Cellular Networking Perspectives

Editor: David Crowe • Phone +1-403-289-6609 • Fax +1-403-289-6658 Vol. 8, No. 2 February, 1999

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Wireless Glossary

A glossary of wireless telecommunications terms is now available at:

http://www.cnp-wireless.com/glossary.html

If the term or acronym you are looking for is not defined there, this page provides a form to submit it to us for definition. If we can define it, we will respond directly to you *and* add the definition to our glossary for the benefit of others.

Bookmark this page and increase your AWTIQ (Apparent Wireless Telecommunications Intelligence Quotient)!

Harry Young: In Memoriam

Harry Young, a well known and well respected wireless industry consultant died suddenly on January 17th, 1999. Harry was a subscriber and contributor to *Cellular Networking Perspectives*, a supportive consulting colleague and, most of all, a friend. He is survived by his wife Michele Young, daughter Laura Bingham, and stepson Michael Buseman.

P.J. Louis of TruePosition has prepared a tribute at:

http://www.cnp-wireless.com/HarryYoung.html

Harry, we will miss you.

Telecom Trivia Trading Cards: Series 2

Our second series of telecom trivia trading cards are now available. They feature an attractive photograph on one side and information about TIA TR-45 standards subcommittees, standards and ad hoc groups on the other. Every subscriber is entitled to a free set, and non-subscribers will receive 3 trading cards with every request for a sample issue. If you are desperate, extra sets can be ordered for $10 each (including mailing).

The locations captured in the photographs on the trading cards form clues to a quiz entitled "Ambling Around America". If your geographic inference skills are well honed, travel to:

.http://www.cnp-wireless.com/cardquiz2.html

…and match your wits against ours! There are even prizes to be won.

US Number Conservation Comparative Matrix

Michele Young provided an article on Number Conservation for the January, 1999 issue. Table 1 is a matrix that summarizes the various number conservation approaches being considered by the US industry, many of which were mentioned in her article.

Our sympathies go out to Michele, who is the wife of Harry Young.

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Table 1: Number Conservation Approaches

Number Conservation Approach	Comments (see http://www.cnp-wireless.com/glossary.html for definition of acronyms)
1. Rate Center Consolidation (RCC)	Opposed by LECs (Local Exchange Carriers) and ICs (Inter-Exchange Carriers) unless revenue neutral; and therefore could require a lengthy regulatory proceeding. Makes wireline number use similar to wireless in that one NXX can serve multiple rate centers. Totally incompatible with Extended Local Calling Areas (see #2) and Inconsistent Rate Centers (see #3) because rate centers must match between carriers. This is, by far, the technically best solution, because traditional rate centers are far too small to ensure that every carrier within the rate center can fill at least one block of 10,000 numbers, the minimum assigned.
2. Extended Local Calling Area (ELCA)	Often used by wireless carriers to ensure that people calling wireless phones are not hit with unexpected toll charges, and because it eliminates the need to micro-manage mobile phone number assignments. Being withdrawn by LECs for wireless use due to Telecom Act concerns. CLECs (Competitive Local Exchange Carriers) are unlikely to use ELCA because of incremental per minute usage rate.
3. Inconsistent rate centers (IRC)	Creates custom, individualized rate centers for each carrier. It is totally incompatible with solutions based on pooling and Rate Center Consolidation (see #1) which require congruent rate centers. Very confusing for consumers and other carriers, who will have a difficult time predicting when toll charges will apply to a call. Viewed as anti-competitive by LECs.
4. Thousands block pooling	Reduces the block size for pooling from 10,000 numbers to 1,000. It only has value in new NPAs after Rate Center Consolidation has been deployed. Trial results have been disappointing. It requires a dedicated independent third party administrator. Each pool can only be shared by carriers with identical rate centers. Only blocks with less than 10% assigned numbers can be pooled, greatly reducing its potential. Carriers, such as wireless, with independent rate center boundaries would need separate pools thereby degrading its efficiency. Participants must have LRN (Location Routing Number) LNP (Local Number Portability) functionality.
5. Individual Telephone Number Pooling (ITN)	The block size for pooling is reduced from 10,000 numbers to a single number. It has been deemed the future by NANC (North American Numbering Council), but is vehemently opposed by all but the CLECs due to administrative and operational complexity. Does not foster a service provider inventory thus would eliminate instant wireless subscriber activation. Requires a dedicated independent third party administrator. Each pool can only be shared by carriers with identical rate centers. Only blocks with less than 10% assigned numbers can be pooled thereby greatly reducing this measure's potential. Wireless IRC carriers would need separate pools, which would degrade its efficiency. Requires LRN LNP functionality to participate.
6. Universal Number Portability (UNP)	All blocks of numbers are opened for individual number pooling. Considered by most except CLEC's as a means to "cherry pick" vanity numbers. The architecture and methodology are not defined. It might require the donating carrier to port their own customers back to its own network. In addition, it has all the problems of ITN (see #5, above).
7. Location portability	Numbers can be ported within a much larger geographic area than local number portability (LNP). Only one proposal, using a database, has been suggested to date. Would solve the alleged wireless-wireline porting disparity and could make wireline number use similar to wireless. Depending on the geographic scope, could have significant carrier and consumer issues. May not be compatible with any of the other measures.
8. NXX Code Sharing	A network nightmare. Evaluated but quickly dismissed due to capacity and routing concerns.
9. Code sharing using route indexing	Another network nightmare. Was not successful on very limited basis for use as interim LNP. Could not possibly work on a widespread basis due to switching and capacity limits in the donating switch.
10. Mandatory 10-digit dialing	Only of value where code sharing (use of same NXX in two adjacent NPAs to perpetuate 7 digit dialing) is employed. Opening of A (1st) and D (4th) digit has been suggested, but the magnitude of the required network changes would take many years to implement and would cause wide scale switch obsolescence.
11. Modification of CO Code Assignment Guidelines	Already underway at the Industry Numbering Committee. Assumes that rules can be created for all scenarios and that NANPA can enforce them. Civil cases have favored code assignees in the past when attempts have been made to recall NXXs.
12. All services overlays	Easy and inexpensive to implement. But, not much is gained if it is used alone. It could produce real efficiencies if coupled with RCC (see #1). However, consumers do not like overlays due to the mandatory 10 digit dialing that it imposes (because of the multiple NPA's used in the same location), although it does avoid number changes for most customers.

