Cellular Networking Perspectives

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Beware the MEID

As we warned in our ***July 2002 issue***, the Mobile Equipment Identifier (MEID) is scheduled to replace the ESN (Electronic Serial Number) around the time that supplies run out, quite possibly some time in 2005. The 32-bit ESN has been used to identify wireless phones since the invention of AMPS, TDMA and CDMA. The 56-bit (14 hexadecimal digit) MEID has many advantages, not the least of which is that it has the capacity to identify many more phones than are likely ever to be required. The MEID is very similar to the GSM IMEI (International Mobile Equipment Identifier) with the significant exception of the use of hexadecimal digits, not just decimal. When compatibility is required (e.g. for dual-technology cdma2000/W-CDMA or GSM phones) a special region code of 99 and an all decimal-digit MEID can be assigned.

The biggest problem with MEID is simply that it is new. Software developers have known for decades that the equipment identifier is 32 bits, and much software has this knowledge so thoroughly embedded that changing to MEID will be difficult.

To avoid problems in the transition, a pseudo-ESN (pESN) has been defined. Generated from the MEID using the SHA-1 hash algorithm, and beginning with the 8-bit manufacturer code 128 (0x80), it can be used instead of a true ESN on systems that do not support MEID. Because pESN never changes for the life of a phone, it can be calculated by the manufacturer and burned into the phone along with the MEID.

MEID will be supported by CDMA (Release D) and TDMA (TIA-136 plus TIA-943). Phones conforming to earlier releases may incorporate an MEID, but they will only be able to transmit the pESN.

Most systems will continue to work with the pESN, but not always optimally. Over-the-air service provisioning (OTASP) may, for example, rely on a database indexed by ESN. The pESN is not guaranteed to be unique (in fact, it is guaranteed to be non-unique for any list of more than 2^{24} codes). Consequently, it may be difficult to find the correct record for provisioning, which could result in the wrong subsidy or phone capability information being used.

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It is important to take the transition from ESN to MEID into account, lest it sneak up on you unawares! The TIA is aware of the need for education, and its committee TR-45 is currently preparing an information package on the topic. We will notify our readers as soon as it is publicly available to help ensure that the issue cannot sneak up on you unawares.

Putting Push-to-Talk to the Test

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On January 26th 2004, I flew to Phoenix, Arizona where I had arranged to run a series of tests using the four push-to-talk systems now in commercial service in the United States: Nextel, Alltel, Sprint PCS, and Verizon Wireless (Alltel being the latest to arrive on the market). I wanted to measure, first hand, not only the time it takes to set up a PTT (Push-to-Talk) session, but also the "volley" time between handsets on each network.

None of the network operators providing PTT service knew that I planned to run these tests and none were present during the tests. Later I will be publishing a more complete report on the results of these tests and others I plan to conduct.

Nextel and Alltel use the voice channel for their PTT sessions while Sprint PCS and Verizon employ their packet-data services and use Voice over IP (VoIP). All of the phones were equipped with a push-to-talk switch on the side of the unit, and all had speaker-phone capabilities for communicating in PTT mode.

There are a number of functional differences between the various services. Typically, the newer services offer more functionality than the "older" Nextel service, which has been in use since Nextel's inception. These feature differences will become more important over time, depending on the targeted audience, and this will be covered in a more detailed report being prepared.

Setting the Stage

The following phones were used during these tests:

Carrier	Phone
Nextel	Motorola i30sx
Alltel	Kyocera 3250
Sprint PCS	Sanyo SCP-5400
Verizon Wireless	Motorola V60P

All units were fully charged and locations providing excellent signals were found for each of the networks. The tests included:

- Timing the setup for each call.
- The "volley" time between the phones, measured by how quickly the other person could respond to the first PTT and subsequent transmissions.
- System-induced delays.
- The number of keystrokes and buttons that had to be pressed to access the PTT mode and select the other handset for the conversation.

Multiple tests were run and times were averaged over the series of tests. It is difficult to measure times precisely in the real world, even with a stopwatch showing hundredths of seconds, but I did my best.

The results were interesting. Nextel retains bragging rights to the fastest setup time, but is no better than Alltel network for its volley times. Setup times for the Sprint PCS and Verizon Wireless systems were erratic, as were the setup times on the Alltel system. The timing results are shown below:

Table 1: Setup Timing

Carrier	Setup Time (seconds)
Nextel	0.8 to 1.0
Alltel	2.4 to 3.2
Sprint PCS	3.6 to 9.8
Verizon Wireless	6.2 to 7.8

Table 2: Volley Timing

Carrier	Volley Time (seconds)
Nextel	< 1
Alltel	< 1
Sprint PCS	1.2 to 1.5
Verizon Wireless	1.9 to 2.4

How long it takes to set up and conclude a PTT session is an important measurement. The longer you wait between hearing another PTT user and being able to respond impacts the amount of time it takes to convey the information. For example, ignoring setup time differences, a PTT volley that took 30 seconds on the Nextel Network would take 36 to 45 seconds on the Sprint PCS network. On the Verizon Wireless system, the same conversation would take 52 to 72 seconds.

