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# Convergence: Commercial Deployment of Wireless Systems

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*Overview*

- **Convergence**
  - Definition/Dimensions
  - Approaches
- **Next Generation Wireless Systems**
  - Wireless Technology Evolution
  - Voice Capacity Comparison
  - Data Throughput Comparison
  - Key Benefits
- **Deployment Status**
- **Guidelines and Principles Related to Convergence**

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*“Convergence involves the ongoing coming together of a number of technologies previously considered separate. There is a need to consider changes in management and regulation associated with this integration of telecommunications, information technology (using computer/internet) and broadcasting. The technology enabled, hybrid applications which are a product of the proliferation of the combined technologies, appear to users through fixed or mobile access, offering voice, data, image pictures, on-line and interactive services simultaneously - as multimedia services.”*

**APEC TEL 19, March 1999**

*Dimensions of Convergence*

- **There are several dimensions of convergence:**
  - **Technologies**
    - Audio, Video, Text, etc.
  - **Services**
    - Fixed + Mobile + Data + Broadcast + Interactive
  - **User Perceptions**
    - Service providers
    - Applications moving to quality of access
  - **Firms**
    - CATV ⇒ Cable modem + Voice
    - POTS ⇒ DSL + Multimedia
  - **Device Level**
    - One device can support voice, data, TV/broadcast services

### *Convergence Approaches*

#### **Convergence can be discussed in various contexts:**

- **Technology**
  - Evolving technologies (e.g., CDMA One → 1x → EVDO → ?)
- **Government**
  - Appropriate regulatory framework
- **Corporate**
  - Positioning

### *Convergence Approaches: Wireless Technology*

#### **Providing Another Delivery Medium for Voice and Broadband Access**

- **Developments in wireless technologies are offering another platform for delivery of voice and data services**
- **Advancements will continue to introduce the delivery of multimedia services to consumers**

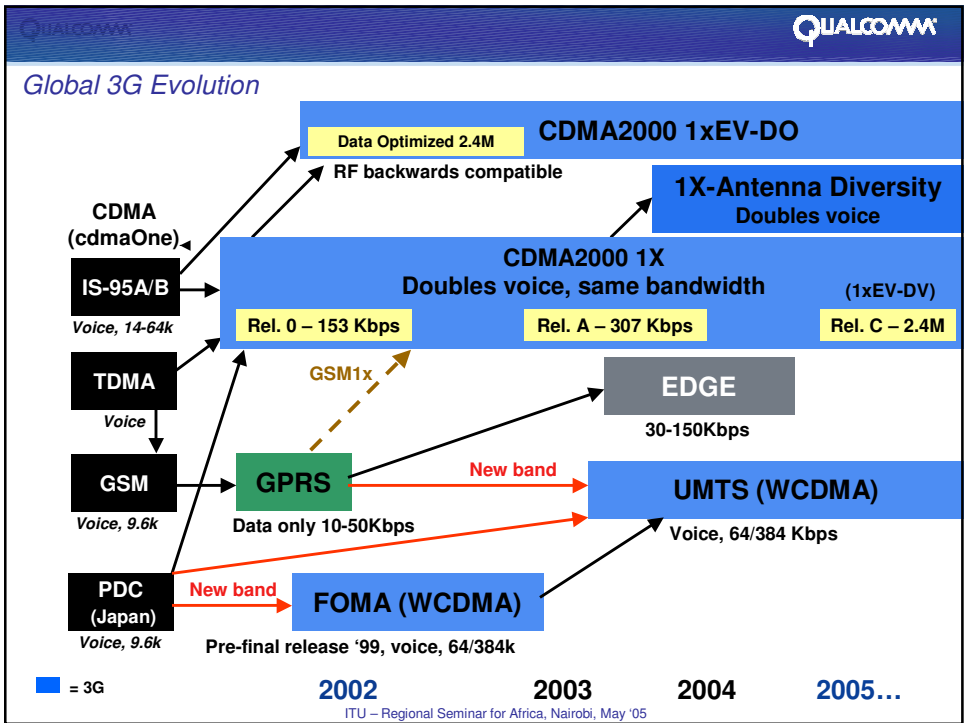
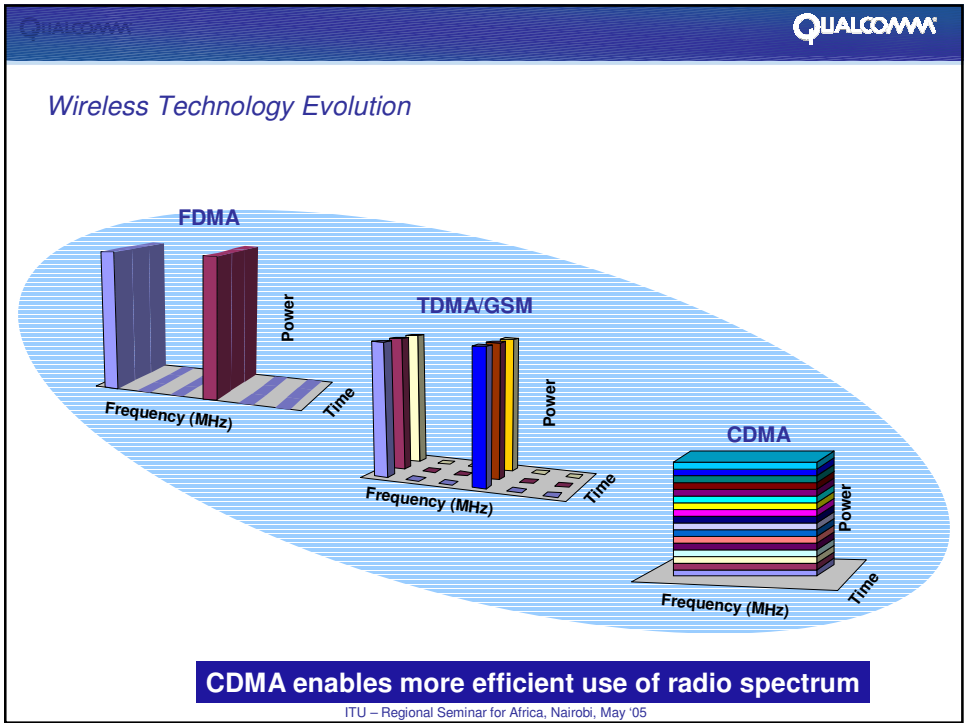
*Convergence Approaches:  
Governments*

