



CDMA Evolution to CDMA2000

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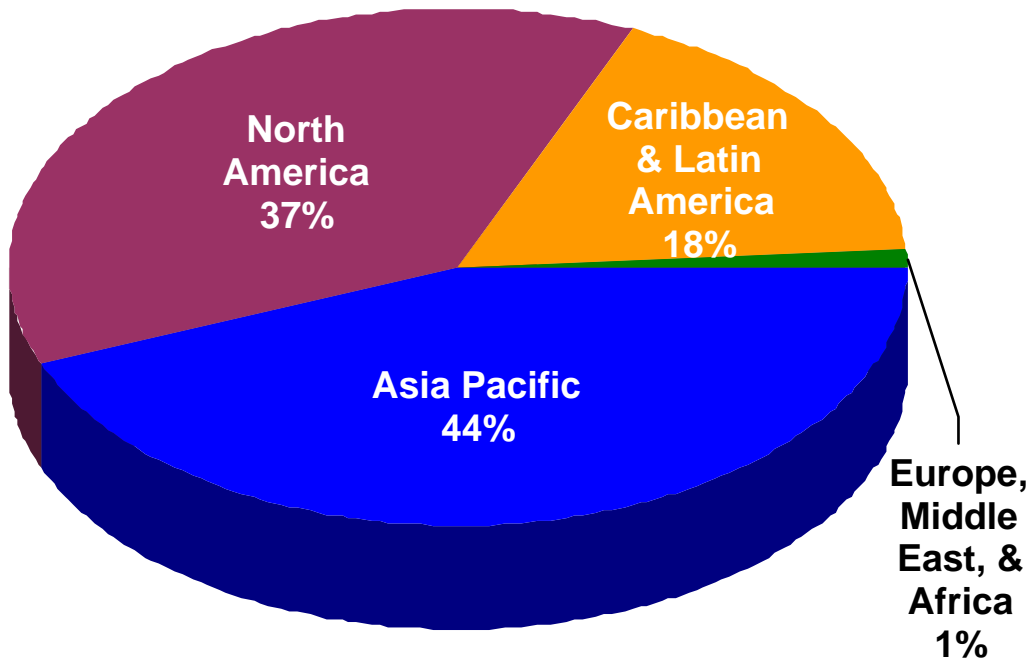
September, 2001



QUALCOMM
MSM5500
San Diego, CA
USA

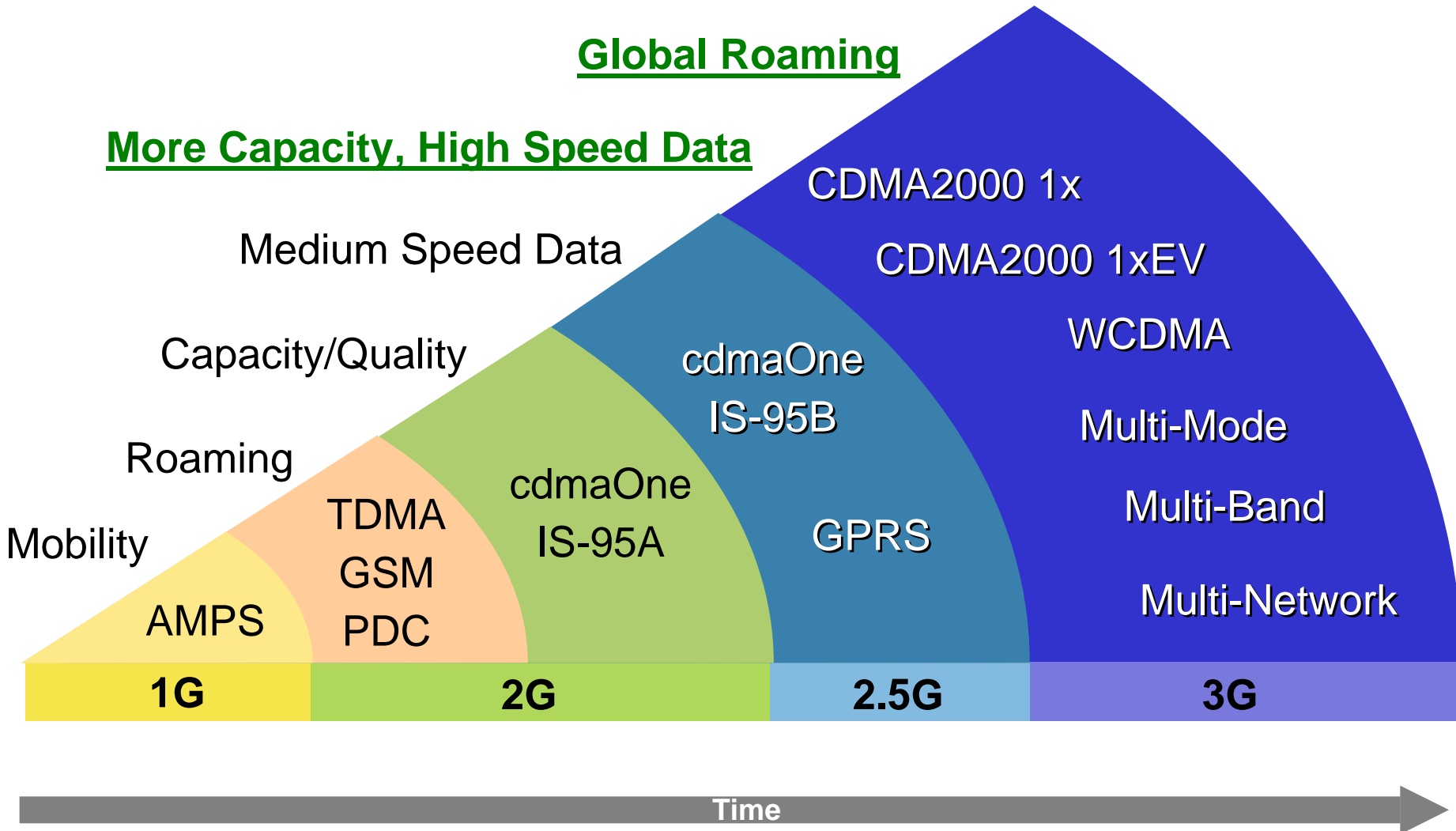
CDMA Subscriber Statistics:

