



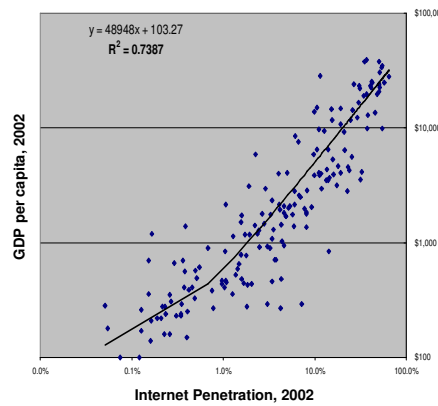
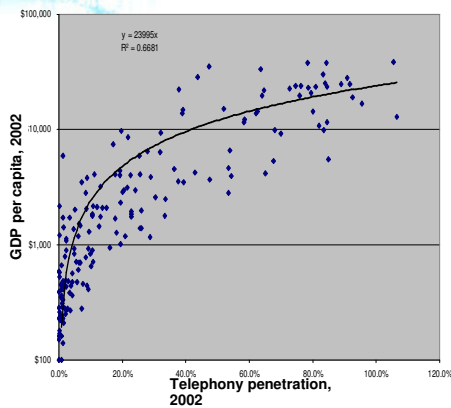
# CDMA2000 Transition Path in Africa

George Mansho  
CDMA Development Group  
Nairobi, Kenya  
May 12, 2005



## The Value of Improving Connectivity

*It is about voice and data...*



**For 1% increase in Telephony penetration, GDP per capita increases by US\$240**

**For 1% increase in Internet penetration, GDP per capita increases by US\$593**

Source: Michael Minges, TMG Telecom, and ITU World Telecommunications Database Statistics, 2003.

## 3G CDMA – Satisfying the demand for Wireless Voice and Broadband today!



*Toll-quality Voice communications (equal or better than landline)*

*High-speed Data transmissions (multiples greater than ISDN speeds)*

*Secure transmissions (including DRM, anti-spam, fraud control, etc.)*

*Excellent coverage (with in-building, multimode & robust hand-off services)*

*Commercially available devices (more than 750 devices from 60 vendors)*

- *Small and attractive form factors*
- *Data-enabled devices based on IEEE (TCP/IP) standards*
- *Operating systems based on "open" execution environment standards*
- *Low battery power consumption*

*Commercial-grade infrastructure (switching, billing, authentication, etc.)*

*Thousands of applications (multimedia, multi-casting, messaging, etc.)*

*Low cost per minute, megabyte or message (due to spectral efficiency)*

*More than 160 million paying subscribers worldwide and growing (~4M/mo)!*

## 3G CDMA for African Development



**Large voice telephony market will continue to be serviced by 2G GSM**

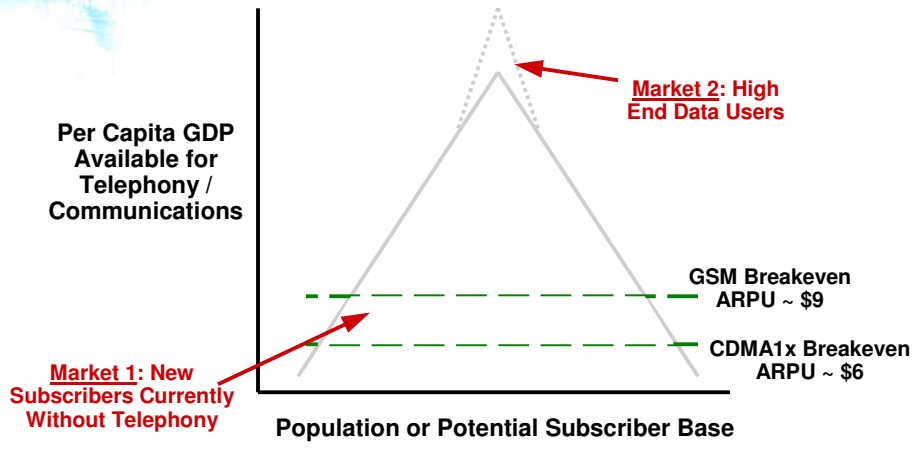
**Two new additional markets to be serviced by 3G CDMA:**

- – Low Cost Voice Telephony:
  - Opportunity afforded by spectral efficiency and capacity of 3G CDMA
  - Spectral efficiency can lead to reduced costs per subscriber. (Notable Example: India)
  - Universal Service Obligations, "Under-Serviced" Areas, Rural Deployments
- – Data Services:
  - Cost effective data services – service comparable to DSL.
  - Very few cost effective wireless alternatives.
  - Residential, small business, corporate and government markets

**Challenges for 3G CDMA Africa Development:**

- Availability of appropriate spectrum allocations.
- Very low cost voice-centric handsets.

