

Cellular Networking Perspectives

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**Look forward to your next issue on:
February 3, 1997**

The Many Names of IS-41, er, TIA/EIA-689, um, ANSI/TIA/EIA-41

The name of the next revision of IS-41 was always predictable for everyone who knows the alphabet, but the ANSI-fication of IS-41 Rev. C is causing confusion. Initially the next revision was going to be called IS-41 Rev. D, but since an interim standard disappears once the ANSI equivalent appears, that name could not be used. The new name was deemed to be TIA/EIA-689 Revision A (based on IS-41 Rev. C being reborn as TIA/EIA-689 Revision 0). However, many people felt that such a totally different identity would cause confusion. After years of educating the industry about what IS-41 was, the process would have to start all over again. So, a last minute attempt was made to procure a name that would bear some resemblance to IS-41. To everyone's surprise, the number 41 was available for a TIA ANSI standard. Consequently, the new standard will be called ANSI/TIA/EIA-41.

However, this new name could also be the cause of some confusion. IS-41 Rev. 0 and TIA/EIA-41 Rev. 0 will be completely different vegetables - a pea versus a pumpkin. It is possible that the TIA TR-45.2 subcommittee will attempt to also align the version numbers (although this may not be allowed). So, the new name of IS-41 Rev. D is still in doubt. Will it be TIA/EIA-41 Rev. A or TIA/EIA-41 Rev. D? We don't know the answer yet, but we will be sure to keep you informed. □

CDPD To Be Standardized

CDPD is finally on the road to true standardization. This packet data protocol allows several terminals to transmit packets over cellular channels. The channels can be permanently dedicated to CDPD or used to transmit data only when not needed for voice. Up to this point, CDPD has been a proprietary protocol, owned by the companies that developed it. But now, the standardization process has begun. The first meeting of a new TIA TR-45 committee ad hoc group will be held on January 7-8, 1997 in Newport Beach, California. Contact Mark Taylor of AT&T Wireless Services for more information (mark.taylor@airdata.com). □

IS-41 Rev. C Field Trial Update

After publishing the status of IS-41 Revision C lab and field trials in the December issue, we received a number of updates. As always, changes are indicated by bold text in the report which we have published again on page 5. □

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IFAST To Allocate MINs

The International Forum on AMPS Standards Technology (IFAST) took a brave step at its November, 1996 meeting. It asserted the right to allocate MIN blocks beginning with the digit 0 or 1 (subject to final approval at its March, 1997 meeting). These MIN blocks are suitable for programming mobiles outside the North American Numbering Plan, as they do not conflict with any NANP directory numbers (assuming that most MINs continue to be programmed with the associated directory number).

IFAST will allocate MIN blocks of the format 0XXX and 1XXX, with each block containing a million possible MINs. Any country that requires more than a million MINs can apply for more blocks. This will provide 2,000 distinct MIN blocks, that should support international roaming until IMSI can be implemented in a critical mass of phones, MSCs, HLRs and networks. IFAST initially allocated MIN blocks 0732 and 0737 for Colombian carriers.

There are already some users of 0XXX and 1XXX MIN numbers, some within the North American Numbering Plan. These blocks of numbers are used to program "shrink-wrapped" phones (to

allow the MIN to be pre-programmed without limiting the area within which the phone can be sold) and specialized systems, such as the HighwayMaster trucking system and the BellSouth Cellemetry meter monitoring system. These blocks of numbers will have to be accommodated in the IFAST allocation plan.

This new system, if ratified at the March, 1997 IFAST meeting, will probably be documented in TIA TSB-29 Revision B, due for publication shortly after that. It will not help international carriers who followed TIA TSB-29 Revision A, which suggested using the E.212 mobile country code (MCC) in the first 3 digits of the MIN. Many of these numbers conflict with area codes that have been allocated since interchangeable area codes were opened for us in 1995. The only way to protect a MIN starting with an MCC is to ensure that the 4th digit is a 0 or 1 (as suggested in TSB-29 Rev. A). However, this reduces the number of MINs available per country from 10 million to 2 million. Even assuming that there are less than 20 carriers in the country, a further digit must be allocated as a national carrier identification, leading to only 20 blocks of 100,000 numbers each.

A comparison of the TSB-29-A, IFAST/TSB-29-B and IMSI mobile identification schemes for wireless systems outside the North American Numbering Plan is shown in Figure 1.

