

## In This Issue...

### *CPP Part I: A Service Whose Time Has Come...or Gone?. p. 1*

Calling Party Pays seems like the dream feature to enable carriers to increase calling to wireless phones. So, why is it virtually unavailable in North America?

### *ATIS T1P1 & TIA TR-46 PCS-1900 ("GSM") Standards ..... p. 4*

GSM standards are largely developed by ETSI, but ATIS T1P1 is responsible for adaptation to North American requirements, and later harmonization with the global GSM standard.

### *TIA TR-45.6 Packet Data Standards (including CDPD) ..... p. 5*

TR-45.6 is moving away from its original focus on the CDPD wireless packet data standard, and concentrating more on 3G packet data standards.

### *Evolution from IS-41 Rev. 0 to TIA/EIA-41-D ("IS-41 on a Page") ..... p. 6*

A complete listing of IS-41 and TIA/EIA-41 message on a page, annotated by the revision of the standard they first appeared in. Mission Impossible? No!

## CPP Part I: A Service Whose Time Has Come...or Gone?

Calling Party Pays (CPP) could make the cost of owning a wireless phone cheaper, could increase the number of minutes used by wireless consumers and could make everyone with a phone, whether wireless or not, a 'virtual customer' of wireless carriers. CPP is the normal way of billing calls in Europe and many other areas. Why do North American carriers stick to the Terminating Party Pays (TPP) model where the mobile pays for airtime no matter whether they initiated the call or not? Does CPP represent an advantage of GSM and a deficiency of North American wireless standards?

There are a number of characteristics of the US telecom environment that conspire to make CPP harder to implement there than elsewhere (note that differing radio interface standards are *not* a factor):

- The huge number of telecom carriers, both wireless and landline. According to the FCC (FCC 99-229) there are over 2,000 landline telephone carriers in the US, and over 700 cellular and PCS carriers. A wireless carrier offering CPP nationwide would have to have agreements with many of these.
- The North American Numbering Plan. Wireless carriers are allocated only central office codes, not distinct and easily recognizable area codes as in

most other countries,

- The imminent threat of wireless number portability.

Number portability makes it impossible to determine the carrier associated with a phone number without performing a database query, and these queries are not normally initiated from outside the local number portability area. CPP may require queries from anywhere in North America.

## Critical Issues

There are a number of critical issues with CPP that must be addressed before any solution can work:

- Can all calls be charged? Surprisingly often with CPP, many calls cannot, particularly from payphones and other types of phones that do not pay for services through billing. The euphemism for this lost revenue is *leakage*.
- Can bills be generated? Wireless and landline carriers use incompatible inter-carrier billing formats.
- Will consumers have a choice? Many countries make CPP the only way that terminating wireless calls can be billed, just as TPP is generally the only choice in North America.
- Will callers know? Consumer complaints will likely sink any system that does not let them know at the time they are placing a call that they will be paying CPP charges.
- Is there any money in it? What are callers willing to pay, and will this cover

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the additional billing and infrastructure costs? Have dirt-cheap local and long-distance calling spoiled North American consumers?

- Do wireless customers want it? With flat-rate calling plans, bundles of free minutes, first incoming-minute free, would it really make much difference anyway?

## Approaches to CPP

There are several different approaches to CPP that are possible, of which only the first has been implemented to any extent in North America:

### 1. CPP Determined by Number Block

CPP subscribers are assigned numbers from a special block. This has problems working nationally (in the US), and with local number portability.

### 2. CPP Through ISUP Signaling

Originating carrier provides information on callers to wireless carrier using modified ISUP signaling. The problem is that ISUP standards will need to be modified to support this method.

### 3. CPP Through LIDB Queries

An alternative to sending caller information during call setup is to have the wireless carrier query it from a Line Information Database (LIDB). Problem is, only landline carriers support this.

### 4. The 'ideal' approach

If all CPP limitations were to be eliminated, what would the service look like?

In future parts of this article, we will discuss these approaches in detail, and analyze the strengths and weaknesses of each one.