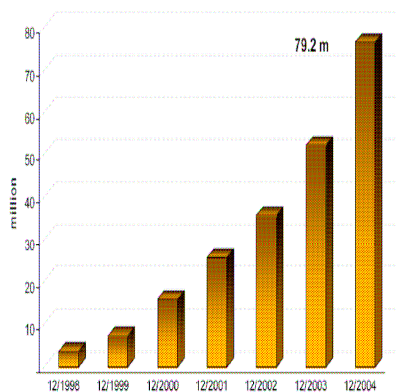
# African Markets Addressed with CDMA2000



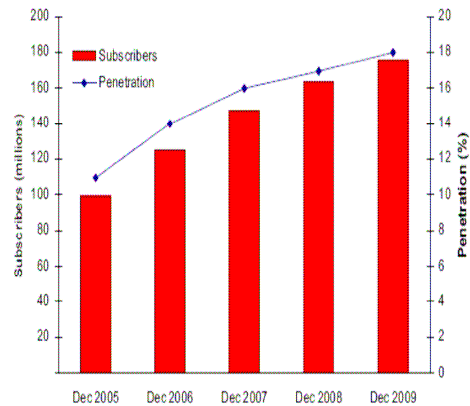
# Africa Telephony Market Growth



Actuals 1998-2004, and Forecast 2005 – 2009



Source: World Cellular Information Service



Source: World Cellular Information Service

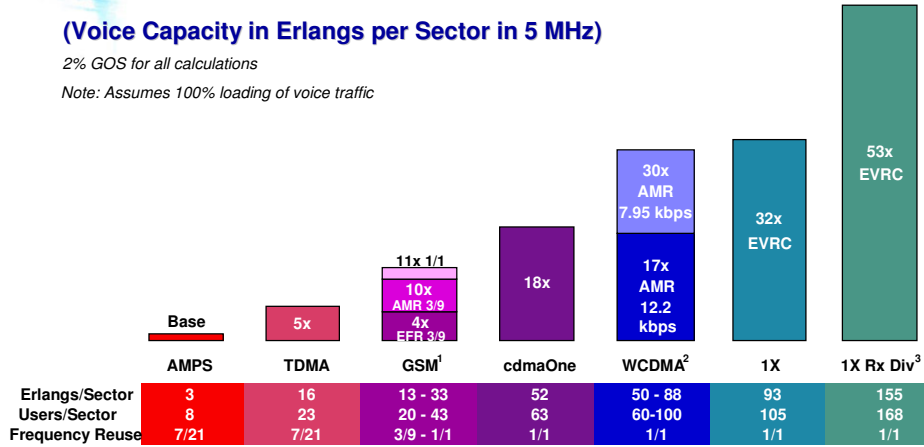
# Affordable Voice Telephony Driven by CDMA2000 Spectral Efficiency



