

CDMA2000: Delivering on 3G

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Sofia**



CDMA Development Group



CDMA Worldwide



CDMA2000: Delivering on 3G



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Charter

To lead the rapid evolution and deployment of CDMA-based systems, based on open standards and encompassing all core architectures, to meet the needs of markets around the world in an emerging, information-intensive environment

Information Distribution

- Conferences
- Emails
- Website
- Etc.

Technical Service Development

- System Testing
- Advanced Systems Evolution
- Etc.

Deployment Assistance

- Time-to-Market
- Int'l Roaming
- Interoperability
- Etc.

Membership

The CDG is a consortium of over 110 member companies from around the world. Members are involved in many aspects of CDMA system deployment and support.

Operators

*Subscriber
Equipment*

*Value-Added
Services*

*Network
Infrastructure*

*Network
Enhancement/
Optimization*

*Network
Interface &
Access*

CDG Membership



- Agilent Technologies, Inc.
- Aicent, Inc.
- Airbiquity, Inc.
- Airvana Inc.
- ALACEL Corp.
- ALLTEL Communications, Inc.
- Alpine Electronics, Inc.
- Anritsu
- AnyDATA Corporation
- ArrayComm, Inc.
- Asia Pacific Broadband Wireless
- Audiovox Communications Corp.
- Bell Mobility
- BellSouth International
- Berkana Wireless, Inc.
- Bitfone Corp.
- Celerica, Inc.
- Celletra Ltd.
- China Unicom
- CIBERNET Corporation
- CommWorks Corporation
- Comverse
- Conductus, Inc.
- CTIA
- CURITEL Communications, Inc.
- Ericsson, Inc.
- Fujitsu Network Communications, Inc.
- Gemplus Corporation
- Giga Telecom Inc.
- Grayson Wireless
- GTRAN, Inc.
- Himachal Futuristic Communications Ltd.
- Hitachi Telecom (USA), Inc.
- Huawei Tech. Co., Ltd.
- Hutchison CAT Wireless
- Multimedia Limited
- Hutchison Telecom (HK) Ltd.
- Hyundai CURITEL, Inc.
- InnovICs Corporation
- ISCO
- IUSACELL
- KDDI
- Komunikasi Selular Indonesia
- (Konselindo)
- Korea Telecom Freetel, Inc. (KTF)
- Kyocera Corporation
- Leap
- LG Electronics, Inc.
- LG Telecom, Ltd.
- Lightbridge, Inc.
- Logica
- Lucent Technologies, Inc.
- Metawave Communications
- Motorola, Inc.
- NEWS IQ Inc.
- Nextel Communications
- Nokia Corporation
- Nortel Networks
- Novatel Wireless, Inc.
- Openwave
- Pacific Bangladesh Telecom Limited
- Pele-Phone Communications Ltd.
- PT Wireless Indonesia
- QUALCOMM, Inc.
- QuickSilver Technology
- Qwest
- Racal Instruments
- Reliance Infocom Limited
- Research In Motion
- RITT
- Rohde & Schwarz
- Samsung Electronics Co. Ltd.
- Sanyo Fisher Company
- Schema Ltd.
- SchlumbergerSema
- Sharp Laboratories of America
- Sierra Wireless, Inc.
- SK Telecom
- SmartCom PCS
- SmartServ Online, Inc.
- SmartTrust
- Sony Electronics
- Spirent Communications
- Sprint
- Starent Networks Corporation
- Tata Teleservices Limited
- Telecom Mobile Limited
- Telefonica Moviles
- Telespree Communications
- Telstra Corporation Ltd.
- Telus Mobility Cellular, Inc.
- Texas Instruments
- TSI
- UNEFON
- U.S. Cellular
- Verizon Wireless
- Via Telecom, Inc.
- WaterCove Networks
- Wavecom, Inc.
- WAVS, Inc.
- Western Wireless
- Wherify Wireless, Inc.
- Willtech, Inc.
- Willtek Communications, Inc.
- Winphoria Networks, Inc.
- Wireless Test Systems
- ZTE Corporation



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CDMA2000: Delivering on 3G

CDMA is the present and future of advanced wireless services

Code Division Multiple Access (CDMA) is a spread spectrum technology used in second and third generation wireless networks



cdmaOne™ identifies 2G and 2.5G cellular, PCS and wireless local loop (WLL) services based on the IS-95A and IS-95B CDMA air interface standards. IS-95A supports data delivery up to 14.4 kbps while IS-95B offers up to 115 kbps.

CDMA2000 is an ITU-approved, IMT-2000 (3G) standard
CDMA2000 1X can double voice capacity and delivers data rates up to 307 kbps

CDMA2000 1xEV is optimized for high-speed data:

CDMA2000 1xEV-DO uses a designated channel for data at speeds of up to 2.4 Mbps in a single carrier

CDMA2000 1xEV-DV integrates voice and data on a single channel with speeds of up to 4.8 Mbps

CDMA Benefits

As the most advanced digital technology, CDMA offers significant benefits to operators and their subscribers

Operators

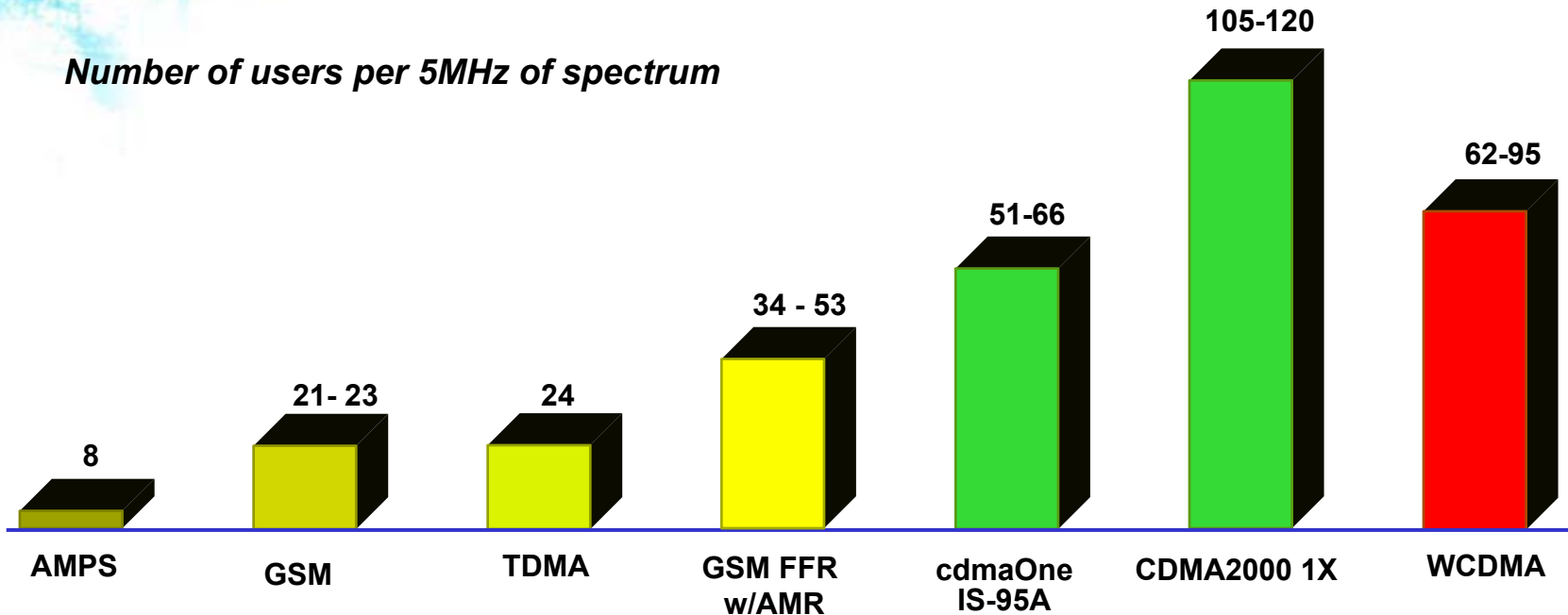
- Greater voice capacity
- Simplified system planning through the use of the same frequency in every sector
- Improved coverage characteristics resulting in fewer cell sites
- Data ready; uses standard IP commands and protocols
- The platform for 3G

Subscribers

- Better voice quality
- Longer talk time
- Improved privacy and security
- Advanced data services