The IFAST is chaired by Fred Gaechter, who has previously handled a large number of numbering issues, having lead the North American Numbering Plan Administration for several years. Further information on IFAST can be obtained from Lori Messing of the CTIA at +1-202-736-3654. □

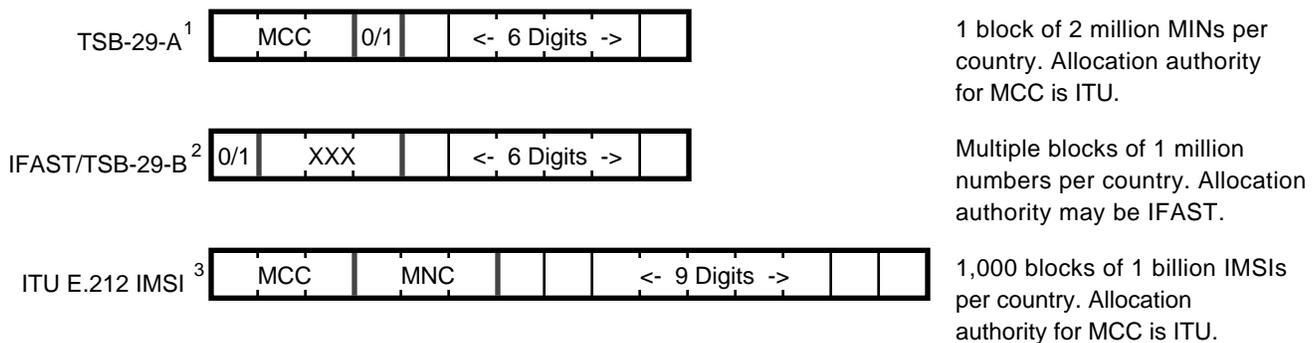
CDMA Engineering Optimization and PCS Technologies Course

March 6-7, 1997
San Jose, California.

Sponsored by the Wireless Institute of Technology.

For more information
phone or fax +1(510)490-6459
or email wtech@worldnet.att.net.

Figure 1: International Mobile Identification Programming Methods



Notes

1. TSB-29-A does not prevent the use of the digits 2-9 in the fourth position, although this may conflict with existing or future area code assignments in the North American Numbering Plan.
2. Subject to approval by IFAST and TIA TR-45.2 subcommittee (expected by 2Q'97).
3. IMSI is not yet supported by TIA network and analog phone standards.

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3. Click on "download a free Acrobat Reader."
4. On the Adobe Acrobat screen, download the free Adobe Acrobat Reader by following the three easy steps outlined. Make sure you choose the version appropriate for your computer.

A more sophisticated version of the reader, called Adobe Acrobat Exchange, is available as a commercial product. □

PCS Multiband Handoff with TIA TSB-76, Part I

PCS has turned out to be “Plagiarized Cellular Standards”, as we predicted several years ago. The major standards being applied in the 1800 MHz PCS band are D-AMPS (TIA IS-136), CDMA (TIA IS-95) and GSM (or, more technically, frequency variants of these standards identified by a J-STD-XXX document number). Consequently, the issue of interworking is extremely important, particularly so for carriers that are trying to fill holes in their cellular network through the acquisition of PCS licenses. We discussed the issue of TIA/GSM interworking using the TIA IS-129 standard in the **October and November, 1996 issues**, concluding that some capabilities were available using a proprietary network to interwork the IS-41 and GSM MAP protocols. Intersystem handoff is notably absent from this list.

TIA TSB-76 (effectively an addendum to IS-41 Rev. C) provides the ability to perform inter-system handoff between cellular and PCS bands or between PCS bands, adding to the already extensive capabilities in IS-41 for inter-system handoff between cellular systems and between analog and digital modes. This capability is restricted to mobiles that implement the relevant TIA protocols (AMPS, NAMPS, TDMA, CDMA).

Figure 2 illustrates the handoff modes that are supported by TSB-76 and IS-41.

Determining Where to Handoff

Before a handoff can occur, the best cell to receive the mobile must be determined. How this is done depends on the current mode of the mobile and the capabilities of the neighbouring cells:

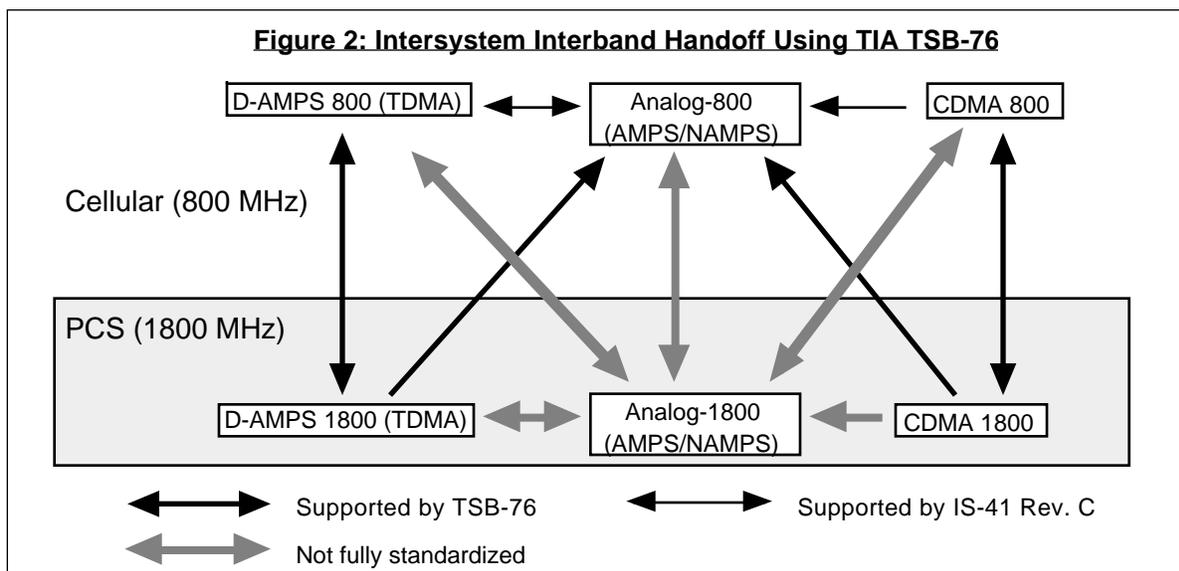
- If the mobile is currently operating in an analog mode there is no command available to inform it that a handoff channel is in another band. Beyond that, the mobile cannot perform signal strength measurements, so neighbouring base stations would be required to measure the signal strength of the current analog voice channel. This requires use of the IS-41/TSB-76 Handoff Measurement Request2 message (which has not been fully upgraded to support analog) if the neighbouring cell is in a different system. It also requires that the neighbouring system has the ability to measure signal strength on an 800 MHz channel, which not be cost effective for 1800 Mhz systems.
- TDMA mobiles have the ability to measure the signal strength of a list of channels (provided by the serving

base station). Traditionally, the analog control channel signal strength has been measured, but in an all digital system (i.e. all 1800 MHz systems) there is no analog control channel. As only the digital control channel transmits continuously, it must be used as the ‘beacon’ for measurement.

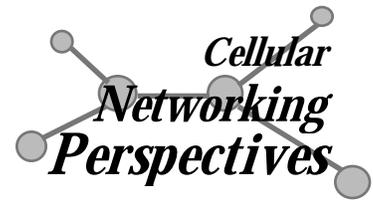
- CDMA mobiles have the ability to measure the signal strength of a number of neighbouring pilot channels. They also can handoff to analog (using a standalone pilot channel as an artificial beacon if the candidate system does not support CDMA). However, they can never return (at least not in this call!). As an alternative to a standalone pilot channel, the approximate location of the mobile can be used to determine the cell to handoff to.
- A system may be able to guess at where a mobile is without measuring signal strength. This is called a ‘Forced Handoff’ and will be discussed in detail later.

To Be Continued...

We will continue our discussion of inter-band, inter-system handoff in the next issue by detailing the requirements and restrictions for handoff between different bands and different modes. □



Status of IS-41 Rev. C (ANSI/TIA/EIA-41) Implementation



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Vendor1	Status	Date	Features	Other Vendors	Carriers	Locations
Alcatel SEL	Lab Trial		A CS	<i>n/a</i>	<i>n/a</i>	<i>tbd</i>
Ericsson	Field Trials	3Q'96	AP S	Tandem*, Lucent*	<i>n/a</i>	<i>n/a</i>
GTE	Field Trial	2Q'97	A	<i>n/a</i>	<i>n/a</i>	<i>tbd</i>
Lucent	Field Trial		A	<i>n/a</i>	<i>n/a</i>	<i>tbd</i>
Motorola	Field Trial	4Q'96	A	Lucent	BANM	Charlotte, NC
Nortel	Lab Trial	mid'97	C V	<i>n/a</i>	<i>n/a</i>	<i>tbd</i>

Explanation:

Status: Development, Planning, Lab Trial, Field Trial or Commercial.
Date: Date of actual or expected completion of listed phase of testing.
Features: Features Being Tested
A Authentication
C Calling Number Identification
P Cellular/PCS inter-band operation (TSB-76)
S Short Message Service
V Voice Mail Notification
Other Vendors: Other equipment vendors involved in trials.
(*) indicates that this information has not been officially confirmed.
Carriers: Carriers involved in trials.
Locations: Locations of trials.