## History of Standards Development

There have been several attempts to promote CPP standardization in North America. Some carriers bravely went ahead with Number Block based systems, with mixed results. Because these

systems are largely LEC-controlled, the CTIA initiated an investigation into CPP that resulted in the publication of a white paper, entitled *The Who, What and Why of "Calling Party Pays"* in June, 1997. Based on encouragement from the CTIA, the FCC initiated a Notice of Inquiry in September, 1997. Meanwhile, the CTIA had pulled together a group of industry representatives and developed a Standards Requirements Document that was released in January 1998. It recommended an ISUP signaling approach, although there were a number of participants who preferred a LIDB-query based approach. Shortly after, the CTIA petitioned the FCC for expedited consideration of CPP issues.

The CTIA submitted their SRD to a number of standardization groups in early 1998, including TIA subcommittee TR-45.2, which initiated project PN-4285. The output of this project was intended to modify the TIA/EIA-41 intersystem operations standard, TIA/EIA-93 interconnection, TIA/EIA-124 call detail recording as well as provide input for modifications to the SS7 ISUP standard controlled by ATIS committee T1S1.

By late 1998 a small industry group had persuaded the CTIA to reconsider a LIDB query approach, and plans were proceeding towards a new industry forum to review the progress on standards, and to determine whether a change in direction was warranted.

All this came to a halt in May, 1999 when the CTIA withdrew support for the project. Since then no work on technical standards has been done by the CTIA, and work on TIA TR-45.2 project PN-4285 has also come to a halt.

Without technical standards, widespread support for CPP is a virtual impossibility. Standards are not the only requirement, there are many related business and political issues as well, but standards certainly are a critical component.

Ironically, the FCC released a ruling on CPP, and notice of a further rulemaking in June, 1999 (with comments due by October, 1999) based on the assumption that the development of standards was still ongoing.

## FCC Rulemaking

The FCC rulemaking ([www.fcc.gov/Bureaus/Wireless/Notices/1999/fcc99137.pdf](http://www.fcc.gov/Bureaus/Wireless/Notices/1999/fcc99137.pdf)) that was adopted in June, 1999 established CPP as a wireless (CMRS) service, and identified other issues for further rulemakings.

### Who Controls the Service?

The FCC agreed with wireless carriers that CPP is their service, and that callers are, for the duration of the call, their customers. They stated that "In agreeing to pay for the call to the [wireless] subscriber, the calling party becomes, for the purpose of completing the call, a customer of the [wireless] provider." Consequently, wireless carriers can collect billing information, with an expectation that callers are legally bound to pay for the CPP calls that they initiate.

### Caller Notification

The FCC believes that callers to CPP numbers should be provided with an announcement that indicates:

- the identity of the wireless carrier,
- that CPP charges will apply to the call,
- the per-minute rate that will apply (and any other charges),
- that charges can be avoided by hanging-up during the announcement.

Later, it is possible that this announcement could be simplified, once consumers have become familiar with the service. A new (November, 1999) CPP offering from Bell Atlantic uses a recording that provides this information.

An alternative form of notification is based on the dialed phone number (assuming that CPP numbers are taken from recognizable blocks). The FCC was cool to this proposal, although they did not eliminate it from consideration.

### Rate Control

The FCC plans to investigate how to place limits on CPP charges to ensure that consumers are not being gouged. They note that CPP is not a truly competitive offering because only one wireless carrier can complete the call to any single subscriber.

## **Billing and Collection**

The FCC will study whether the originating carrier should be forced to provide Billing and Collection services, or whether it would be feasible for wireless carriers to bill the caller directly. Many wireless carriers believe that without billing and collection being provided at a reasonable price, CPP would simply not be an economically viable service.

## **CPP by Interconnection**

An alternative to billing for CPP is to use an interconnection arrangement. In this approach, the originating carrier pays the wireless carrier for the privilege of terminating to them. It is then up to the originating carrier to collect for the call. One problem with this is that there must be some way for the originating carrier to recognize that a call is CPP.

## **Technical Requirements**

The major requirements for CPP have been gleaned from the FCC rulemaking and various CTIA documents ([www.wow-com.com/techops/cpp](http://www.wow-com.com/techops/cpp)), most notably the Standards Requirement Document. Each carrier will prioritize the requirements differently, but ideally they should all be met.

