



**THE NATIONAL EMPLOYERS' FEDERATION OF
THE PUBLIC UTILITIES OPERATORS OF ROMANIA**
ACCESS TO THE INFORMATION SOCIETY IN THE EUROPE OF 25

BROADBAND IN ROMANIA :

Actual Situation & Future Perspectives

Dr. MARIUS – EUGEN OPRAN, PRESIDENT
Presidential Counsellor - FNPSPR President
Vice President, IT & C CEEP Commission



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... BACKBONES IN ROMANIA

- **ROMTELECOM**
- **MOBIFON**
- **ORANGE**
- **STS – SERVICIUL DE TRANSMISIUNI SPECIALE**
- **SNR - SOCIETATEA ROMANA DE RADIOCOMUNICATII – WIRELESS**
- **CFR TELECOMUNICATII – OVER 4,100 KM O.F.**
- **TRANSELECTRICA – OVER 3,500 KM OF OPTICAL FIBER**
- **RDS&RCS – OVER 3,000 KM OF OPTICAL FIBER**
- **ASTRAL TELECOM**



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... USERS / TECHNOLOGY MATRIX

	RESIDENTIAL	BUSINESS	MOBILE CLIENTS
ISDN			
xDSL			
Cable			
FO			
V-SAT			
W-LESS MOBILE			
W-LESS FIX			
Wi-Fi HOT SPOTS			
WiMAX			



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... BROADBAND ACCESS : WIRED

- **ISDN**
 - ✓ 9,500 ESTIMATED CONNECTIONS COUNTRYWIDE
 - ✓ LAUNCHED BY ROMTELECOM (NAT'L TELCO) IN SEPTEMBER 2001
- **xDSL**
 - ✓ NO OFFER FROM ROMTELECOM
 - ✓ PROVIDED BY PCNET, DIGICOM, ADISAM TELECOM OVER ROMTELECOM LINES
 - ✓ LOW DATA RATE UP-LINK (GOOD FOR INTERNET, BAD FOR VPN)
- **CATV**
 - ✓ PROVIDED BY CABLE COMPANIES (RDS&RCS , ASTRAL TELECOM, CVR ETC.)
 - ✓ NO QOS (NO GOOD FOR BUSINESS)
 - ✓ RESIDENTIAL LOW COST INTERNET ACCESS
- **FO (OPTICAL FIBER)**
 - ✓ HIGH COSTS FOR LOCAL LOOP
 - ✓ BIG TIME FOR INSTALLATION (AROUND 2 MONTHS)
 - ✓ AFTER INSTALLATION ⇒ CHEAP BROADBAND ACCESS TO URBAN NETWORK
 - ✓ MOSTLY PROVIDED BY RDS&RCS, ASTRAL TELECOM AND EQUANT



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... BROADBAND ACCESS : MOBILE

- **GPRS, HSCSD, EDGE (GSM based)**
 - ✓ LIMITED AVAILABILITY TO SPECIFIC AREAS
 - ✓ HIGH COSTS
 - ✓ LIMITED DATA TRANSFER UP TO 100 KBPS
 - ✓ PROVIDED BY CONNEX AND ORANGE
- **CDMA – 2000, EV-DO (CDMA based)**
 - ✓ LIMITED AVAILABILITY AND COVERAGE
 - ✓ HIGH COSTS
 - ✓ DATA TRANSFER UP TO 2.4 MBPS
 - ✓ ASYMMETRICAL, NON-GUARANTEED TRANSFER RATES, LARGE DELAYS
 - ✓ GOOD FOR INTERNET, BAD FOR VPN
 - ✓ PROVIDED BY ZAPP



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... BROADBAND ACCESS : FIXED WIRELESS (I)

➤ V-SAT

- ✓ HIGH BW AND EQUIPMENT COSTS
- ✓ LOW DATA RATE UP-LINK / LARGE DELAY
- ✓ REMOTE AREAS, ONLY

➤ 2,4 GHZ / 5.4GHSZ / 5.7 GHZ – UNLICENSED

- ✓ NO QUALITY OF SERVICE (QOS)
- ✓ CROWDED SPECTRUM IN BUCHAREST AND BIG CITIES
- ✓ PROVIDED BY ALMOST ALL ISP COMPANY FOR INTERNET ACCESS

➤ WI-FI SPOTS (IEEE 802.11)

- ✓ NO QUALITY OF SERVICE (QOS) BECAUSE OF THE UNLICENSED FREQUENCY
- ✓ WI-FI EQUIPPED LAPTOPS
- ✓ LAN ORIENTED
- ✓ AVAILABILITY LIMITED TO CERTAIN LOCATIONS (SUCH AS HOTELS AND AIRPORTS), MOST OF THEM IN BUCHAREST
- ✓ PROVIDED BY MOBIFON, ORANGE AND ASTRAL TELECOM
- ✓ REPRESENTS THE TESTIMONY OF THE MARKET NEED FOR MOBILE INTERNET



