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FCC Gives Go-Ahead to Handset Based Location Solutions for Enhanced Wireless 911

On September 15, 1999 the US FCC decided that handset-based solutions are acceptable for compliance with their Enhanced Wireless 911 Phase II rules. These solutions have to meet the same requirements as solely network-based solutions, plus some new timing requirements. Carriers that choose this solution must make location-enabled handsets available for sale by March 2001, and ensure that 50% of all new handsets sold after October 2001 are location capable. Within 6 months of a PSAP request (but no earlier than October 2001), they have to ensure that all *new* handsets are location capable and within 2 years (but no earlier than December 2004) have to ensure that *all* handsets are location capable.

This solution accommodates companies that are promoting GPS-based location solutions, and is of particular importance to CDMA carriers, as these phones are more difficult to locate. It should be noted that most GPS solutions are not restricted to the handset, but also require network equipment to be installed. By reducing the hardware in the handset to the minimum necessary to capture the GPS signal, much of the processing can be centralized in a network server.

Location Accuracy

The FCC has also tightened the rules for location accuracy (see Figure 1). The initial ruling demanded location accuracy of 125 meters 67% of the time, but the new ruling has tightened the rules slightly for network based solutions to within 100 meters for 67% of calls and 300 meters for 95%. Handset-based solutions require double the accuracy, within 50 meters for 67% of calls and 150 meters for 95%.

New Wireless Data Standards Project: WIPP

The TIA has initiated a new wireless data standardization project under the name WIPP: Wireless Internet Partnership Project. Its aim is to study IP (Internet Protocol) requirements for digital wireless systems, providing similar access to the internet from multiple different radio access technologies.

Some of the work areas that are being planned are:

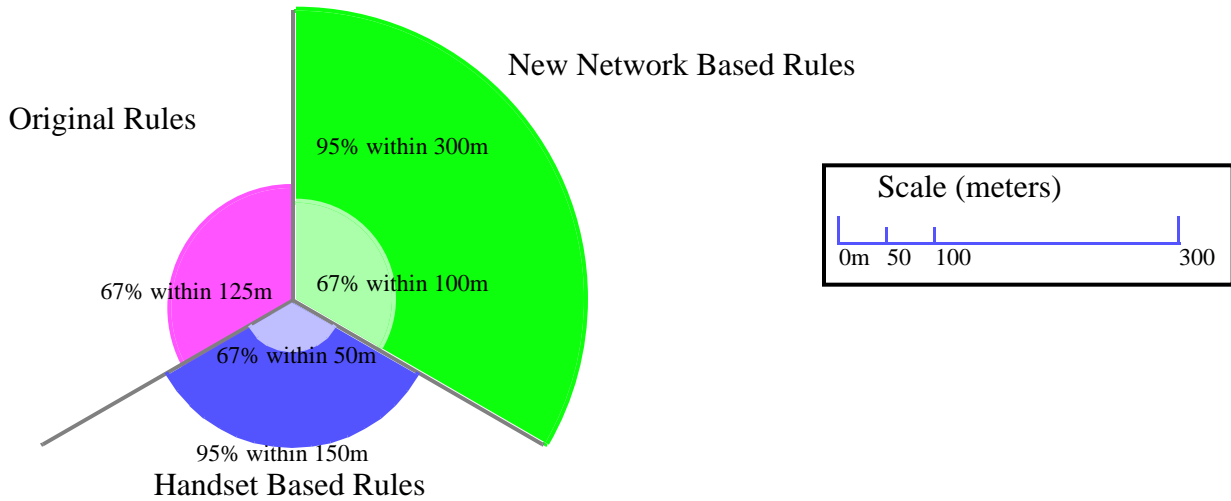
- Wireless data service interfaces and operations,
- Application Programming Interfaces (API), and
- Mobile device interface and operation.

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Next Issue: November 2, 1999

Figure 1: Changes in FCC E911 Positioning Rules



CTIA on Number Conservation

The CTIA posted reply comments on August 30, 1999 to the US FCC investigation into number conservation alternatives, concluding that Number Pooling and Service-specific overlays are far inferior to Rate Center Consolidation, both costing more and accomplishing less. These are similar to the conclusions that we reached in our January, February and June, 1999 issues. These feelings are boosted by information from California (published in Wireless Review magazine) that indicates that more than half the new central office (NXX) codes allocated there in 1998 went to competitive local exchange carriers, even though they have only a fraction of the customers as wireless carriers, and are not signing them up at a rapid rate.