**Nearly 1 Million 3G CDMA2000 1x Subscribers
- Initial Launch End of 2000**



**Over 100 Million CDMA
Subscribers Worldwide**

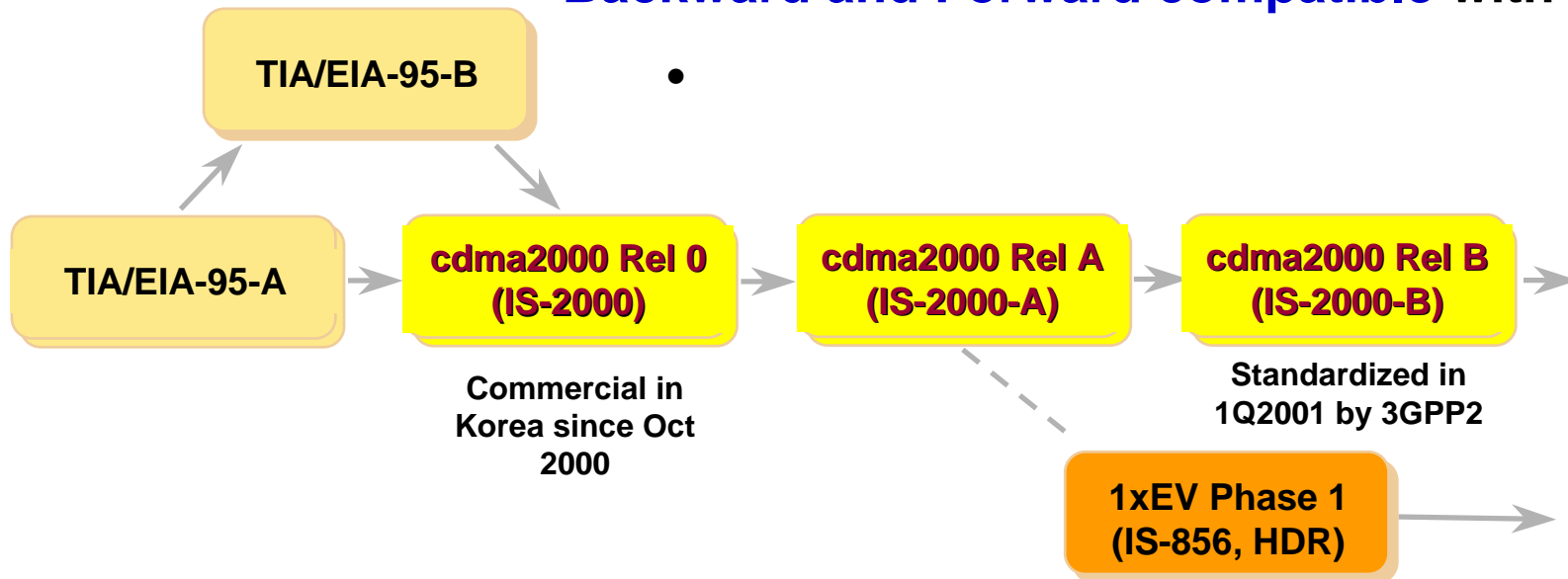
Key Drivers for Wireless Market



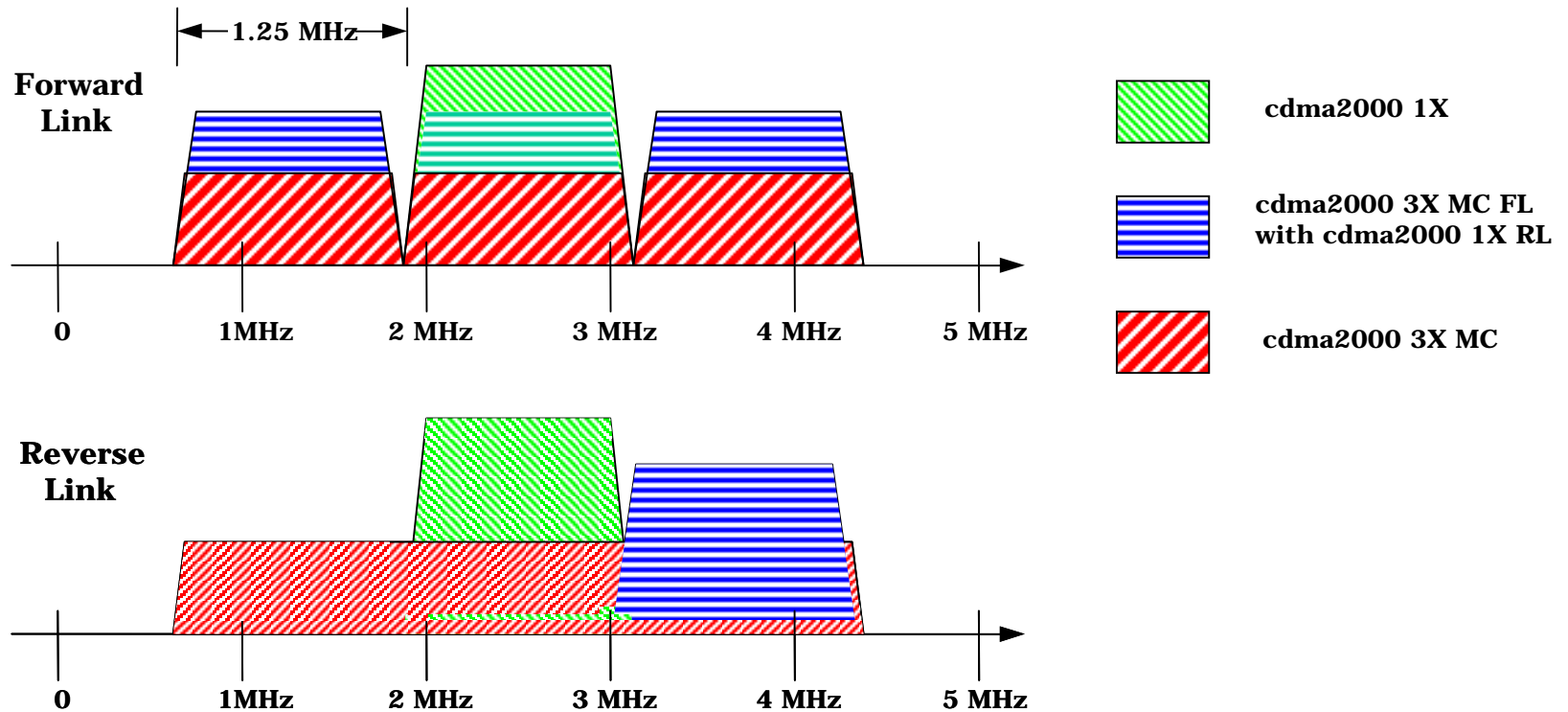
3G 1x Standard

The First
3G Technology -
Available Today!

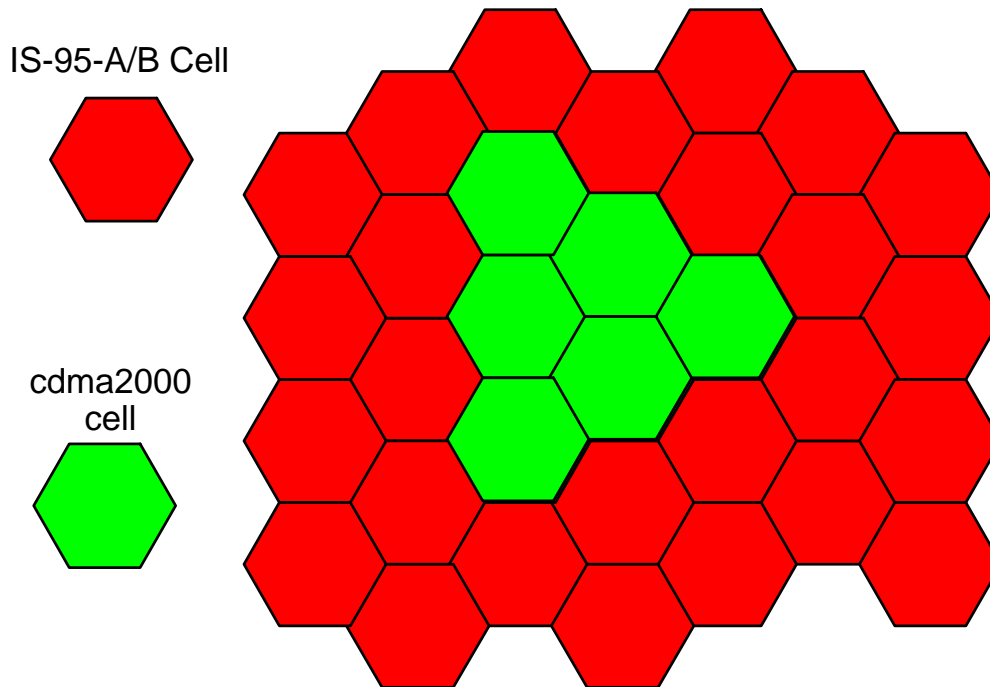
- 1x is the *first IMT-2000 standard* that offers high-speed Always-On wireless data at *307 kbps* peak data rate *today*
- **Doubles the capacity** of IS-95 systems for voice services. Achieved through FFPC, lower code rates, and a coherent reverse link
- Offers **50% longer stand-by times**
 - Supported by the Quick Paging Channel
- **Backward and Forward compatible** with IS-95A/B



cdma2000 Multi-Carrier Extensions



cdma2000 Deployments



- **Mix 3G CDMA cells with IS-95-A/B cells**
 - Support higher data rates
 - Support enhanced capacity
- **cdma2000 MC 1X and 3X cells can support IS-95-A/B mobile stations on the same frequency**
- **Can deploy cdma2000 MC 1X and MC 3X cells on the same or different frequency as IS-95-A/B cells**
- **Can deploy cdma2000 MC 1X and then migrate to cdma2000 MC 3x**

What is 1xHDR?

