

Cellular Networking Perspectives

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

Alcatel provided a late update to the status of its TIA/EIA-41-D implementation. Capabilities available now that were not recorded in our March 1999 issue are:

- Calling Name Presentation/Restriction (CNAP/CNAR)
- Data for CDMA mobiles

Capabilities that are scheduled for availability in 1Q'2000 are:

- Hyperband handoff for CDMA mobiles,
- Local Number Portability, Phase II (MIN/MDN separation),
- Over-the-air Activation
- WIN Phase I
- IMSI (Int'l Mobile Station Identity)

Quote of the Month

"More and more, these critical systems are driven by, and linked together with, computers, making them more vulnerable to disruption. Last spring, we saw the enormous impact of a single failed electronic link... And we are already seeing the first wave of deliberate cyber attacks."

US President Bill Clinton

"... what kind of genius would allow critical systems to *become* more vulnerable in the first place. It seems that kind of poor thinking would pose more of a threat than any organized attack."

2600 Editor Emmanuel Goldstein

Dr. Jon's Wireless Security

The last free issue of *Dr. Jon's Wireless Security* is attached to this issue. Contact us at cnpsales@cnp-wireless.com to continue receiving this invaluable bulletin!

Upcoming Conferences

Caribbean Wireless & Satellite '99: April 12-14 1999, Montego Bay, Jamaica

This conference will examine how satellites — both mobile and direct broadcast services — can help a developing country boost its commercial infrastructure. Leading Caribbean wireless and satellite operators, manufacturers, financiers and regulatory experts will gather to examine the changing regulatory framework and financial risks and rewards.

Contact: AiC at +1-212-714-1444 (800-409-4242), www.aic-usa.com or by fax at +1-212-714-9815.

Wireless Partnering: April 27-30 1999, Miami

An authoritative roaming conference from Cibernet Corp. and CTIA, the people who wrote the book on roaming. David Crowe, editor of *Cellular Networking Perspectives* will be speaking at this conference.

Contact: +1-602-443-4058 or by fax at +525-687-9536 in Mexico, +541-328-1966 in Argentina or +1-602-443-8767 elsewhere.

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Air Interface Technology Capacity Comparisons

Elliott Drucker is a well known wireless industry consultant, with particular expertise in technical mobile, base station and radio interface issues. He can be reached at:

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The following tables compare predicted wireless system call and traffic capacities for several widely used air interface technologies. Table 1 considers the “standard” configuration of channel reuse densities typically ascribed to the various technologies. In most cases, the capacities derived from these configurations will be optimistic, as irregular terrain and non-homogeneous traffic distribution will usually require a relaxation of reuse density to provide acceptable call quality.

Table 2 considers “practical” reuse densities which are typically realized in

large systems providing high quality service. This is reflected by reuse densities for narrow-band systems which are relaxed from the figures used in the “standard” configurations, and, for CDMA systems, by more guard band between RF channels and fewer traffic channels per RF channel.

Table 3 considers reuse densities that may be achievable by optimization. For narrow-band systems (i.e. not CDMA), this primarily means optimized frequency planning, abandoning reliance on periodic reuse in favor of channel-by-channel assignment for interference minimization based upon sector-to-sector interference matrices. These optimizations require the use of multi-channel linear power amplifiers in base stations rather than conventional cavity combiners to allow for arbitrary minimum channel spacing. For CDMA systems, optimization entails “fine tuning” the physical configuration of base station antenna systems, primarily in terms of height, downtilt, and radiation patterns.

In each table, the following conditions are assumed:

- Base stations are configured with three sectors each (the most commonly used configuration).
- A total of 12.5 MHz is available for each path (uplink and downlink) and the entire spectrum is used for the air interface technology in question. For consistency, spectrum required for signaling channels is ignored.
- Erlang capacity per sector is calculated based upon a blockage rate of 2%.
- Reuse factor is defined assuming a very large number of sectors in an interference limited system, and dividing this number by the average number of sectors to which each RF channel is assigned.