## **National Scope**

All current CPP alternatives are geographically limited. While limiting the service to calls originating from within the US and Canada is probably not a big problem, some systems are limited to calls originating from the home calling area of the mobile. This particularly applies to systems that use an office code (e.g. npa-NXX-xxxx) to distinguish CPP mobiles. It would be an enormous burden for every switch in North America to maintain a database of all CPP NXX codes.

## **Notify Callers**

As noted above, the FCC has indicated that a fairly complex announcement will be required for CPP. The wireless industry hopes that once consumers become familiar with CPP this requirement will be reduced to just a distinct tone.

## **Block Upon Request**

It must be possible for callers to be able to have their lines blocked. This is particularly necessary for phones in public places that allow free local calls or on PBX's serving businesses that may want to control these costs. Blocking long distance calls can easily be performed by simple digit analysis, but CPP calls may not be recognizable in this way.

## **Minimize Leakage**

There are certain types of phones from which CPP charges may never be collectable (e.g. payphones), while for other types of phones charging may be possible if appropriate systems are developed (e.g. prepaid). The greater the fraction of calls that can be collected, the more successful the feature is likely to be.

## **Recognize Leakage**

It is not good enough to minimize the calls for which CPP charges cannot be collected, there will probably always be calls for which revenue cannot be collected. It is important to recognize these so that they can either be blocked or diverted to a system that can offer to accept alternate billing information (e.g. calling card or credit card number).

## **No Roaming Charges**

It is generally the consensus that roaming charges should not be paid by the caller (since the location of the mobile they are calling is something they have no control over, and cannot be determined from the number that they dial). Consequently, wireless callers will need to be educated to understand that only local airtime will be free with CPP. Flat-rate calling plans will obviously not experience this problem.

## **Subscription Option**

CPP is mandatory in most countries in which it exists, just as TPP is mandatory for most wireless customers in North America. However, many North American customers, particularly business users, will probably be opposed to charging callers who may be their customers. Consequently, CPP must be a subscription option.

## **Work with Local Number Portability**

CPP systems based on a recognizable dialed number have problems with Local Number Portability (LNP). If a mobile is ported to a landline carrier, or to a wireless carrier that does not support CPP, CPP charges may continue to be collected. Conversely, charges may not be collected on a landline phone that is ported to a wireless carrier.

Another problem is related to billing. The calling number does not identify the carrier responsible for handling billing for customers that have ported. Billing systems may have to perform the equivalent of a number portability query to obtain this information, or the information will have to be provided in real-time by modified signaling messages (i.e. ISUP).

## **Exchange Billing Records**

Billing records are exchanged between wireless carriers in CIBER format and between landline carriers in EMI/EMR formats – but if the originating carrier performs billing and collection, CPP will require that billing records be exchanged between wireless and landline carriers. Although some preliminary work has been performed to examine this exchange, no systems currently exist to do this commercially.

## **Carrier Control**

Current CPP systems are largely controlled by the originating carrier, usually the Local Exchange Carrier (LEC). This makes flexibility in billing difficult (e.g. different rates for different subscribers), and does not give the wireless carriers much control over the parameters of the system. The CTIA SRD strongly supported a wireless carrier controlled service, and the FCC rulemaking appears to endorse this.

## **To be continued...**

We will continue our discussion of Calling Party Pays by describing the four basic methodologies, and measuring them against the identified requirements.

