CDMA2000 Benefits and Market Status

IMT-2000 Seminar
Doha 2003

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Introduction

1. **What is 3G?**
   - **According to ITU, 3G should provide:**
     - **144Kbit/s high mobility (vehicular) data transmission**
     - **384Kbit/s low mobility (pedestrian) data transmission**
     - **2Mbit/s stationary (untethered) wireless data transmission**
   - **The ITU also identified the following bands for IMT-2000 3rd generation services:**
     - **806 – 960 Mhz**
     - **1710 – 1885 Mhz**
     - **1885 – 2025 Mhz**
     - **2110 – 2200 Mhz**
     - **2500 – 2690 Mhz**
   - **ITU announced In 2000 that any country may license 3G technology in any other frequency band that is allocated to mobile services.**
     - **Therefore we now have CDMA in 450Mhz**

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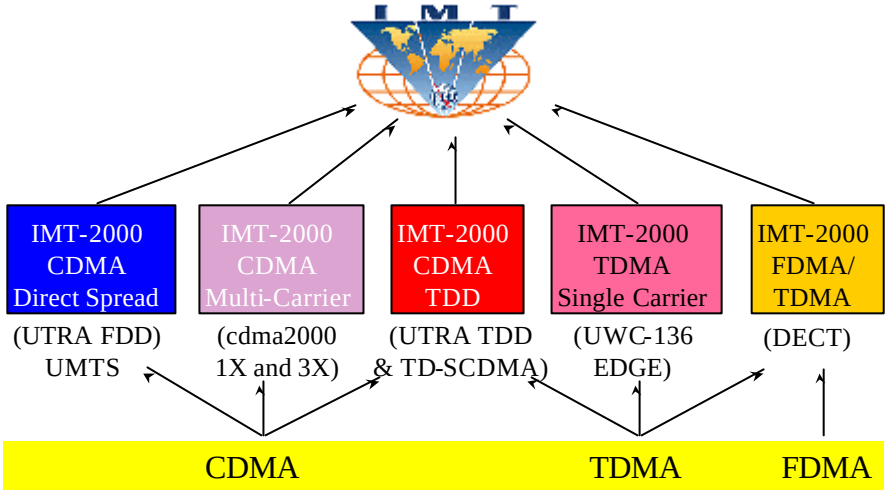
IMT-2000 Terrestrial Radio Interfaces (ITU-R Rec. M.1457)



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A Number of Factors Are Driving the Wireless Internet and Wireless Information...

1. **Societal trends**
   - Emerging computer literate society
   - Increasing travel and mobility
2. **Technology enablers**
   - High speed, cost effective mobile systems
   - Integrated multimedia applications
   - Small, powerful, application-rich user devices
3. **Market trends**
   - Rapid growth in mobile
   - Rapid Internet adoption
   - Accelerating pace of electronic commerce (aka M-commerce)
   - Rapid growth of portable and palmtop computers

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Industry Challenges...

1. **IMT-2000 Challenges…**
   - Combined cost of IMT-2000 licenses and infrastructure
   - Competition with other countries for financing
   - Need to support large land mass with rural, sparsely populated areas
   - Salvaging recent investments made in 1G and 2G mobile systems

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Certain Factors are Critical for Making 3G a Success

- ✓ Solutions that are globally recognized and meet adopted, international standards
- ✓ Solutions that work, enable quick time-to-market, and meet industry expectations
- ✓ Spectrum flexibility, efficiency, and cost
- ✓ Capacity to meet future demand
- ✓ Seamless and cost effective migration from today's systems
- ✓ Broad range of competitively-priced products for end-users (consumers, enterprises)
- ✓ Broad range of applications for end-users