CDMA technologies deliver superior capacity for voice and data

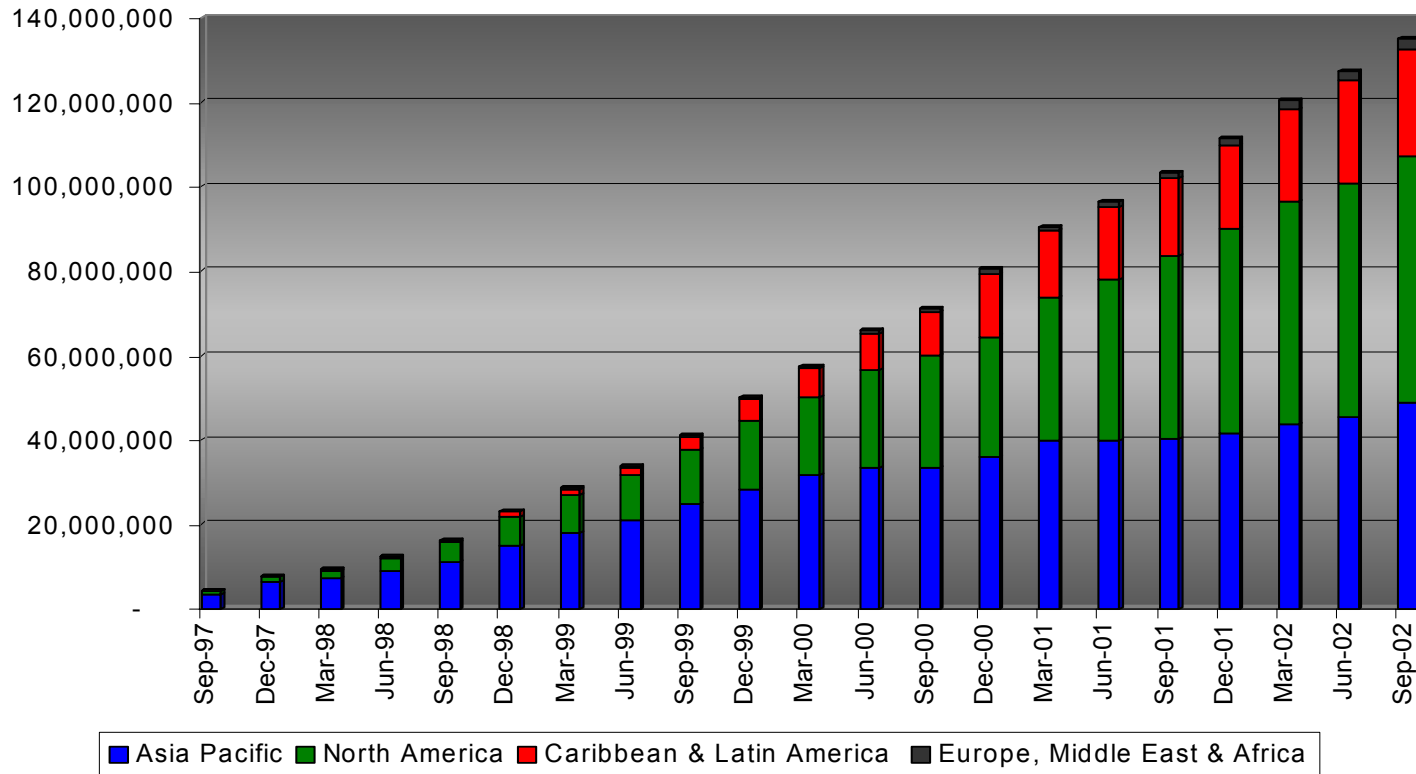
Number of users per 5MHz of spectrum



CDMA is the most spectrally efficient technology

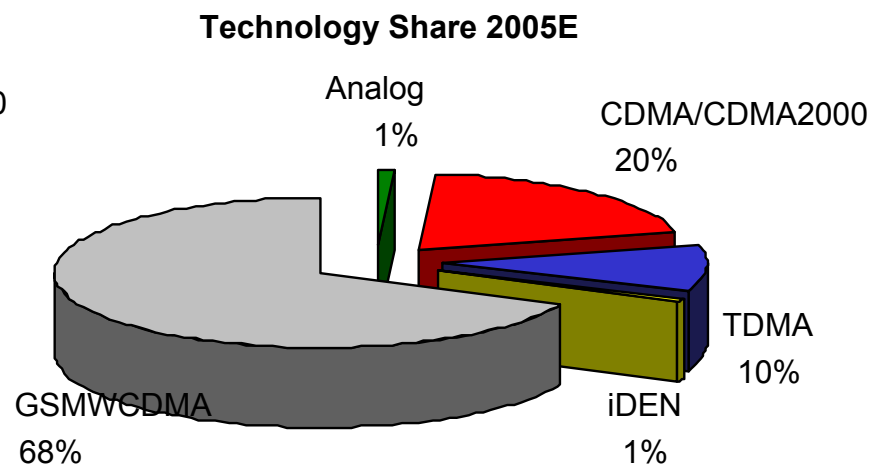
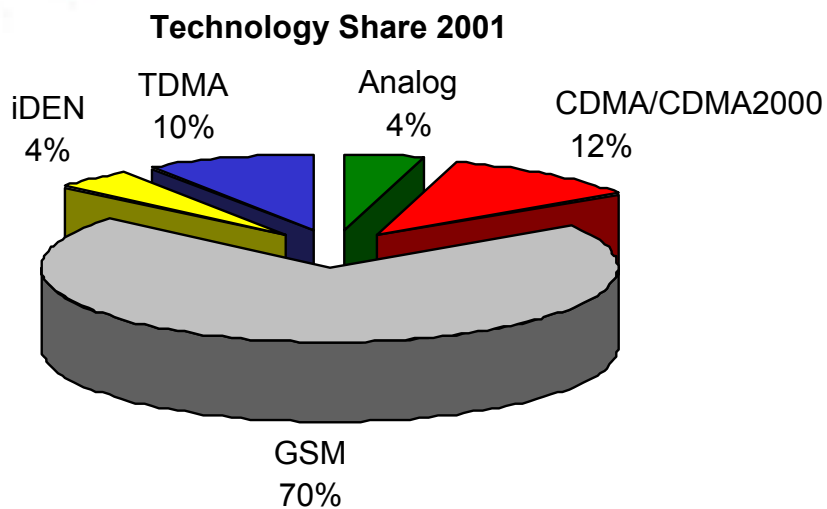
- cdmaOne delivers 14x increase in voice capacity over analog and more than 2x more than GSM and TDMA*
- CDMA2000 doubles voice capacity of cdmaOne systems making it the most spectrally efficient technology available today*

CDMA is the fastest growing technology, serving more than 135 million subscribers worldwide...