Implications of the FCC CALEA Ruling

The FCC ruling on compliance with US CALEA legislation was briefly described in our September issue. The two recent Report & Orders firmly establish the standing of the TIA/ATIS joint standard J-STD-025, gives law enforcement most of what they were asking for, and gives civil liberties organizations very little.

FCC Rulings

The FCC has produced several rulings on CALEA Legislation (all within CC Docket 97-213):

1. In September, 1998, the FCC extended the date for compliance with J-STD-025 to June, 2000.
2. A Further Notice of Proposed Rule-making released in November, 1998 (FCC 98-282) laid the groundwork for the most recent rule-makings, identifying Location and Packet Data as the only two questionable items in J-STD-025, and indicating that most of the FBI 'punch list' would need to be implemented.
3. A Second Report & Order (FCC 99-229) released on August 31, 1999 dealt mostly with non-technical issues. It identified the types of carriers covered by CALEA, mostly those providing interconnect phone services. This includes local and long distance land-line phone service as well as cellular and PCS service. SMR services are only covered while providing cellular-like services (i.e. interconnected to the telephone network), but not when providing traditional 'push-to-talk' group-oriented services.

This order also declined to extend the January 1, 1995 funding deadline for automatically receiving government funding for CALEA equipment upgrades. However, the FCC left open the possibility that carriers can

apply for funding, if the upgrade costs are excessive (e.g. if it requires a switch replacement).

4. The Third Report & Order (FCC 99-230) was also released on August 31, 1999, and covers most of the technical issues discussed in this article.

TIA/ATIS Standards

The FCC rule-makings have recognized J-STD-025 as the standard solution for CALEA compliance.

1. J-STD-025 Rev. 0 (PN-4116) was published as a joint TIA/ATIS interim standard in December, 1997.
1. J-STD-025 Revision A (PN-4465) is under development by a joint TIA/ATIS *ad hoc* group, and will also be published as an interim standard.
2. A project number exists for an ANSI version of J-STD-025 (Revision B, PN-4464), but because of the lengthier time it takes to have an ANSI standard approved, and because the process failed last time (due to negative ballots by law enforcement), it is unlikely that it will be undertaken, at least not until Revision A is safely published and well on the road to implementation.

Deadlines

The FCC has ruled that J-STD-025 Rev. 0 (including limited support for location, but excluding support for

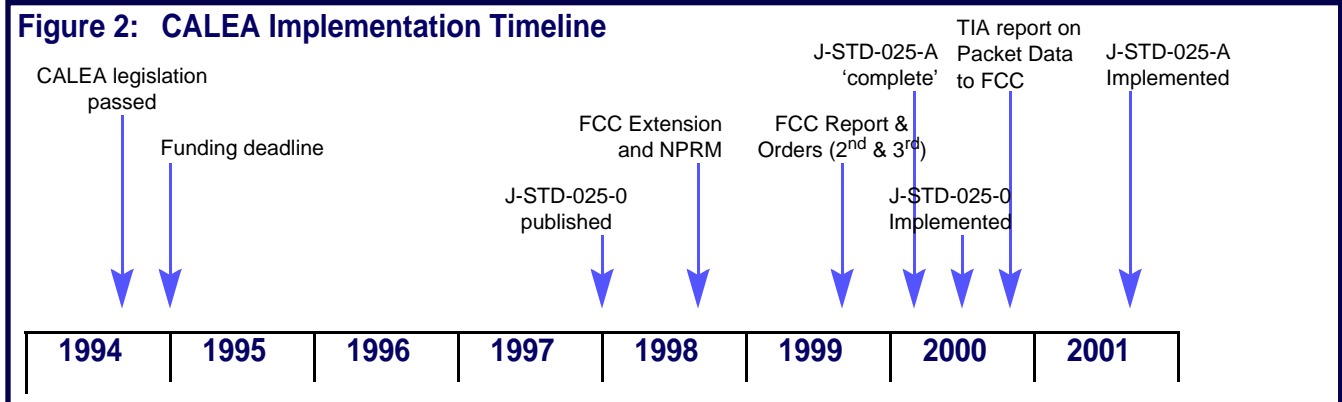
packet data monitoring) must be implemented by US carriers by June 30, 2000. Revision A of J-STD-025 must be completed by March, 2000 and implemented by carriers no later than September 2001. It is not clear whether 'completed' means 'ready for ballot', or actually pub-

lished. Since it is common for the ballot process to take 3-4 months, this makes a very significant difference in the schedule. Currently, the LAES *ad hoc* group is assuming the former interpretation.