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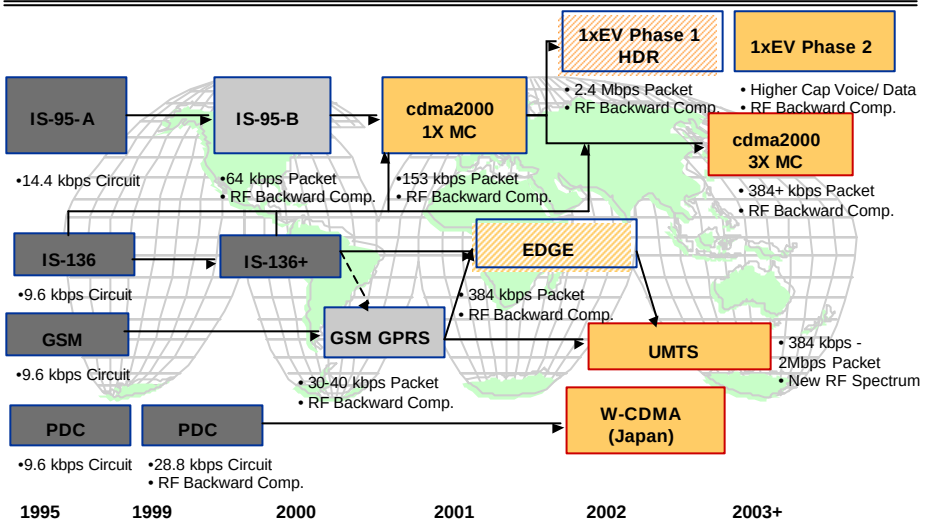
IMT 2000: Standards Evolution Paths



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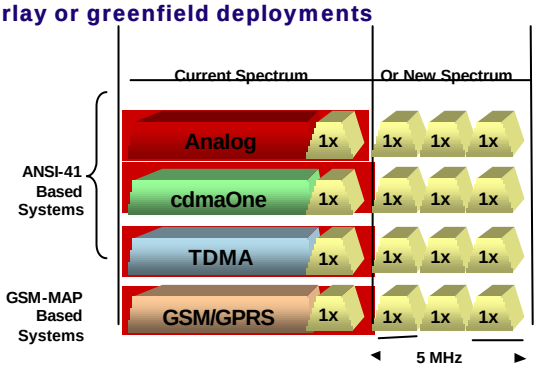
Spectrum Flexibility Is a Key Consideration for Any Technology...

1. CDMA2000 3G services in a small amount of spectrum

- Effective use of spectrum, significant to ALL operators
- Effective both in overlay or greenfield deployments

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

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



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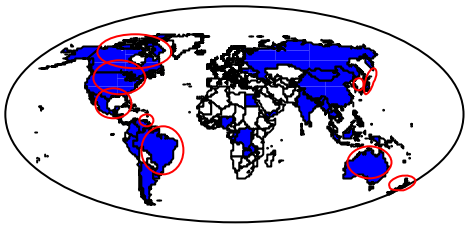
Going Forward, Addressable Population Will Be a Key Driver of Technology Market Share

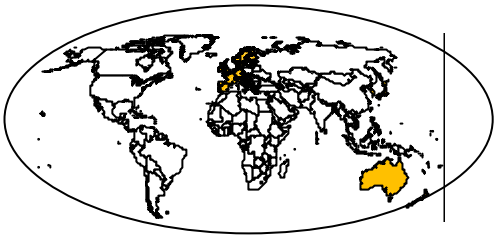


Countries able to deploy CDMA2000 in existing **cdmaOne** networks represent **over 4.428 billion** pops

Countries announcing CDMA2000 deployments represent **2.168 billion** pops

Countries with Commercial CDMA Networks

Countries with CDMA2000 Networks, Plans or Trials



Countries that have awarded UMTS spectrum represent only 617 Million pops

Countries with **UMTS** Licensed Spectrum at 2.1 GHz

Source: CIA World Factbook: July 2000, CDG: 2001, Ovum: June 2001, BIS: 2001

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Advantages of CDMA2000 @ Any Frequency

1. **CDMA2000 1x allows for unparalleled voice capacity of up to 26 erlangs per sector/carrier.**
2. **CDMA2000 1x allows for current realized data speeds of 153Kbps increasing to 307 Kbps**
3. **1XEV:DO (HDR): is a dedicated channel which will have peak speeds of 2.4 Mbps and has 5 times the data traffic capability.**
4. **The upgrade to 1xEV:DO does not require new spectrum or new base stations.**
   - **Rather, it can be implemented by adding channel cards and software to existing base stations.**
   - **It is the most cost effective solution available.**