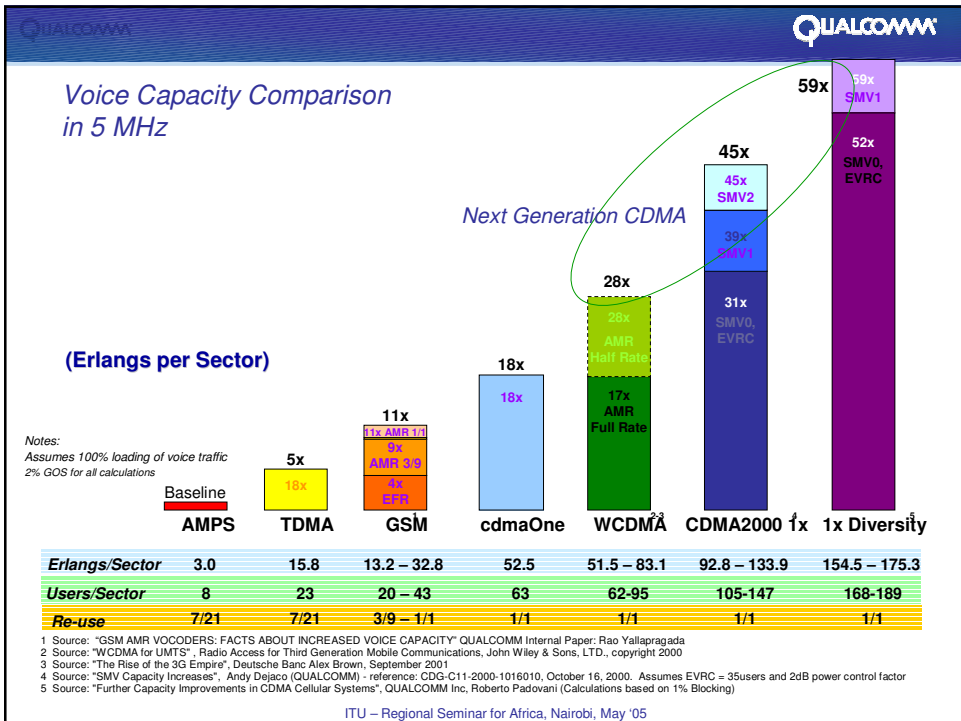
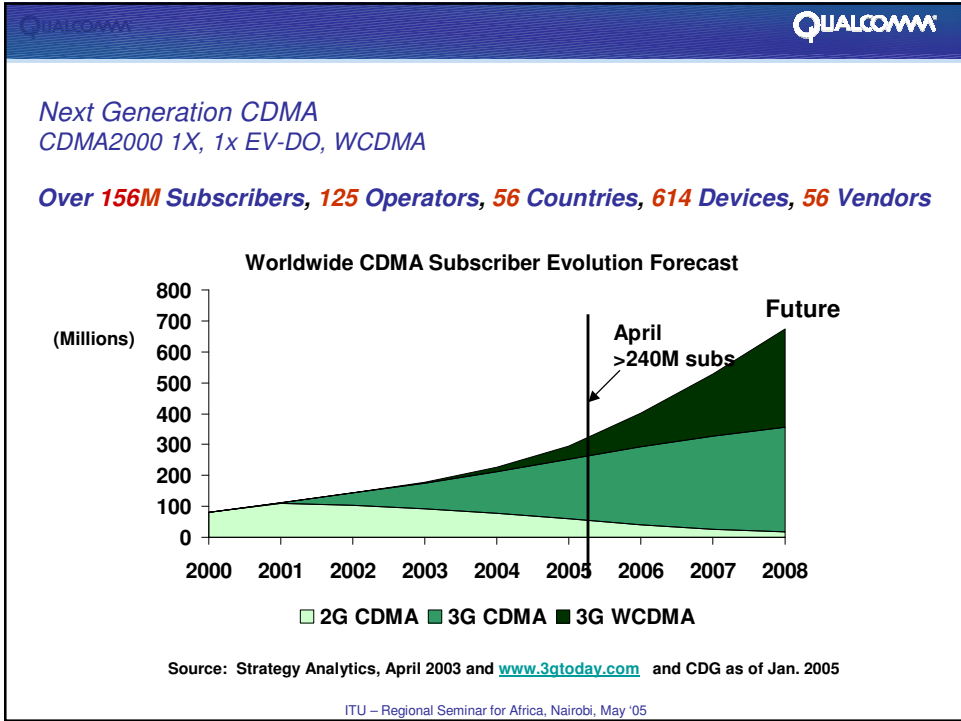
- **Regulatory institutions are being created/reformed**
- **Licensing approaches are being reformed (e.g., Unified License in India)**
- **Technology neutrality**
- **Spectrum flexibility**
- **Secondary trading**