Another test I ran, which is a bit more subjective, was to count to six while listening to the second handset. I then recorded the number I was speaking and the

number that was being heard on the other handset. This experiment was an effort to determine total system latency. The results of this test were as follows:

- Nextel – Second handset heard the same number that was being spoken.
- Alltel – Second handset heard the same number that was being spoken
- Sprint PCS – Second handset heard "one" while "two" or "three" was being spoken.
- Verizon – 2nd handset heard "one" while "four" was being spoken.

In addition to these timing tests, I am in the midst of evaluating the various offerings in terms of features and functions, including how easy they are to set up and use, how many keystrokes it takes to initiate a session, whether new contacts or groups can be created on the handset, whether there is a "presence" indication of who is available, what happens when one member of a group drops off of the session, whether call-waiting is supported, if the handset speakerphone mutes when a regular voice call is received, and a dozen or more other criteria that I believe will make a significant difference for various groups of customers.

This evaluation will take time to complete. Today the three new PTT contenders each offer a single handset while Nextel offers a dozen or so. Consequently, it is possible that some of the features offered by the contenders are also available on some of the Nextel/Motorola handsets while others may be network capabilities not implemented in iDEN.

These tests are a snapshot in time. iDEN systems have been offering push-to-talk for a long time, while the others have only recently entered the market. The new methods of creating a PTT session will improve over time. My goal for this round of testing is to measure the current offerings and compare them to the "industry standard" Nextel. (The *real* industry standard is two-way radio as used by the public safety and business radio communities. Even Nextel does not measure up when two-way radio is used as the "gold standard").

Nextel is currently the one to beat when it comes to combining the functionality of a full-duplex wireless phone with PTT. My tests indicate that in today's market, the Alltel system is the only real threat to Nextel's existing customer base. Sprint PCS and Verizon Wireless have offerings that will appeal to family and friends, and what I call "voice instant messaging".

Comparing Nextel and Alltel, it is clear to me that Alltel's system, which makes use of the Kodiak Networks PTT solution, will be giving Nextel a real run for the money. I suspect, since this is the first Kodiak offering in the United States, that the standard of comparison is about to shift from Nextel to Alltel!

*For more information on packet-data-based PTT systems, also known as Press-to-Talk Over Cellular, consult our **December, 2003** issue.*

About the Author

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Indian CDMA Goes Roaming

In an article in our ***November 2003*** issue we described how Indian fixed wireless carriers had all installed cdma2000 systems, but were highly restricted in the roaming they offered. We also described the ongoing battle by these carriers for the right to provide full national and international roaming services.

The CDMA carriers eventually won this battle, although it comes at a price. The carriers will have to pay license fees to the government to become a roaming carrier. This puts them on a level playing field with GSM carriers who were opposed to new full-service wireless carriers entering without the burden of these fees.

The new licenses are known as Unified Access Services Licenses (UASL). Existing GSM carriers, known as CMSP (Cellular Mobile Service Providers) will pay no fees to migrate to this new license, but Basic Service Providers (i.e. fixed wireless carriers) will have to pay the difference between their license fees already paid and the license fees paid by the fourth cellular licensee in that area.

Soon after the release of this decision by the Indian Department of Telecom in November 2003, Reliance Infocomm, the biggest CDMA carriers, paid US$339 million to migrate to UASL. They were followed a day later by Tata Teleservices (which paid about one-third of that amount), Shyam Telelink and HFCL Infotel.

3GPP TSG T (Terminals) Update

3GPP TSG Terminals (TSG T) specifies logical and physical interfaces, capabilities (such as execution environments), performance requirements and testing. TSG T leaves specification of the radio aspects of terminals to TSG RAN. Speech and multimedia codecs aspects are left to TSG SA WG4.

This report covers TSG T meetings #20 and #21.

An important discussion (at TSG T#22) was on the transfer of MMS (TS 23.140) to OMA. No agreement was reached on the four proposals presented (not all mutually exclusive):

1. Move post-Release 6 technical discussion to OMA immediately.
2. Discussions on the technical maintenance of TS 23.140 Rel 6 and earlier should be moved to OMA on the completion of Rel 6.
3. The 3GPP PCG should first consider OMA IPR and copyright issues.
4. Further consideration of the need to split or rewrite specifications should precede the transfer of control of MMS specifications.