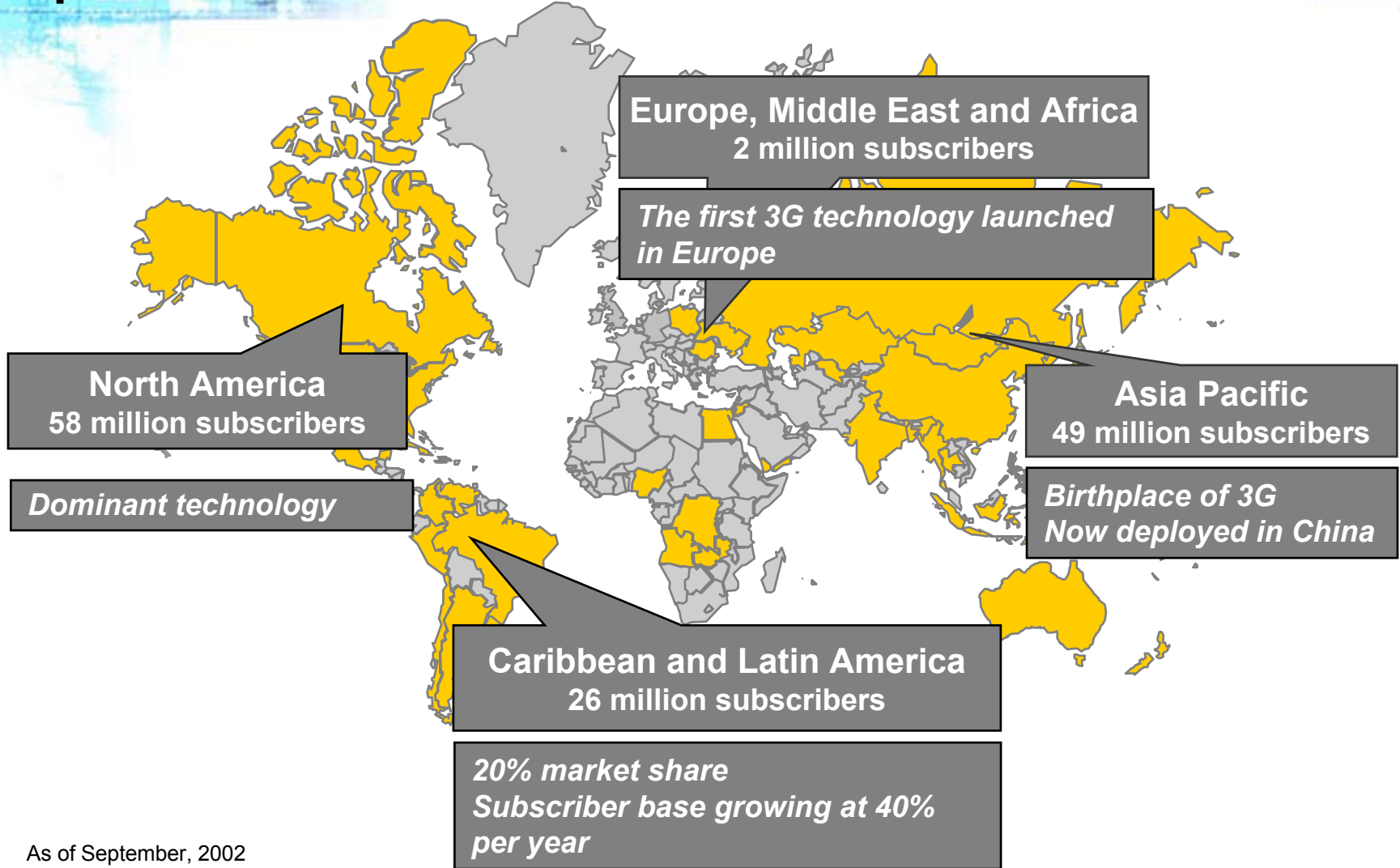


Source: CDMA Development Group

...and it will continue to be the fastest growing technology platform



CDMA is one of the leading technologies with presence across all continents

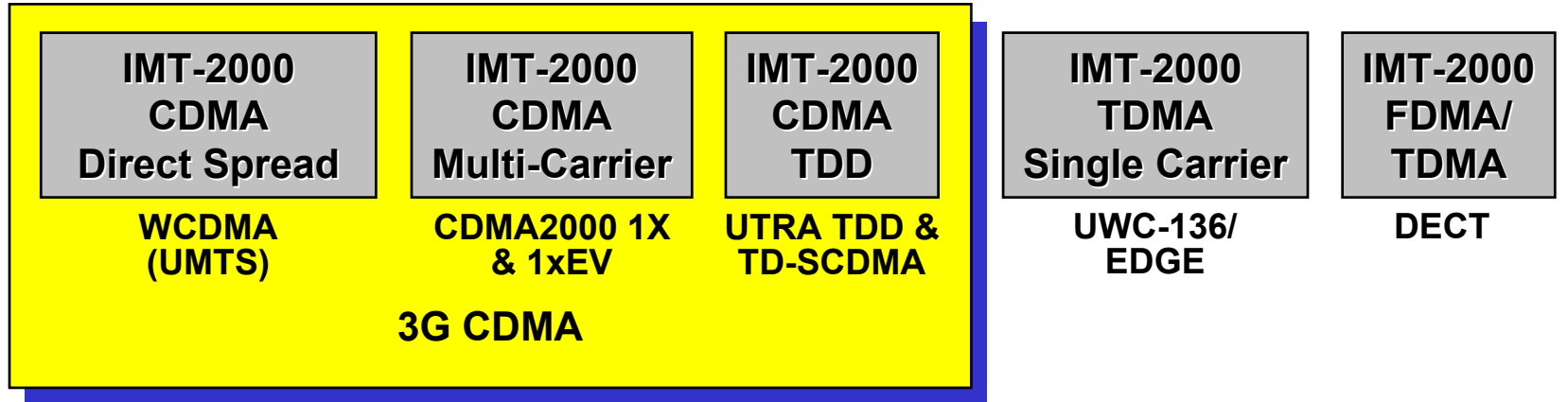


As of September, 2002

The dominant 3G standards are based on CDMA



IMT-2000 Terrestrial Radio Interfaces



Although there are five terrestrial standards, most of the attention and energy in the industry has been directed toward the CDMA standards



CDMA Development Group



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CDMA2000: Delivering on 3G



Dominates the 3G market



Offers significant lead time and service differentiation

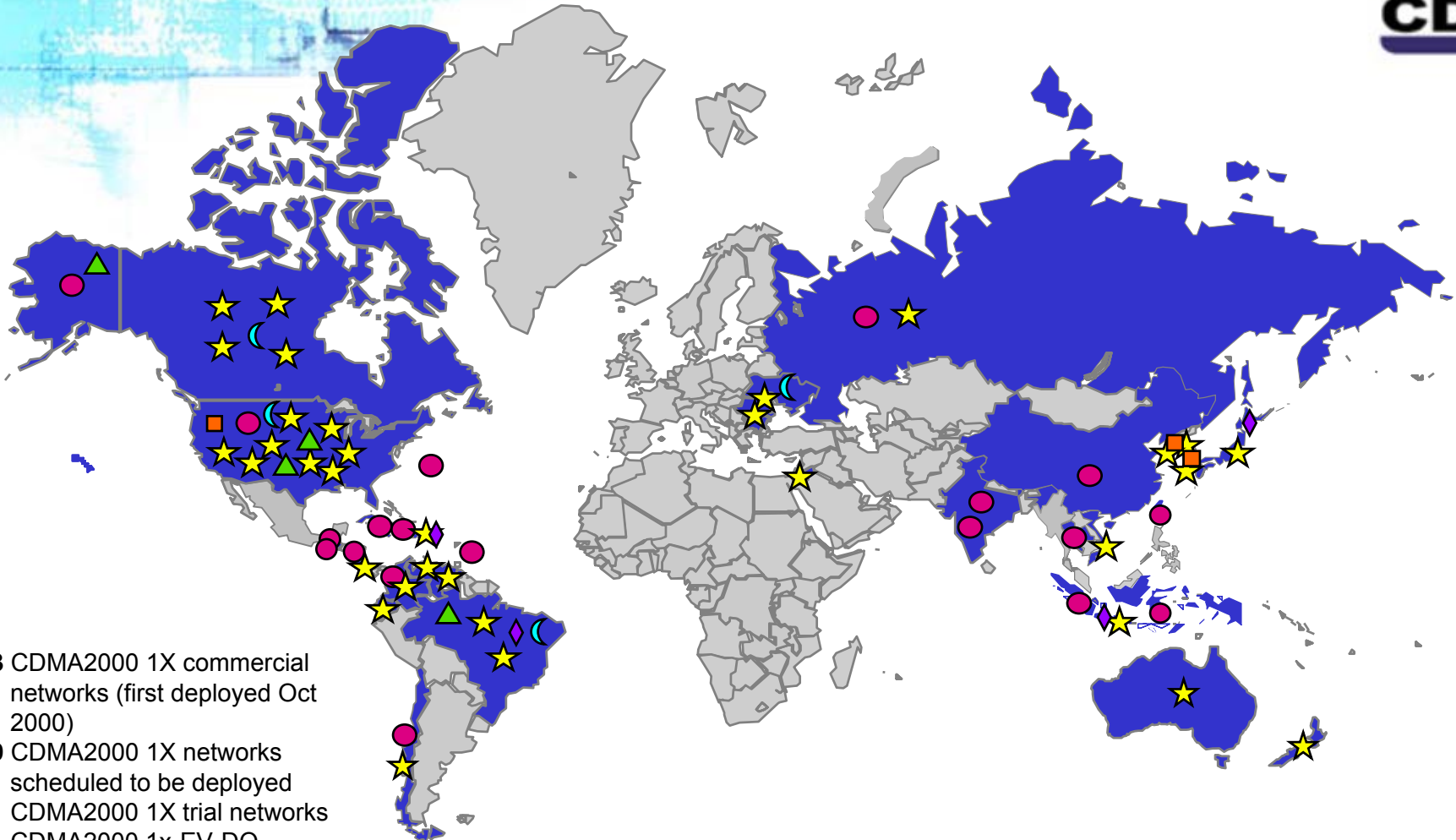


Delivers services to consumers and revenues to operators



Key success factors

CDMA2000 Deployments



33 CDMA2000 1X commercial networks (first deployed Oct 2000)

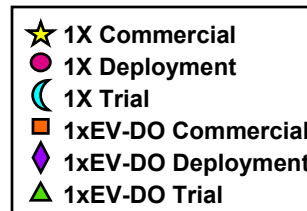
19 CDMA2000 1X networks scheduled to be deployed