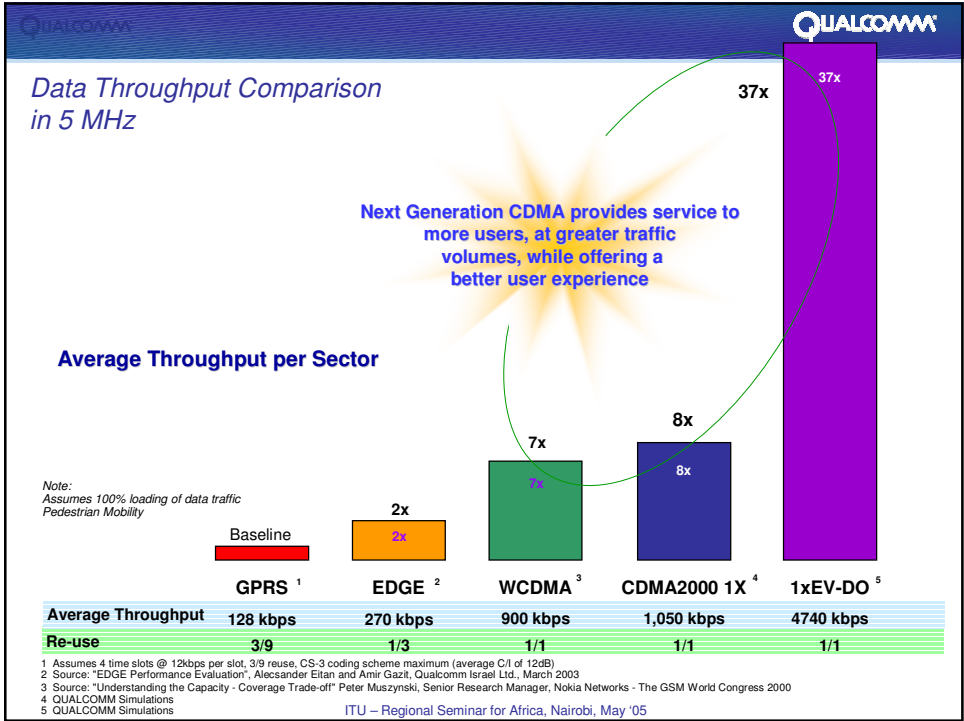
*Convergence Approaches:  
Corporations*

**Convergence is impacting how corporations do business**

- **Businesses are changing – for example:**
  - Deutsche Telekom announced that it would abandon strict separation of four main business units to better react to evolving technologies and changes in the market
  - Verizon Wireless' revenue now accounts for 41 percent of Verizon's total revenue. Total wireless revenue has increased by more than 10%, year-over-year, for 11 consecutive quarters, with growth in the last five quarters in the 20% growth range.







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## How Fast is Wireless?