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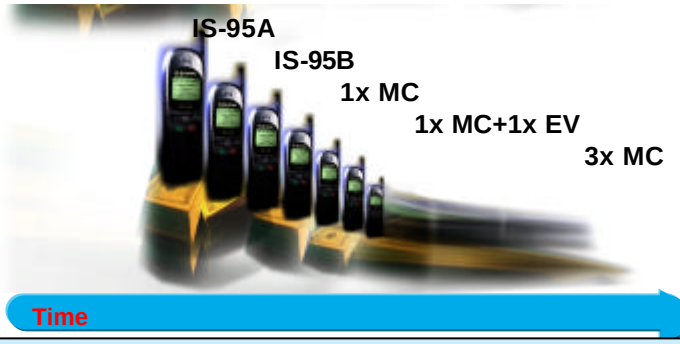
Terminal Compatibility

CDMA/CDMA2000



CDMA/CDMA2000 phones are forward and backward compatible. This is unique to CDMA/CDMA2000 Technology

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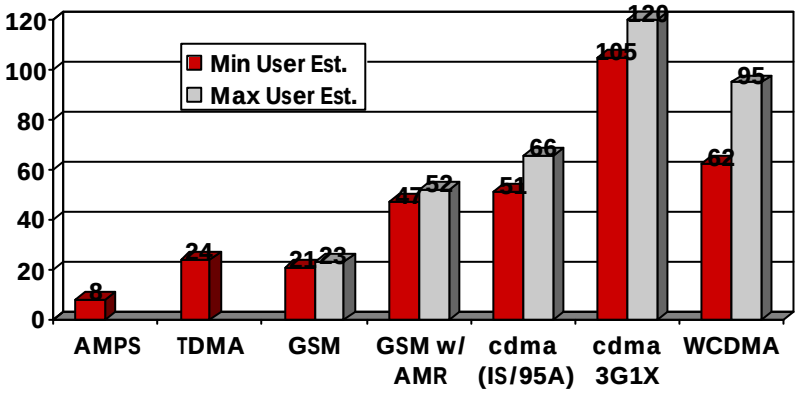
Voice Capacity Per 5mhz of Spectrum



Source: Deutsche Banc Alex. Brown estimates from various sources, "The Rise of the 3G Empire," Sept. 2001.

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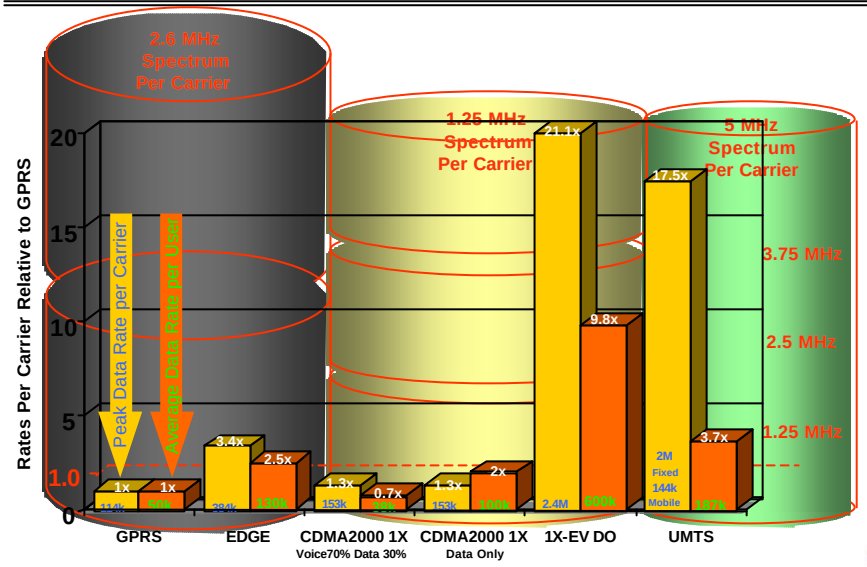
Summary of Data Capacity Comparison



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Why Is CDMA2000 So Successful?

Requires 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

14 Source: Morgan Stanley, June 2002

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Why Is CDMA2000 So Successful?