Table 1: Number Conservation Approaches (Continued)

Number Conservation Approach	Comments (see http://www.cnp-wireless.com/glossary.html for definition of acronyms)
13. Retroactive overlay	Detested by consumers due to second number change in short period of time. Carriers have to pay for code relief twice for the same area. May require reprogramming of all existing wireless phones.
14. Expanded overlay	Would permit large wireless carriers or a group of small carriers to share an NPA based on wireless boundaries. Creates significant jurisdictional issues as NPAs, with rare exceptions, do not cross state boundaries today. Not compatible with local number portability, as it would be rendered useless as soon as a customer ported in or out of the NPA. It also might require reprogramming of all existing wireless phones.
15. Specialized overlay	Precluded by multiple FCC orders due to lack of technological neutrality. Also is incompatible with LNP, and becomes obsolete as soon as the first customer ports to or from the all services NPA. These NPAs could have very low fill rates thus resulting in a waste of resources.

Riding the (TIA/EIA-634 A-Interface) Range

"Give me a Home, Where Buffalo Can Really Roam"

This is the second in a series by Eileen McGrath Hadwen, a wireless standards consultant based in Boulder, Colorado. Her website is:

http://home.att.net/~mcgrath.hadwen

Where did we leave each other last month? Ah yes, riding the wireless range with a heavy dollop of A-interface Alphabet Soup under our belt, and using the TIA/EIA-634-B roadmap of sub-interfaces to navigate the two incompatible network architectures, raucously referred to as Architecture A, and Architecture B. This month, Santa is safely back in the North Pole, oiling the sleigh bells for next year, so who is that mob on horseback riding up over the ridge?

Hold on there, stranger! It's a posse of carriers and they don't look none too happy. They're waving a thick set of documents in the air, and looking for mischief. Seems they don't like the fact that vendors can adhere to the new TIA/EIA-634 standard, and still not interoperate with a competitor's equally adhering equipment. Seems like they smell a skunk, and the smell itself is adhering a little too well. This posse's out for a fix, and they ain't coming home 'til they get it. Well, hey now. Fancy that! What ya say we go have a look-see 'round their campfire and do us some eaves droppin' upon their story tellin'? We all might just hear somethin' worth our while… Hush, now.