Approximate transfer times for a 3 minute MP3 song file

Download Time

Air Interface	Data Rate	In Seconds
GSM	9.6 kbps	2466 (41 minutes) ouch!
IS-95A CDMA	14.4 kbps	1852 (31 minutes)
GPRS	45 kbps	526 (8.8 minutes)
IS-95B CDMA	64 kbps	364 (6 minutes)
CDMA2000 1x	307 kbps*	87 (1.5 minutes) with 1.25 MHz
WCDMA	384 kbps**	61 (1 minute) with 5 MHz
1xEV - DO	2.4 Mbps	11 (0.2 minutes) with 1.25 MHz

\* Peak data rate for first commercial release of 1x MC terminals will be 153.8 kbps  
 \*\* At launch of service, the WCDMA's reverse link will only support 64 kbps

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*CDMA Advantages Introducing a New Platform for Offering Voice and Data*

**Bigger Cells**

- In rural deployments in markets such as Australia, CDMA has demonstrated coverage in excess of 90 Km
  - Due to system timing constraints, these ranges are not possible using GSM

**Higher Voice Capacity**

- 4 to 5.5 Times Voice Capacity

**Higher Data Rates**

- Peak rates of 2.4 Mbps possible, commercially supports ~500 to 700 kbps average

**Fewer CDMA base stations are required,  
leading to lower CAPEX and OPEX**

*CDMA Capacity Advantage Leads to Lower Tariffs*

**Greater spectral efficiency leads to greater capacity**

- Greater call capacity leads to lower tariffs for voice minutes
- Greater data throughput leads to lower data tariffs

**Mobile Voice**



**Bharat Sanchar Nigam Ltd.**

*India*

Free incoming calls,  
**\$0.008 per minute** (outgoing)

**Lowest  
Mobile Voice Tariff  
in the world**

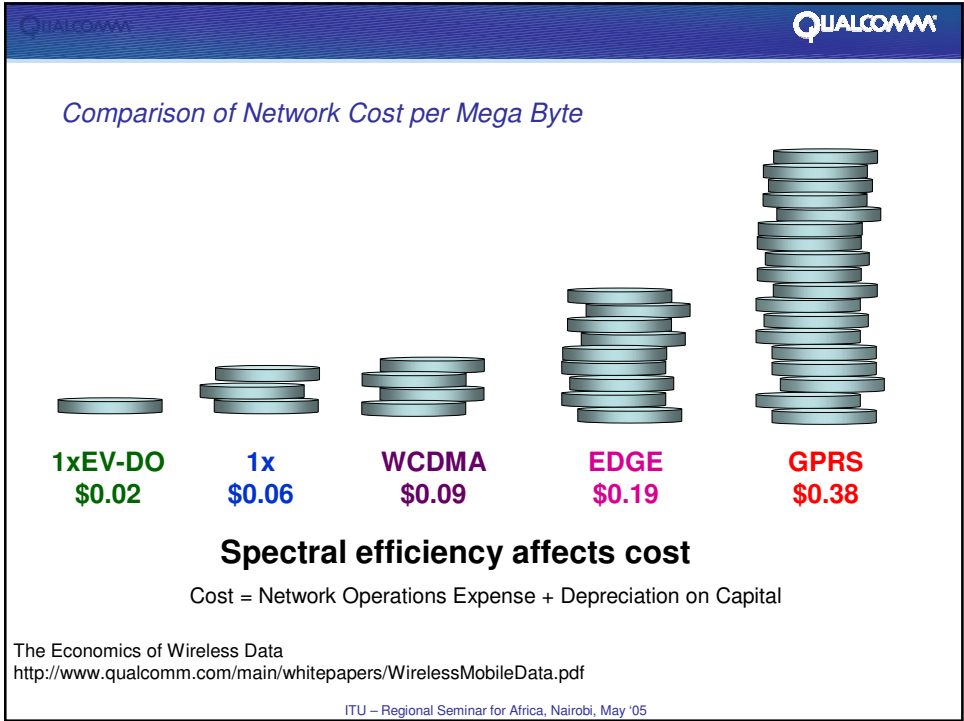
**Mobile Data**



After a free 3-month trial period,  
an **unlimited data** plan for cell phones  
at \$10 a month

**Lowest  
Mobile Data Tariff  
in the world**





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### CDMA2000 1xEV-DO Highlights: Convergence of Voice and Data

- EV-DO stands for **E**volution – **D**ata **O**ptimized
- 1xEV-DO is a high-performance and cost-effective Internet access solution
- Today systems offering up to 2.457 Mbps forward link and 153.6 Kbps reverse link peak data rate in 1.25 MHz
- CDMA2000 1xEV-DO Release A approved in April 2004 offering 3.1 Mbps forward link and 1.8 Mbps reverse link

**\* all figures are per sector/1.25 MHz**

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*What's Next for CDMA2000 1xEV-DO?  
Further convergence of wireless technologies...*

*Multimedia Services, Increase Data Rates  
and System Capacity, and Lower Costs*

**Next Level Enhancements**

**Receive Diversity**  
4X capacity in 1.25 MHz

**2x Multicarrier**  
Two 1xEV-DO carriers simultaneously,  
doubling data rates

**Equalizer**  
Increase sector capacity 20-60%

**Quality of Service (QoS)**  
Different levels of priority

**Instant Multi-media**  
Audio and video together

**Personal Media**  
Multiple channels of  
video/audio

**Location-based services (LBS)**  
High resolution locations

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*Evolution of Mobile Services*

