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The telecommunications industry is ready to finalize standards to support US CALEA electronic surveillance legislation...but the anticipated FCC rulemaking has yet to appear.

### **FCC Notice of Proposed Rule-making on CPP** ..... p. 1

This paper on Calling Party Pays lays the groundwork for future services that will reverse the current method of charging for mobile terminated calls.

### **CIBER: The Inter-Carrier Billing & Settlement Standard, Part I** ..... p. 2

Jack Hwang of Cap Gemini provides an introduction to the CIBER record format, which is the standard for sharing information about charges for wireless calls, at least in the AMPS world. This format is an integral part of the wireless billing and settlement infrastructure.

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The status of developing and published wireless network standards.

**Next Issue: Sept. 1, 1999**

## FCC Action on CALEA: Still Waiting

We last reported on standards activities related to Lawfully Authorized Electronic Surveillance conforming to the US CALEA legislation in December, 1998. We noted that the US FCC had recently issued a Notice of Proposed Rulemaking (NPRM). Recently, rumors that the FCC would issue the final Report and Order in July became so strong that the joint T1P1/T1S1/TR-45.2 *ad hoc* group was revived in anticipation. However, even by the time of their first conference call on August 2, 1999, the expected FCC action had not occurred.

The haste is motivated by the 180 days that the FCC's NPRM indicated would be available to develop a standard. While the telecommunications industry almost

universally agrees that this is insufficient, they may have to live with it.

A second conference call will be held on August 17, 1999...assuming that the Report and Order is available by then. If not, the *ad hoc* group will go back into hibernation for, hopefully, a short time.

The chair of the *ad hoc* is Terri Brooks of Nokia.

## FCC Notice of Proposed Rule-making on CPP

The FCC Notice of Proposed Rule Making (NPRM) on Calling Party Pays (CPP), which was released on July 7 1999, provides a 'line in the sand', from which the FCC can be moved in either direction, based on comments received from users, providers and manufacturers of telecommunications equipment and services. It is important to note that an NPRM has no legal weight, and any part of it can be changed in the final rule-making (Report & Order). However, it is an important starting point. With this NPRM the FCC has identified a number of key issues to the provision of viable and competitive CPP services in the US, some of which have significant technical impact:

- There is an implied contract between someone calling a CPP phone and the wireless carrier serving that phone, making it possible for wireless carriers to collect for calls from any other US carrier.
- CPP will be a benefit to people calling CPP mobiles because, although they

### Quote of the Month

"Ideally, what the FBI and the Department of Justice wants is [for Canadian Satellite carrier] TMI to retrofit – at its own expense – all of its suitcase telephones to include a [GPS] receiver...That way, the FBI reasons, the built-in GPS receiver could always tell whether a telephone call was being made to or in the United States [and whether CALEA surveillance is therefore applicable]."

Peter Morton  
National Post (Canadian)  
July 16, 1999

will have to pay for these calls, they will be more likely to reach the mobile they are calling.

- CPP will be a benefit to users of mobile services by allowing them to be more available, to get more calls for the same money, and not be forced to pay for undesirable calls.
- Notification to callers should at first include an indication of the CPP charges that will apply and the name of the wireless carrier. It should also give them an opportunity to disconnect without incurring any charges. Later, after consumers are familiar with CPP, notification could be changed to a distinctive tone.
- Notification based on dialed digits (e.g. area codes or exchange codes dedicated to CPP) will not be allowed as the sole means of notification.
- The lack of distinctive digits (due in part to the FCC ruling on Local Number Portability) will not allow pay-phones and PBX's to recognize CPP calls, and therefore they will not be able to block them. It will be necessary for the wireless carrier to block these calls.
- Technical solutions are required to allow the terminating wireless carrier to obtain information about the calling party. These solutions could involve ISUP signaling or LIDB queries.
- Allowing CPP to be a subscription option will exclude solutions based on distinctive digits and revenue sharing based on interconnect agreements.
- The FCC does not yet have an opinion on whether it is necessary to regulate originating carriers to ensure that they provide billing and collection services for CPP charges.

The FCC NPRM is available at:

[www.fcc.gov/Bureaus/Wireless/Notices/1999/fcc99137.pdf](http://www.fcc.gov/Bureaus/Wireless/Notices/1999/fcc99137.pdf)

In a future issue, we will be discussing some of the technical approaches to CPP, including the current LEC based approach, and the two approaches that were being considered by the CTIA and wireless carriers: ISUP signaling based and LIDB database query based.