# ATIS T1P1 & TIA TR-46 PCS-1900 ('GSM') Standards

## Cellular Networking Perspectives

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### Published Standards

Standard	Description	Published
IS-104-A	PCS Service Descriptions	1996
IS-129	Interworking/interoperability between DCS1900 and IS-41 MAPs	1996
IS-651-0	SS7/GSM "A" Interface (RS/PCSC)	1995
IS-651-A	SS7 "A" Interface (RS/PCSC) for GSM systems	1998
IS-652-0	Intersystem Operations - DCS1900 (GSM) MAP based	1996
IS-653-0	ISDN "A" Interface (RS/PCSC). Includes SS7 as a transport option.	1996
J-STD-007	PCS Air Interface Specification	1996
J-STD-007a	Calling Name Presentation supplement to J-STD-007	1997
J-STD-023	Intersystem Operations based on PCS1900 (GSM) Standard (prev. IS-652)	1996
J-STD-024	SS7 based A-interface Standard (previously IS-651)	1997
J-STD-025	Lawfully Authorized Electronic Surveillance (CALEA)	1997
J-STD-034	Enhanced Emergency Services (E911) Phase I (callback, cell/sector identification)	1997
<b>T1.708</b>	<b>PCS 1900 Support for Number Portability (Routing to ported landline numbers)</b>	<b>1998</b>
<b>T1.711</b>	<b>PCS 1900 Support for Number Portability (Ported wireless numbers)</b>	<b>1999</b>

### Standards in Ballot

Ballot	Standard	Description	Status
LB 800		Harmonization between North American and European GSM	Default ballot

### Active Projects

Project	Description	Status
	Determining Location of a GSM Phone	<b>CR to ETSI. Completion scheduled 02/00</b>
	Adaptation of GSM A-Interface to PCS-1900	CR to ETSI
	GSM support for 14.4kbps data	CR to ETSI
	<b>Harmonization of number portability work (T1.708 and T1.711) with ETSI standards</b>	

- Note:
1. CR - Change Request, ETSI - European Telecommunications Standards Institute, IS - TIA Interim Standard, J-STD - Joint ATIS/TIA Standard, LB - Letter Ballot Number, PN - TIA Project Number, SP - ANSI Standards Proposal Number, T1 - Prefix for ATIS T1 ANSI standards (and standards committees), TSB - TIA Telecommunications Systems Bulletin.
  2. **Bold Type** indicates a modification since the previous publication of this information.
  3. Published TIA standards can be obtained from [www.tiaonline.org](http://www.tiaonline.org), and published ATIS T1 standards from [www.t1.org](http://www.t1.org) or [www.ansi.org](http://www.ansi.org).

Thanks to Terri Brooks and Margaret Robbins (Nokia) for their assistance compiling the information in this report.

# TIA TR-45.6 Packet Data Standards (including CDPD)

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### Published Standards

Standard	Description	Published
IS-732	Cellular Digital Packet Data (CDPD) Standard. See June, 1998 issue for full list of part numbers	02/98
TSB-87	IS-732 support documents. See June, 1998 issue for full list of part numbers	02/98