**Past**

- Mobility for Voice Svcs
- Roaming
- Increased capacity
- Basic Ringtones
- SMS, and basic email

**Enabled by 3G**

- Broadcast Media
- Multimedia
- Telemedicine
- e-Government
- e-Commerce
- e-Education/Training
- Network-based Games

**Present**

- Polyphonic Ring tones
- Mobile Web Access
- Location-based Services
- Video-On-Demand
- Broadband Access
- PTT
- Video Telephony

**Location-based Services**

**Broadcasting Media**

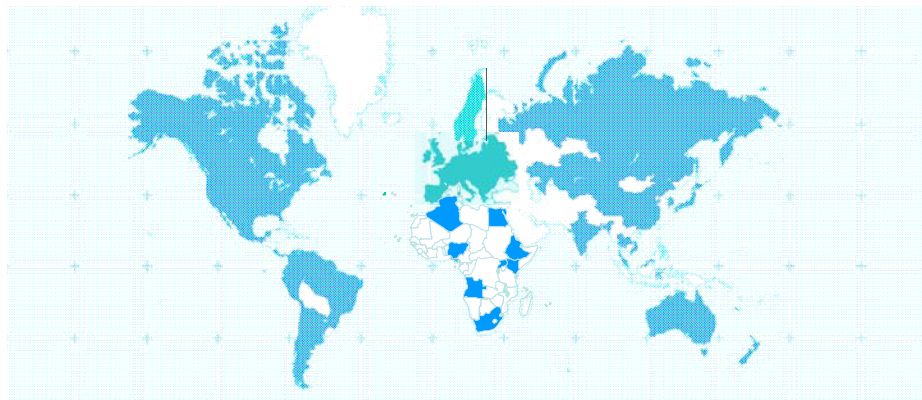
**Technology and Spectrum/Cost Efficiencies  
Make New Services Possible**

### CDMA Deployments

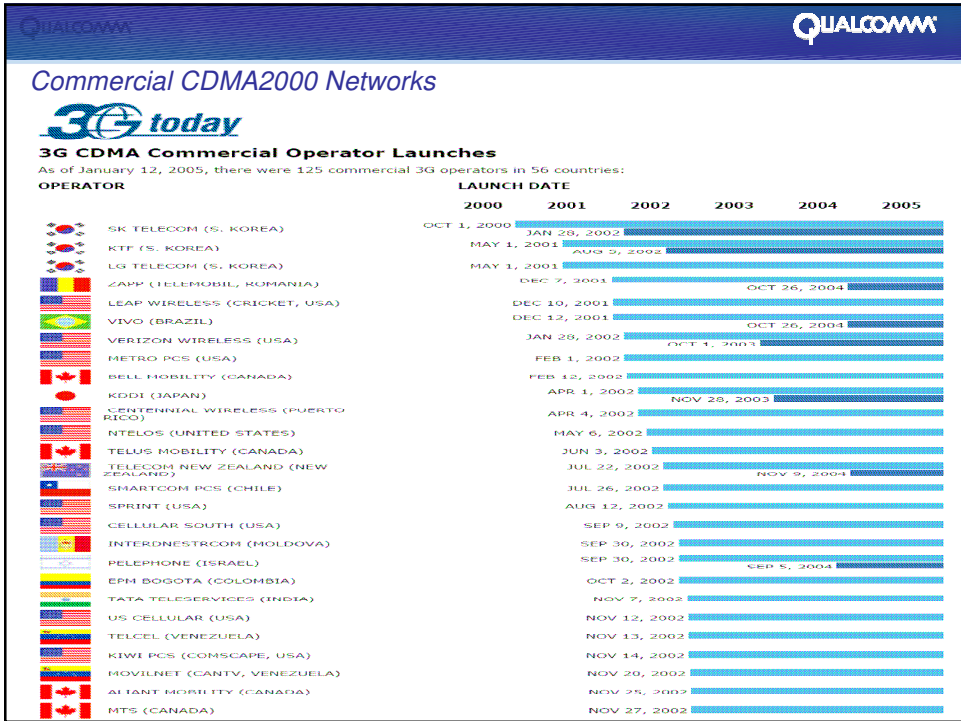
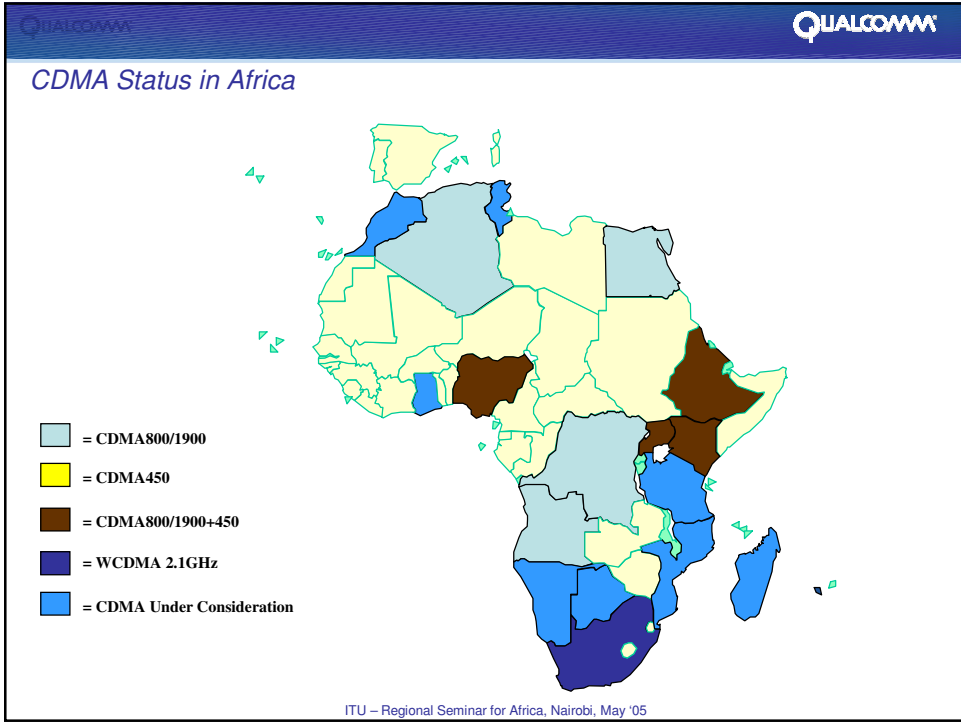
- CDMA can be deployed in various frequencies – 450 MHz, 800 MHz, 1900 MHz, 2100 MHz
- Number of CDMA450 systems continues to grow with commercial deployments or trials taking place in many countries including Kenya, Ethiopia, Tanzania, Uganda, Mozambique, Belarus, Brazil, Indonesia, Romania, Russia, Vietnam, and so on..
- Over 156 million 3G CDMA subscribers using CDMA2000 and WCDMA systems