The Next
Enabling
Technology for
Growth



HDR: the Internet Unleashed

1xHDR is a *high-performance* and *cost-effective* Internet access solution

Capable of up to *2.4 Mbps peak data rate* on a 1x (1.25 MHz bandwidth) carrier

Separate 1xHDR carrier *optimized for Packet Data*

Complements 1xMC carrier optimized for Voice

Replaces fixed (DSL, Cable) Internet access... *with mobility*

*Next Generation
Performance
Today!*

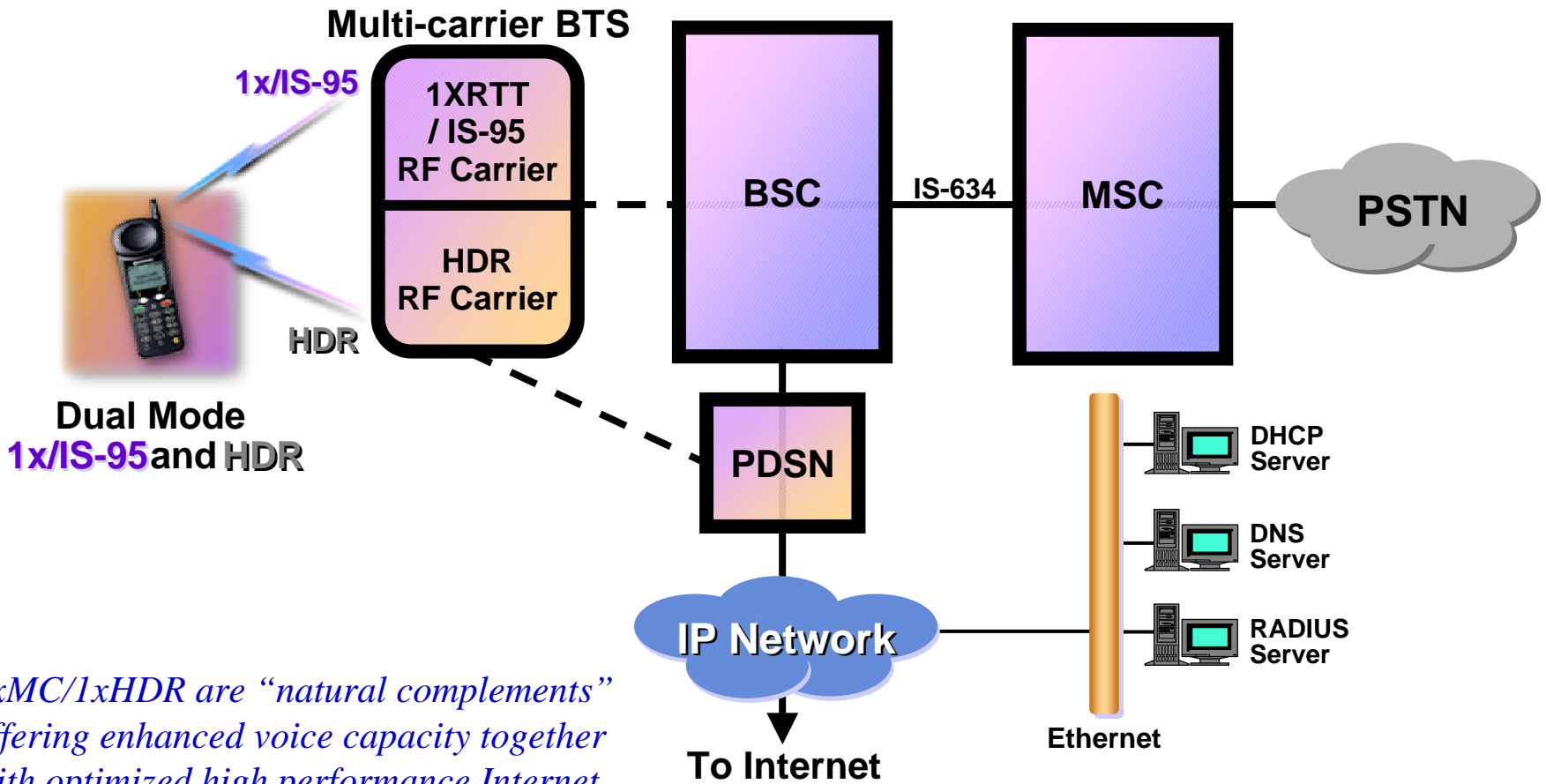


HDR Air Link

- ***Spectrally efficient*** air link provides 2.4 Mbps forward peak throughput per sector with a ***standard*** CDMA 1.25 MHz frequency carrier
- Asymmetric forward and reverse links
 - Forward link: **670-750 kbps/sector average throughput 1.2 Mbps/sector (dual receive antennas)**
 - Reverse link: **220 kbps/sector average throughput**
- Identical RF characteristics as IS-95/1xMC
 - Same chip rate, link budget, and coverage area
 - HDR carrier looks like an IS-95/1xMC carrier to the rest of the network



IS-95/1xMC and 1xHDR Complementary Services



1xMC/1xHDR are “natural complements” offering enhanced voice capacity together with optimized high performance Internet access