## (Voice Capacity in Erlangs per Sector in 5 MHz)

2% GOS for all calculations

Note: Assumes 100% loading of voice traffic

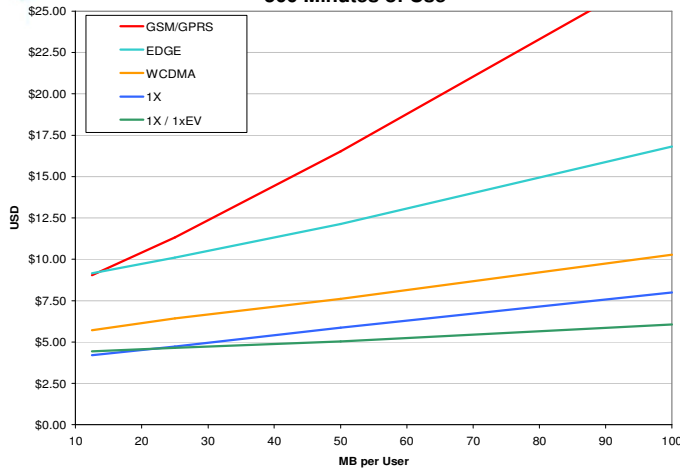


1. "GSM AMR VOCODERS: FACTS ABOUT INCREASED VOICE CAPACITY", QUALCOMM Internal Paper: Rao Yallapragada
2. "Comparing HSDPA vs R99 Capacity v7", QUALCOMM Internal Paper: Thomas Klingebrenn
3. "Further Capacity Improvements in CDMA Cellular Systems", QUALCOMM Inc, Roberto Padovani (Calculations based on 1% Blocking)

# CDMA enables lower costs for voice and 3G data



## Combined Voice and Data Network Expense /User/Month 500 Minutes of Use



## The Reliance Impact on the Indian Market for Affordable Telephony



Parameter	Before Reliance	After Reliance
Total no. of mobile phones (Million)	11 mn (Jan '03)	30 mn (Jan '04)
STD rates ( Mumbai – Delhi Call Cost)	Rs. 9.60 / min	40 paisa / min (RIM – RIM)
SMS cost	Re 1	Free
Total minutes of use per day	2.2 billion minutes	5.7 billion minutes
Min Cost of Data Services like: news, games on mobile	750	Free
Entry Cost for going mobile ( handset upfront cost+ activation charges + security deposit)	> Rs. 5000	Rs. 501

Source: Reliance Infocomm

## India is the World's Largest Wireless Opportunity



India is driving the demand for affordable 3G services

### 2004

Indian wireless market grows from 30M to 47M in 2004

CDMA operators lobbying for additional spectrum

### 2005

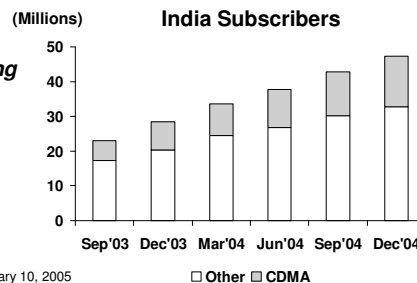
Reliance and Tata reach nationwide footprint

CDMA competition drives new services

World phones introduced for CDMA/GSM roaming

EV-DO deployments start in key metros for enterprise and high end consumer segments

Fixed wireless market continues to grow



Source: ABTO, December 2004; Association of Unified Service Providers of India January 10, 2005

# CDMA2000 Capacity Advantage Leads to Lower Tariffs



Greater spectral efficiency leads to greater capacity

- Greater call capacity can lead to lower tariffs for voice service
- Greater data throughput can lead to reduced 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**

# 3G is fulfilling Universal Service Obligations



Connecting Citizens to voice & Internet services

Rainbow Chalta Firta PCO

In **India**, Reliance will meet universal service obligations by providing 3G service to 48,310 villages that don't have public phone facilities<sup>1</sup>

In **India**, Shyam Telecom has equipped a fleet of around 200 self-employed rickshaw drivers with a mobile calling office, including fax<sup>2</sup>



In the **Dominican Republic**, Tricom deployed over 1,700 public pay phones in underserved rural areas. These phones will eventually be used for high-speed Internet access<sup>3</sup>

In **Brazil**, Anatel & Lucent provided universal broadband (800 kbps @ 45 km) access with 3G



In **Ecuador**, Edumasters installed 3G kiosks at several public schools to provide free Internet access. Panama is next.<sup>4</sup>



In **Chile**, BellSouth provided 3G broadband access to 667 schools nationwide<sup>5</sup>