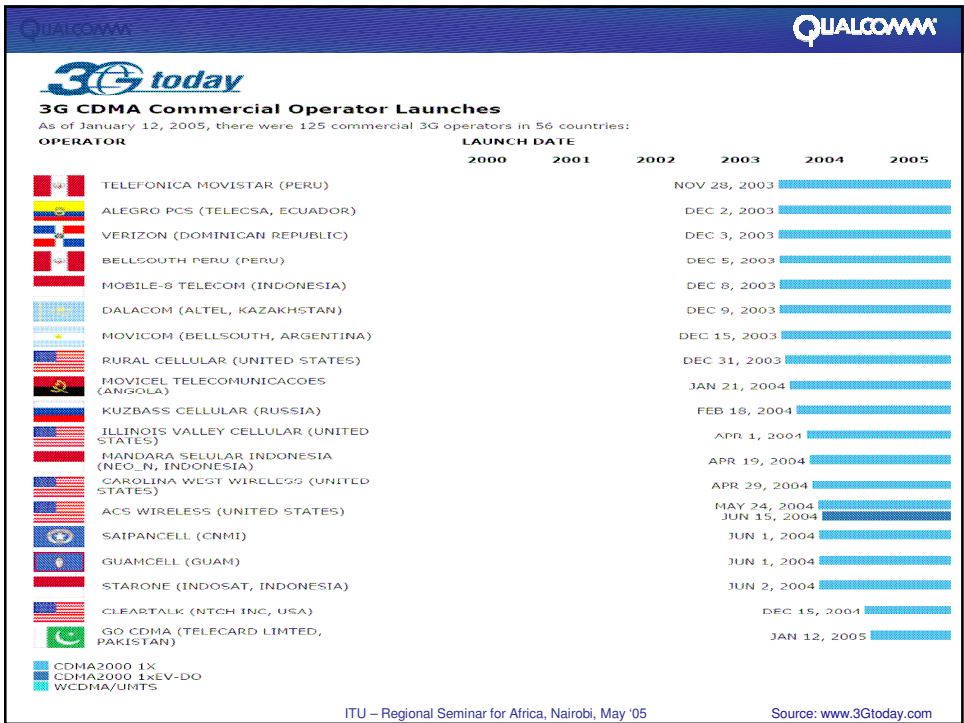
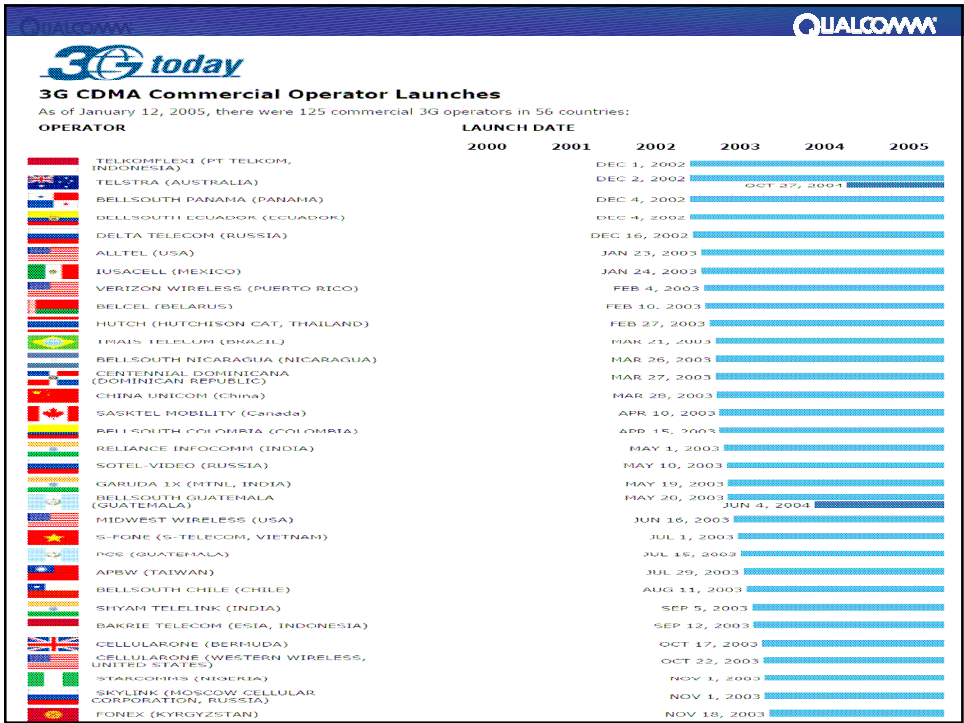
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### Commercial 3G CDMA Networks