4 CDMA2000 1X trial networks

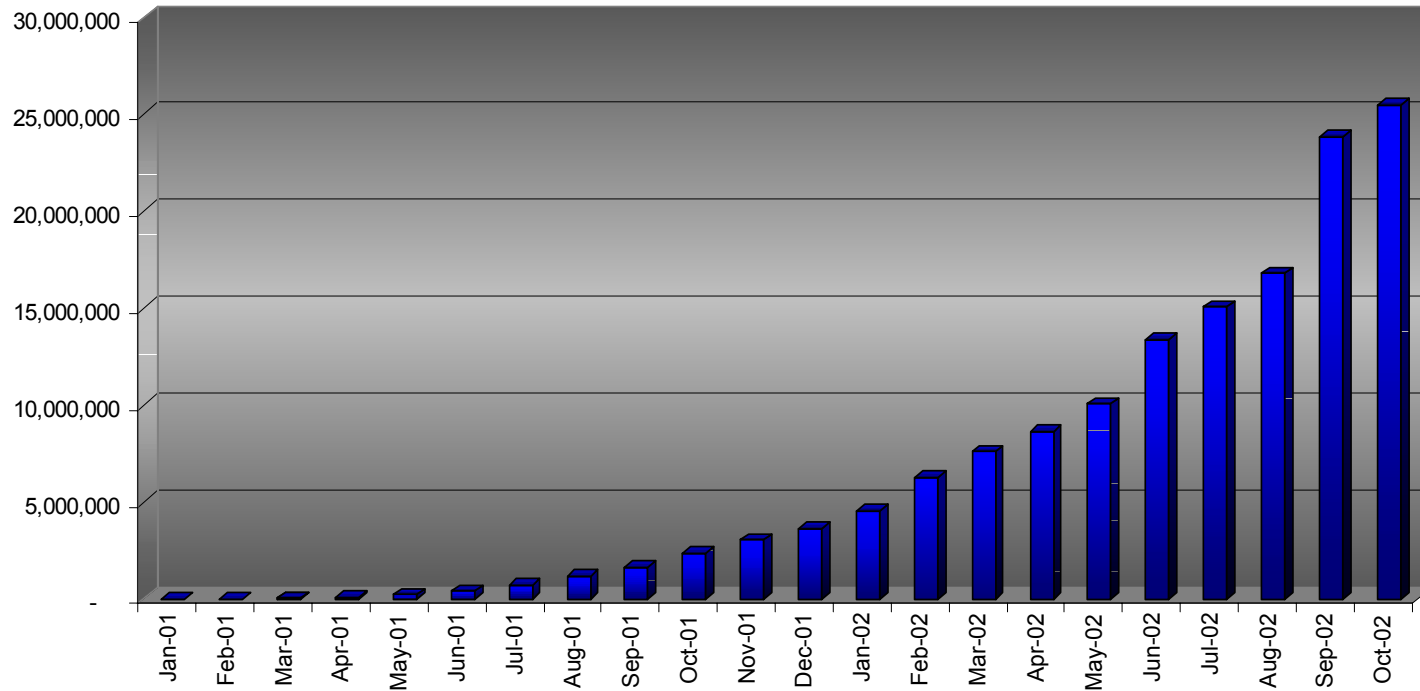
3 CDMA2000 1x-EV-DO commercial networks (first deployed Jan 2002)

4 CDMA2000 1xEV-DO networks scheduled to be deployed

4 CDMA2000 1xEV-DO trial networks

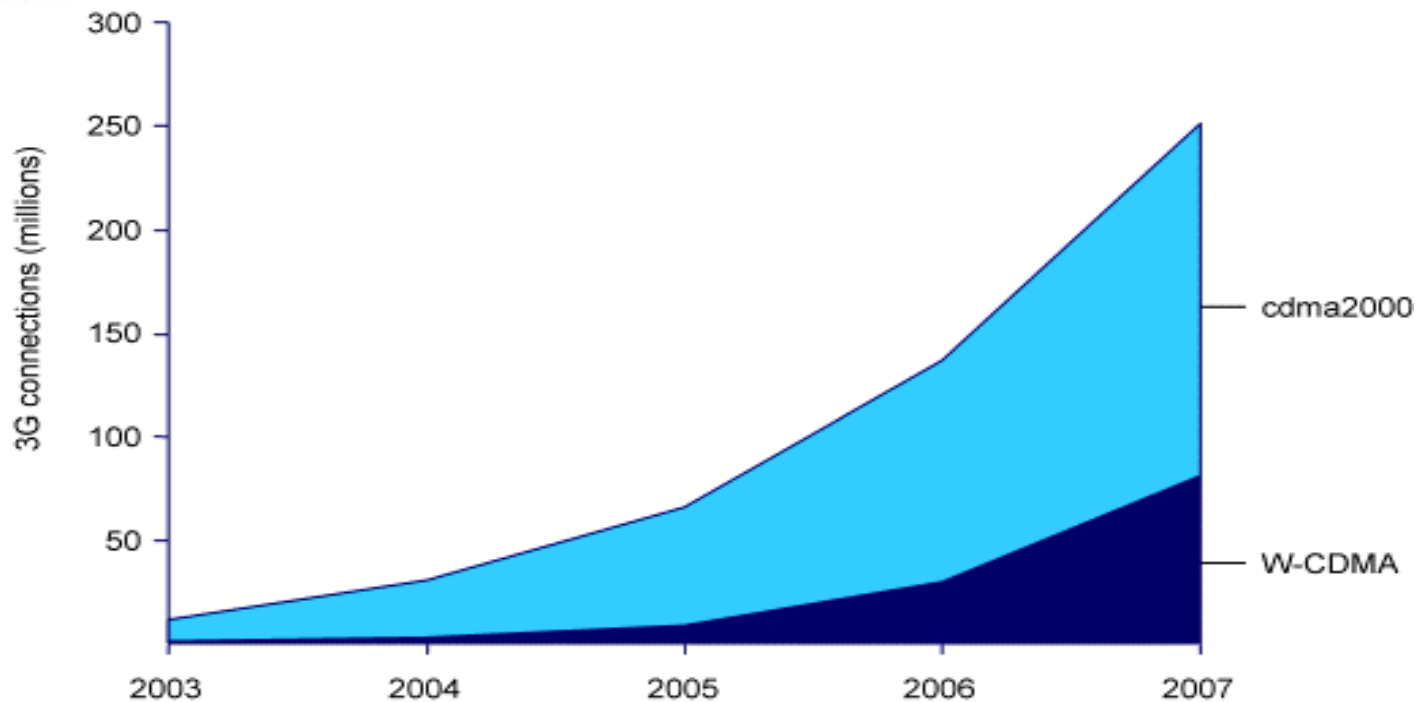


CDMA2000 dominates the 3G market today...



- *Over 25 million CDMA2000 subscribers as of October 2002*
- *More than 2 million are being added every month*

... and will continue to lead throughout the decade



Source: Mobile@Ovum

CDMA2000 delivers greater value to the end users...