1. <http://www.thehindubusinessline.com/2004/09/20/stories/2004092002090100.htm>  
 2. <http://www.hellorainbow.com/aboutus.asp>  
 3. BNamericas.com, "GEC-Tel, Tricom Partner for wireless Network – Dominican Republic, November 20th, 2004"  
 4. <http://projetoscd.isat.com.br>  
 5. [www.edumasters.net](http://www.edumasters.net)  
 6. [http://www.subtel.cl/servtel/page?\\_pageid=57&\\_dad=portal30&\\_schema=PORTAL30&p\\_language=e](http://www.subtel.cl/servtel/page?_pageid=57&_dad=portal30&_schema=PORTAL30&p_language=e), Sept. 3, 2003

# Connecting Citizens Around the World



3G is playing an important role in bridging the digital divide

Around the world, mobile phone users are overtaking fixed-line subscribers due to the affordable high-quality voice and data services that are made possible by today's technologies. The number of wireless-only homes is growing and there are far more mobile phones than PCs in the world.

3G CDMA networks foster various levels of global connectivity – from wireless local loop to high-speed mobile voice and/or data in many different licensed frequency bands.

3G CDMA enables high-quality voice, wireless broadband access and a variety of multimedia applications making telemedicine, public safety, education, business and entertainment a reality everywhere.

# How Fast is Wireless?



Approximate transfer times for a 3 minute MP3 song file



Air Interface	Data Rate	Download Time In Seconds
GSM	9.6 kbps	2466 (41 minutes)
IS-95A CDMA	14.4 kbps	1852 (31 minutes)
GPRS	45 kbps	526 (8.8 minutes)
IS-95B CDMA	64 kbps	364 (6 minutes)
EDGE	80 kbps*	295 (5 minutes)
CDMA2000 1X	144 kbps**	161 (2.7 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

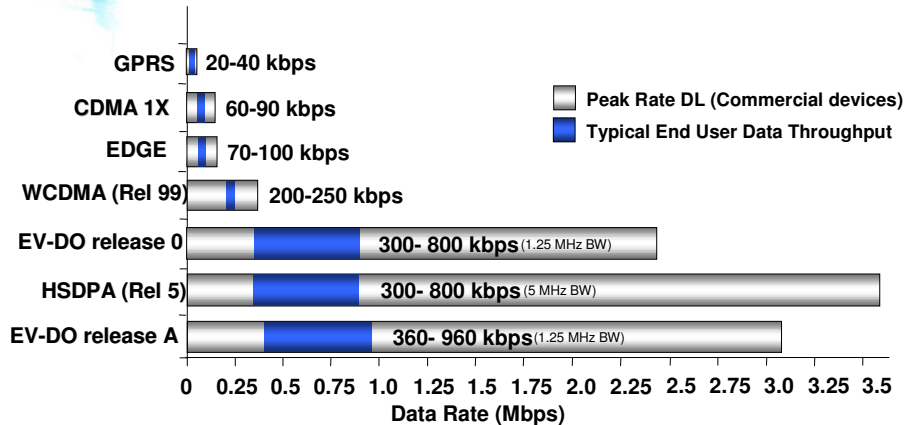
\* Maximum data rate of Nokia 6200 EDGE phone on AT&T Wireless network, as of May 20, 2003  
 \*\* Peak data rate for first commercial release of 1x MC terminals will be 153.8 kbps  
 \*\*\* At launch of service, the WCDMA's reverse link will only support 64 kbps

## How Fast is... Fast Enough?

## “User Experience” Data Rate Comparison



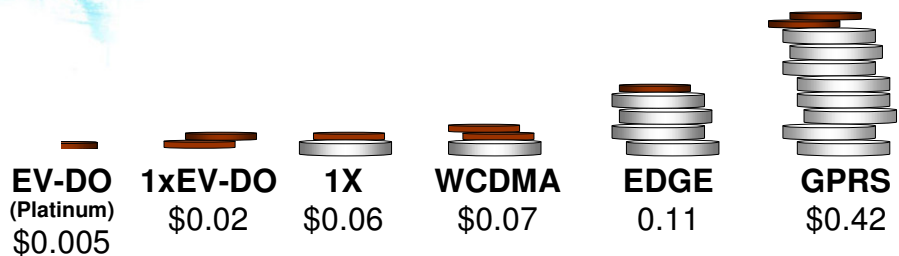
3G CDMA is Leading the Way in Providing “Mobile” Broadband Wireless Services