Table 1: “Standard” Configuration

AIR INTERFACE TECHNOLOGY						
Parameter	Analog		TDMA		CDMA	
	AMPS	NAMPS	GSM	D-AMPS	13 kbps Vocoder	8 kbps Vocoder
Standard(s)	EIA/TIA-553	IS-88, IS-91	TS GSM	IS-54, IS-136	IS-95	
A: Available Spectrum	12,500 kHz (amount allocated for US cellular, used as a base for comparison purposes)					
B: RF channel bandwidth in kHz	30	10	200	30	1250	1250
T: Number of traffic channels per RF channel	1	1	8	3	16	23
R: Reuse Factor	21	21	12	21	1	1
V: Number of Traffic channels per sector ((A ÷ B) × (T ÷ R))	19.8	59.4	41.6	59.5	160	230
E: Erlangs / sector	12.8	47.2	30.9	47.2	140	210
Capacity relative to “standard” AMPS	1 (datum)	3.7	2.4	3.7	10.9	16.4

Table 2: “Real World” Configuration

AIR INTERFACE TECHNOLOGY						
Parameter	Analog		TDMA		CDMA	
	AMPS	NAMPS	GSM	D-AMPS	13 kbps Vocoder	8 kbps Vocoder
Standard(s)	EIA/TIA-553	IS-88, IS-91	TS GSM	IS-54, IS-136	IS-95	
A: Available Spectrum	12,500 kHz (amount allocated for US cellular, used as a base for comparison purposes)					
B: RF channel bandwidth in kHz	30	10	200	30	1389	1389
T: Number of traffic channels per RF channel	1	1	8	3	13	18
R: Reuse Factor	24	28	18	36	1	1
V: Number of Traffic channels per sector ((A ÷ B) × (T ÷ R))	17.4	44.6	27.8	34.7	117	162
E: Erlangs / sector	9.9	33.6	18.5	24.5	101	144
Capacity relative to “standard” AMPS	0.8	2.6	1.4	1.9	7.9	11.3

Table 3: “Optimized” Configuration

AIR INTERFACE TECHNOLOGY						
Parameter	Analog		TDMA		CDMA	
	AMPS	NAMPS	GSM	D-AMPS	13 kbps Vocoder	8 kbps Vocoder
Standard(s)	EIA/TIA-553	IS-88, IS-91	TS GSM	IS-54, IS-136	IS-95	
A: Available Spectrum	12,500 kHz (amount allocated for US cellular, used as a base for comparison purposes)					
B: RF channel bandwidth in kHz	30	10	200	30	1389	1389
T: Number of traffic channels per RF channel	1	1	8	3	15	21
R: Reuse Factor	17	20	15	27	1	1
V: Number of Traffic channels per sector ((A ÷ B) × (T ÷ R))	24.5	62.4	33.1	46.2	135	189
E: Erlangs / sector	15.9	50	23.3	35.1	118	170
Capacity relative to “standard” AMPS	1.2	3.9	1.8	2.7	9.3	13.3