The big fella in the white hat kicks the dust from his boots and settles down for a long night. He's speaking to the crowd of MSC vendors gathered round the warm glow of the fire. Let me tell ya, he's got their attention. Listen up. "Give me a home where my buffalo can really roam, and you'll be giving me a standard that is interoperable. I want one specification which works, across the range. Did I make myself clear?" Now everyone else is shuffling their boots in the dirt and rubbing their chapped hands nervously, nodding their heads, and just looking mighty humble. Looks like ole' White Hat found his outlaws, and they're getting an earful.

"Well, folks, it's the CDG [CDMA Development Group] campfire, and this here is an IOS hoedown. That stands for Inter-Operability Specification. It's like this. There's things called standards that are standard and then there's standards that are just called standards. And TIA/EIA-634-B falls into the latter category.

"It seems this CDG posse' here, which caught ya red-handed this afternoon, don't take lightly to standards that don't specify a single interoperable specification. Instead, y'all keep giving us newfangled tongue twisters for sub-interfaces and add-ons like incompatible multiple architectures that don't work when they're hooked up, one to t'other. It don't make no difference that some of ya use A4, and others of ya don't. I couldn't give a fig's leaf. You've missed the point, entirely. We want an A-interface Standard. Period. One that works!"

"So we've rounded up you vendors of the wireless range who're responsible for these shenanigans, and brought y'all back for a little fireside chat. Friendly-like. Listen up. We're gonna get ourselves a specification which works. First time, every time. So, get your thinking caps on 'cause we got 'til sun-up to make this thing work."

Well, golly. You should see those vendors now. They're shaking hands, and pulling out laptop computers from their saddle bags, getting into little packs of 3 or 4, talking up a storm. Looks like ole' White Hat has got them vendors working together, towards one goal, like. We may just get ourselves a fix, yet, my friends… Wouldn't that be somethin', after a couple of years of wrangling and wrassling in the standards meetings. Now that would be somethin' to write home about…[Editor's note: We're taking that as a promise.]

And so it went. On through the night, huddle after huddle, little packs of vendors compromising their own needs for the benefit of ole' White Hat's goal: Interoperability. It's an hour from sun-up, now. Let's sneak on back for one last look. Quiet, now. Real easy, like.

Sure enough, looky here. Everyone is smiling and it sure does look like they've got themselves a specification. It surely does look an awful lot like Architecture A, from here, with no A4 and soft hand-off transfer. Well, shiver me timbers.

Those vendors did it. Well done. Ole' White Hat is pacing the line between the horses and the fire, watching for the first light of day. And those vendors are putting the finishing touches on what looks to be a solid specification. Ain't that something?

Well, folks, thanks for joinin' me for this fireside vigil. We'll leave these happy campers now, and move on down along the wireless range, keeping our eyes open for more action like the one we just witnessed. That ole' CDG posse' really knew what they were doin', didn't they? Well, hey now. Yes, they did at that.

> Oh, give me a home,
>
> Where my customers roam,
>
> And my A-in-ter-face
> in-ter-operates,
>
> Yippy - I - O - S!"

Giddy-up! Happy trails!

Brief History of the CDG Inter-Operability Specification (IOS):

- First CDG IOS meeting
  Fall, 1998
- CDG IOS Chair
  Sprint PCS (the guy in the White Hat)
- Foundation Document
  Sprint PCS IOS
- Relationship to TIA/EIA-634-B
  Currently includes Common Protocol section without soft handoff transfer, supporting only Architecture A topology with its sub-interfaces (not A4).
- Status
  Being developed by the CDG, with portions being deployed as they become available.
- International Interest
  Japan, China, Mexico, India, Russia and others.

Wireless Local Number Portability Standards, Part I: Marching Orders

Local Number Portability (LNP) is one of three major US government mandates that is having a significant impact on wireless network standards (the others are the CALEA electronic surveillance legislation, and the Enhanced 9-1-1 mandate). LNP appears to be both less useful for wireless consumers, and more complex for wireless vendors and carriers to implement. However, even though the wireless industry is attempting to have the mandate removed (or pushed far out into the future), the current position of the FCC is that it still applies.

The FCC LNP Order: Any Port in a Competitive Storm

Local Number Portability is an important component of the FCC's desire to promote local telephone competition. Their belief is that residential and business customers will be less likely to change to a new carrier (known as a CLEC, Competitive Local Exchange Carrier) if they cannot keep their existing telephone directory number. Changing numbers will result in missed calls, and also will force them to incur expenses, such as reprinting stationery, signs and advertising materials.