Wireless Internet



Wired Internet

+

Mobility

+

Location Sensitivity

+

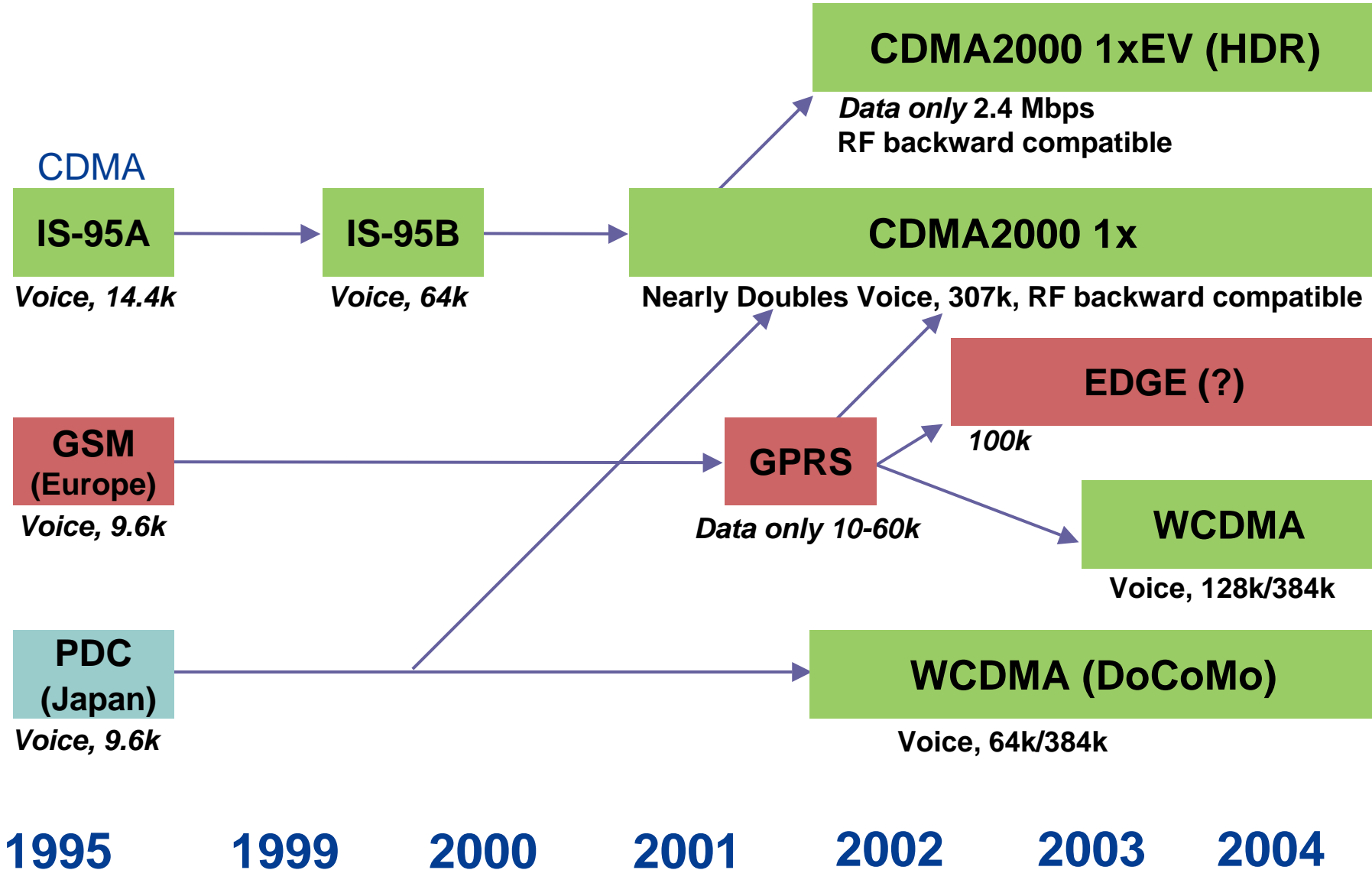
Time Sensitivity

+

Always On,
Always With You



Global Evolution to 3G CDMA



Development Process for Any New Wireless System

0. Build and test several cell prototype system (optional)

WCDMA → 1. Set a firm specification for system and handsets

- Significant effort even after first formal standard is set
- Performance testing and standard releases

2. Optimize system and handset performance

- Interoperability test with each system, multi-mode, multi-band

CDMA2000 1xEV → - Final chips and software

- Early commercial launch
- Full deployment

CDMA2000 1x →

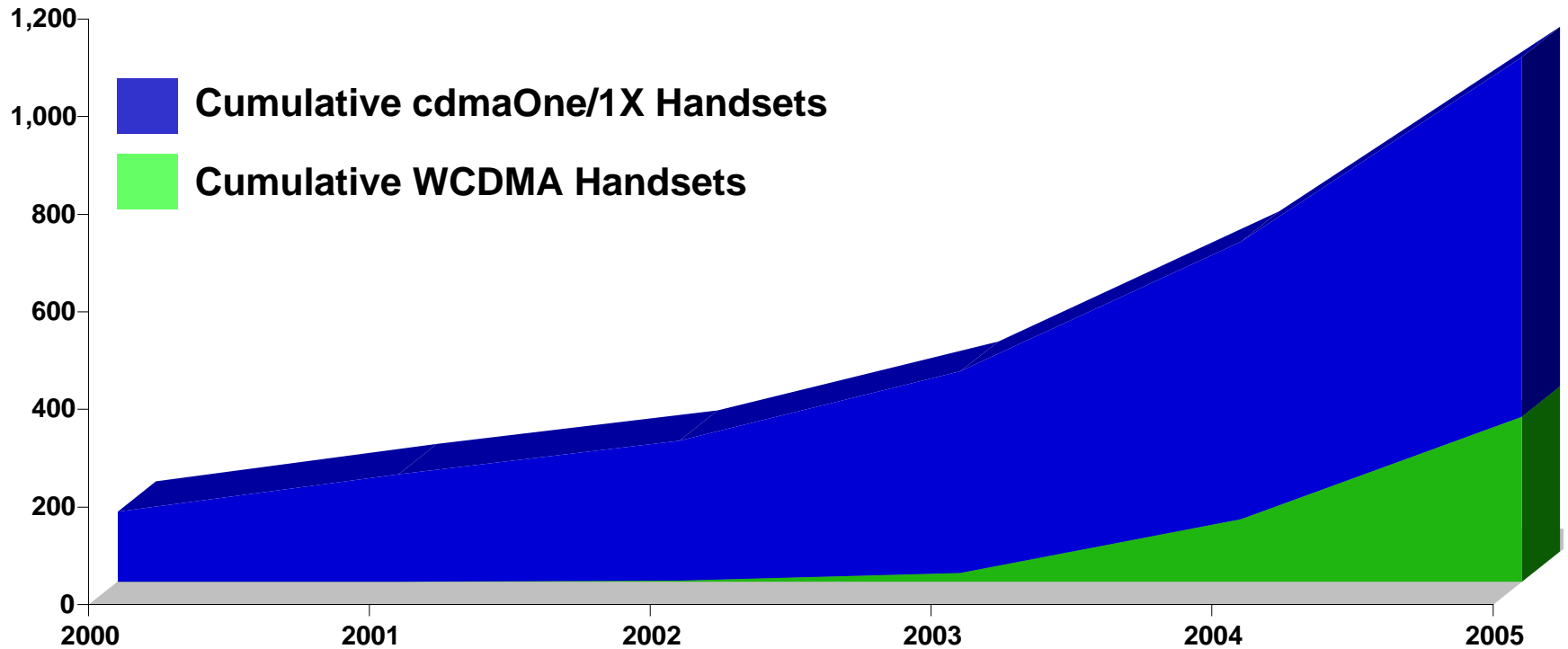
IS-95A/B → 3. Adding rich feature sets for multimedia, etc.

- Ramp volume, decrease cost

CDMA2000 Has Volume Advantages

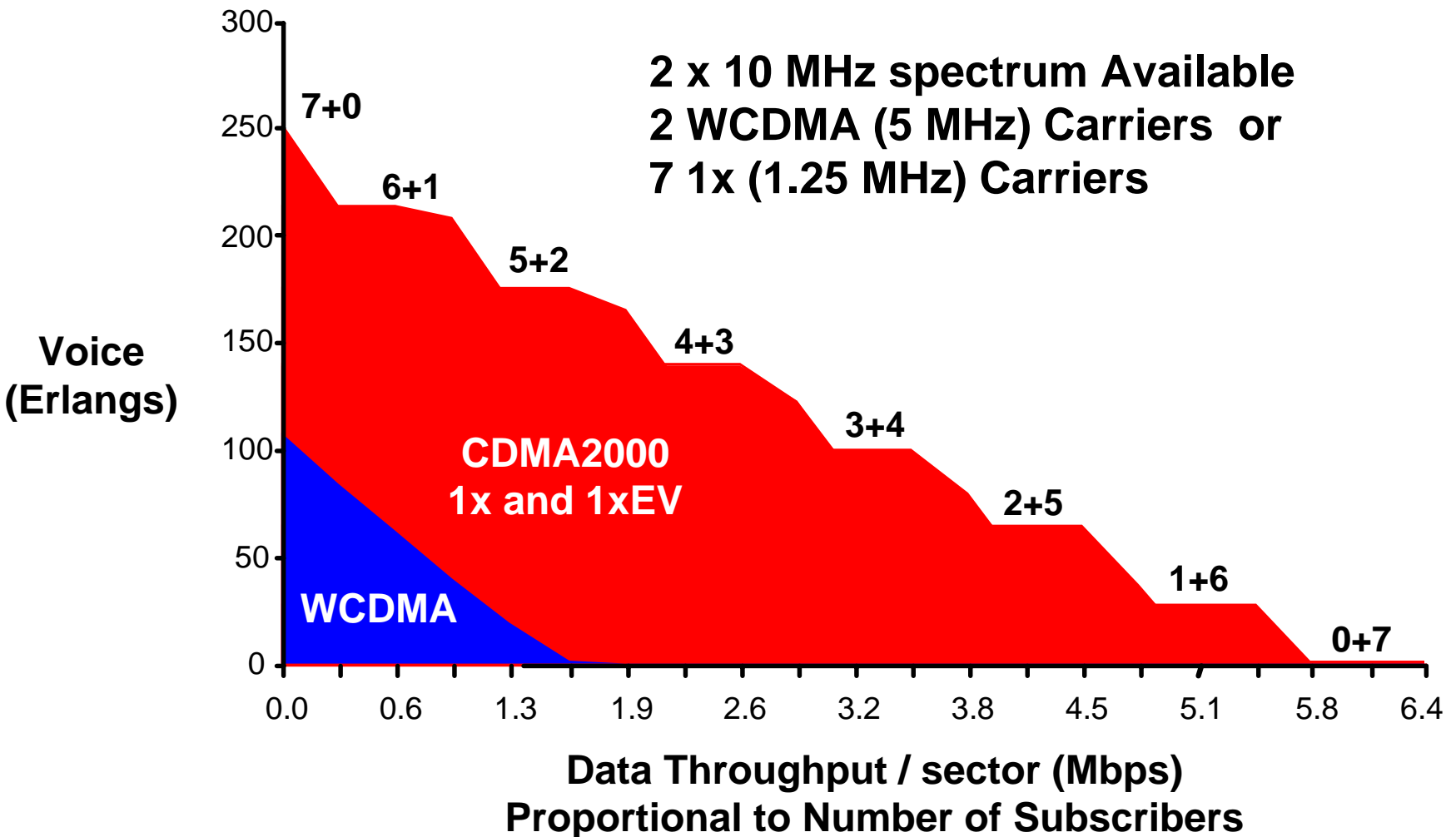
**Full cdmaOne Replacement
vs.
Partial WCDMA Adoption**