## CIBER: The Inter-Carrier Billing & Settlement Standard, Part I

*Jack Hwang has worked in the telecommunications industry since 1990, being involved with industry standards since 1994. He has been actively involved with the maintenance and transformation of the CIBER record format since 1996. He works for Cap Gemini Telecommunications, based in Denver, with much of his work focused on ensuring standards compliance in new and existing systems. He can be reached at [jhwang@usa.capgemini.com](mailto:jhwang@usa.capgemini.com). For information about Cap Gemini, visit [www.capgemini.com](http://www.capgemini.com).*

After a wireless phone call is disconnected a bill must be generated by the home carrier. The bill is often based on call detail records generated by another carrier while a subscriber is roaming there. The process of one carrier (most often the home carrier) compensating other carriers for roaming services is called *settlement*, and when only the net difference is exchanged between carriers, *net settlement*.

In the North American AMPS environment (including D-AMPS and CDMA) settlement is generally performed using CIBER (Cellular Intercarrier Billing Exchange Roamer Record) records. This format was developed in the mid 1980's by the CTIA Roamer Committee, with the first release published in 1988. The second and most current version was published in 1990, and a new version has been developed, and will be implemented in August 1999, to support Local Number Portability, GSM and International Roaming. Since 1988, the CIBER record has been maintained by CIBER-NET Corporation, a wholly owned subsidiary of the CTIA. CIBER-NET can be contacted at:

[info@cibernet.com](mailto:info@cibernet.com)

The CIBER Record manual specifies the record formats, field sequences and contents, policies, and procedures for the acceptance and rejection of roamer information between carriers. CIBER records are exchanged to facilitate car-

rier-to-carrier settlement and carrier-to-subscriber billing for roamer related charges. For example, if a subscriber roams in a market, the serving carrier's billing system would generate CIBER records and submit those records to the home carrier for carrier-to-carrier settlement. The CIBER records are then processed by the home carrier billing vendor or system for subscriber billing. Note that switches send unrated call detail records, usually in a proprietary format, to their associated billing system and not CIBER charge records.

### CIBER Record Description

The CIBER record includes two header records, two trailer records, and ten charge records as shown in Table 1.

#### Format

CIBER records were originally designed to be transmitted by magnetic tape, although they are now often transmitted over networks. A tape contained one or more CIBER batches, each being a collection of CIBER Records sandwiched between a header and a trailer record. Each record type is of a fixed size, and contains a fixed number of fields, each of which is also fixed in length. Space for all parameters is always present, although it may be filled with blanks (for alphanumeric fields) or zeroes (for numeric fields).

This contrasts dramatically with TIA/EIA-124 records, which are variable in length because they contain optional parameters, and because each parameter may itself vary in length. TIA/EIA-124 records may also be transmitted individually, rather than in batches.

#### Choosing a Record Type

Each CIBER record provides the ability to convey a unique set of charges. For example, if just an air charge needs to be conveyed, a Type 10 record should be used. If an air and a toll charge is to be conveyed, then a Type 20 record is used.

Once the charges have been identified, the CIBER records that are generated are batched together on a System ID (SID) or Billing ID (BID) to SID/BID relation-

**Table 1: CIBER Header, Charge and Trailer Records**

Type	Name
01	Batch Header Record
02	Batch Header Record for Clearinghouse Returns
10	Air Charge Record
11	Intersystem Network Charges Record
20	Air and Toll Charges Record
22	Air and Toll Charges Record (to support Number Portability/Intertechnology Roaming)
30	Call Specific Charges Record
32	Call Specific Charges Record (to support Number Portability/Intertechnology Roaming)
42	Intersystem Network Charges Record (to support Number Portability/Intertechnology Roaming)
50	Billing OCC Charge Record
52	Billing OCC Charge Record (to support Number Portability/Intertechnology Roaming)
70	Selective Use Charge Record
97	Batch Trailer Record for Clearinghouse Returns
98	Batch Trailer Record

ship. A batch must start with a header record and end with a trailer and may contain zero, one or multiple charge records. For batches originating from a billing system, the Type 01 header and Type 98 trailer records are used. For batches originating from a clearinghouse used to return rejected records, the Type 02 header and Type 97 trailer records are used.