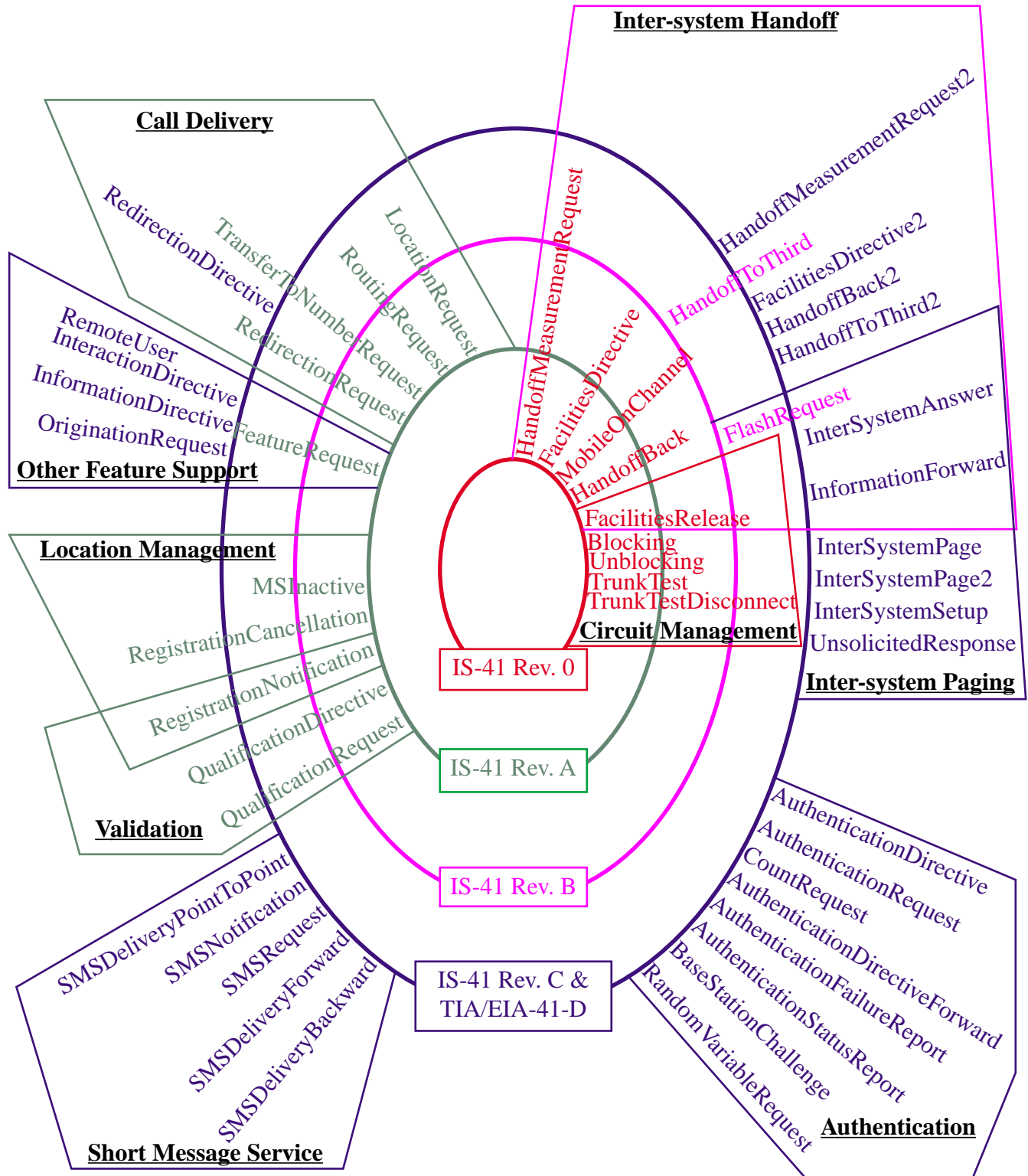
### Developing TR-45.6 Standards

PN/SP	Standard	Description	Status
PN-4166	<del>IS-732-311-A</del>	<del>Lower Layer Subprofiles</del>	<b>Cancelled (no work was required on these parts)</b>
PN-4167	<del>IS-732-312-A</del>	<del>Subnetwork Subprofiles, including option for IP communication between MD-ISs</del>	
PN-4168	<del>IS-732-500-A</del>	<del>Mobility Management, allowing an intermediate MD-IS in the Location Update Service (LUS)</del>	
PN-4169	IS-732-501-A	Mobile Network Location Protocol, allowing an intermediate MD-IS in the Location Update Service (LUS).	<b>In press</b>
PN-4170	<del>IS-732-A</del>	<del>Standard and System Specification Overview</del>	<b>Cancelled (no work was required on this part)</b>
PN-4286	<b>TSB-115</b>	Wireless IP Network Architecture for 3G Systems	<b>Ballot</b>
PN-xxxx		<b>Further work on Wireless IP network standards</b>	<b>Proposed</b>

- Note:
1. IS- TIA Interim Standard, TSB- TIA Telecommunications Systems Bulletin, PN- TIA 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 Global Engineering Documents at 1-800-854-7179.

Thanks to Mark Munson (GTE; Chair of TR-45.6) for his assistance compiling the information in this report

# Evolution from IS-41 Rev. 0 to TIA/EIA-41-D ("IS-41 on a Page")



Note: Concentric ovals indicate the major revisions to IS-41 and TIA/EIA-41. Names of operations are attached to the oval indicating the revision they first appeared in. Operations are also grouped by category, with some belong to more than one category.

Thanks to Ben Levitan, GTE TSI for the inspiration