3G CDMA is already standardized – future enhancements are ongoing

Notes: 1. Peak and typical average end-user forward link data rates based on actual commercial implementations of each standard.  
 2. 1X and 1xEV-DO data rates are achieved in a 1.25 MHz carrier bandwidth, WCDMA and HSDPA (Category 12) rates are achieved in a 5 MHz carrier.  
 3. 1xEV-DO (Rev A) or 1xEV-DOvA data rate includes the implementation of an “equalizer” and reverse link peak data rate enhancement to 1.8 Mbps

## Cost per Megabyte Comparison



Spectral efficiency affects cost

Cost = “Greenfield” Network Operations Expenses + Depreciation on Capital

**Operators Prefer Mobile Broadband Technologies that are Affordable & Evolutionary**

Source: The Economics of Wireless Data, <http://www.qualcomm.com/main/whitepapers/WirelessMobileData.pdf>  
 Assumptions: On demand Traffic: a) 15% of traffic demand occurs at the busy hour, b) 7,600 kbps / sq km at busy hour, c) 5MHz  
 Multicast Traffic: a) 2,000 subscribers / cell, b) 30 live streaming minutes / day at 128kbps data rate, c) 1.25MHz



## 3G is fulfilling Public Safety Initiatives

*Protecting & Saving Lives*



In the **U.S.**, 3G carriers offer E911 services with accurate (5-30m) position location capabilities<sup>1</sup>

In **Japan**, SECOM launched a nationwide location-based security service<sup>2</sup>

In **China**, Unicom donated 150 kid tracker devices to the Beijing School of the Blind<sup>3</sup>

In **Korea**, SKT and National Police Agency introduced a Missing Children Service<sup>4</sup>

In **Canada**, the Ontario Police quickly access vital information (including fingerprints IDs) and respond to emergencies instantly with position location dispatch<sup>5</sup>

In **Florida**, the Broward County Sheriff's Office uses 3G for child protection services<sup>5</sup>



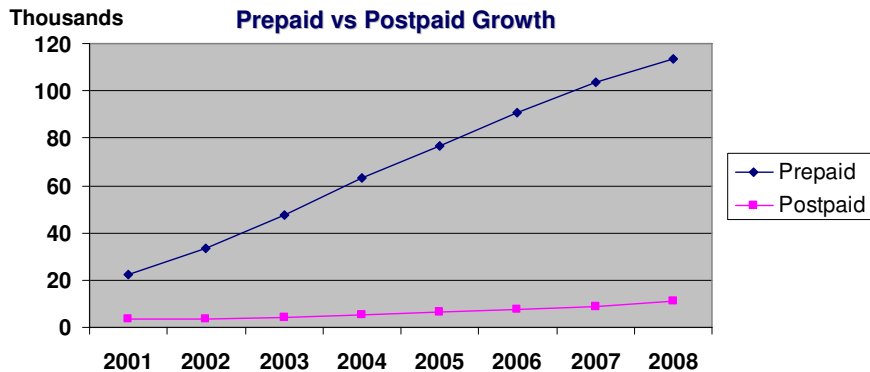
1. [www.fcc.gov/911/enhanced/](http://www.fcc.gov/911/enhanced/)
2. [www.secom.co.jp](http://www.secom.co.jp)
3. [www.chinaunicom.com.hk](http://www.chinaunicom.com.hk)
4. [www.cnn.com](http://www.cnn.com), Friday October 1st, 2004
5. CDMA A-List Award Winners

## Market Trends in Africa



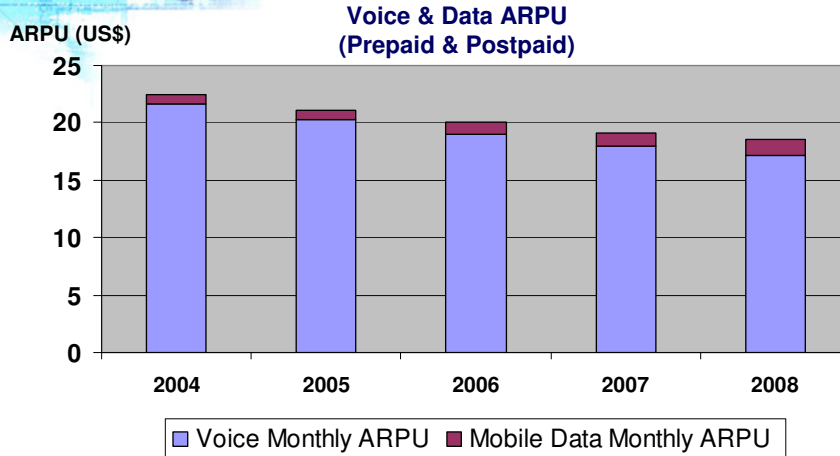
Explosive prepaid growth will dominate for the coming years