(Millions of Units)



Source: EMC August, 2001

Operators Have Choices to Support Voice & Data:



Download Times for a 3-minute MP3 Song



<i>Air Interface</i>	<i>Data Rate</i>	<i>Download Time</i>
GSM	9.6 kbps	41 minutes
IS-95A CDMA	14.4 kbps	28 minutes
GPRS	45.0 kbps	9 minutes
IS-95B CDMA	64.0 kbps	6 minutes
CDMA2000 1X	307.0 kbps*	78 seconds – 1.25 MHz
WCDMA	2.0 Mbps	12 seconds – 5 MHz
CDMA2000 1xEV	2.4 Mbps	10 seconds – 1.25 MHz

Note: ~ 3 Mbytes size

* Peak data rate for first commercial release of 1X terminals will be 153.8 kbps

CDMA is Better Positioned Than Any Other Mobile Cellular Technology To Deliver Low Cost Bits

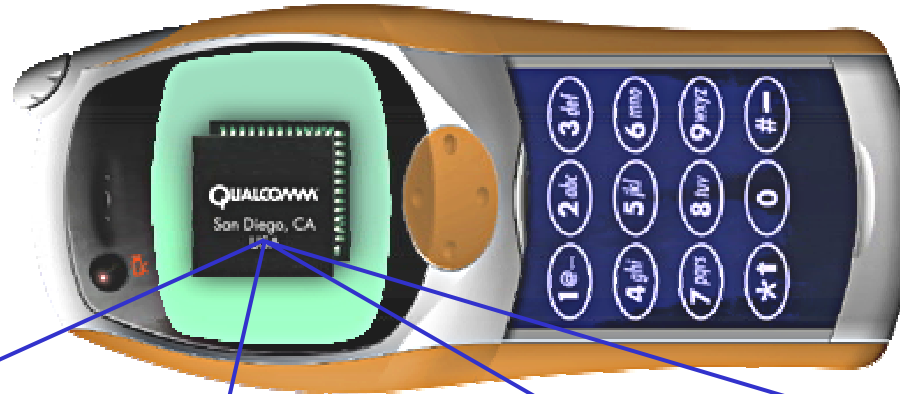
<u>Technology</u>	<u>Network Cost per Mbyte**</u>	<u>Network Cost per Month (200 Mbyte data)</u>
GPRS	\$.42	\$83
WCDMA	\$.07	\$14
CDMA2000 1x	\$.06	\$12
CDMA2000 1xEV	\$.02	\$4

**Note: i-Mode revenues \$23.44 per Mbyte;
\$.003 i-Mode packet (128Bytes)**

GPRS max 20 kpbs, rate achieved per time slot
Assumes capacity vs. coverage conditions

**15% traffic volumes at busy hour

Internet Launchpad™ Adds Built-in Services



Multimedia

- Qtunes™
 - MP3, MPEG-AAC
- QTV™
 - MPEG-4
- Qsynth™
 - 128-sound/MIDI support
- MIDI player
 - 16-voice polyphony
- Still image (PNG, JPEG...)
- CMX™ (Compact Media Extension)
 - Text/animation
- IP voice chat

User Interface

- Color screen
- Voice recognition
 - SD and SI voice
 - Digit dialing
- SIM/UIM card interface
- PureVoice Recorder™
 - Voice memo
 - Answering machine
- PureVoice Audio AGC™
- CMOS/CCD image sensor

Connectivity

- USB
- Bluetooth
- JAVA engine
- Security Software (SSL)
- PureVoice Mail™
 - Attachments
- IP protocol stack
- WAP interface

Positioning

- SnapTrack/gpsOne™
 - Hybrid wireless digital compass

Storage

- MMC
- SD-Card

CDMA Terminals Today Compare to Desktop PCs in the 1990s

Intel 80486 based Desktop Computer

Date:	1992
Processor:	486
Speed:	33 - 66 MHz
RAM/Flash:	8 MB
Drive/Storage:	80 - 300 MB



Sony C404S cdmaOne Phone

Date:	2001
Processor:	ARM7
Speed:	50 - 110 MHz*
RAM/Flash:	8 - 16 MB
Drive/Storage:	32 - 128 MB

* Based on ARM7 specifications

Plus Connectivity, Multimedia and Authentication

New Devices Improve the User Experience



**Samsung
SCH-X200**



**Kyocera QCP-6035
Smartphone**



**Sony C404S
(Japan)**

Easy Migration from cdmaOne to 3G cdma2000

cdmaOne Handsets



Pin Compatibility:



3G Handsets



Over 45 manufacturers



IS-95A to 1x



IS-95A/B to 1x



IS-95A/B to 1x



1x to 1xEV



First commercial
cdma2000 1x
handsets
available now

RF Compatibility:
No changes required for
RF Front-end

CDMA2000 1X Handsets Available Now

Over 40 Customers Have Commercial Agreements & Growing...

More Than 12 Handset Models Capable of Supporting Up To 144 kbps Have Been Produced Since October 2000...