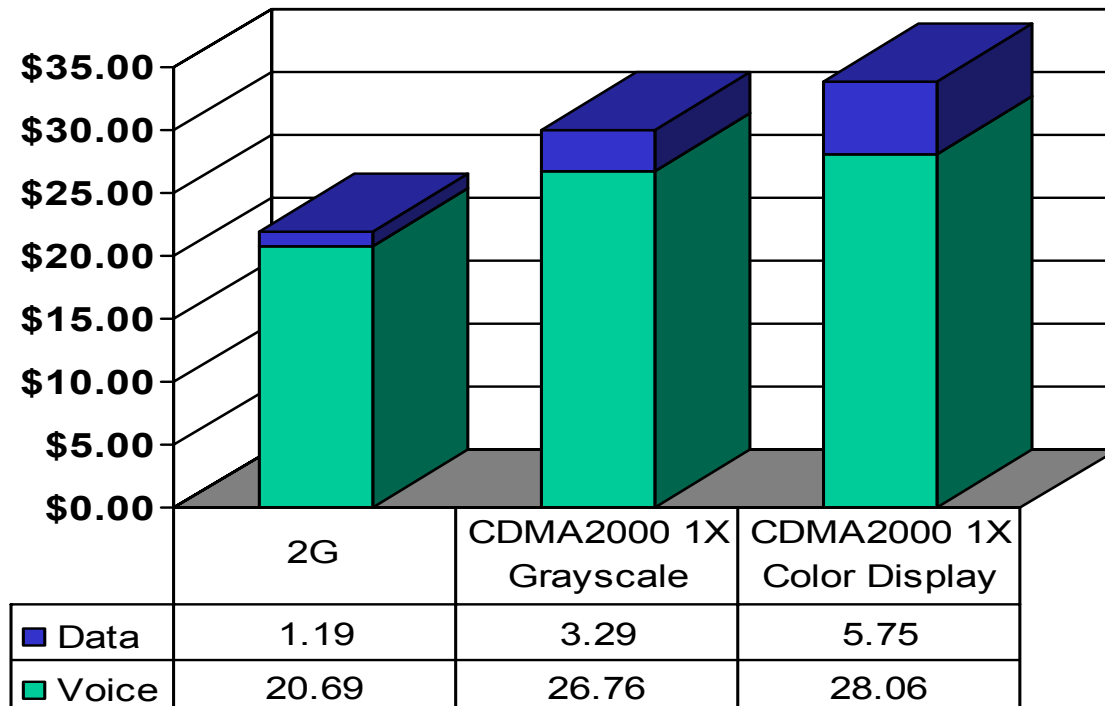
Applications

- MMS
- Streaming Video
- Broadcasts
- GPS/Telematics

Data Rates

	CDMA2000 1X	CDMA2000 1xEV-DO
Peak	144-153 kbps	2.4 Mbps
Throughput (mobile)	60-100 kbps	490-600 kbps
Throughput (fixed)	N/A	980-1200 kbps

... and incremental revenue for operators

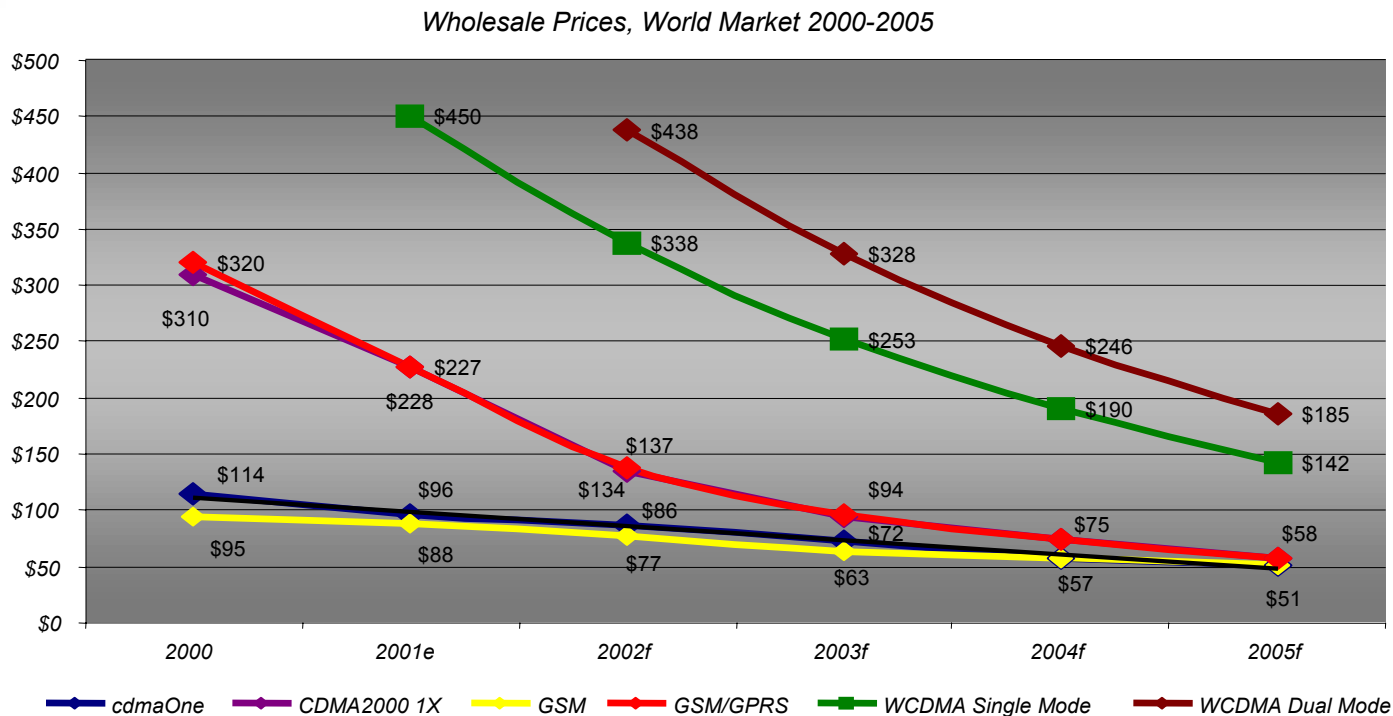


CDMA2000 delivers a nearly five-fold increase in data revenue and more than 50% higher total revenue per subscriber

More than 250 CDMA2000 terminals are available in the market



...at competitive prices



- *cdmaOne phone prices will continue to decline and will reach \$53 by 2005*
- *CDMA2000 1X phone prices will decline at a faster rate to reach \$58 by 2005*
- *UMTS phones, especially dual mode, will remain at least 3 times more expensive than CDMA2000*

CDMA2000's spectrum flexibility



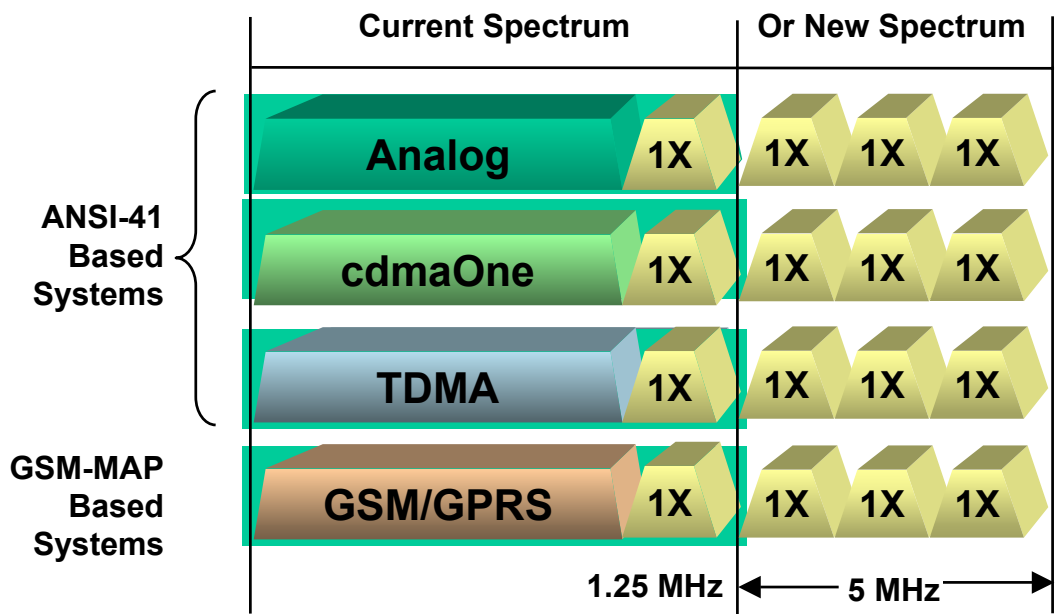
CDMA2000 can be deployed in any existing cellular, PCS and IMT-2000 spectrum