The first FCC Report & Order was released in July 1996. It required that wireless carriers that are covered by the order (the top 100 MSA's) provide the ability to route calls to ported wireline numbers by December 31, 1998 (known as Phase I) and the ability to support ported wireless numbers by June 30, 1999 (Phase II). This was extended in September 1998 to March 31, 2000.

The FCC has not mandated a particular methodology, but the LRN (Location Routing Number) method has become the *de facto* standard. For any potentially portable telephone number, a database must be queried to obtain a routing number (the LRN). For non-ported numbers the directory number can continue to be used for routing.

The Wireless Industry: Not Happy Campers

The wireless industry has not been happy at having the number portability mandate imposed on it. While they recognize that wireless systems must support Phase I to allow wireline porting, and they recognize the increase in competition that theoretically should arise when wireline customers can keep their phone numbers when changing carriers, they do not accept that portability will increase competition in wireless. While local wireline telephone service is generally a monopoly today (or close to it), most wireless consumers have had two carriers to choose from for several years, and with the advent of PCS, they may now have two or more additional choices. Furthermore, high rates of churn in the wireless industry are proof that many people don't consider the need to change phone numbers a barrier to changing carriers.

The CTIA, and individual wireless carriers, have been lobbying for an extension to the LNP mandate on wireless carriers. While they received a 9 month extension, they are hoping for a 5 year grace period, with the need for wireless LNP being re-examined at that time. Bell Atlantic even has a lawsuit to attempt to persuade the courts that the FCC does not have the authority to impose LNP on wireless carriers.

TIA Standards Subcommittee TR-45.2: On a Forced March

Standards committees cannot wait around until the dust settles, for to do that would be to guarantee that the LNP mandate could not be met by wireless carriers. They have actually published a standard (TIA/EIA IS-756) for both Phase I and Phase II, and are working on a non-mandated Phase III, which will extend the standard to enhanced services, such as Short Message Service, and will be improving its efficiency.

We will be examining how wireless networks can use IS-756 to implement Phases I, II and III of LNP in subsequent issues of *Cellular Networking Perspectives*.

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Superseded Interim Standards and TSBs

IS/TSB	Description	Published
IS-41-B	Intersystem Operations	12/91
IS-41-C	**Intersystem Operations**	**02/96**
IS-52-0	Cellular Subscriber Dialing Plan and Service Codes	11/89
IS-53-0	Cellular Features Description	09/91
IS-124-0	Cellular Inter-System Non-Signaling Data Communications	11/93
IS-756	**Wireless Number Portability (Phase I)**	**04/98**
TSB-29-A	International Implementation of Cellular Systems Compliant with TIA-553	09/92
TSB-41	Technical Notes for IS-41 Revision B	11/94
TSB-51	Inter-System Authentication, Signaling Message Encryption and Voice Privacy	05/93
TSB-55	IS-41 Rev. A/B Forward Compatibility	05/94
TSB-64	Wideband Spread Spectrum Intersystem Operations	02/94

ANSI Standards and Annexes

ANSI #	SP #	TIA IS-	Subject	Published
TIA/EIA-41-D	SP-3588	IS-41-C	Intersystem Operations	12/97
TIA/EIA-93-A	**SP-3295**	**IS-53**	**Ai and Di Interfaces Standard**	**in press**
TIA/EIA-124-B	**SP-3816**	**IS-124-A**	**Call detail/billing record transfer**	**in press**
TIA/EIA-660		IS-52-A	Dialing Plan	09/96
TIA/EIA-664		IS-53-A	Features	09/96

Published TIA/EIA Interim Standards

IS-	Description	Published
IS-52-A	Uniform Dialing Procedures for use in Cellular Radiotelephone Systems	03/95
IS-53-A	Cellular Features Description	04/95
IS-93-0	Ai and Di Interfaces Standard (PSTN/MSC)	12/93
IS-124-A	Cellular Inter-System Non-Signaling Data Communications	09/97
IS-725	IS-41 support for Over-the-air Service Provisioning (OTASP)	12/97
IS-728	Inter-System Link Protocol	04/98
IS-730	IS-41 support for IS-136 DCCH (TDMA digital control channel)	10/97
IS-735	IS-41 support for IS-95-A (advanced CDMA)	02/98
IS-737	IS-41 support for data services for digital terminals (TDMA and CDMA)	05/98
IS-751	TIA/EIA-41 support for IMSI (International Mobile Station Identity)	02/98
IS-756-A	**Wireless Number Portability, Phase II (portable mobile numbers)**	**12/98**
IS-764	Calling Name Presentation/Restriction (CNAP/CNAR)	06/98
J-STD-025	Lawfully Authorized Electronic Surveillance (joint with ATIS T1)	12/97
J-STD-034	Enhanced Emergency Services (E9-1-1), Phase I: identify mobile and cell/sector location	12/97