- Rapid growth in Prepaid segment
- Overall effect will be to drop the ARPU in the market



Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005

## Voice and Data ARPU's



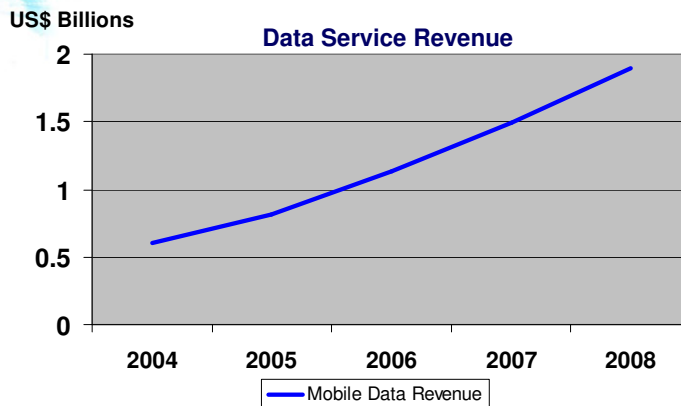
**Rapidly increasing Prepaid segment will drive down ARPU's**

Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005

## Data Revenue in Africa



**Data service revenue will increase dramatically in the future**



**Data revenue is becoming increasingly important to maintain earnings**

**Data revenue opportunities are plentiful in this emerging market**

Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005, and "Latin America Mobile Forecast", Pyramid Research, January 2005

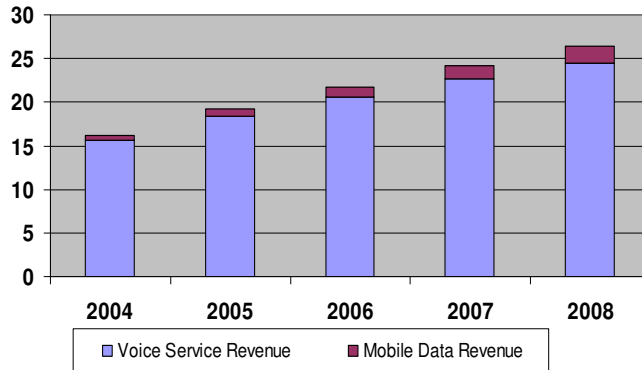
# Voice and Data Revenues in Africa



Growth in voice service revenue will flatten out within the next two years

US\$ Billions

Voice and Data Service Revenue



Voice becoming a commodity

Pricing pressure on airtime will contribute to slower voice revenue growth

Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005

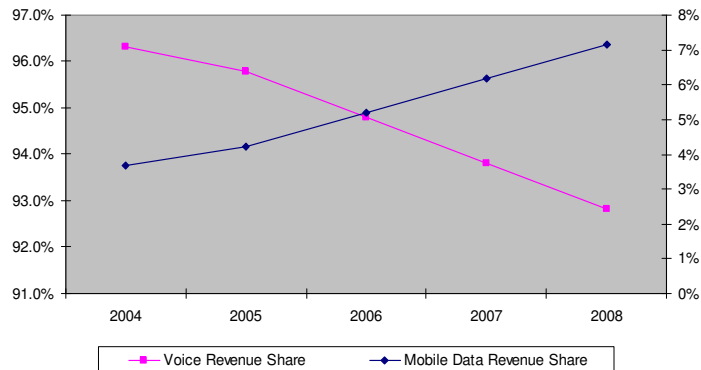
# Voice and Data Revenue Share in Africa



