

Cellular Networking Perspectives

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CTIA SRD on Location-Based Services

On October 11, 1999 the CTIA released a Standards Requirements Document (SRD) on Location-Based Services. This is an attempt to combine WIN (Wireless Intelligent Network) capabilities with both existing location information (cell and sector) with more accurate information required to meet the FCC Enhanced Wireless 9-1-1 mandate.

Four 'service drivers' have been identified. These are not intended to be standardized as fully fledged features, but as building blocks that can be incorporated by each carrier as competitively distinct features:

- **Location-Based Charging**
Subscribers are charged differently based on their location. For example, a customer could get free airtime at home, or a business arrange for employees to get free airtime while on company premises. In many situations, the cellsite or sector would be sufficiently granular.
- **Fleet and Asset Management**
Allows companies to track fleets of trucks or other high-value items, such as containers. Even people using wireless phones could be tracked with this service – assuming that privacy concerns are satisfied.
- **Enhanced Call Routing**
Generic access codes can be defined for services. For example, #AAA or #GAS might route a call to the closest

(participating) service station and #ESP to the closest psychic, who can tell you where you are going, and what will happen when you get there. These calls will likely be free to the caller, with the carrier being paid by the recipient, who can hopefully drum up new business (oh, we forgot #DRUM for the closest music store).

- **Location-Based Information Services**

An extension of Enhanced Call Routing, these services would be more interactive, allowing organizations hosting them to take advantage of the short message and text display capabilities of existing wireless phones, and more exotic capabilities (such as graphics) as they become available.

Location-based services will be standardized by the Location Services Focus Group within TIA standards subcommittee TR-45.2, chaired by Larry Young of Sprint PCS:

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CDMA Mobile Assisted Location: IS-801

CDMA proponents have been the most strongly committed to mobile-assisted location technology, based on GPS capabilities built into each phone. TIA's CDMA standards subcommittee TR-45.5 has recently published IS-801, which provides a protocol for mobile stations to provide GPS information to the network, which can then convert it into location information (e.g. latitude and longitude). The network also provides the mobiles with information that makes the acquisition of satellites quicker.

TIA standards can be purchased from:

www.tiaonline.org

FCC and Location Testing

On October 12, 1999 the US FCC Office of Engineering & Technology (OET) and Wireless Telecommunications Bureau (WTB) requested comments on measuring the accuracy of Wireless 911 location systems. The FCC plans to develop guidelines for test procedures to verify compliance with their accuracy standards (see the October, 1999 issue for more details). Location systems may provide dramatically different results in rural, suburban or dense urban environments, and the information that is collected could be interpreted in a multitude of ways.

Motorola IS-41-C & TIA/EIA-41-D Updates

Motorola provided some late updates to the table entitled *Status of IS-41-C and TIA/EIA-41-D Implementations* (page 5 of our October issue).

- LNP Phase II (IS-756-A) is under development for both CDMA and Analog mobiles,
- Message Waiting Notification (MWN) is in field trial or commercial service for both CDMA and Analog mobiles,

- Circuit Switched Data (IS-737) is in field trial or commercial service for CDMA mobiles, and
- Over-the-air-Activation (OTASP; IS-725) is in field trial or commercial service for CDMA mobiles.

Packet Data Surveillance Update

TIA Standards Subcommittee TR-45.2 has, in a letter to telecom and computer standards organizations, outlined a plan for providing the FCC with a report on packet data 'minimization' well before the September 30, 2000 deadline. To merely meet this deadline might require the development of two packet data solutions, one within J-STD-025 Revision A (based on the current ruling) and one in the next version (based on any modifications the FCC chooses from the TIA report or other sources). Instead, TR-45.2 has plotted a more aggressive schedule, a process which will culminate in a Joint Experts Meeting (JEM) in February 2000. This will hopefully allow a single solution, a single implementation and a single cost to carriers.

