, callers may be annoyed by lengthy delays from paging or ringing phones unsuccessfully.

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## Miscellaneous Features

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### Message Waiting Notification

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This feature, in its most simple form, causes a subscriber to hear a 'pip' tone when originating or answering a call when they have messages waiting in their voice mailbox. While this is useful, much more complexity has been dreamed up to provide some extra pizzazz.

The number of unread voice mail messages can be displayed on digital terminals (IS-54 and IS-95) and future analog terminals (IS-88 for NAMPS). While the TIA IS-54 standard does not state what to do when this number is received from a cellular system, it is assumed that it will be displayed by the terminal. This seemingly minor change to the feature has the nasty side effect of requiring, while roaming, an IS-41 transaction every time a message is left in a voice mailbox (which will increase the count by one).

While this feature will notify a user who makes or receives calls regularly, it does nothing for subscribers when they

turn on their phone after a period of inactivity. Another optional part to Message Waiting Notification will notify these subscribers that messages are waiting with a special alert tone, that can even be used to connect the subscriber to their voice mailbox if they answer the alert.

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### Preferred Language Service

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Subscribers can receive service in their native language if Preferred Language Service is supported, assuming the cellular system supports this language. Their language choice can be entered into the HLR database when each phone is activated or, for use in rental phones in particular, it can be selected by dialing a \*XX feature code from the phone. Languages currently specified in IS-53 Revision A are English, French and Spanish. Services covered by this feature may vary, but would usually include recorded announcements, operator assistance, directory assistance and business office services.

This feature has been in use in Canada, which is officially bilingual, for several years, but has never been standardized because the two major Canadian cellular service providers (Cantel and Bell Mobility) restrict their MSC and HLR purchases to a single vendor each, and thus can survive without standardized solutions.

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### Priority Access and Channel Assignment

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This feature allows terminals access to an overloaded system based on their priority level (High, Medium or Low) or call type (e.g. 911) and the time they requested service. The feature has no impact if channels are available, but causes mobiles to be queued when all channels are in use. The first channel to come free will be assigned to the highest priority terminal that has been waiting the longest. This feature does not support preemption of existing calls.

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### Remote Feature Control

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This feature allows a subscriber to modify features, such as call forwarding, from any phone by entering their MIN and numeric password (PIN). This will be useful for subscribers that forget to forward their phone when they leave their car in airport park and do not remember until they have got on the plane. An interesting question is, since

most people do not plan for screwups, whether they will remember their PIN and how to activate this feature on the rare occasions when they need this feature!

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## Voice Privacy

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This feature of digital phones (IS-54 TDMA and IS-95 CDMA) allows conversations to be protected from eavesdropping by encryption. It must be authorized by the home system, supported by the visited system base stations and activated in the digital terminal before it can be used. To work while roaming, IS-41 Rev. B and TSB-51 are also required to be implemented.

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## To Be Continued ...

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### TR-45.2 Standards Update

Major developments this month include the allocation of the IS-124 designation to the DMH online call record transfer standard, previously known as PN-2754. IS-93, the PSTN/ MSC interface standard has been approved for publication and the IS-41 Rev. B Test Plan has been approved for ballot as TSB-42.

IS-41 has been given a reprieve. By reaffirming Revision B at a TR45.2 sub-committee meeting, its life can be extended long enough to get Revision C out for ANSI ballot.

You will notice that several documents previously identified with a PN- designation are now prefixed with SP-. This is the TIA designation for a Standards Proposal, in other words, a document in the ballot process. In the conversion from a PN to an SP the associated number does not change.

### Intersystem Non-Signaling Data Communications (SP-2754, IS-124)

• This document, known internally as *DMH*, describes record layouts and protocols for online transmission of cellular call detail records for billing, fraud detection and other purposes. This document has been **approved for publication as interim standard IS-124**. This will be the last report on DMH, but expect to see work on IS-124 Revision A starting soon!

### **PSTN Interface (IS-93, SP-3098) •**

A definition of both the analog (i.e. MF signaling) and digital (SS7 signaling) interfaces required to connect MSCs to the PSTN has been written. Only one company voted against approval of this standard and their concerns were resolved at the October TR45.2 meeting. Some non-technical changes will be incorporated and then this document will be **published as IS-93**. Expect fireworks when cellular carriers try to use IS-93 as leverage to receive billing information from Local Exchange Carriers. For more details see the related article on Page 1.

**CDMA TSB (SP-3199) •** A TSB on CDMA inter-systems operations in IS-41 Rev. B systems has been completed by a Working Group I task group. The document is **out for ballot**. Approval for publication is likely by December.

**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 will be sent out for a 'Default' Ballot which allows comment only on this single change. It will **likely be approved for publication in November**.