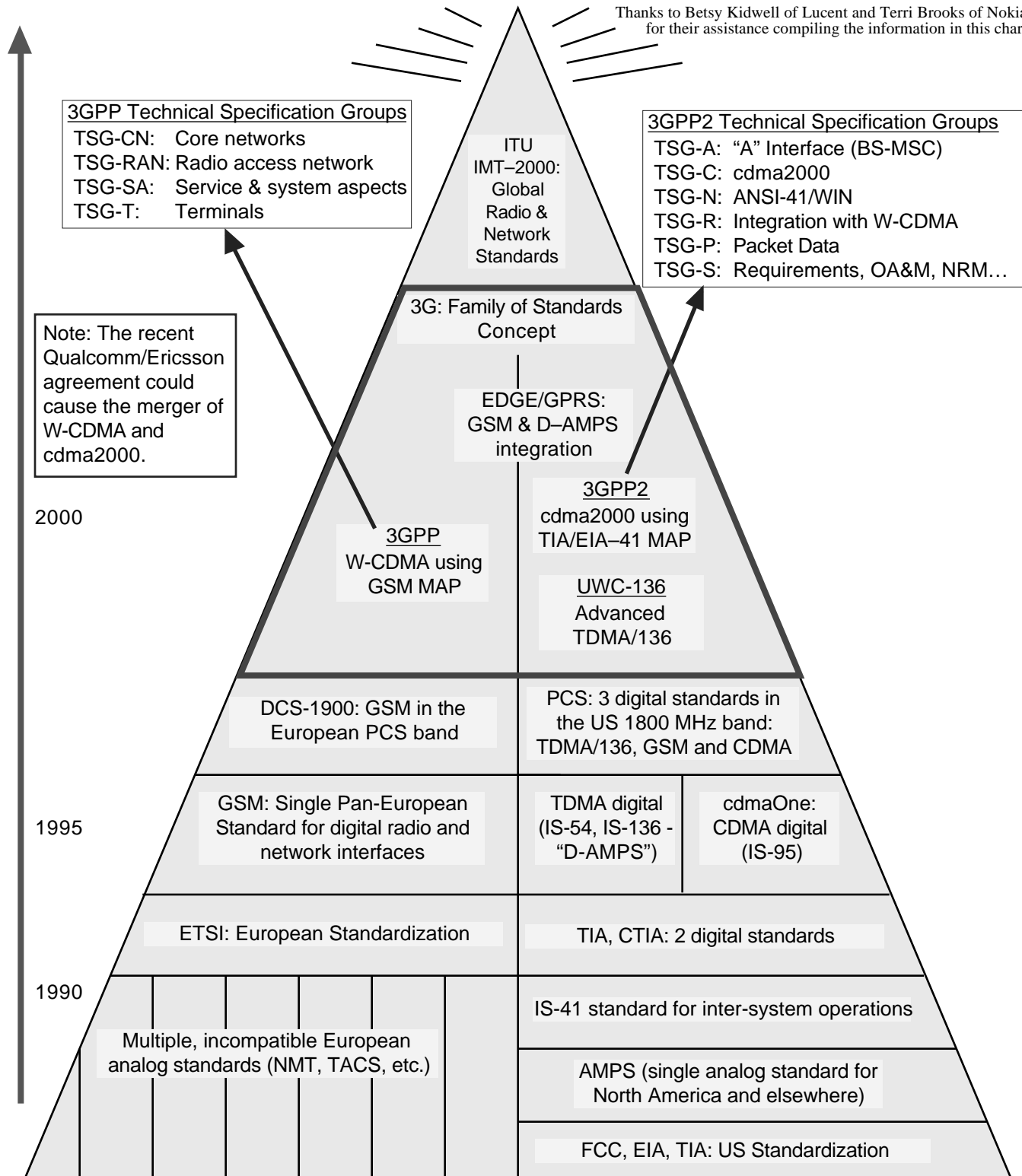
The Evolution of Wireless Standards: Evolving to 3G, IMT-2000

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First publication

Thanks to Betsy Kidwell of Lucent and Terri Brooks of Nokia for their assistance compiling the information in this chart