A report on a number of packet data issues must be prepared by the TIA by

September, 2000. These recommendations may result in further modifications to J-STD-025 in the future to improve the separation of packet data 'call' identifying data from content.

The timeline is illustrated in Figure 2.



Surveillance Concepts

There are several important concepts that are critical to an understanding of the political and technical issues swirling around lawfully authorized electronic surveillance. There are three major types of surveillances:

- Pen Register
Records numbers dialed *from* a subject's phone.
- Trap and Trace
Records the identity of callers *to* a subject's phone.
- Title III
Records the subject's call content.

These terms arose in before wireless and digital communications, and have required adaptation and interpretation to fit today's technology. A critical legal distinction has to be made between:

- Call Identifying Information
This is information about a call, including the phone used to make the call, the destination phone number and the time the call was originated, answered and disconnected.
In J-STD-025, call identifying information is carried on a CDC (Call Data Channel).
Pen Registers and Trap & Trace surveillance orders require access only

to call identifying information.

- Call Content
This normally refers to the conversation carried by a telephone call. However, for data communications, this refers to the user data, as opposed to the data that identifies where the data came from or where it is going.
In J-STD-025, call content is carried on (usually) a pair of CCC's (Call Content Channels). One carries the content being transmitted by the subject, and the other the content being received.
Call content can be obtained if a law enforcement agency has a Title III surveillance order.

The Current Version of J-STD-025 (Rev. 0)

The FCC has ruled that the majority of capabilities in the current (Rev. 0) version of J-STD-025 are to be implemented by US carriers by June 30, 2000. These capabilities are described in our August, 1997 issue.

Two capabilities in J-STD-025 that were objected to by organizations concerned with civil liberties (EPIC, ACLU, EFF, CDT) are Location and Packet Data.

Location

The FCC has drawn an analogy with landline surveillance and concluded that the location of the cellsite (or sector) at the beginning and end of a call is *call identifying information* and therefore is available for law enforcement, even when only a Pen Register or Trap & Trace authorization is available. The analogy is based on the fact that knowing the calling and called parties' phone numbers in a landline call identifies their location, yet this is clearly call identifying information.

Based on this decision, J-STD-025 will not support the provision of location information at other times during the call, and will not provide more accurate location (such as what can be obtained under the FCC's E911 mandate). Law enforcement may still be able to obtain more extensive location information, but not under the CALEA mandate and not using J-STD-025.

There is an ambiguity in the FCC Report & Order over the word 'termination'. In telecommunications this refers to the process of reaching the destination of the call, and obviously has to occur before the call is answered. The FCC, however, appears to sometimes use it to mean 'disconnect'. If the telecommunications interpretation is used, then location

would only have to be provided at the beginning of a call, and not at the end.

Location information must be implemented by carriers according to the J-STD-025 deadline (June, 2000).

Packet Data

Data packets (such as are used by internet protocols and X.25) contain both packet identifying information and user data. The packet usually contains the address of the sender and of the recipient, and may contain other information that can be analogized to call identifying information. The FCC has recognized that it may be difficult for carriers to separate out these two kinds of data, and has ruled that:

- Packet data does not have to be implemented until the Revision A deadline (September, 2001),
- Carriers will send entire packets to law enforcement at first,
- Law enforcement will be responsible for 'minimization' (deletion of information which they are not entitled to),
- The TIA will report to the TIA by September 2000 describing approaches that can be taken to minimize privacy concerns (e.g. through better separation of identifying information from content).

'Punch-List' Items to be Included in J-STD-025-A

Most of the items in the law enforcement 'punch list' of claimed deficiencies in J-STD-025 were approved for inclusion in J-STD-025 by the FCC. Carriers must provide these capabilities by September, 2001.