CDMA2000 handsets are readily available and relatively inexpensive compared to other 3G devices

Devices available today

1. **Over 410 CDMA2000 Devices Commercially Available**
2. **45 Manufacturers Across Asia, Europe and America**
3. **Color displays, MP3 players and cameras, supporting high-speed data access**

Handset pricing and performance

	CDMA2000 1X (SKT, KTF)	**CDMA2000 1xEV-DO** (SKT, KTF)	**W-CDMA** (DoCoMo)
Wholesale price	$200-400	$400-500	$600-$750
Speed (kbps)			
Maximum	144	2400	64-384
Average	100-120	400-800	80-90
Battery life	250 hours	N/A	55 hours

15 Source: Morgan Stanley, June 2002

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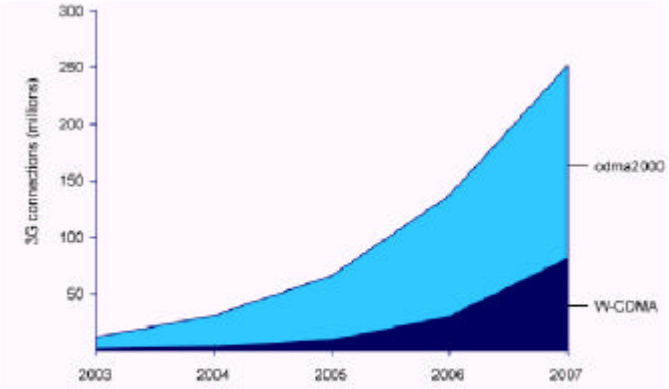
3G Connections Worldwide (2003-2007) – Ovum Study



New data from European industry consultants, Ovum, shows the potential growth of CDMA2000. Already CDMA2000 Growth Has Surpassed their Forecast with over 54 Million Subscribers Today!

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Affordable IMT-2000/3G
The Case for 450 MHz

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Implementing IMT-2000 in the 450 MHz Band ...CDMA450

- 450 MHz is good spectral "real estate"
  - ➢ *better propagation = fewer base stations*
- IMT-2000 provides mobile Internet access
- Many developing countries have 450MHz band licensed for mobile applications or available for licensing
- Timing coincides with first 3G availability
- About cdma450
  - cdma450 =>CDMA-MC operating in the 450 MHz band
  - ✉ *cdma450 fully complies with ITU-R IMT-2000 Recommendations and detailed specifications*
- CDMA-MC is the only *"CDMA"* IMT-2000 radio interface that fits into the NMT450 licenses

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The Economics Of Propagation

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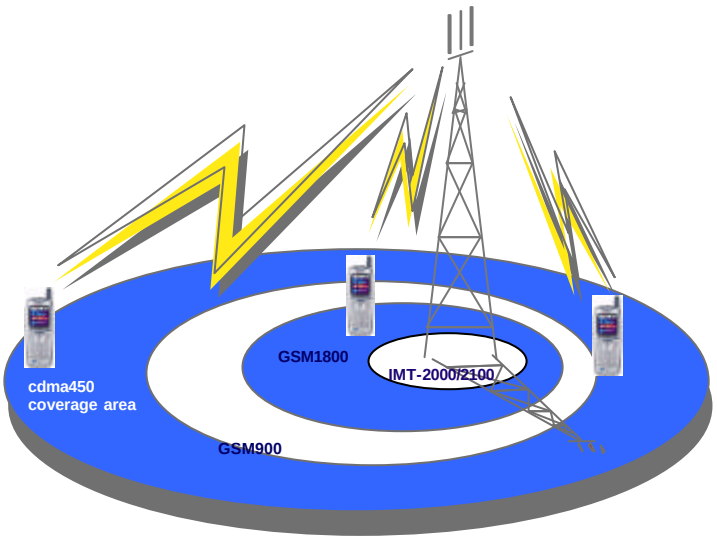
Using RF Propagation to its best advantage



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What are the alternatives?

Frequency (MHz)	Cell radius (km)	Cell area (km^2)	Relative Cell Count
450	**48.9**	**7521**	**1**
850	**29.4**	**2712**	**2.8**
950	**26.9**	**2269**	**3.3**
1800	**14.0**	**618**	**12.2**
1900	**13.3**	**553**	**13.6**
2500	**10.0**	**312**	**24.1**

*Source: Qualcomm ITU 8/F Submission, June 11, 2001, "**COVERAGE COMPARISON OF IMT-2000 SYSTEMS AT VARIOUS FREQUENCY RANGES, INCLUDING 450 MHZ**"*

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Expected structure of a UMTS / IMT-2000 network

Cell type	**rural**	**macro**	**micro**	**pico**
Cell Radius	**8 km**	2 km	0.5 km	0.125 km
Application	high mobility	high mobility	low mobility/ pedestrian	indoor/ pedestrian
Offered capacity per cell in 5 MHz	400 kbps	400 kbps	1000 kbps	1000 kbps