**Key Identifiers and Fields**

There are two sets of key identifiers used throughout the CIBER records. The first are the carrier identifiers. Because of its AMPS-based heritage, carriers are indirectly identified in the CIBER records by SIDs and BIDs. A variation of the “Home Carrier” SID/BID and “Serving Carrier” SID/BID can be found on each CIBER record.

The second set of identifiers is used to identify the end user. In the AMPS environment, the end user is uniquely identified by the combination of the Mobile Identification Number (MIN) and the Electronic Serial Number (ESN). The MIN is also used to determine the Home Carrier’s SID. The MIN and ESN can be found on all the CIBER records except the header and trailer records.

Because the CIBER records are used to convey usage information for the pur-

pose of financial settlement, other important fields in the CIBER record include charge fields, such as airtime charges, toll charges, and taxes.

Other key fields include the settlement period, used to determine whether the charges from a CIBER batch are to be included in one industry bill cycle or another, and the batch sequence number used for processing integrity.

**X2 Records**

The term “X2” is generically used to identify the set of CIBER records with the second digit being “2”. The X2 records were created to support Number Portability, Intertechnology Roaming (e.g. GSM to TIA/EIA-41), and International Roaming.

The main change to support Number Portability was to split the existing MIN field into two fields: the Mobile Directory Number (MDN) and the Mobile Subscriber Identifier (MSID). Additionally, the Location Routing Number (LRN) field and a charge for an LRN dip were added to support Local Number Portability (LNP). To support inter-technology roaming, identifiers such as the IMSI (International Mobile Subscription Identity) and IMEI (International Mobile Equipment Identity) were added. To support international roaming, the Calling

Country and Serving Country fields were added. International roaming may also require use of the IMSI field.

The X2 records have an effective date of August 16, 1999.

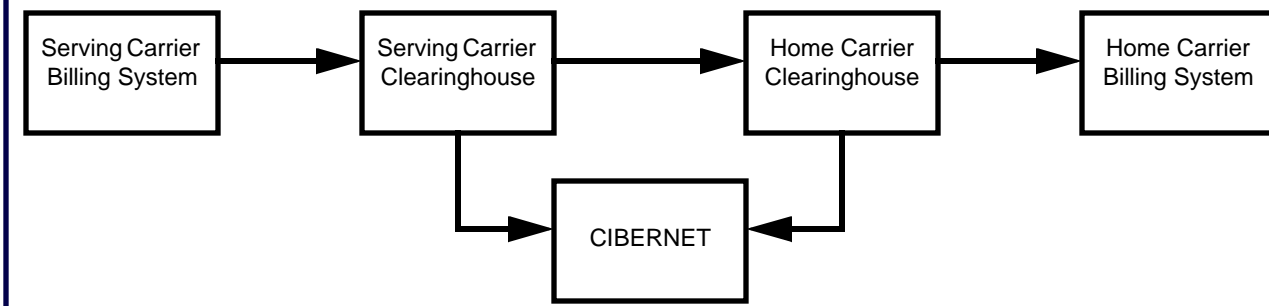
**Roamer Billing and Settlement Entities**

The typical process flow for roamer billing and settlement (illustrated in Figure 1) involves information exchange between the following entities:

- Serving Carrier Billing System
- Serving Carrier Clearinghouse
- Home Carrier Billing System
- Home Carrier Clearinghouse
- Authorized Receipt Point (ARP)
- CIBERNET Corporation

In a “normal” intercarrier roaming record exchange, the Serving Carrier generates a batch of CIBER records. The CIBER batch is then sent to that carrier’s clearinghouse vendor. The Serving Carrier Clearinghouse performs technical edits on the CIBER batch and forwards the batch on to the Home Carrier Clearinghouse. The Home Carrier Clearinghouse is often designated as the Authorized Receipt Point (ARP) for the home carrier. As defined in the CIBER Record specifications, the ARP is the single entity designated by the home car-

**Figure 1: High Level CIBER Process Flow**



rier to perform CIBER edits as well as other business-related edits on its behalf. After passing the Home Carrier Clearinghouse/ARP edits, the batch is sent to the Home Carrier Billing System for carrier-to-carrier settlement processing and subscriber billing.

At the end of the industry bill cycle, the clearinghouses pass carrier payable and receivable data to CIBERNET for reconciliation. If all the clearinghouse reports reconcile, CIBERNET forwards those reports onto a settlement bank for actual settlement between net debtor carriers and net creditor carriers.