FCC CALEA Ruling, Part II

In our October, 1999 issue we started our discussion of the impact of the FCC CALEA ruling on the wireless industry, and in particular, on J-STD-025. We discussed the FCC's partial clarification of issues included in Revision 0 of this standards – Packet Data (also see preceding article) and Location, along with mandated 'Punch List' items related to Secondary Signaling.

Timing Issues

Information, whether call content (e.g. voice) or call identifying information will be received by law enforcement after the event being reported occurs. Also, call content and associated call data are sent on different channels and will arrive at different times. The FCC ruled that J-STD-025 Revision A must

support time stamps (± 200 msec) in every message on the Call Data Channel (CDC), and ensure that messages are sent to law enforcement no more than 8 seconds after the event they are reporting occurs, at least 95% of the time.

This will allow correlation of messages on the CDC with the conversation (or data) on the CCC.

Multi-Party Call Capabilities

There are several call types that involve more than two parties, including Call Waiting, Three Party Calling and Conference Calling for more than three parties. The FCC largely sided with the position of law enforcement, and requires that J-STD-025 support:

- Content (e.g. voice) of parties on hold
- Reporting changes in connection status (Hold, Join and Drop)

Content of Parties on Hold

Call Waiting allows a phone to be used to alternate between a conversation with one party, and with a second (see Figure 1). When one party is in conversation, the other is on hold. Three Way Calling is initiated by placing one party on hold, and it remains in that state until the add-on party answers, and three-way conversation is requested (see Figure 2). True conference calling may allow parties to be arbitrarily placed in the conversation or on hold at any time (although please do not try this while driving!), as illustrated in Figure 3.

The FCC ruled that parties on hold will still be monitored, unless they participate in another call, in which case that conversation is protected from surveillance. This does introduce an ambiguity, because this additional party can be placed into the subject's multi-party conversation on some systems, resulting in a mixture of conversations on one conference bridge, of which some are protected, and some are not.