\*Source: 3GToday.com and Company Launch Announcements, Jan. 2005  
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*Guidelines and Principles on Convergence (From APEC)*

- **Principle One:**
  - **Establish regulatory and market structures that provide users with choices, enable suppliers of telecommunication services to extend their business activities, and implement competitive safeguards for the market to grow**
  - **A liberalized telecommunications market is critical to accommodate converging technologies and services**

*Guidelines (con.)*

- **Principle Two:**
  - **Establish open dialogue with industry to gain greater insight into prospects for or markets where convergence may be occurring and to aid regulators in gathering information to determine trends towards convergence**

*Guidelines (con.)*

- **Principle Three:**
  - **Exert caution in assuming current regulatory rules applied to dominant providers or monopolies can be applied in converging markets**

*Guidelines (con.)*

- **Principle Four :**
  - **Given fluidity of convergence, regulators should be flexible in their policy approaches to address convergence and be able to modify their rules without facing overly burdensome procedures**



*Guidelines (con.)*

- **Principle Five :**
  - **Measures should be adopted that rely on continual review of the regulatory authority including its organizational structure and existing rules**

*Guidelines (con.)*

- **Principle Six :**
  - **When dealing with convergence, regulators should avoid interim solutions that attempt to achieve regulatory commonality at the costs of precluding services at affordable rates by consumers**

### *Guidelines (con.)*

- **Principle Seven:**
  - **As new players in a market begin to compete with existing/dominant providers, regulators should commence deregulating the dominant provider**

### *A Success Story - India's Regulatory Reform*

- The Telecom Regulatory Authority of India (TRAI) adopted the concept of unification of both fixed and mobile services under a Unified License. The recommendations of TRAI were accepted by the Government making it a part of the telecom policy in October 2003. This policy change entitled all fixed line operators to move to a Unified License by depositing a certain entry fee and thereby being able to offer both fixed and mobile services on the CDMA platform.
- Permitting move from fixed to mobile offerings, has contributed to overall subscriber growth in the country – growing from 135,000 subscribers in January 2002 to more than **12 million** as of March of 2005.
- The Government has made significant progress in removing unnecessary regulatory distinctions in the wireless industry by introducing the Unified License. This decision offers a good example of the importance and impact regulatory and policy issues can have on a country's overall economy and is a model for other countries in the region.