As voice revenue declines, the share of data revenue will increase

Voice Revenue  
Percent of Total Revenue

Data Revenue  
Percent of Total Revenue



Pricing pressure on airtime will contribute to declining voice revenue

Data plays a critical role to compensate declining voice revenues

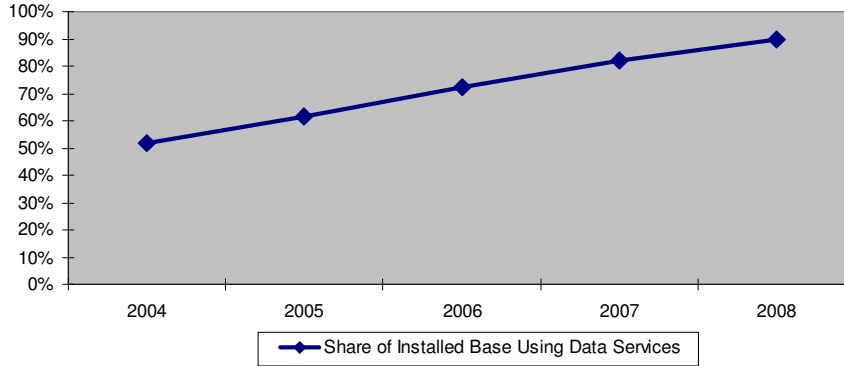
Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005

# Data Usage Adoption Rates



90% of Installed base will use Data services by 2008

Share of Installed Base Using Data Services



Source: "Global Mobile/Wireless Forecast", The Yankee Group, January 2005

# The Convergence with Consumer Electronics



3G is improving people's productivity and quality of life... Affordably!



An Indispensable Device

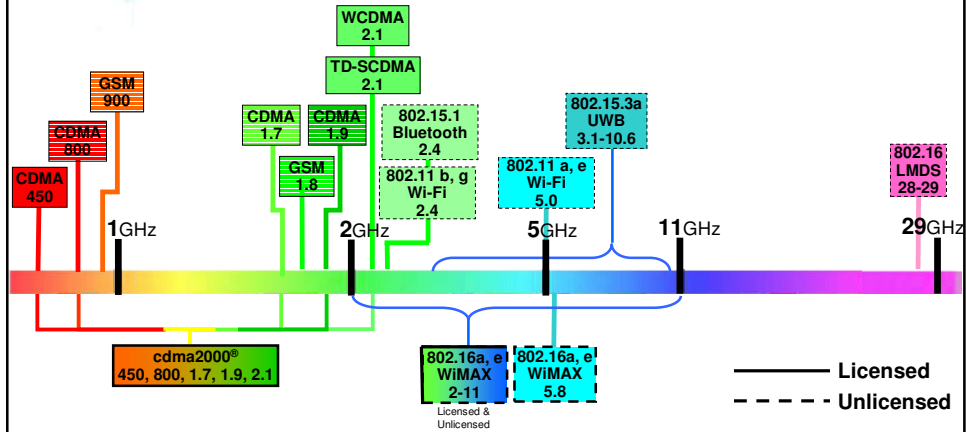


3G has enabled:  
Personal connectivity, access to value information, convenience, entertainment and safety

# Spectrum Allocations



Providing affordable coverage is crucial in wireless telecommunications.  
The warmer (lower) frequencies are best!



## Licensed Spectrum vs Unlicensed Spectrum

The use of unlicensed spectrum creates interference issues

# Theoretical Cell Sizes (Voice)



## Reverse link dominates coverage:

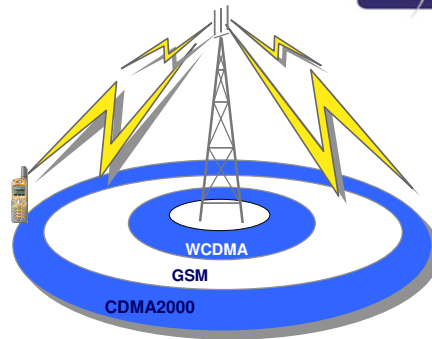
- Limiting link due to several issues

## Link budget determines available margin required to achieve a high quality link

- Easy to compare technologies

## Difference in coverage is affected by a variety of factors, including:

- Morphology
- Tower height
- H/W and rate set assumptions, etc.