**Reconciliation and Settlement**

At the end of the industry billing cycle, the clearinghouses create a report with all the receivables and payables for their respective carrier clients. The reports are sent to CIBERNET which reconciles the reports. For example, for a particular car-

rier pair, the receivables reported for one carrier should match the payables for the other carrier. If there is a discrepancy in the reporting, CIBERNET creates a discrepancy report and notifies the appropriate clearinghouses of the discrepancy. The clearinghouses then work with each other to resolve the discrepancy. Currently there are four clearinghouses that provide AMPS-based clearing services: BellSouth International Wireless Services, Inc., EDS PC, GTE Telecommunication Services Incorporated, and MACH USA.

**To be continued...**

In our September 1999 issue we will continue with a detailed look at the CIBER editing and returns process. This process ensures that both carriers are aware of which batches or records have been rejected, and provides a way to resubmit them.

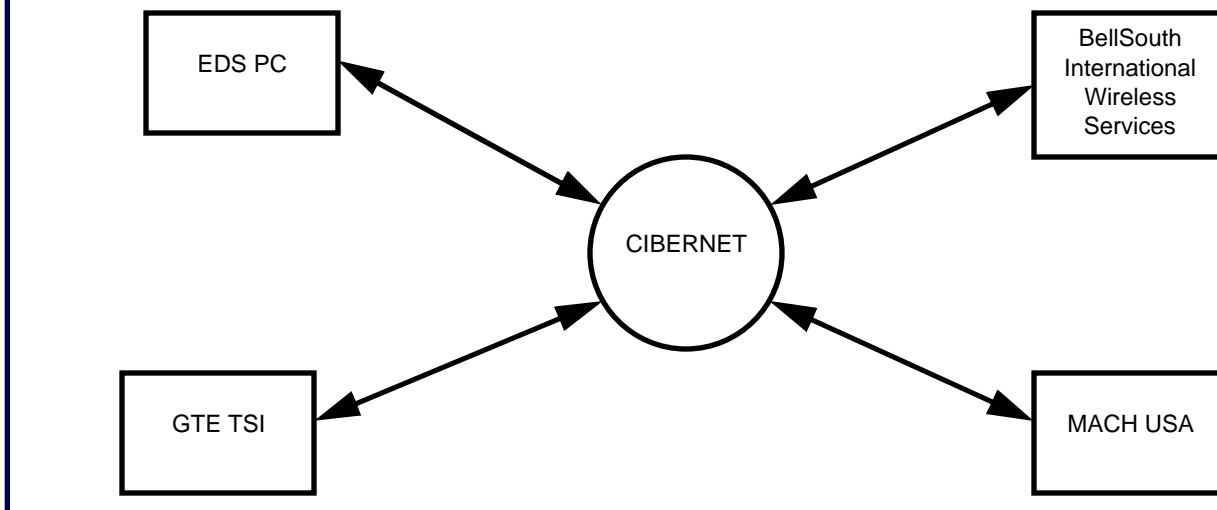
**Location Services**

There are a number of standards groups within TR-45 and 3GPP2 are working on support for location services and technologies in wireless systems. Location technology has not only been mandated in the FCC rule-making on Enhanced Emergency Services, but is also being eyed for a number of commercial services (see our September 1998 issue for more details). A meeting to try to ensure that these activities are coordinated will be held on August 11<sup>th</sup>-12<sup>th</sup> in Dallas Texas, chaired by Larry Young of Sprint PCS. For more information contact Bob Plunkett of Fujitsu:

[bob.plunkett@fnc.fujitsu.com](mailto:bob.plunkett@fnc.fujitsu.com)

Location technology is especially critical for CDMA systems, where it appears that network-based solutions may not be viable, and hybrid handset/network solutions based on GPS may be needed.