Figure 1: Call Waiting Surveillance



Figure 2: Three Way Calling Surveillance with One Held Party

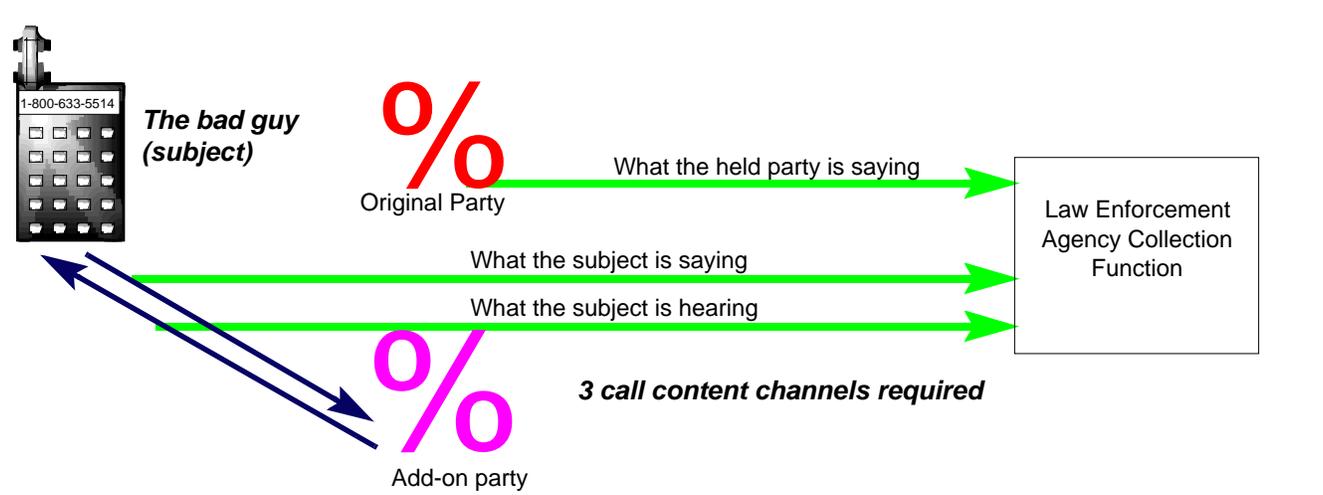
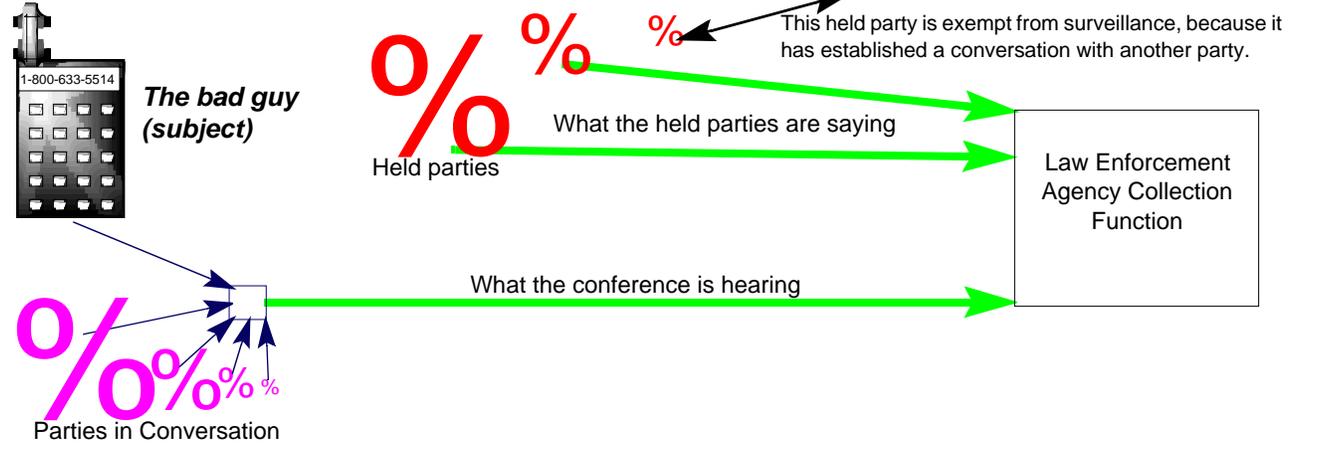