Nominal cell radius				
(Rural area)				
	Freq. (MHz)	Radius (km)	Area (km <sup>2</sup> )	BTS Count
WCDMA	2100	13.3	553	13.6
GSM	900	26.9	2269	3.3
CDMA2000	800	29.4	2712	2.8

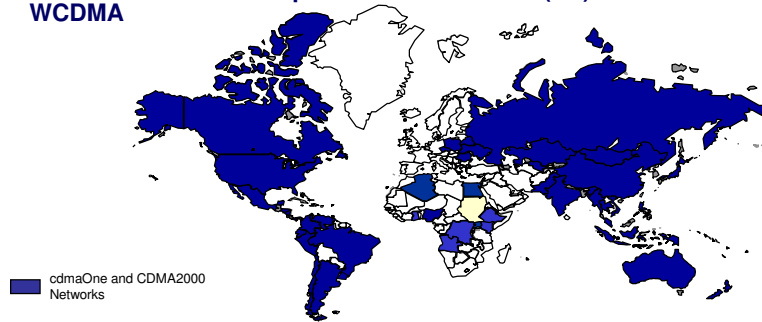
**Lower Frequencies Provide Greater Coverage and Reduce Base Stations**

Source: Lucent Technologies. **Note:** This is a simplistic estimation that real-world terrain and environmental variables will affect. It assumes all parameters are equal: terrain, output power, antenna height, etc.

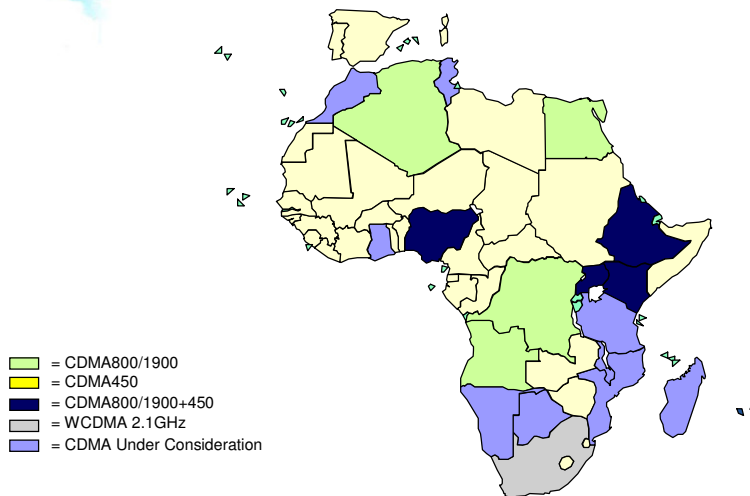
## CDMA Worldwide




- **Rapidly expanding: 260 networks on six continents**
  - North America: Dominant technology with 47% market share
  - Latin America: 25% market share and 39 operators in 20 countries
  - Asia: Largest market for CDMA and rapidly expanding in China and India
  - Africa and Middle East: Emerging markets for CDMA2000 and CDMA450
  - Europe: Emerging market for CDMA450
- **The fastest-growing technology worldwide: 240 million users**
- **CDMA is the dominant platform for IMT-2000 (3G): CDMA2000® and WCDMA**




## CDMA Status in Africa





**“When You Come to a Fork in the Road, Take It.”**

*-Yogi Berra, American “Philosopher” and Sports Celebrity*



### Road to the Future

**CDMA Will Dominate Well into the 21<sup>st</sup> Century**

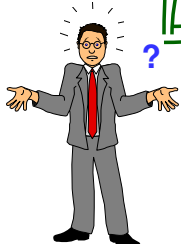
800 MHz CDMA2000

450 MHz CDMA2000

1900 MHz CDMA2000

2100 MHz WCDMA

Higher Teledensity/Penetration, Competitive and Lower Tariffs, Greater Educational and Commercial Opportunities etc.



## **Conclusions: Road-Mapping of 3G CDMA in Africa**



**The Future is both Voice and Data. Africa needs both.**

**“Warmer Frequency” (800 and 450 MHz) spectrum provides best geographic coverage and economic alternatives.**

**When you come to the fork in the technology road, take it.**

**Thank you**