*Thank you!*

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*Commercial CDMA2000 Networks (1/3)*

Country	Operator	Date	Technology	Frequency Bands
Korea	SK Telecom	Oct. 1, 2000	CDMA2000	800 MHz
Korea	LG Telecom	May 1, 2001	CDMA2000	1800 MHz
Korea	KT Freetel	May 2, 2001	CDMA2000	1800 MHz
USA	Monet	Oct. 21, 2001	CDMA2000	1900 MHz
Romania	Zapp Mobile	Dec. 7, 2001	CDMA2000	450 MHz
Brazil	Telesp	Dec. 10, 2001	CDMA2000	800 MHz
USA	Leap Wireless	Jan. 17, 2002	CDMA2000	1900 MHz
USA	Verizon Wireless	Jan. 28, 2002	CDMA2000	800 and 1900 MHz
USA	MetroPCS	Feb. 1, 2002	CDMA2000	1900 MHz
Canada	Bell Mobility	Feb. 12, 2002	CDMA2000	800 and 1900 MHz
Japan	KDDI	Apr. 1, 2002	CDMA2000	800 MHz
Puerto Rico	Centennial Wireless	Apr. 4, 2002	CDMA2000	1900 MHz
Brazil	Telefonica Celular	Apr. 16, 2002	CDMA2000	800 MHz
Canada	Telus Mobility	June 3, 2002	CDMA2000	800 and 1900 MHz
New Zealand	Telecom N.Z.	July 22, 2002	CDMA2000	800 MHz
Chile	Smartcom PCS	July 26, 2002	CDMA2000	1900 MHz
USA	Sprint PCS	August 8, 2002	CDMA2000	1900 MHz
USA	Cellular South	Sept. 9, 2002	CDMA2000	800 MHz

\*Source: company press releases

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### Commercial CDMA2000 Networks (2/3)

Country	Operator	Date	Technology	Frequency Bands
Moldova	Interdnestrom	Sept. 30, 2002	CDMA2000	800 MHz
Israel	Pele-Phone	Oct. 1, 2002	CDMA2000	800 MHz
Colombia	EPM-Bogota	Oct. 2, 2002	CDMA2000	1900 MHz
India	TataTeleservices	Nov. 7, 2002	CDMA2000	800 MHz
Venezuela	Telcel	Nov. 13, 2002	CDMA2000	800 MHz
USA	KiwiPCS (Comscape)	Nov. 14, 2002	CDMA2000	1900 MHz
Venezuela	Movinet	Nov. 20, 2002	CDMA2000	800 MHz
Canada	Alliant Mobility	Nov. 25, 2002	CDMA2000	800 MHz
Canada	MTS Mobility	Nov. 27, 2002	CDMA2000	1900 MHz
Indonesia	Telecom Flexi	Dec. 1, 2002	CDMA2000	800 MHz
Australia	Telstra	Dec. 1, 2002	CDMA2000	800 MHz
Ecuador	Bell South	Dec. 3, 2002	CDMA2000	800 MHz
Panama	Bell South	Dec. 3, 2002	CDMA2000	800 MHz
Russia	Delta Telecom	Dec. 16, 2002	CDMA2000	450 MHz
Mexico	IUSACELL	Jan. 24, 2003	CDMA2000	1900 MHz
Puerto Rico	Verizon Wireless	Feb. 4, 2003	CDMA2000	800 MHz
Belarus	Belcel	Feb. 10, 2003	CDMA2000	450 MHz
Thailand	Hutchison CAT	Feb. 27, 2003	CDMA2000	800 MHz

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### Commercial CDMA2000 Networks (3/3)

Country	Operator	Date	Technology	Frequency Bands
Nicaragua	BellSouth	Mar. 26, 2003	CDMA2000	800 MHz
Dominican Republic	Centennial Dominicana	Mar. 27, 2003	CDMA2000	1900 MHz
China	China Unicom	Mar. 28, 2003	CDMA2000	1900 MHz
Canada	Sasktel Mobility	April 10, 2003	CDMA2000	800 MHz
Columbia	BellSouth	April 15, 2003	CDMA2000	800 MHz
Brazil	Giro (Vesper)	May 01, 2003	CDMA2000	800 MHz
India	Reliance Infocomm	May 1, 2003	CDMA2000	800 MHz
Russia	SOTEL- Video	May 10, 2003	CDMA2000	450 MHz
India	Garuda 1X	May 19, 2003	CDMA2000	800 MHz
Guatemala	BellSouth	May 20, 2003	CDMA2000	1900 MHz
USA	Midwest Wireless	June 16, 2003	CDMA2000	1900 MHz
Vietnam	S-Fone	Jul. 01, 2003	CDMA2000	800 MHz
Taiwan	APBW	Jul. 29, 2003	CDMA2000	800 MHz
Guatemala	PCS	Jul. 15, 2003	CDMA2000	1900 MHz
Chile	BellSouth	Aug. 11, 2003	CDMA2000	1900 MHz
Russia	MCC	Nov. 1, 2003	CDMA2000	450 MHz
Peru	Telefonica Moviles	Dec. 1, 2003	CDMA2000	800 MHz
Ecuador	Telecsa	Dec. 2, 2003	CDMA2000	1900 MHz

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