SK Telech
SKY IM-3100



LG
Cyber X-1



Samsung
SCH-X100



Samsung
SCH-X110



Samsung
SCH-X120



Samsung
SCH-X200



Samsung
SPH-X1000



Motorola
V671C



Samsung
SCH-X2000



Samsung
SCH-X130



SK Telech
IM-2300



SK Telech
IM-2400



Number of Exciting CDMA2000 1x Terminals Are Entering the Market*

Video Phone



Web PDA



Navigator



Web Phone



Handset + PDA





PCMCIA Card




* SK Telecom presentation to 2000 CDMA Americas Congress, San Diego, CA, USA

3G Multi-mode Chips

Q1 CY00
*Q3 CY00

CDMA2000 1x (entry level)
cdmaOne
AMPS

Q1 CY01
*Q2 CY01

CDMA2000 1x (high end)
cdmaOne
AMPS

Q4 CY00
*Q1 CY01

CDMA2000 1x (low cost)
cdmaOne
AMPS

Q3 CY01

WCDMA

Q2 CY01

CDMA2000 1x/ 1xEV
cdmaOne
AMPS

Q1 CY02
*Q2 CY02

CDMA2000 1x (entry level)
cdmaOne

1H CY02

CDMA2000 1x (low cost)
cdmaOne

2H CY02


CDMA2000 1x (high end)
cdmaOne

1H CY02

CDMA2000 1x
cdmaOne
GSM/GPRS

1H CY02

WCDMA
GSM/GPRS

CY03

CDMA2000 1x/ 1xEV
cdmaOne
GSM/GPRS

CY03

WCDMA
CDMA2000 1x
cdmaOne
GSM/GPRS

**Solves
Global
Roaming!**

Sampling Date

*Production Date

Chips are not drawn to scale

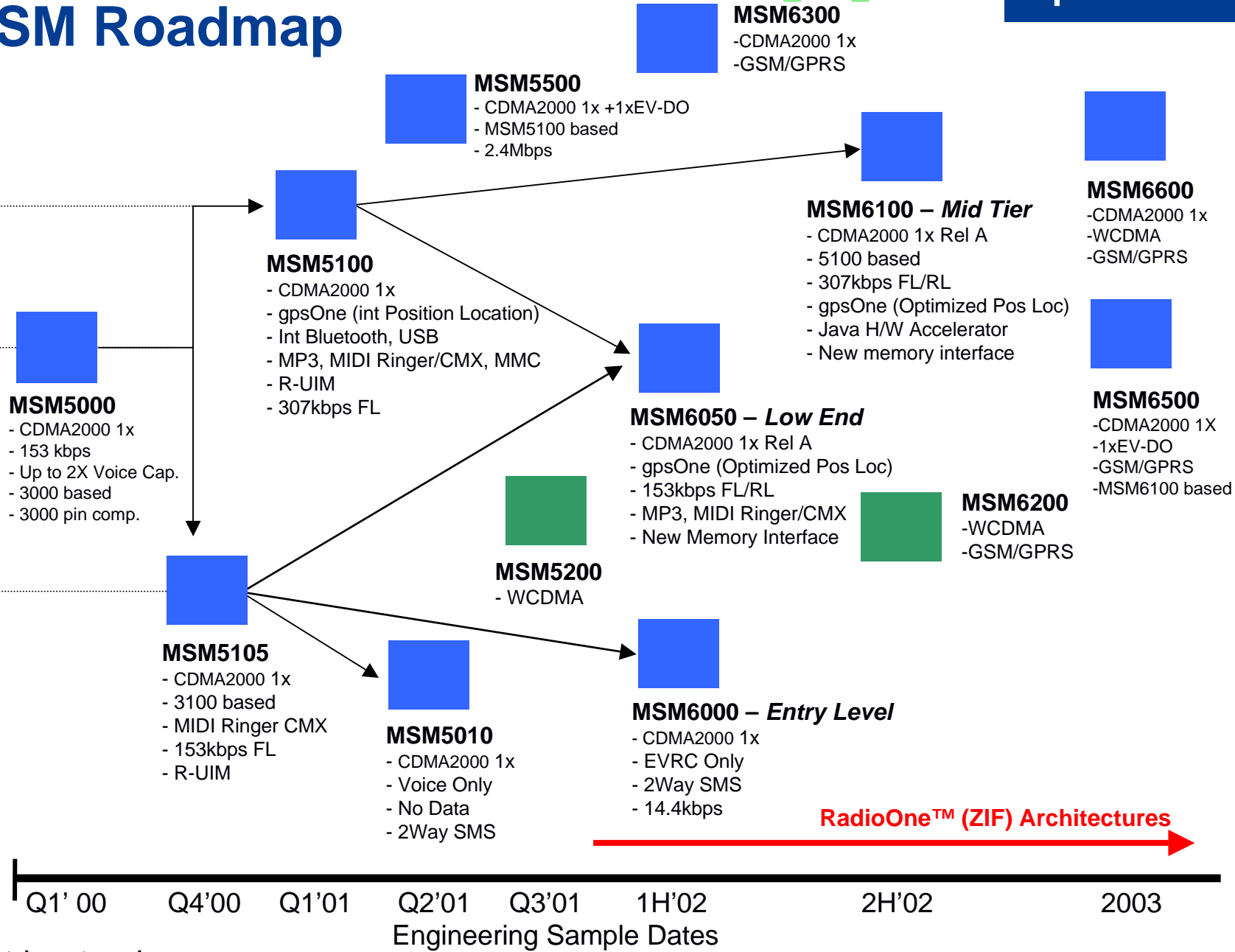
MSM Roadmap

ITU-T_Rio_06.09.01

QUALCOMM
MSM3300
San Diego, CA
USA

QUALCOMM
MSM3000
San Diego, CA
USA

QUALCOMM
MSM3100
San Diego, CA
USA



*Chips are not drawn to scale

CSM Roadmap

- Highest Integration of Channels Per Chip
- Lowest Power Consumption
- Smallest Footprint Base Stations
- Only End-to-End Solution for Wireless



Multi-chip solution

- CSM Modulation
- CSM Demod
- Viterbi Decoder



CSM 1.0

- IS-95 A/B
- Integrated Solution
- Adds 14.4 kbps
- Improved Rcvr



CSM 1.5

- Size, Cost & Power Reduction



CSM2000

- IS-95 A/B
- 8 Channels



CSM5500

- CDMA2000 1x EV
- 2.4 Mbps



CSM5000

- CDMA2000 1x
- IS-95 A/B
- 307.2 kbps
- 32 Channels



CSM5200

- WCDMA
- 16 Channels
- 384+ kbps

1991

1994

1997

1998

Q1 '00

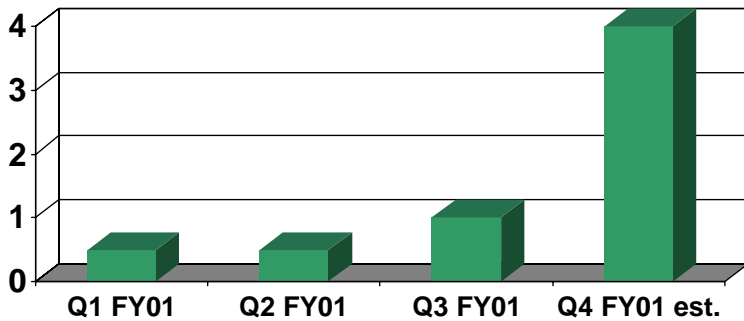
Q2 '01

Q4 '01

*Chips are not drawn to scale

CDMA2000 1x 3G - Staying Well Ahead of the Competition

CDMA2000 1x Chip Shipments (Millions)