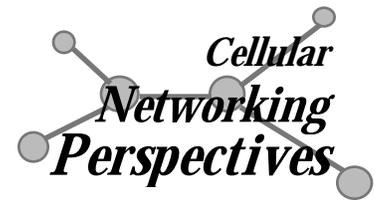
Note: IS-41 Revision C is in the early stages of implementation, and some vendors have not yet revealed their plans for implementation. There are several differences in the implementation of IS-41 Rev. C versus IS-41 Rev. B:

- i. IS-41 Revision C implementation will occur a feature or two at a time, with the early candidates being Authentication (kills fraud dead), Calling Number Identification (sells digital), Message Waiting Notification (sells air-time) and Short Message Service (sells digital).
- ii. Complete vendor-vendor pairwise testing will not be required, a trend that was apparent towards the latter stages of IS-41 Rev. B implementation. Vendors and carriers have more confidence in their ability to install IS-41 solutions after testing with only selected vendors, and the ability to resolve compatibility issues in the field.
- iii. ANSI/TIA/EIA-41 has not been published yet, however for all practical purposes, implementations of this ANSI standard will be indistinguishable from IS-41 Rev. C.

We will provide continual updates as implementation progresses.

TIA TR-45.1

Analog Air Interface Standards Report



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Last Published 07/96

Analog Air Interface Standards - First Generation

Standard	Description	Status
IS-3 (Rev. A,B,C,D)	Original Analog Air Interface Standard (see EIA/TIA-553-0)	Rescinded 09/89
EIA/TIA-553 Rev. 0	Analog Air Interface Standard	Published 09/89
IS-19-B	Mobile minimum performance standards	Published 06/88
IS-20-A	Base Station minimum performance standards	Published 06/88
TSB-35	Cellular mobile receiver dynamic range	Published 04/92
TSB-39	Message Type Assignment for Extended Protocol	Published 03/93

Analog Air Interface Standards - Second Generation

Standard	Description	Status
EIA/TIA-553 Rev. A	Analog air interface (including authentication)	In press
IS-88	Narrowband (3:1) analog air interface ("NAMPS")	Published 02/93
IS-89	IS-88 base station performance standards	Published 02/93
IS-90	IS-88 mobile performance standards	Published 02/93
IS-91 Rev. 0	Analog air interface (including "NAMPS" and Authentication)	Published 10/94
IS-94	In-building analog air interface ("CAPS")	Published 05/94
IS-680	Residential ("cordless") base station PSTN interface	Published 05/96
SP-3598	"Core" Analog Standard	Ballot
TSB-70	Cross Reference for FSK Control Channel	Published

Analog Air Interface Standards - Third Generation

Standard	PN- #	Description	Status
EIA/TIA-690	SP-3495	Mobile minimum performance standards (IS-19-C)	Second ballot
EIA/TIA-691	SP-3665	Enhanced analog ANSI version of IS-91-A (without IS-680 cordless)	Ballot
EIA/TIA-xxx	PN-3597	Base station minimum performance standards (prev. IS-20-A)	Ballot
IS-91-A	PN-3476	Revised IS-91 air interface (including IS-94/IS-680/sleep mode)	Second ballot
IS-xxx	PN-3668	1900 MHz upbanded AMPS (based on IS-91-A)	Ballot
TSB-70-A	PN-3610	Updated version of TSB-70 cross reference	Ballot
TSB-71	PN-3477	IS-94 enhancements and issues	Published 10/95

Analog Air Interface Standards - Fourth Generation

Standard	PN- #	Description	Status
IS-91-B	PN-3666	Revised version of IS-91 (including IMSI, PCS band support, over-the-air-provisioning, priority access, 9-1-1)	Development
TSB-xxx	PN-3667	EIA/TIA-553-A without authentication (for use outside USA)	cancelled
TSB-xxx	PN-3798	Additional modem options for IS-680 ("cordless")	In Press

- Note:
1. IS- TIA Interim Standard, PN- TIA Project Number, SP- ANSI Standards Proposal, TSB- TIA Telecommunications Systems Bulletin.
 2. Bold Type indicates modification since the previous publication of this report.