Figure 3: Conference Call with Multiple Held Parties



Reporting Changes in Connection Status

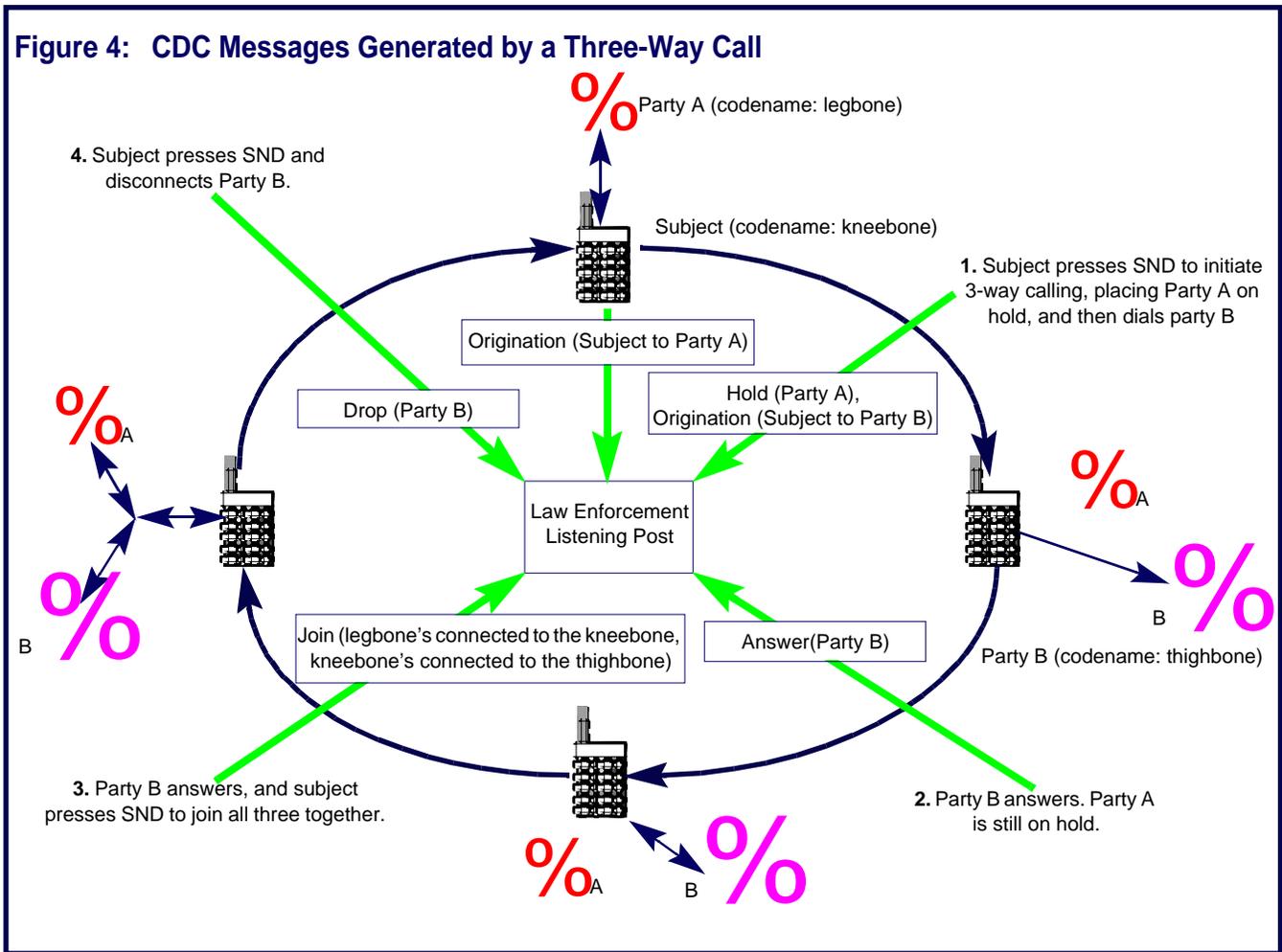
When a multi-party call is being monitored, every time a party is placed on

hold, added to a conversation, or dropped entirely, a message will need to be sent to law enforcement over the CDC identifying the affected parties. Situations in

which these messages may be sent are illustrated in Figure 4.

The actual implementation in J-STD-025 has not been determined. It is likely that

Figure 4: CDC Messages Generated by a Three-Way Call



instead of explicit messages indicating which parties have been placed on hold, joined to a call or dropped from a call, a single message will be provided that lists the parties that are now joined together, along with a link back to the old connections. Both approaches convey the same information. Distinct messages (as shown in Figure 4) are easier to understand, although somewhat harder to implement.

Not a Lot That’s Not Hot

The FCC rulemaking did decide that three items in the law enforcement ‘punch list’ were not required by the CALEA legislation.

Surveillance Status

If this capability had been required, carriers would have had to provide regular reports on the status of current wiretaps. This would have allowed law enforce-

ment to determine when wiretaps were not started, or were terminated too early or too late. This capability is a victim of the legalistic interpretation of CALEA that has resulted from the sometimes frosty relationships between telecommunications carriers and law enforcement. It is not included in the law (nor excluded), but could easily have been included by telecommunications carriers as a trade-off for another capability.