The requirements that were approved can be grouped into three categories:

- Secondary Signaling
Provides access to signaling that is not carried in the primary signaling channels (e.g. audible tones).
- Timing
Correlation of information on CCC's and CDC's by time-stamping.

- Multi-Party Call Capabilities
Provides access to information about calls involving more than two parties, such as three-way calls, call waiting and multi-party conference calls.

Secondary Signaling

Signaling occurs in telecommunications systems at several different levels, and often in a fashion that is transparent to much of the connected telecommunications equipment. Law enforcement requested that all of this signaling be provided to them as call identifying information, making it accessible with a Pen Register or Trap & Trace surveillance authorization. Since some of this signaling information is transmitted as voice-band information, it is automatically available with a Title III surveillance order. The FCC has recognized three classes:

1. Subject-initiated dialing and signaling information
Information entered by subscribers to control features and services.
2. Dialed digit extraction
Digits dialed during a call to control external services (e.g. inter-exchange carrier, banking or voice mail services).
3. In-band and out-of-band signaling
Network initiated signaling, indicating the status of an outgoing call.

It is often not easy to determine which of this signaling information constitutes call identification (e.g. a speed-dial code transmitted to a long distance carrier) and which represents user data (e.g. access to a bank account). The FCC has decided that minimization will be performed by law enforcement.

Subject-initiated dialing and signaling information

Feature and service control can be implemented in different ways. GSM, for example, generally relies on specific air interface messages that identify a service being invoked. AMPS, TDMA and CDMA systems rely on dialed digits (e.g. *+Feature Code) that are interpretable only by the home system. However,

no matter how this is physically accomplished, the wireless system is aware of the signaling, and can relatively easily transmit it to law enforcement.

Dialed Digit Extraction

Services that are accessed by dialing DTMF digits are more troublesome, as they may be sent transparently to the system from which they are generated. While on digital cellular systems they must be transmitted across the air interface in special messages to avoid corruption by voice coders, on analog wireless and landline systems they are considered by the telecommunications system as voice information (or, rather, they are not considered at all). In neither case are they available at the likely point of interconnect to law enforcement.

The consequence of this FCC requirement is that every surveillance order that does not provide call content will require a DTMF receiver to be attached to the subject's outgoing voice path. Any digits detected must be forwarded to law enforcement over the CDC.

In-band and out-of-band signaling

Signals provided by the network (e.g. busy tone) raise similar technical problems, perhaps even greater problems, than Dialed Digit Extraction. The FCC order appears to require a device to be attached to the subject's incoming voice path for every non-content surveillance to detect busy tone, fast busy, ring-back and other common network in-band signals. Ironically, the FCC has ordered that when these signals are provided by the subject's phone, they do not need to be provided, even though this is technically much easier to accomplish!

To be continued...

In our November, 1999 issue we will conclude our discussion of J-STD-025 and compliance with US CALEA legislation by discussing the additional requirements for multi-party calls and timing information. We will also list the capabilities in the FBI 'punch list' that were not accepted by the FCC.

Status of IS-41 Rev. C & TIA/EIA-41-D Implementations

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Vendor and Radio Technology														
Intersystem Operations Capability	Alcatel (MSC)			Ericsson (MSC/BS)		GTE (HLR)	Lucent (MSC/BS)			Motorola (MSC/BS)		Nortel (MSC/BS)		
	Analog	CDMA	TDMA	Analog	TDMA	all	Analog	CDMA	TDMA	Analog	CDMA	Analog	CDMA	TDMA
Authentication	4	4	4	4	4	4	4	4	4	4	4	4	4	4
IS-778 Authentication Enhancements														
CNAP/CNAR		4	4		4	4		⓪	⓪			⓪	⓪	⓪
CNIP/CNIR		4	4	4	4	4	4	4	4	4	4	4	4	4
Data (IS-737)		4			4								⓪	⓪
Inter-MSC handoff: Analog to...	4		4	4	4		4		4	4		4		4
Inter-MSC handoff: CDMA to...	4	4					4	4		4	4	4	4	
Inter-MSC handoff: TDMA to...	4		4	4	4		4		4	4		4		4
IMSI (IS-751)		⓪	⓪		⓪			⓪	⓪				⓪	⓪
Hyperband handoff (TSB-76)		1Q'00	4		4			4	4		4		4	4
LNP Phase I (IS-756)	4Q'98	4Q'98	4Q'98	4	4	⓪	4	4	4	⓪	⓪	4	4	4
LNP Phase II (IS-756-A)	1Q'00	1Q'00	1Q'00	4	4							⓪	⓪	⓪
MWN		4	4	4	4	4		4	4	⓪	⓪	4	4	4
Origination Triggers	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Over-the-air Activation (IS-725)		1Q'00	1Q'00		⓪			4	⓪				4	4
SMS Origination		4Q'98	4Q'98		4	4		⓪	⓪				4	4
SMS Termination		4	4		4	4		4	4	4	4	4	4	4
Termination Triggers				⓪	⓪	4	4	4	4	4	4	4	4	4
Voice Privacy			4		4			4	4				⓪	⓪
WIN Phase I (IS-771)	1Q'00	1Q'00	1Q'00	4	4		⓪	⓪	⓪			4	4	4