5000 Series Shipping Now

**MSM 5000
MSM 5105**

Up to 153 kbps

Production volumes

MSM 5100

Up to 307 kbps

**On time sampling
Q2 CY'01**

Full Multimedia

MSM 5500

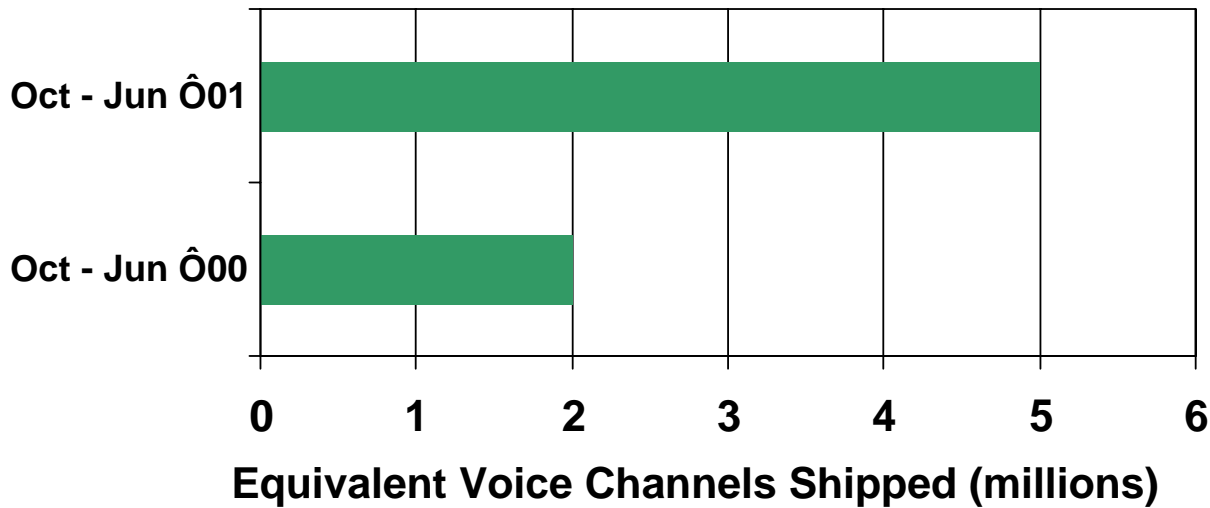
Up to 2.4 Mbps

**On time sampling
Q2 CY'01**

Data Optimized

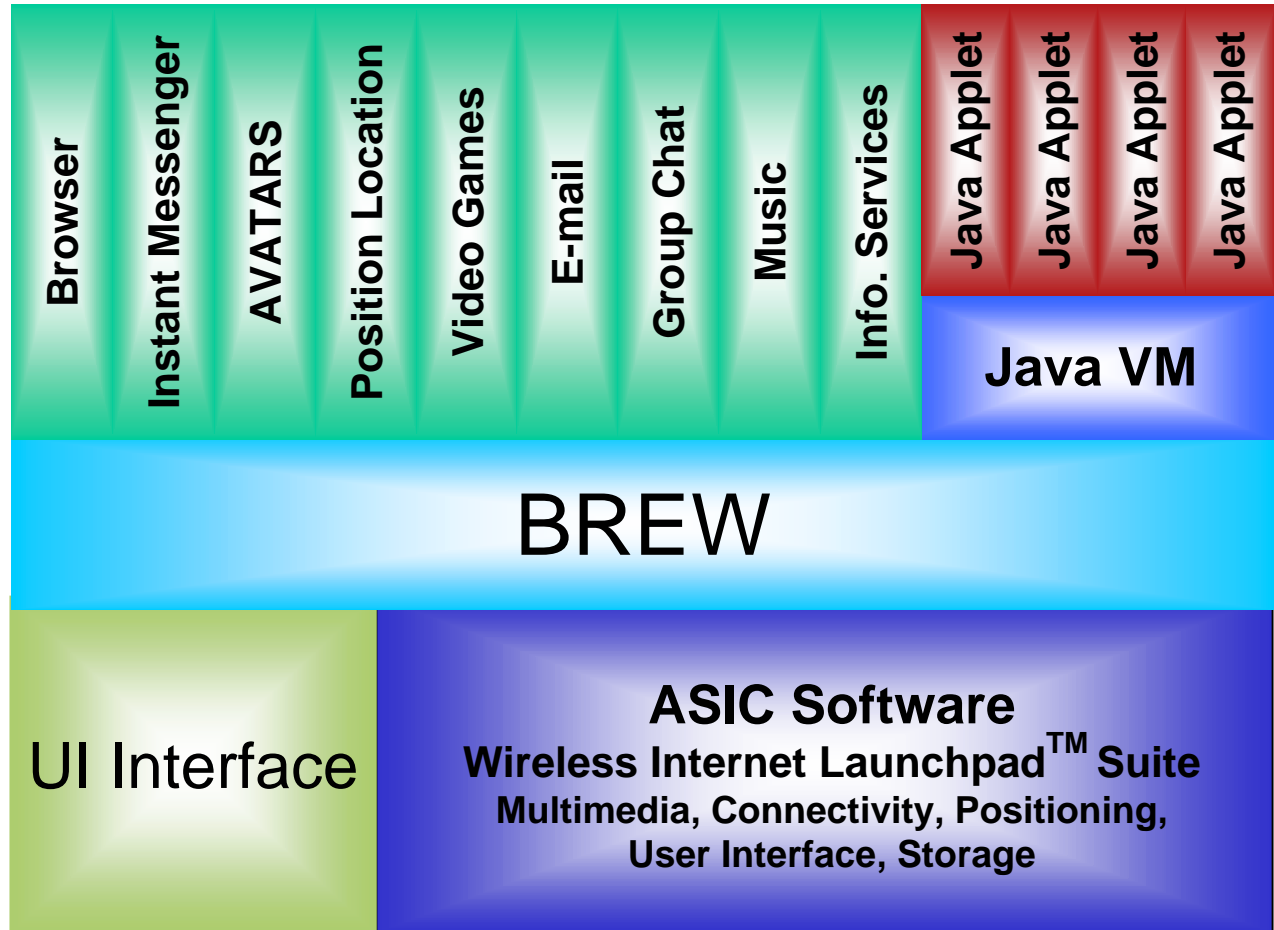
CSM - Base Station Volumes Increasing

On-time Sampling of 1xEV CSM 5500 Up to 2.4 kbps



CSM Shipments Include	CSM 1.5	} IS-95 A/B
	CSM 2000	
	CSM 5000	3G CDMA2000 1x

BREW Enables Access to Devices for Wireless Applications and Content



A Wide Variety of Applications. . .

Mobile Text Communications

- Enhanced email
- Enhanced instant messaging



Position Location Services

- Navigation assistance
- Friend finder
- Emergency services



Entertainment

- Downloadable & streaming music
- Internet radio
- Streaming video
- Info. services
- e-Books