***Source:** Germany (Federal Republic of), ITU 8/F Submission, March 3, 2000, "PROCEDURES FOR SIMULATING MATURE DEPLOYMENT OF CELLULAR NETWORKS IN THE MOBILE SERVICE"*

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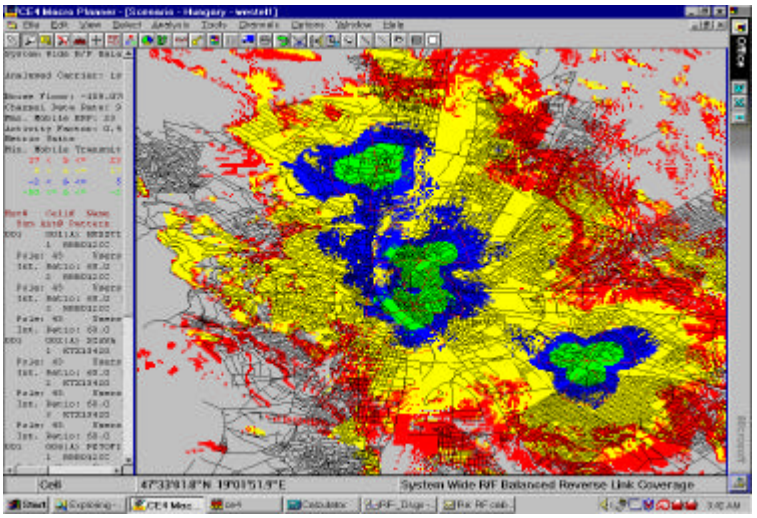
Four CDMA450Basestations covered most of Budapest.



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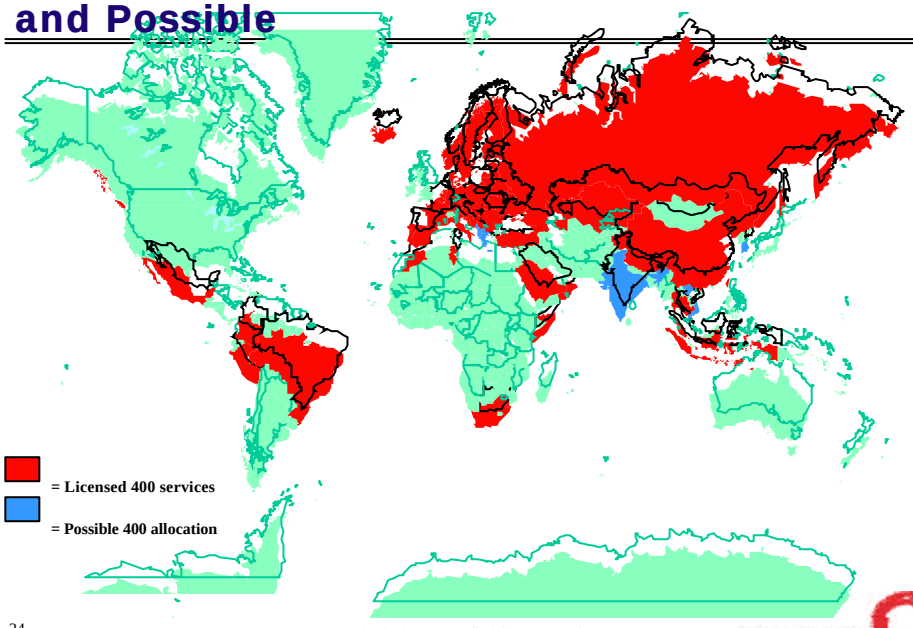
The 400 MHz Footprints: Past, Present, and Possible