Continuity Check

Another victim of the legalistic interpretation of CALEA is verification of the ability of CCC’s to carry traffic. Without this capability, law enforcement is either going to have to ante up money to pay carriers to implement it as an extra or they will have to wait until a CCC is actually malfunctioning, by which time they may have lost call content for some time (particularly if they are taping conversations and reviewing them later).

Feature Status

Law enforcement wanted the HLR to report every time a feature was activated or deactivated. While a convenience, this information can be derived from interpretation of digits, or other signals, initiated from a mobile. Also, this would have been the only capability requiring HLR modifications, so its absence is a significant cost reduction for wireless carriers.

More on J-STD-025-A Later

J-STD-025 Revision A is in the early stages of development. After it has reached a state of maturity, we will be reporting on it in more detail, including a description of the new transactions that will be included to support the new FCC requirements.

TIA TR-45.5

CDMA Digital

Air Interface Standards

Cellular Networking Perspectives

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First Wave – Cellular

Standard	Description	Status
IS-95	CDMA Dual-Mode Air Interface Standard (Authentication Appendix pub. 11/92)	Published 07/93 (since rescinded)
IS-96	CDMA Option 1: Voice Coder	Published 04/94
IS-97	Base Station minimum performance standards	Published 12/94
IS-98	Mobile Station minimum performance standards	Published 12/94
IS-126	Service option 2: Loopback	Published 12/94 (rescinded 04/99)

Second Wave – Cellular & PCS

Standard	Description	Status
IS-95-A	IS-95 Revised (Authentication Appendix "A" Nov. 1994)	Published 05/95 (rescinded 04/99)
IS-96-A	CDMA Voice Coder	Published 05/95
IS-97-A	Base Station minimum performance standards for IS-95-A	Published 07/96
IS-98-A	Mobile minimum performance standards for IS-95-A	Published 07/96
IS-98-A-1	Errata and additional tests for IS-95 mobile stations	Published 09/97
IS-99	Data Services (9.6kbps Fax and Circuit Switched Data)	Published 07/95
IS-125	Voice coder minimum performance standards	Published 05/95
IS-126-A	Mobile station loopback service option	Published 07/96 (rescinded 04/99)
IS-637	Short message service (rate set 1)	Published 12/95
J-STD-019	Base station minimum performance standards. Note: publication date is 1996, but it was not released by the TIA until 1998)	Published 07/96
J-STD-008	IS-95 adapted for 1800 MHz frequency band. Note: publication date is 1996, but it was not released by the TIA until 1998)	Published 07/96 (rescinded 04/99)
J-STD-018	Mobile minimum performance standards (for J-STD-008). Note: publication date is 1996, but it was not released by the TIA until 1998)	Published 07/96
TSB-58	Parameter value assignments	Published 12/95

Third Wave – Integrated Cellular/PCS

Standard	PN-/SP-	Description	Status
IS-96-B		CDMA variable rate voice coder (max. 8 kbps)	Published 07/96
IS-127		Option 3: enhanced variable rate (max. 8kbps) voice coder (EVRC)	Published 01/97
IS-127-1	PN-4146	Addendum to IS-127 (EVRC)	Published 08/98
IS-127-2	PN-4651	Addendum to IS-127 to support TTY/TDD	Published 09/99
TIA/EIA-637	SP-4391	Short message service	Published 12/95
IS-657		Packet data services (Internet, CDPD)	Published 07/96
IS-658		Data inter-working function interface (e.g. modem pool)	Published 07/96
IS-658-1	PN-4385	IS-658 revision to support mid-call interface status queries	development
IS-683	PN-3569	OTASP: Over the air activation and service provisioning (App. A 03/96)	Published 02/97
IS-683-A	PN-3889	OTASP including roaming system selection and subsidy lock (App. A 01/98)	Published 06/98
IS-707	PN-3676	14.4 kbps data services (including async data, fax, STU-III and packet data)	Published 02/98
IS-707-A	PN-4145	Revision to IS-707 to be consistent with TIA/EIA-95 capabilities	Published 04/99