**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 has been **approved 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 balloted. Due to the number of technical changes being incorporated due to ballot comments, reballot is not likely until February, 1994.

**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. Although the document is basically complete, due to a few unresolved issues, the date for ballot cannot

be predicted.

**Subscriber Features (IS-53 Rev. A, PN-2977) •** A completely revised and rewritten version of the baseline document was accepted at the August TR-45.2 meeting. TR-45.2 has agreed to cap the number of features at 24 (IS-53 Rev. A, by comparison, had 5). Much text remains to be developed and agreed to. **Publication is not likely before 2Q'94**.

**IS-41 Revision C (PN-2991) •** An initial draft of this revision of the cellular intersystem operations standard was available to committee members at the July meeting of TR-45.2. This document is still in a very preliminary state, not yet including, for example, text from TSB-51 on authentication. Publication is officially scheduled for December, 1993 but more recent estimates place **publication no sooner than 3Q'94**.

**Cellular Dialing Plan (IS-52, PN-3166) •** Plans are being made to revise the cellular dialing plan standard, IS-52 Rev. 0. An editing group tasked with dusting off this document has determined that major changes to it are required, possibly a complete rewrite.

**International Applications (TSB-29 Rev. B, PN-3173) •** There are several recognized problems with the use of AMPS cellular outside North America. WG VI of TR45.2 is studying solutions to these problems. TR-45.2 is currently soliciting opinions from the four 800 MHz air interface sub-committees (TR45.1, .3, .4 and .5) on the viability of extending mobile identifications from 10 to 15 digits.◊

### ***A Sweet Reason to Drop Our Name***

**W**e are still rewarding those who refer a new subscriber to us. The prize is a box of delicious Belgian chocolates mailed to you.◊

### **Back Issues Available**

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

#### **February, 1993**

Bellcore has Your Numbers ... and They Want to Keep Them! • Inter-System Handoff Part IV - New Air Interfaces • WG V: Subscriber Features.

#### **March, 1993**

Wireless '93 in review • Multi-Lingual Cellular ... Mais Oui! • TR45.2 News • Status of IS-41 Rev. A Implementation.

#### **April, 1993**

TR-45.2 News. IS-41 Explained. TR-45.2 International Working Group VI.

#### **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.

The price of a back issue is:

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# Status of IS-41 Rev. B Implementation

## *Cellular Networking Perspectives*

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Vendor1	Vendor2	Status	Date	Type	Location
Alcatel-SEL	EDS PCC	Lab Trial	TBD	- V-DXST	Mobile, Alabama (BellSouth)
	GTE TSI	Lab Trial	TBD	- V-DXST	Mobile, Alabama (BellSouth)
Astronet		Development			
AT&T	<b>GTE TSI</b>	<b>Lab Trial</b>	<b>2Q/94</b>	<b>- V-DXS</b>	<b>Philadelphia (BAM)</b>
	<b>NTI</b>	<b>Lab Trial</b>	<b>TBD</b>	<b>H V-DX</b>	<b>Detroit (Ameritech)</b>
EDS PCC	Alcatel-SEL	Lab Trial	TBD	- V-DXST	Mobile, Alabama (BellSouth)
Ericsson	NTI	Planning		H VAD ST	<i>location not announced</i>
GTE TSI	Alcatel-SEL	Lab Trial	TBD	- V-DXST	Mobile, Alabama (BellSouth)
	<b>AT&amp;T</b>	<b>Field Trial</b>	<b>2Q/94</b>	<b>- V-DXS</b>	<b>Philadelphia (BAM)</b>
Motorola	<b>NTI</b>	<b>Field Trial</b>	<b>1Q/94</b>	<b>H V-DXS</b>	<i>location not announced</i>
NTI	<b>AT&amp;T</b>	<b>Lab Trial</b>	<b>TBD</b>	<b>H V-DX</b>	<b>Windsor (Bell Mobility)</b>
	Ericsson	Planning		H VAD ST	Ft. Myers (Palmer)
	<b>Motorola</b>	<b>Field Trial</b>	<b>1Q/94</b>	<b>H V-DXS</b>	<i>location not announced</i>

Explanation:	Status:	Development, Planning, Lab Trial, Field Trial or Commercial
	Completion:	Date of actual or expected completion of listed phase of testing.
	Type:	Type of test:
		H Includes handoff forward and back
		H+ Also includes path minimization and/or flash handling (new in IS-41 Rev. B).
		V Includes validation
		A Includes authentication (published in TSB-51 in 1993)
		D Includes call delivery
		X Uses X.25 datalink protocol
		S Uses ANSI SS7 datalink protocol
		C Uses CCITT SS7 datalink protocol
		<b>T Uses TDMA digital mobiles (IS-54)</b>
	Location:	Location of test and carrier. Usually listed for first trial only.