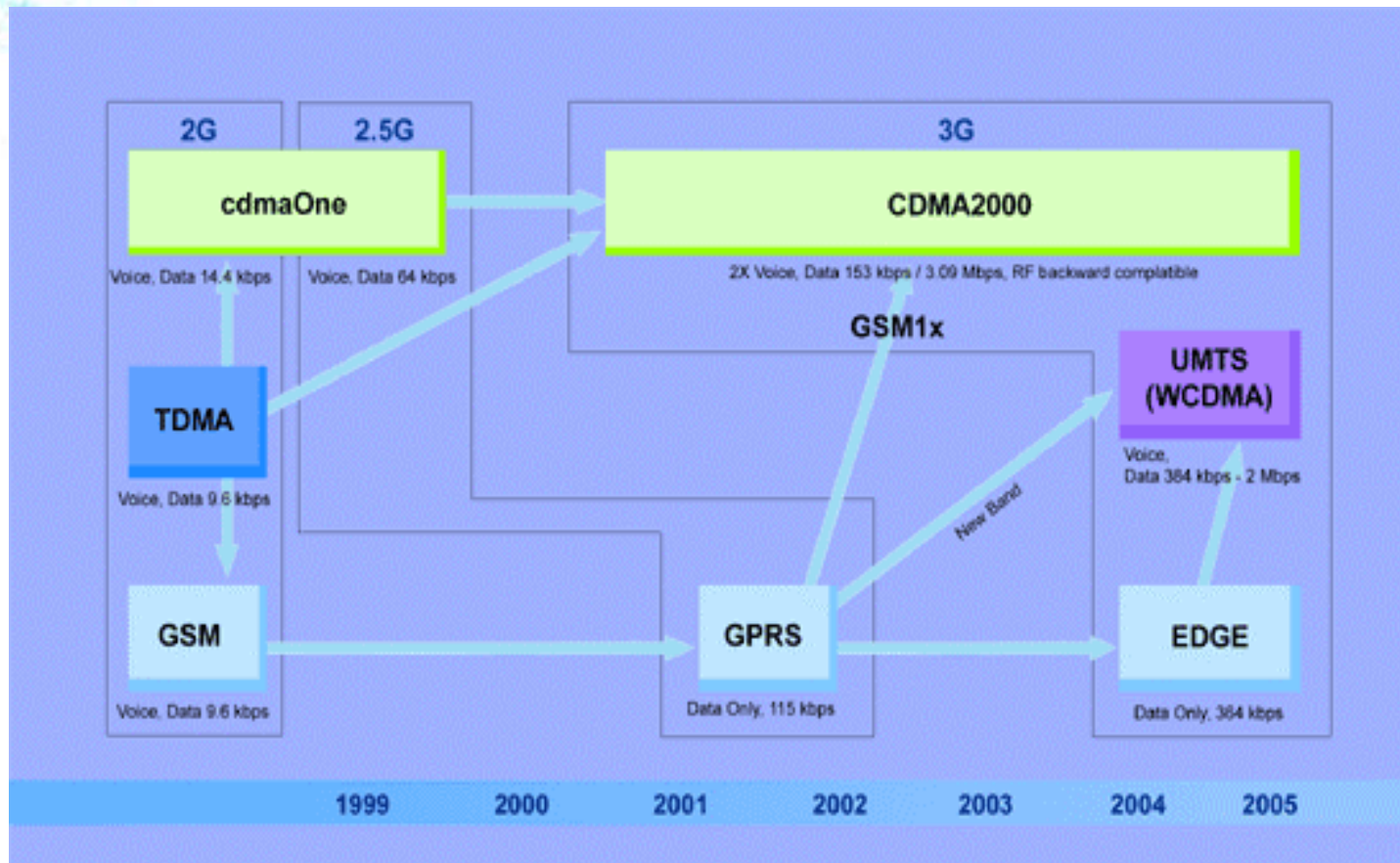
CDMA2000 can be deployed in a small amount of spectrum

CDMA2000 is not constrained to only the IMT-2000 band. It is defined to operate in existing and IMT-2000 spectrum:

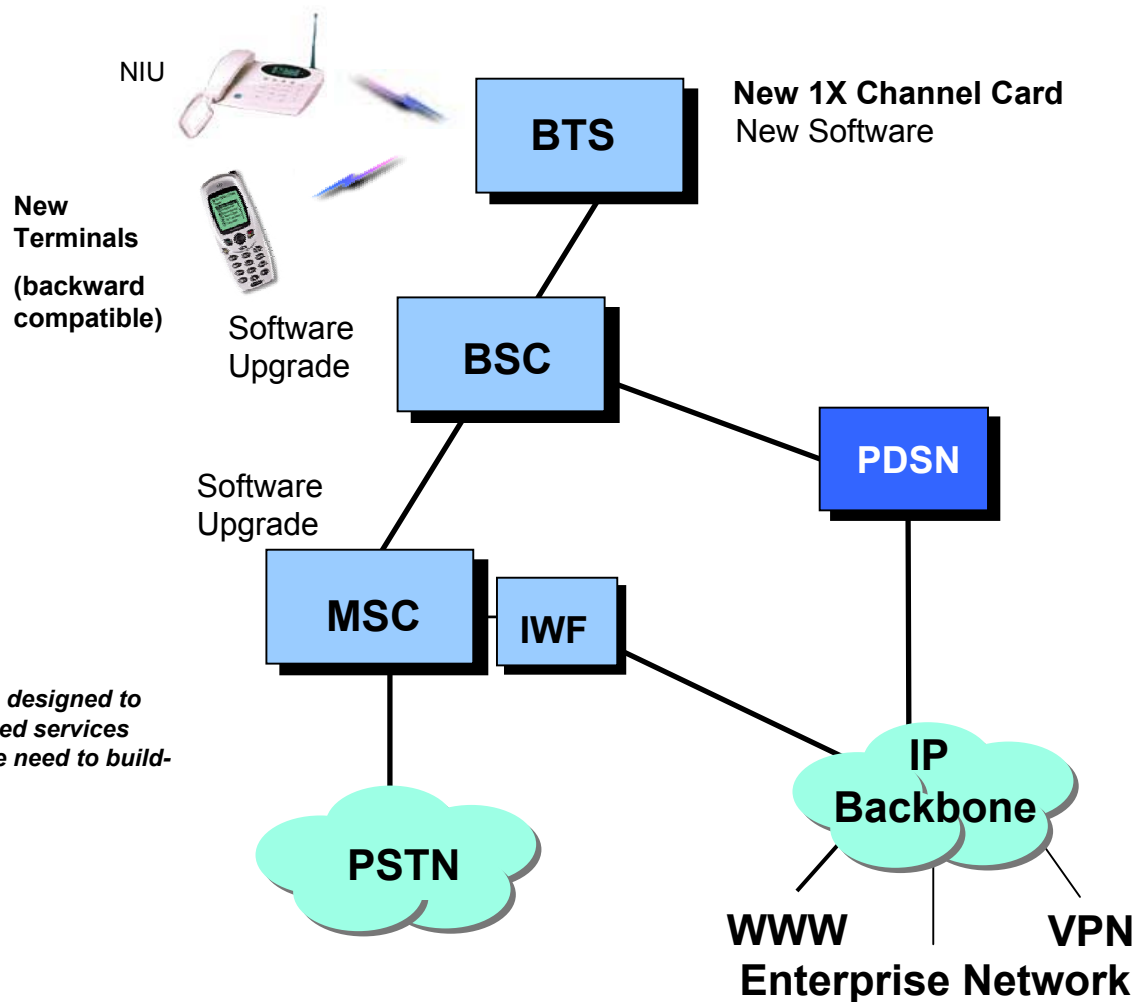
- 450 MHz
- 700 MHz
- 800 MHz
- 900 MHz
- 1700 MHz
- 1800 MHz
- 1900 MHz
- 2100 MHz



Offers a direct migration path to 3G



Requires only minor enhancements to the existing cdmaOne network...