TSG T WG1 (Conformance Testing)

TSG T Working Group 1 on Mobile Terminal Conformance Testing (T1) drafts UE (terminal) conformance tests based on requirements defined by other groups. This includes RAN WG4 for radio tests and RAN WG2 and CN WG1 for signaling and protocols tests. T1 has two subgroups: RF and Signalling.

T1 highlights from meetings #21 and #22 include:

- A project to analyze Radio Resource Management (RRM) resulted in report TR 34.902 to specify multi-cell RRM conformance tests. It is scheduled for completion before the end of 2004 to allow validation and approval by the GSM Global Certification Forum (GCF) this year.
- The 'Single Version' Release of TS 34.122 (Terminal Conformance Specification; Radio Transmission and Reception (TDD)) provides a single document, based on Rel 5, to also cover Rel 99 and Rel 4. Rel 99 and Rel 4 specifications will just contain pointers to this new combined document.
- TS 34.121 was rushed to completion to allow testing of the 800 MHz band. This will allow Japanese regulations to be met for the introduction of DS CDMA.
- High Speed Downlink Packet Access (HSDPA) work has begun with the definition of a work plan. A dedicated convener may be appointed later. T1 has requested more guidance from RAN2 on the need for testing of alternatives for Radio Link Control (RLC) payload sizes and the number of Hybrid Automatic Repeat Request (HARQ) processes for different UE categories. T1 has tentatively adopted the following TSG RAN-proposed Radio Bearer configurations for the High Speed-Downlink Shared Channel (HS-DSCH):
  - » One U/L packet switch configuration for 64 kbps;
  - » One U/L packet switch configuration for 384 kbps;
  - » Physical Channel parameters specified for each UE category (as defined in TS 25.306).

Table 3: 3GPP TSG T Working Group 1 (Conformance Testing) Specification Update

Document	Title	Status
tbd	Conformance Testing for A-GPS Rel 6 Minimum Performance Requirements	New work item (WI).
TS 34.108	Common Test Environments for User Equipment (UE) Conformance Testing	Versions 3.14 (Rel 99) and 4.9 being revised.
TS 34.121	Terminal Conformance Specification; Radio Transmission and Reception (FDD)	Version 5.2 being revised.
TS 34.122	Terminal Conformance Specification; Radio Transmission and Reception (TDD)	Versions 3.12 (Rel 99), 4.10 and (new) 5.0 being revised.
TS 34.123-1	Mobile Station (MS) Conformance Specification; Part 1: Protocol Conformance Specification	Version 5.6 being revised.
TS 34.123-2	User Equipment (UE) Conformance Specification; Part 2: Implementation Conformance Statement (ICS) pro forma specification	Version 5.6 being revised.
TS 34.123-3	User Equipment (UE) Conformance Specification; Part 3: Abstract Test Suites (ATSs)	Version 3.4 (Rel 99) being revised.

TSG T WG2 (Services & Capabilities)

3GPP TSG T Working Group 2 for Mobile Terminal Services & Capabilities (T2) defines terminal-based applications, features and interfaces. It is organized into 3 subgroups:

- SWG1 – MExE (Mobile Execution Environment). This was dissolved at the last meeting.
- SWG2 – UE Capabilities and Interfaces.
- SWG3 – Messaging.

Highlights of the recent meetings include:

- SWG1 (MExE) was dissolved. Most of this type of work is now being performed by OMA.
- Two new Rel 6 MMS Work Items were approved.
- There were no candidates for second vice-chair.

SWG2 – UE Interfaces and Capabilities. There was significant progress on the Generic User Profile (GUP). TS 23.241 on the XML Schema and data description methods and TS 24.241 on Common Objects are both about half complete.

SWG3 – Messaging . Corrections for the following MMS issues were agreed to:

- MM1-MM4/MM7 header mapping.
- Clarification of the "Linked ID".
- Replace erroneous reference to IETF RFC 822 by RFC2822.
- Clarification of automatic and manual retrieval modes.
- MM4 addressing.
- Addition of missing MM7 delivery status codes.
- Specification that MM7 assume 'true' as the default value for the 'allow adaptations' element.
- Cell Broadcast data structure for UMTS.

Functional enhancements for conditional delivery mechanisms for MMS were agreed to.

There are ongoing discussions of:

- MM4 routing of messages with multiple addresses.
- MM7 enhancements.
- Multimedia message storage on the USIM.
- Hyperlinks (URLs).

Table 4: 3GPP TSG T Working Group 2 (USIM) Specification Update

Document	Title	Status
tbd	Private Addressing Schemes	New work item
tbd	Multiple Relay / Server Architecture	New work item
TS 23.041	Technical realization of Cell Broadcast Service (CBS)	Version 5.2 and 6.2 being revised.
TS 23.140	Multimedia Messaging Service (MMS); Functional Description; Stage 2	Versions 5.9 and 6.4 being revised.
TS 23.141	3GPP Generic User Profile (GUP); Stage 2; Data Description Method	Under development.