Published Telecommunications Systems Bulletins (TSBs)

TSB-	Description	Published
TSB29-B	International Implementation of Wireless Systems	10/97
TSB29-B-1	TSB29-B updates following IFAST #6	03/98
TSB29-B-2	TSB29-B updates following IFAST #7	06/98
TSB56-A	Application Level Testing for IS-41 Rev. B, IS-53 Rev. 0 and TSB-51	06/94
TSB-76	PCS Multi-Band Support	09/96

Balloting TR-45.2 Projects (PN = TIA Project Number)

PN/SP	Description	Status	Standard
PN-3661	Wireless Intelligent Network	Ballot	**TIA/EIA/IS-771**
PN-4081	**Authentication enhancements**	**Ballot**	**TIA/EIA/IS-778**
PN-4173	**Over-the-air activation/provisioning addendum**	**Ballot**	**TIA/EIA/IS-725-A**

Developing TR-45.2 Projects (PN = TIA Project Number)

PN/SP	Description	Editor	Standard
PN-3362	Cellular Feature Descriptions	Terry Watts	TIA/EIA-664-B
PN-3590	Intersystem Operations	Terry Watts	TIA/EIA-41-E
PN-3890	**Enhanced 9-1-1, Phase II (125 m. location accuracy)**	**Arturo Vega**	**J-STD-034-A**
PN-4104	Broadcast/Multicast Short Message Service	Michel Houde	TIA/EIA-41,-664
PN-4117	International Implementations of Wireless Systems	Steve Jones	TSB-29-C
PN-4177	Law enforcement support beyond CALEA (ESS)	Mike Hammer	
PN-4186	**Wireless Number Portability, Phase II: portable mobile directory numbers**	**Chuck Ishman**	**IS-756-A**
PN-4197	Internationalization of TIA/EIA-41 (beyond IMSI)	Charles Teising	IS-xxx
PN-4206	PSTN interconnect (including number portability, 9-1-1 Phase II location and Calling Party Pays)	David Crowe	TIA/EIA-93-B
PN-4284	Expanded ESN (Electronic Serial Number)	Chuck Ishman	TIA/EIA-124 & TIA/EIA-41
PN-4285	Calling Party Pays	David Crowe	TIA/EIA-124 & TIA/EIA-41
PN-4287	Wireless Intelligent Network (WIN) Phase II: charging and location services- User Description	Terry Jacobson	TIA/EIA-664
PN-4288	**Enhanced 9-1-1, Optional features (congestion control and subscriber information)**	**Arturo Vega**	**J-STD-034-A**
PN-4289	WIN Phase II - Protocol Definition	Terry Jacobson	TIA/EIA-41
PN-4371	**Personal Mobility (Smart card)**		
PN-4372	**Analog (group III) fax connected to CDMA WLL**		
PN-4390	**Segmentation of TIA/EIA-41 messages**	**Lee Valerius**	**TIA/EIA-41**
PN-4392	**Enhanced security (authentication and encryption). Stage I description only.**		**TIA/EIA-664**
PN-4393	**Enhanced security (Stage II, III changes)**		**TIA/EIA-41**
PN-4410	**Automatic Code Gapping (ACG) for WIN and WNP**		
PN-4411	**Wireless Number Portability (WNP) Phase III (feature interactions and optimization)**		**IS-756-B**
PN-xxxx	**WIN Phase II - Prepaid Calling**	**Terry**	**TIA/EIA-41**
PN-4465	**CALEA surveillance, including FCC ordered changes**		**J-STD-025-A**
SP-4464	**CALEA surveillance, including FCC ordered changes (ANSI version)**		**J-STD-025-B**
SP-xxxx	**TIA/EIA-124 modifications to support WIN and CIBERNET NSDP-B&S**	**Dubi Silverstein**	**TIA/EIA-124-C**

Note: 1. IS- Interim Standard, J-STD- Joint ATIS/TIA Standard, PN- Project Number, SP- ANSI Standards Proposal , TSB– Telecommunications Systems Bulletins.

2. **Bold Type** indicates modification since previous publication.

3. Published TIA standards can be obtained from Global Engineering Documents at 1-800-854-7179.