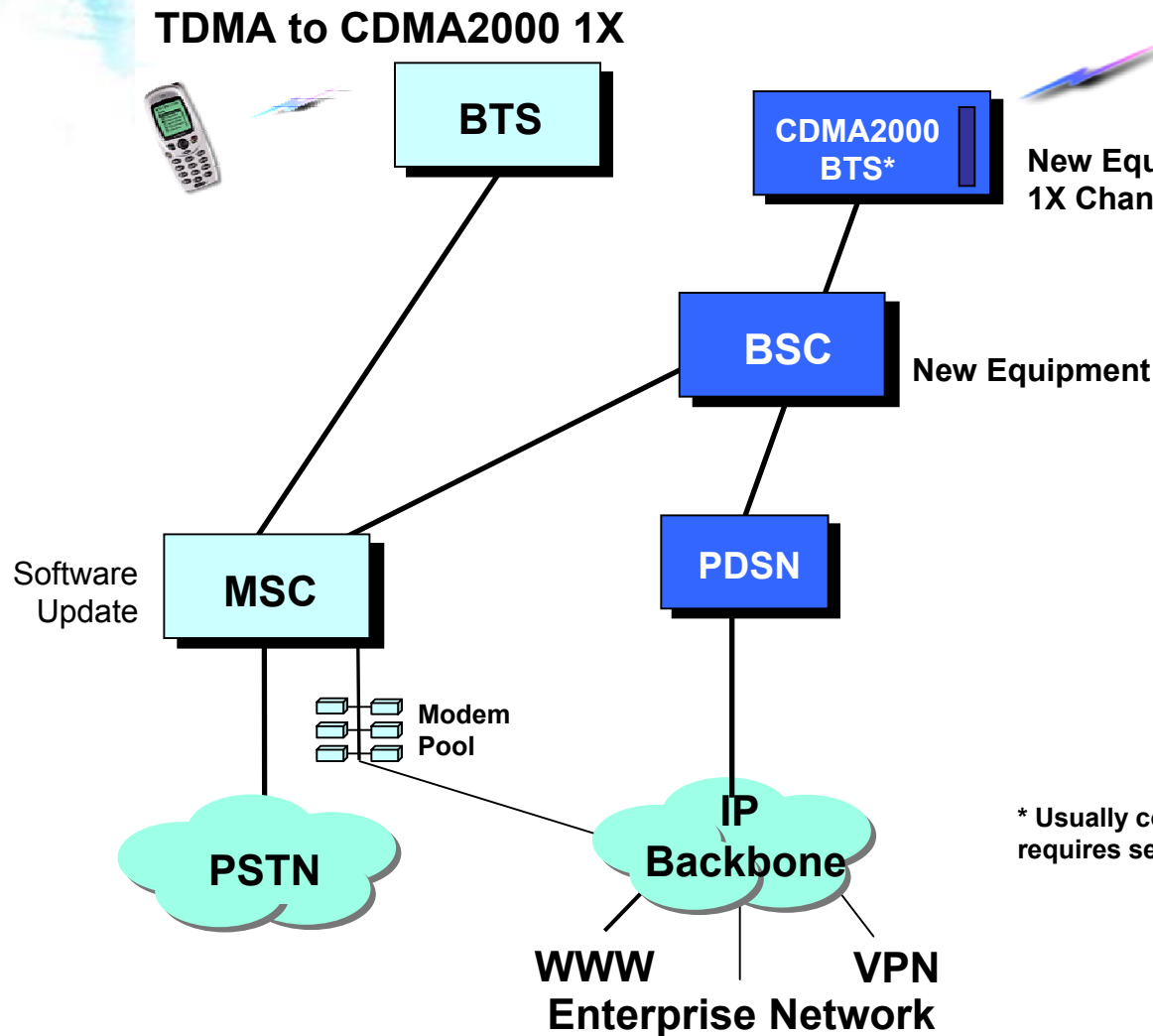
The network architecture is designed to deliver Internet and advanced services seamlessly, and without the need to build-out a new packet network

...and relatively small capital investment

		Total CapEx (US\$ billion)
Korea	SKT (CDMA2000 1X and 1xEV-DO)	2.4
	KTF (CDMA2000 1X and 1xEV-DO)	1.2
	LGT (CDMA2000 1X)	0.4
Japan	KDDI (CDMA2000 1xEV-DO)	2.5
	DoCoMo (W-CDMA)	10.9
U.S.	Sprint PCS (CDMA2000 1X and 1xEV-DO)	2.4
	AT&T Wireless (GSM/GPRS/EDGE/WCDMA)	4.4

*Sprint PCS will spend \$8 per POP to migrate to CDMA2000
Recently, Moody's estimated that cdmaOne carriers could upgrade to
CDMA2000 1X for \$3 to \$5 per POP*

TDMA to CDMA2000: One step evolution to 3G



New off-the-shelf CDMA2000 Terminals

New Equipment with 1X Channel Card

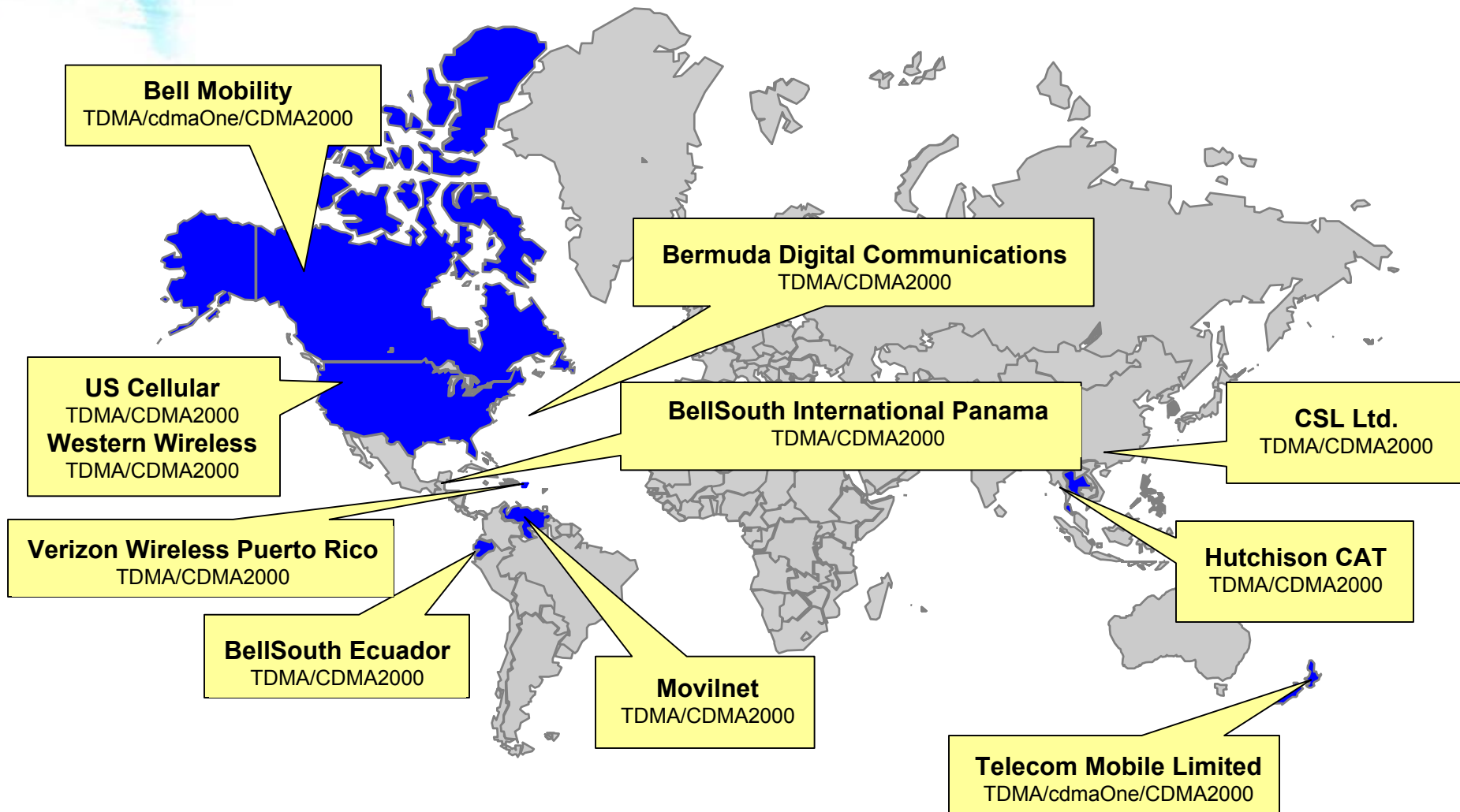
New Equipment

As with AMPS, benefits of this path include:

- Re-use of the core network
- Ability to deploy 3G in-band, without the cost of buying new spectrum
- Ability to deploy 3G in only a small amount of spectrum