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J. Nordgaard

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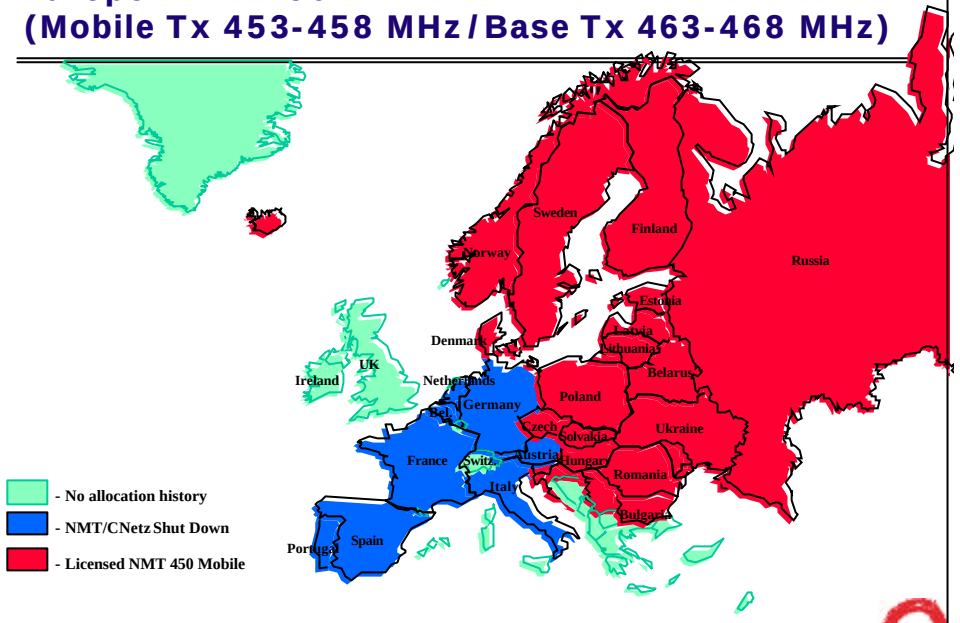
Europe: NMT 450
(Mobile Tx 453-458 MHz / Base Tx 463-468 MHz)



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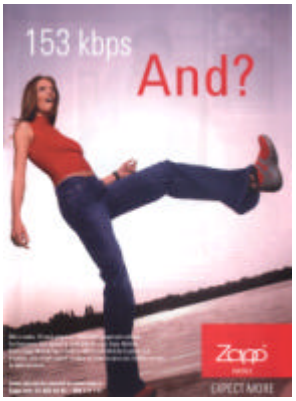
Zapp, a CDMA 450 Success Story



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CDMA 450 Expectations and Benefits

SUBSCRIBER EXPECTATIONS

- **Voice quality that meets or exceeds wireline**
- **Flexibility in service delivery - location independent**
  - *High speed mobility*
  - *Low speed (pedestrian) mobility*
  - *Fixed*
- **Reliable service**
  - *Available when needed*
  - *Available where needed*
- **Ease of Use**
  - *No Service Contracts/Commitments*
  - *Ease of Subscription - Over-the-Air Activation/Programming*
  - *Low Price/Known Price - Simplified Rate Structure Based on Type Service Delivery/Location*
- **Evolution to Higher Speed Data**
  - *Internet Access/Multimedia*
  - *Cost effective Short Message Services*
  - *EMAIL Services*

OPERATOR BENEFITS SOUGHT

- **Coverage**
- **Capacity - Voice and Data**
- **Quality/Clarity - Competitive vs. Wireline**
- **Network capabilities - features and functions (richness of features)**
- **Time to market**
- **Investment Protection**
  - **Evolution to future services and technologies**
  - **Preservation of investment in existing operating systems and infrastructure**
- **Cost Effectiveness of cdma vs. Analog 450 Systems**
  - *Cost effective solution - initial investment and operating costs*
- **Deployment assistance**
- **Availability of Terminals**
- **Flexibility in Service Delivery**
  - Addition of new services and features with ease

CDMA450 Solution

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CDMA 450 Value proposition

➔ **Enables an immediate move from analog to a fully digital wireless network that is 3G-1X from inception, with high voice capacity as well as high data rates.**

➔ **cdma450 allows operators to realize the full market potential of 450 spectrum and achieve their revenue growth objectives with a cost-effective highly flexible approach to satisfying the evolving needs of the subscribers.**

➔ **Provides IMT-2000 capabilities, without the need for additional spectrum, making service providers competitive with larger players.**

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What Are We to Conclude?

1. Lower frequencies are the key to reducing cost.
2. The world needs a more “economical” 3G solution for rural coverage.
3. The 800 and 400 MHz range has multiple bands available in many countries.
4. We need your support to have the 400 MHz range recognized by the ITU as an identified 3G band.

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Thank You !

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