TSG T WG3 (SIM/USIM)

3GPP TSG T Working Group 3 (T3) for the Subscriber Identity Module defines operations and interfaces for the Subscriber Identity Module (SIM) used by 2G systems and the Universal Subscriber Identity Module (USIM) used by 3G systems, with the exception of the security algorithms, which are developed by SA3. T3 also develops specifications and test cases for the USIM and its interface with the Mobile Terminal.

Highlights of the most recent meetings were:

- T3 approved the continued existence of the API SWG, at least until completion of Release 6.
- T3 was informed that the SA WG3 work on Voice Group Call Service (VGCS) might impact T3 specifications, as it could lead to the introduction of new files or procedures on the USIM.
- T3 approved CRs for the Rel 6 Cell Broadcast Data Download in UTRAN based on work in T2.
- T3 was asked by SA1 to create CRs to allow Unstructured Supplementary Service Data (USSD) message transfer to the SIM/USIM. A liaison was sent back to SA1 indicating that the introduction of this feature is complex and might affect various aspects of SIM / USIM Application Toolkits (SAT/USAT). Further action will be taken at the next T3 meeting.
- 3GPP2 TSG C informed T3 they are working on the implementation of IMS/MMD for the R-UIM and that they are planning to base their work on the ISIM specification in TS 31.103.
- T3 received several proposals on USIM usage for MBMS security and initiated an ad hoc group to fully discuss them.

Table 5: 3GPP TSG T Working Group 3 (SIM/USIM) Specification Update

Document	Title	Status
TS 11.10-4	Mobile Station (MS) Conformance Specifications; Part 4: SIM Application Toolkit Conformance Specification	Version 8.6 (Rel 99) being revised.
TS 11.11	Mobile Equipment (SIM - ME) Interface	Version 8.11 (Rel 99) being revised.
TS 11.14	Subscriber Identity Module - Mobile Equipment (SIM - ME) Interface	Version 8.15 (Rel 99) being revised.
TS 23.048	Security Mechanisms for the (U)SIM Application Toolkit; Stage 2	Version 5.8 being revised.
TS 31.102	Characteristics of the USIM Application	Versions 3.15 (Rel 99), 4.11, 5.7, and 6.4 being revised.
TS 31.103	Characteristics of the ISIM Application	Version 5.5 being revised.
TS 31.111	USIM Application Toolkit (USAT)	Versions 3.11 (Rel 99), 5.6 being revised. Version 6.0 being released.
TS 31.115	Secured Packet Structure for (U)SIM Toolkit Applications	Version 6.3 being revised.
TS 31.122	USIM Conformance Test Specification	Version 3.7 (Rel 99) being revised.
TR 31.900	SIM/USIM Internal and External Interworking Aspects	Version 5.4 being revised.
TS 51.011	Mobile Equipment (SIM - ME) Interface	Version 4.10 being revised.
TS 51.013	Application Programming Interface (API) for Java Card™	Versions 4.1 and 5.1 being revised.
TS 51.014	SIM Application Toolkit	Version 4.3 being revised.

Meeting Schedule

The most recent plenary meeting of TSG T was held December 9th–12th 2003 in Hawai'i. Meetings during 2004 are scheduled for:

- February 2nd–6th in Hyderabad, India for T1.
- February 9th–13th in Sophia Antipolis, France for the T3 MBMS ad hoc.
- February 16th–20th in Malaga, Spain for T2.
- March 10th–12th in Phoenix, Arizona for the plenary.
- April 19th–23rd in Edinburgh, Scotland for T2.
- April 27th–30th in Berlin, Germany for T3.
- May 10th–14th in Beijing, China for T1.
- June 2nd–4th in Seoul, Korea for the plenary.
- August 23rd–27th for T2 (location tbd).
- August 26th–30th in Canada for T1.
- September 8th–10th in Palm Springs for the plenary.
- November 1st–5th in Europe for T1.
- November 8th–12th for T2 (location tbd).
- November 16th–19th in Sophia Antipolis for T3.
- December 8th–10th in Athens for the plenary.

For a complete schedule of 3GPP meetings consult:
www.3gpp.org/Meetings/meetings.htm

Get Purple! Get Hyper!

In recent issues (electronic only) we have been hyper-linking the first occurrence of terms that might not be widely known – linking them to our online glossary. This is indicated by words being placed in purple prose, as in "MOS". This feature is yet another reason to convert from paper to PDF delivery!

Hyperlinks to email addresses are in green and other URLs are shown in red.

We like to hear from our readers. If you have comments on any articles, or suggestions to improve this bulletin, please contact the editor at:
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