Standard	PN-/SP-	Description	Status
IS-718	PN-3648	Minimum performance standards for EVRC voice coder	Published 07/98
IS-733	PN-3972	High rate CDMA voice coder (max. 13 kbps)	Published 02/98
IS-733-1	PN-4650	Addendum to IS-733 to support TTY/TDD	Published 09/99
IS-736	PN-3973	Minimum performance specification for IS-736	Published 11/98
IS-736-A	PN-4653	Corrections to flawed testing procedures in IS-736	Published 02/99
TIA/EIA-95-B	SP-3693	IS-95 for 800 MHz and 1800 MHz frequencies (including J-STD-008)	Published 03/99
TIA/EIA-96-C	SP-4138	CDMA variable rate voice coder (max. 8 kbps)	Published 08/98
TIA/EIA-97-B	SP-3814	Minimum performance standards for base stations	Published 08/98
TIA/EIA-97-C	SP-4384	Revision of TIA/EIA-97-B	Published 09/99
TIA/EIA-98-B	SP-3815	Minimum performance standards for mobile stations	Published 08/98
TIA/EIA-98-C	SP-4383	Merges TIA/EIA-98-B and J-STD-018	Published 06/99
TIA/EIA-126-B	SP-4136	ANSI version of IS-126 (MS loopback option)	Published 08/98
TIA/EIA-637-A	PN-4391	ANSI version of IS-637 (short message service, including TSB-79)	Published 09/99
TSB-58-A	PN-4158	Parameter value assignments	Published 04/99
TSB-74		14.4 kbps radio link protocol and inter-band operations	Rescinded 04/99
TSB-79	PN-3823	IS-637 update for 14.4kbps SMS, service negotiation and Y2K	Published 02/97

3G Version (cdma2000, IS-2000)

Standard	PN-/SP-	Description	Status
IS-2000		cdma2000	
.1	PN-4427	cdma2000 Introduction and Overview	All parts of IS-2000 published 08/99
.2	PN-4428	cdma2000 Physical Layer	
.3	PN-4429	cdma2000 Media Access Control (MAC) layer	
.4	PN-4430	cdma2000 Signaling Layer 2 Link Access Control (LAC)	
.5	PN-4431	cdma2000 Signaling Layer 3	
.6	PN-4432	cdma2000 Analog Operation	
-A		cdma2000 authentication and encryption	
TIA/EIA-97-D	PN-xxxx	Minimum performance standards for IS-2000 base stations	Development
TIA/EIA-98-D	PN-xxxx	Minimum performance standards for IS-2000 mobiles	Development
TIA/EIA-99	PN-4617	9.6 kbps data for IS-2000	Ballot
TIA/EIA-125-A	SP-4682	Correction of errors in speech service option 1	Ballot
TIA/EIA-126-C	SP-4578	Mobile Station loopback test	Ballot
IS-707-A-1	PN-4541	Adds cdma2000 radio link protocol 3E support to 14.4kbps data	Ballot
IS-801	PN-4535	Position determination services	Published 10/99
TSB-58-B		Parameter value assignments	Ballot
TSB-2000	PN-4534	Capabilities requirements mapping	Published 09/99
n/a	PN-4575	Selectable mode voice coder (formerly EVRC)	Development

“Smart Card” Capable CDMA (IS-2000-A)

Standard	PN-/SP-	Description	Status
IS-2000-A	PN-4693-8	cdma2000 (all 6 parts to be revised)	Development
IS-707-A-2	PN-4692	Data support for IS-2000-A	Development
IS-820	PN-4690	R-UIM (Removable “Smart Card”)	Development
TSB-58-C	PN-4691	Parameter value assignments for IS-2000-A	Development

- Note: 1. IS- Interim Standard, TSB- Telecommunications Systems Bulletin, PN- 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.

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