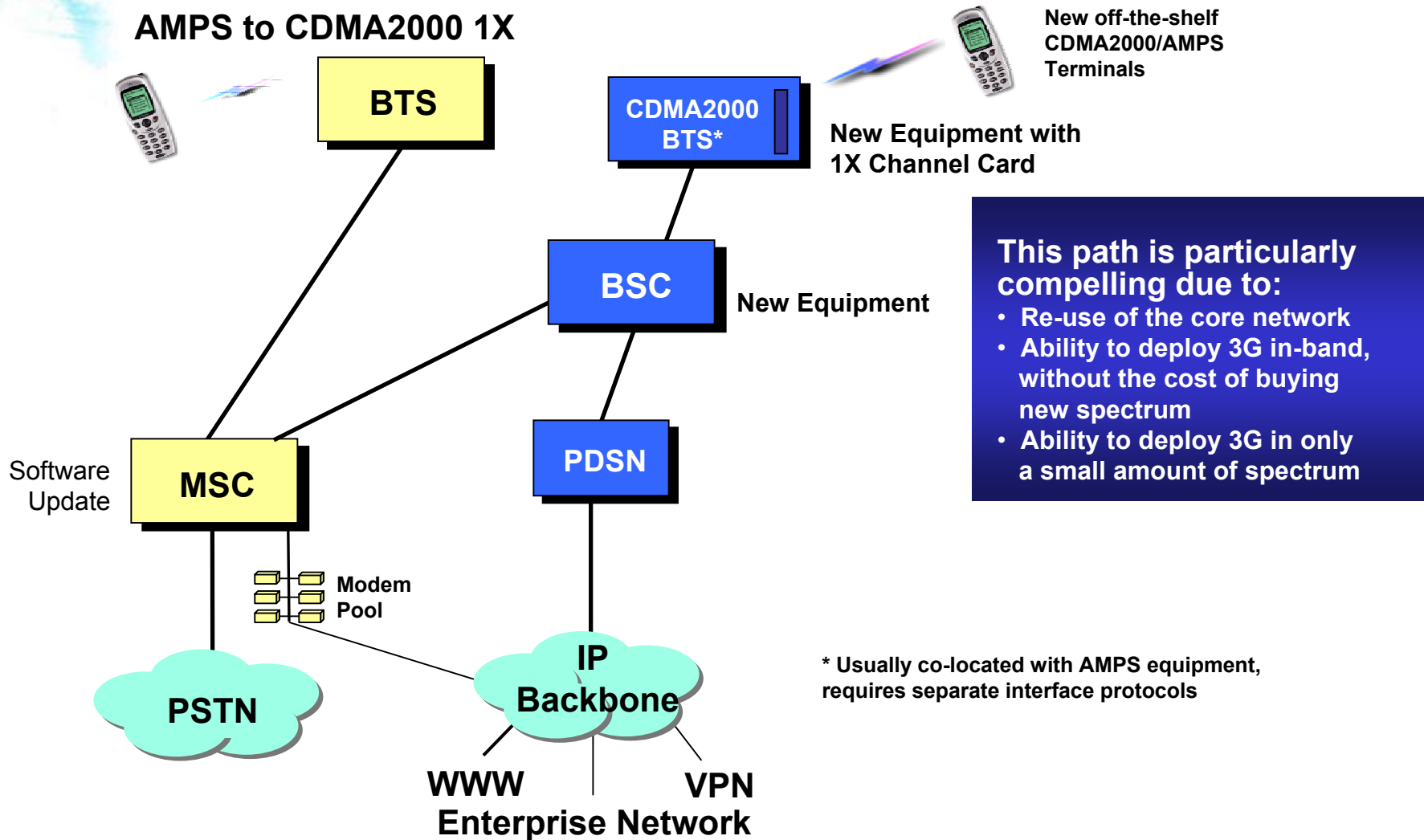
* Usually co-located with TDMA equipment, requires separate interface protocols

A number TDMA operators around the world have deployed or are in the process of upgrading their networks to CDMA2000



AMPS to CDMA2000: One step evolution to 3G

AMPS to CDMA2000 1X

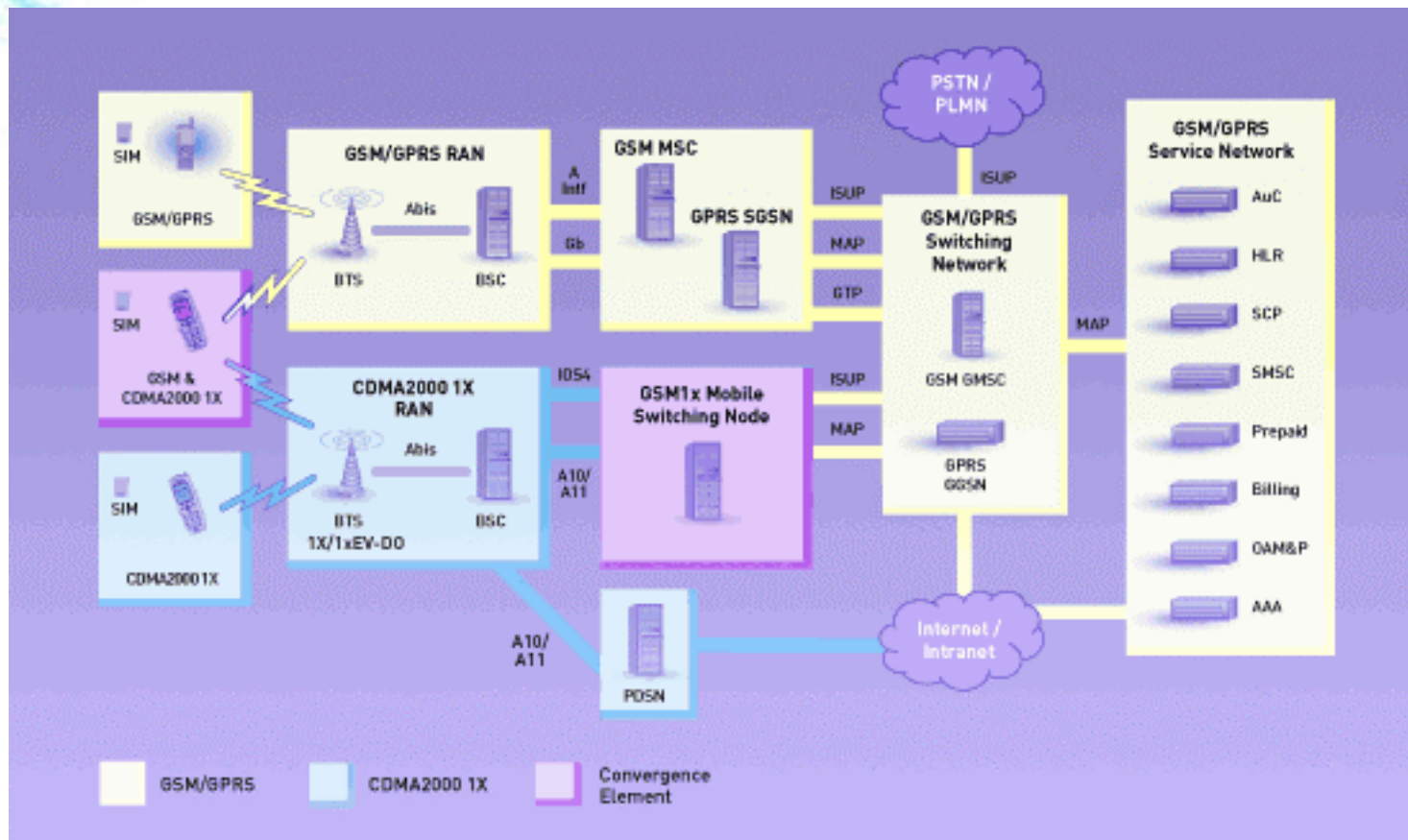


This path is particularly compelling due to:

- Re-use of the core network
- Ability to deploy 3G in-band, without the cost of buying new spectrum
- Ability to deploy 3G in only a small amount of spectrum

* Usually co-located with AMPS equipment, requires separate interface protocols

GSM to CDMA2000: One step evolution to 3G through GSM 1X



CDMA2000 - Operators Perspective



KTF

*“CDMA2000 is designed to build a simple and cost-effective network evolution...the first phase of CDMA2000, known as 1X, is already in commercial operation, **offering double the voice capacity** of second-generation (2G) networks.”*



SEC Filing S1-A 11/28/01 – “Our CDMA network positions us to meet the growing voice and data needs of our customers... Upon full deployment of our 1XRTT network and 1XRTT handsets we expect that this technology **will effectively double our network's voice capacity** compared to the current version of CDMA.”



William Esrey, Chairman – “Essentially, we're spending zero additional dollars to **convert our network to 3G.**”

CDMA2000 – analysts perspective

“The power of the platform is unlike anything the wireless industry has ever seen. The handset is no longer a simple device for voice communications as it is throughout most of the world, but is a multimedia platform in the truest sense of the word.” - **ABN AMRO**

“...only CDMA 1x comes with affordable and attractive handsets and applications, matched with half the capex per pop of W-CDMA.” -
Morgan Stanley