**Figure 2: CIBERNET Reconciliation of Clearinghouse Reports**



# TIA TR-45.2 Wireless Network Standards

*Cellular  
Networking  
Perspectives*

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## Superseded Interim Standards and TSBs

Standard	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-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-124-0/A	Cellular Inter-System Non-Signaling Data Communications	11/93(0),09/97(A)
<b>IS-725</b>	<b>IS-41 support for Over-the-air Service Provisioning (OTASP)</b>	<b>12/97</b>
IS-756	Wireless Number Portability (Phase I)	04/98
TSB-29-A	International Implementation of Cellular Systems Compliant with TIA-553	09/92
<b>TSB29-B</b>	<b>International Implementation of Wireless Systems (including two addendums)</b>	<b>07/97</b>

## ANSI Standards and Annexes

ANSI Std.	Formerly	Description	Status
TIA/EIA-41-D	IS-41-C	Intersystem Operations	12/97
TIA/EIA-93-A	IS-53	Ai and Di Interfaces Standard	11/98
TIA/EIA-124-B	IS-124-A	Call detail/billing record transfer	in press
TIA/EIA-660	IS-52-A	Wireless Dialing Plan (North America only)	09/96
TIA/EIA-664	IS-53-A	Stage I Feature Descriptions	09/96
TIA/EIA-664-536	PN-4372	Analog (group III) fax connected to CDMA WLL (Stage I)	In press

## Published TIA/EIA Interim Standards (IS)

IS-	Description	Status
<b>IS-725-A</b>	<b>Over-the-air activation/provisioning addendum</b>	<b>In press</b>
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
<b>IS-771</b>	<b>Wireless Intelligent Network</b>	<b>In press</b>
<b>IS-778</b>	<b>Network Authentication enhancements</b>	<b>03/99</b>
<b>IS-807</b>	<b>Internationalization of TIA/EIA-41 (beyond IMSI)</b>	<b>In press</b>
<b>IS-812</b>	<b>TIA/EIA-41 message segmentation and reassembly</b>	<b>In press</b>
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
<b>TIA-664-536</b>	<b>Analog (group III) fax connected to CDMA WLL (Stage I)</b>	<b>In press</b>

## Current Telecommunications Systems Bulletins (TSBs)

TSB	Description	Published
TSB29-C	International Implementation of Wireless Systems	In press
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/SP	Description	Status	Standard
PN-4104	Broadcast/Multicast Short Message Service	Ballot	
PN-4529	Broadcast of emergency alerts to wireless phones	Ballot	

## Developing TR-45.2 Projects

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-4177	Law enforcement support beyond CALEA (ESS)	Mike Hammer	
PN-4206	PSTN interconnect (including number portability, 9-1-1 Phase II location and Calling Party Pays)	David Crowe	TIA/EIA-93-B
<b>PN-4284</b>	<b>Expanded ESN (Electronic Serial Number). <i>On hold.</i></b>	<b>Chuck Ishman</b>	<b>TIA/EIA-124 &amp; TIA/EIA-41</b>
PN-4285	Calling Party Pays	David Crowe	TIA/EIA-41
PN-4287	WIN Phase II - Prepaid Calling	Terry Jacobson	TIA/EIA-41
PN-4288	Enhanced 9-1-1, Optional features.	Arturo Vega	J-STD-034-A
PN-4289	WIN Phase II - Additional billing and location services.	T. Jacobson	TIA/EIA-41
PN-4371	Personal Mobility	Charles Teising	
PN-4392	Enhanced security (authentication and encryption). Stage I.	Terry Jacobson	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	N. Mazarella	IS-756-B
<b>PN-4464</b>	<b>CALEA surveillance, including FCC ordered changes (ANSI version) [on hold, pending FCC action]</b>		<b>J-STD-025-B</b>
<b>PN-4465</b>	<b>CALEA surveillance, including FCC ordered changes [on hold pending FCC action]</b>		<b>J-STD-025-A</b>
PN-4528	TIA/EIA-124 modifications to support WIN and CIBERNET NSDP-B&S	Dubi Silverstein	TIA/EIA-124-C
<b>PN-4550</b>	<b>Answer holding. Enhancement to call waiting.</b>		
<b>PN-4551</b>	<b>User Selected Call Forwarding. Redirection to number specified at time of incoming call.</b>		
<b>PN-4582</b>	<b>User Identity Module (Smart Card)</b>	<b>Ben Levitan</b>	
<b>PN-4609</b>	<b>Addendum 1 to TSB-29 Rev. C, incorporating IFAST input</b>	<b>Steve Jones</b>	<b>TSB-29-C.1</b>
<b>PN-4610</b>	<b>Optimal Routing to Wireless Phones</b>		
<b>PN-4615</b>	<b>Out of Band Feature Activation/De-activation (for GSM compatibility)</b>		
<b>PN-4616</b>	<b>3G Circuit Switched Data</b>		

- Note:
1. IS- TIA Interim Standard, J-STD- Joint ATIS/TIA 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.