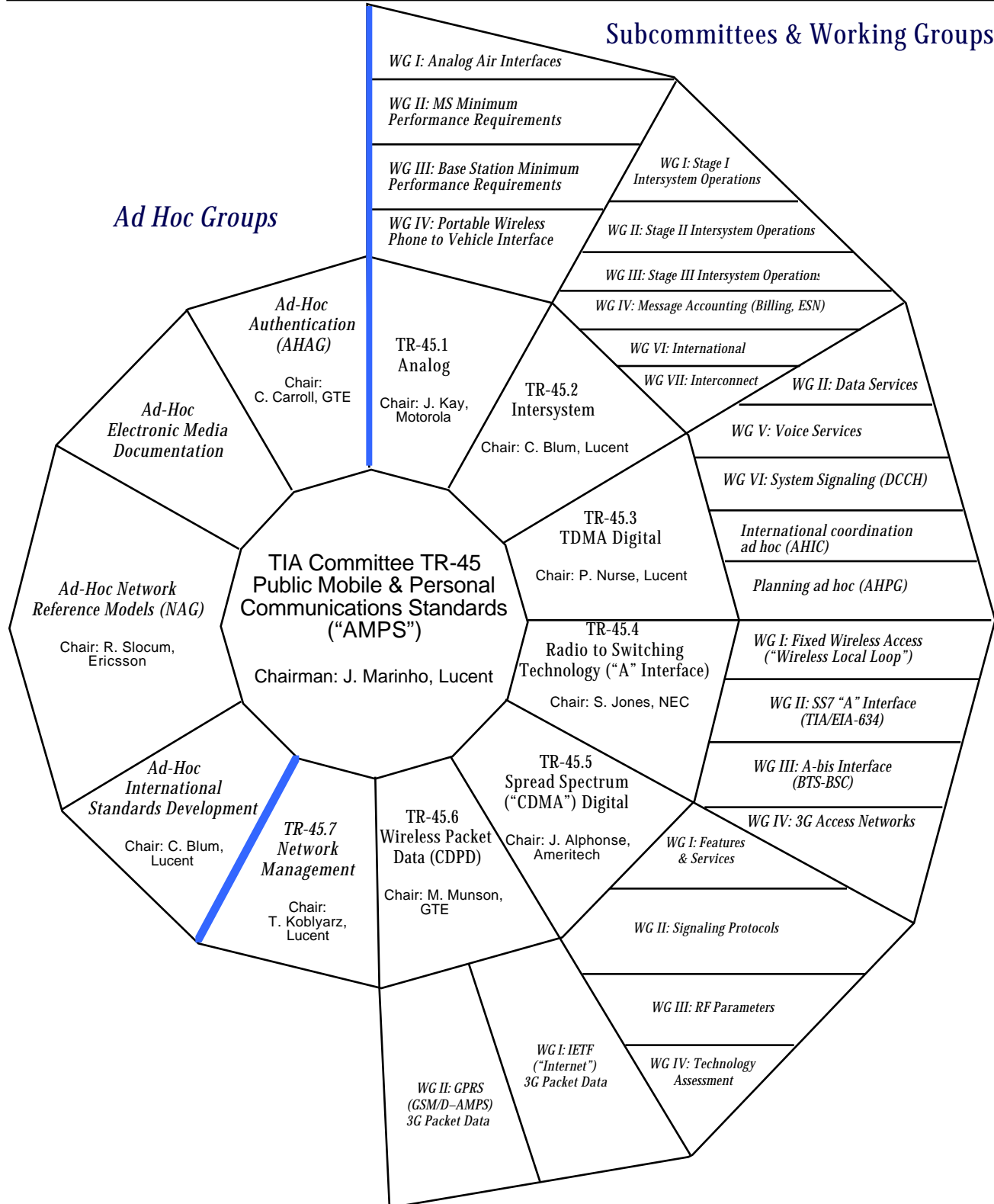
For definitions of acronyms see: <http://www.cnp-wireless.com/glossary.html>

TIA TR-45 Cellular/PCS “AMPS” Standards Development

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TIA TR-45.4 Subcommittee Radio to Switching Technology Standards Status Report

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Published Documents

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	in press

Completed Internal Documents

PN	Description	WG	Editor
3142	Cellular Microcell/Microsystems Requirements Document	III	Steve Jones
3296	MSC-BS Interface (A-Interface) Requirements for Public 800 MHz	II	Mike Burke

Active TR-45.4 Projects (PN=TIA Project Number)

PN	Description	Schedule	IS/TSB
PN-3746	ISDN based A-Interface, adding: <ul style="list-style-type: none"> • address alignment with Mobility Management • CDMA and TDMA support, and • support for architectures with separate mobility management and call control functions 	Cancelled	IS-653-A
PN-3964	Use of A-Interface standards in Wireless Local Loop	Ballot	
SP-4276	Fixed Wireless Access (Stage I Description)		
PN-4376	Addendum to TIA/EIA-634-B for 3rd generation systems	Cancelled	TIA/EIA-634-B.x
SP-4377	Next revision of TIA/EIA-634 "A" Interface (including addendums & 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		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-xxxx	cdma2000 Access Network Interface		IS-xxx
SP-xxxx	cdma2000 Access Network Interface (ANSI version)		TIA/EIA-xxx

- Note:
1. IS- TIA Interim Standard, PN- TIA Project Number, SP- ANSI Standards Proposal , TSB- Telecommunications Systems Bulletin.
 2. **Bold Type** indicates modification since previous publication.
 3. Published TIA standards can be obtained from Global Engineering Documents at 1-800-854-7179 or <http://ihs.global.com>.

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