Terms: See <http://www.cnp-wireless.com/glossary.html>.

Symbols: 4 In field trial or commercial service.

XQ'9X Specifies the quarter during which commercial availability is expected (e.g. 4Q'98).

⓪ In lab trial.

⓪ Under Development

█ Indicates a capability that is not technically feasible at present, or for which no standard yet exists.

Bold type Company names in **bold type** have indicated a change in status since the last report.

Red Text and figures in **red** indicate specific changes since the last report (visible only in electronic edition of newsletter).

Updates: Please contact the editor by email at crowed@cnp-wireless.com, by phone at +1-403-289-6609 or by fax at +1-403-289-6658.

TIA TR-45.4

Radio to Switching Technology Standards

Cellular Networking Perspectives

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Superseded Interim Standards and TSBs

Standard	Description	Published
TSB-80	IS-634-0 Addendum (corrections, SMS, subrate voice frame format)	11/96
IS-94	Mobile Station - Land Station Compatibility Specification for Analog Cellular Auxiliary PCS (CAPCS)	05/94
TSB-104	PCS Service Description (now IS-104 in committee TR-46)	06/94
IS-634-0	MSC-BS "A" Interface Standard	12/95
IS-634-A	MSC-BS "A" Interface standard, supporting analog, CDMA, SMS, data services, frame relay transport, and 1800MHz PCS	10/98
TIA/EIA-634-B	"ANSI" version of MSC-BS "A" Interface standard, supporting analog, CDMA, SMS, data services, frame relay transport, and 1800MHz PCS, with multiple sections: .000 - global references, definitions, terminology, purpose, scope, organization, conventions .100 - Common protocol .200 - Architecture A: SDU located at base station .300 - Architecture B: SDU located elsewhere .400 - Message, message element and timer definitions .500 - Interoperability between architecture A and B	08/99

Completed Internal Documents

PN	Description
PN-3142	Cellular Microcell/Microsystems Requirements Document (project transferred to TR-45.1)
PN-3296	MSC-BS Interface (A-Interface) Requirements for Public 800 MHz

Active TR-45.4 Projects

PN/SP	Description	Status	Standard
PN-3964	Use of A-Interface standards in Wireless Local Loop (WLL)	Ballot failed	
SP-4276	Fixed Wireless Access (Stage I Description)		
SP-4377	Next revision of TIA/EIA-634 "A" Interface (including addendums and Japanese/Korean input)	12/99	TIA/EIA-634-C
PN-4378	Addendum to TIA/EIA-634-B to support TIA/EIA-136 (TDMA) — in danger of cancellation due to lack of interest		TIA/EIA-634-B.x
PN-4379	Addendum to TIA/EIA-634-B to support TIA/EIA-95-B (CDMA). To be included in TIA/EIA-634-C		TIA/EIA-634-C
PN-4545	cdma2000 Access Network Interface based on CDG IOS V4	New	IS-2001
PN-4546	cdma2000 Access Network Interface (ANSI version)	New	TIA/EIA-2001
PN-4604	A bis (BTS-BSC) interface for cdma2000	New	
PN-xxxx	Tandem free operation	New	

- 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.

Thanks to Steve Jones (NEC) for his assistance compiling the information in this table.