Mobile Chat

- Group conferencing/voice chat
- Video conferencing

Avatars

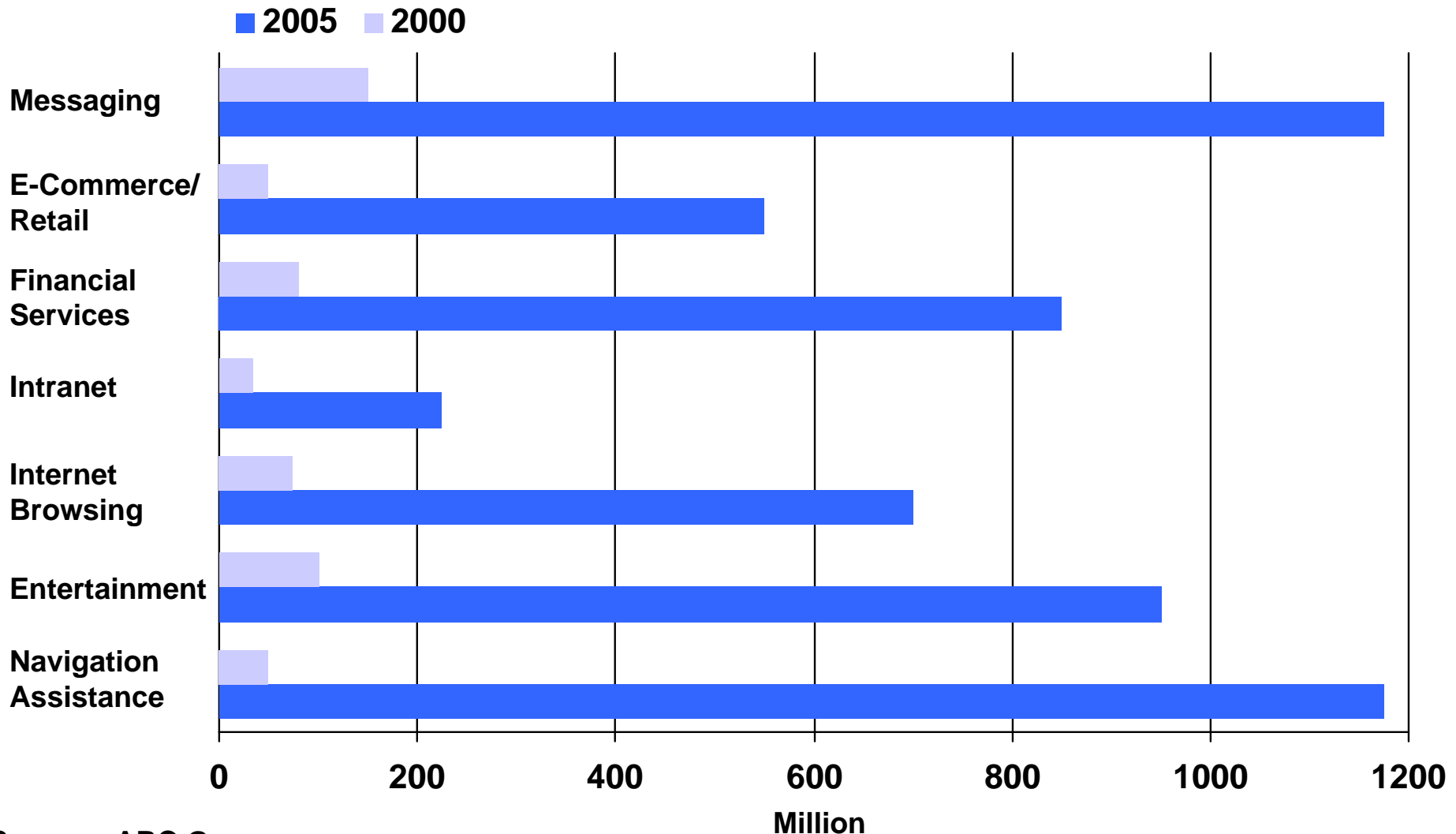
- Personalized agents

Games

- Off- and on-line
- Multiple-player
- 3D motion, video, music



Mobile Application Users



BREW Partners



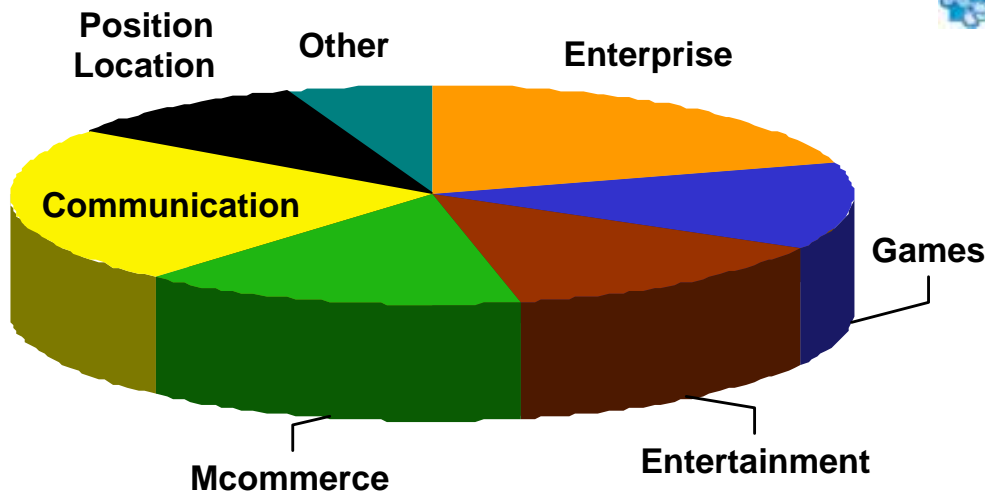
China Unicom



Target Market:
69,625,500 Subscribers

	January	March	April	August
Carriers	5	5	6	12
OEMs	2	6	10	12

More Than 3,300 Developers Signed Up For BREW



Developer Alliance Program Site Launched Aug, 2001

CDMA in China

•China Unicom Roaming Agreements

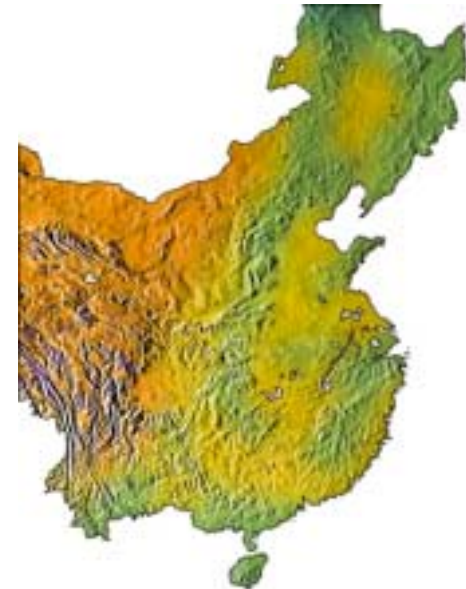
- Bell Mobility (Canada)
- Sprint PCS (US)
- Lusacell (Mexico)
- Hutchison (So. Korea)
- KT Freetel (So. Korea)
- KDDI (Japan)
- SK Telecom (So. Korea)
- Telstra (Australia)
- NZ Telecom (New Zealand)

**Network Capacity for
Over 15 Million
Customers by Early 2002**

- CDMA Development Center - China's Silicon Valley
- ZTE Becomes First CDMA subscriber licensee
- Great Dragon enters into CDMA infrastructure license

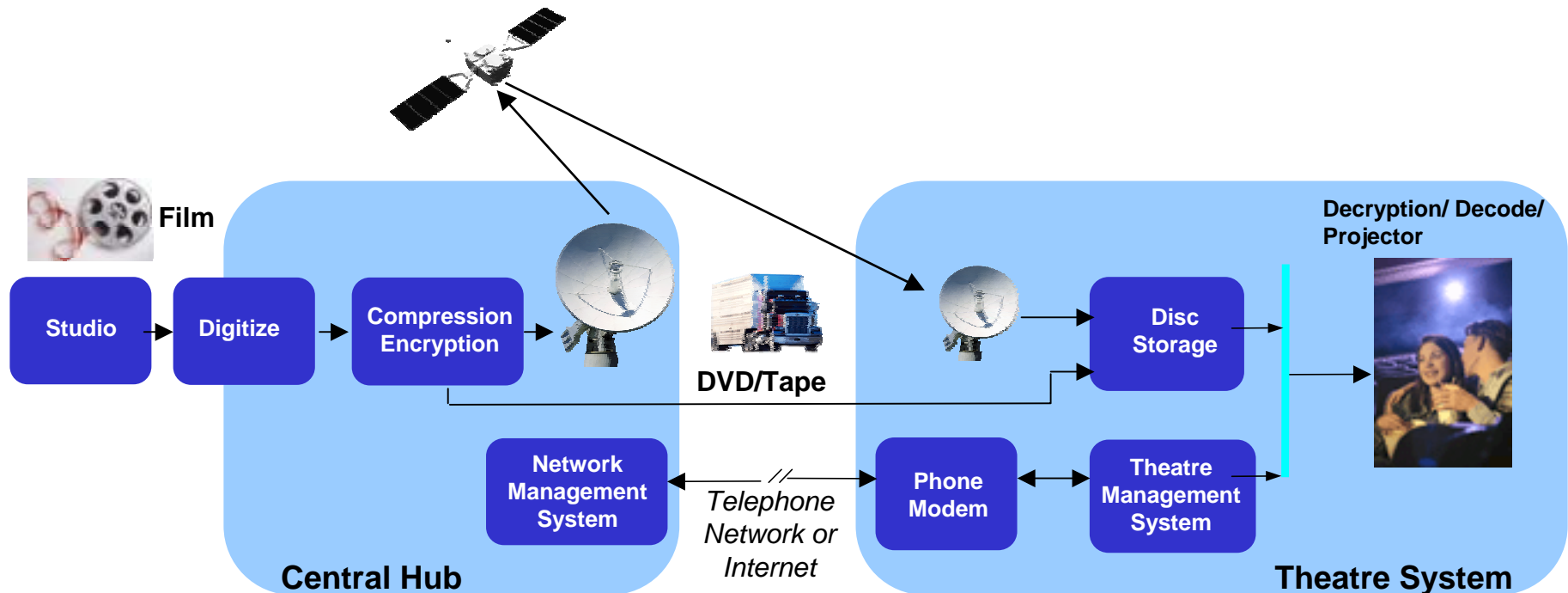
300 Major Cities

Lucent	4.6
MOT	3.6
ERIC	3.0
Nortel	2.0
Samsung	1.0
ZTE	0.9
Total	15.1 Lines



Digital Cinema

- Transforming the cinematic experience with digital technology
- World's first end-to-end solution for processing and delivering digitized motion pictures and other programming to theatres
- Through a joint venture with Technicolor, QDM's Digital Cinema meets the needs and economies of cinema distribution worldwide



CDMA Evolution to CDMA2000

Thank You

Severino Camilo,
Sr. Manager of Development Business

September, 2001



QUALCOMM
MSM5500
San Diego, CA
USA