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... BROADBAND ACCESS : FIXED WIRELESS (II)

➤ 3,5 GHZ – LICENSED FREQUENCY

- ✓ GUARANTEED QUALITY OF SERVICE (QOS)
- ✓ VPN, INTERNET, VOICE, VIDEO-CONF
- ✓ WIDE COVERAGE (EX.: ACCESSNET COVERS 150 MOST IMPORTANT CITIES NATIONWIDE)
- ✓ LICENSED COMPANIES: ACCESSNET, ASTRAL, EQUANT, MOBIFON, MOBIROM, SNR, POST TELECOM

➤ 26 GHZ – LICENSED FREQUENCY

- ✓ HIGH BW / HIGH COSTS
- ✓ AVAILABILITY LIMITED CURRENTLY TO BUCHAREST
- ✓ THE BASE STATION COVERAGE LIMITED TO A RADIUS OF MAXIMUM 5 KM
- ✓ LICENSED COMPANIES: ACCESSNET, SNR, SKYTEL, MOBIFON



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... BROADBAND ACCESS : FIXED W-LESS

THE FUTURE ...

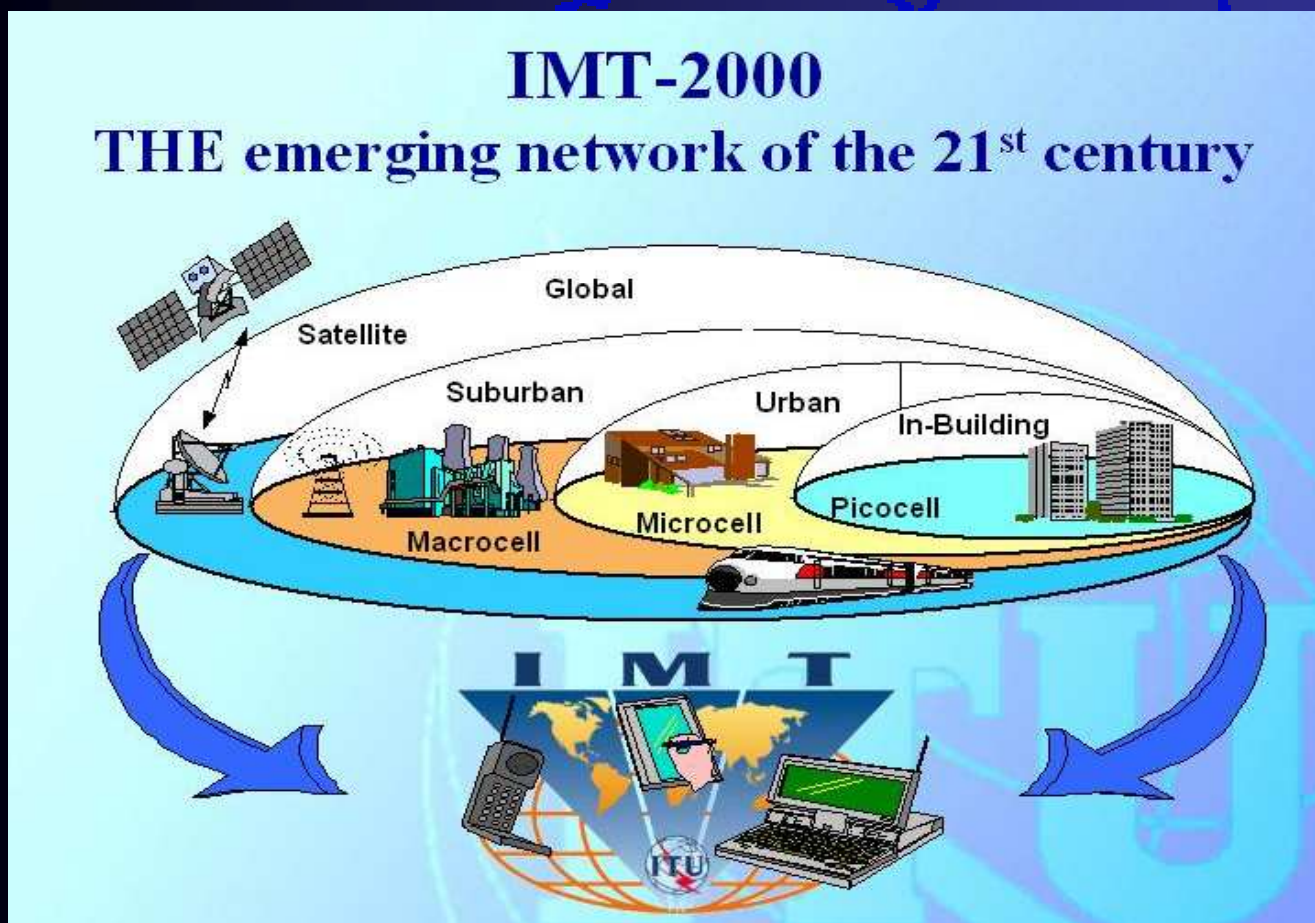
➤ **WIMAX (IEEE802.16D&ETSI HIPERMAN)**

- ✓ **QOS THROUGH TIME SLOT ALLOCATION**
- ✓ **MAN ORIENTED**
- ✓ **OFDM (256FFT) -> NLOS (NON LINE OF SIGHT PROPAGATION)**
- ✓ **FULL DUPLEX BASE STATIONS**
- ✓ **FLEXIBLE BW SLOTS**
- ✓ **MOBILITY SOON (IEEE802.16E IN 2005)**
- ✓ **ALTERNATIVE TO 3G**
- ✓ **LED BY INTEL AND ALVARION**



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WIRELESS NETWORK TECHNOLOGIES



**ANYWHERE,
ANYTIME
COMMUNICATIONS**

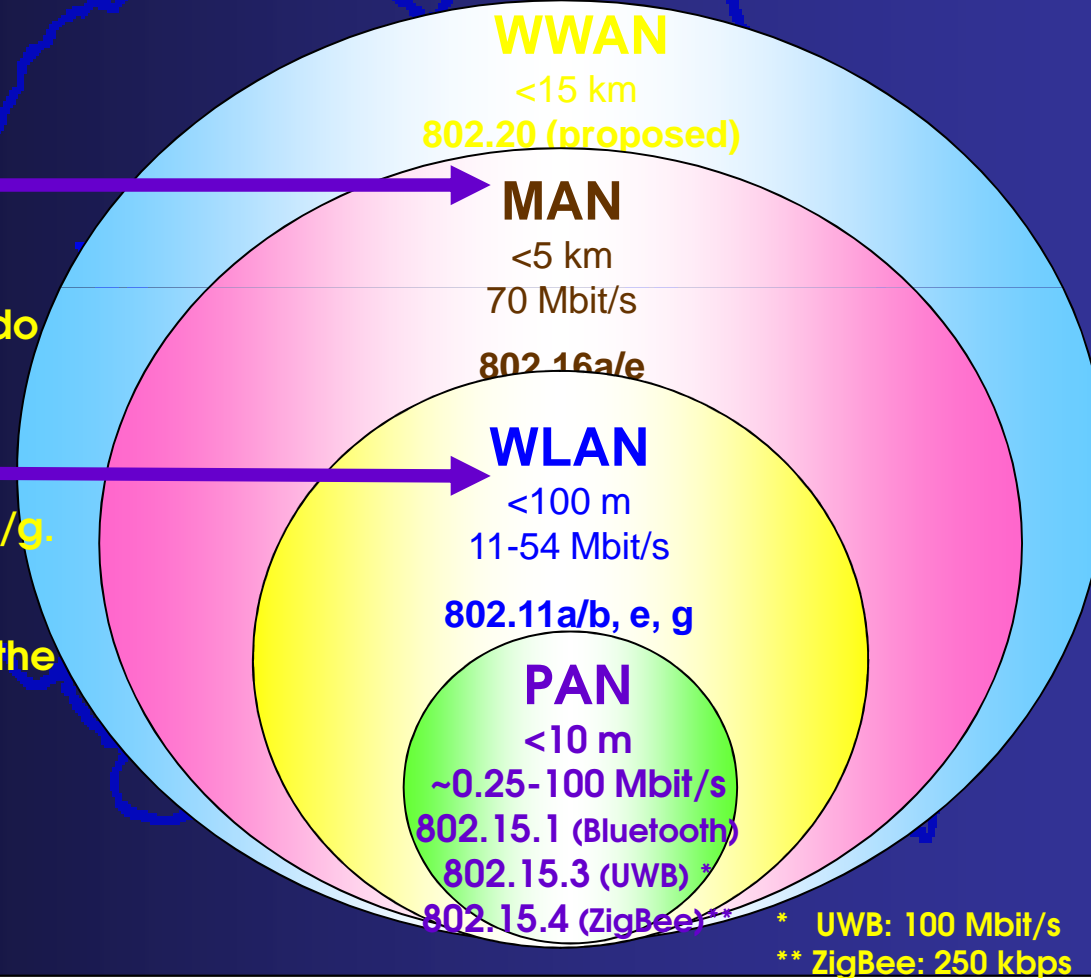


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IEEE STANDARDS

WiMAX
New standard for Fixed broadband Wireless. Trying to do for MAN what Wi-Fi did for LAN.

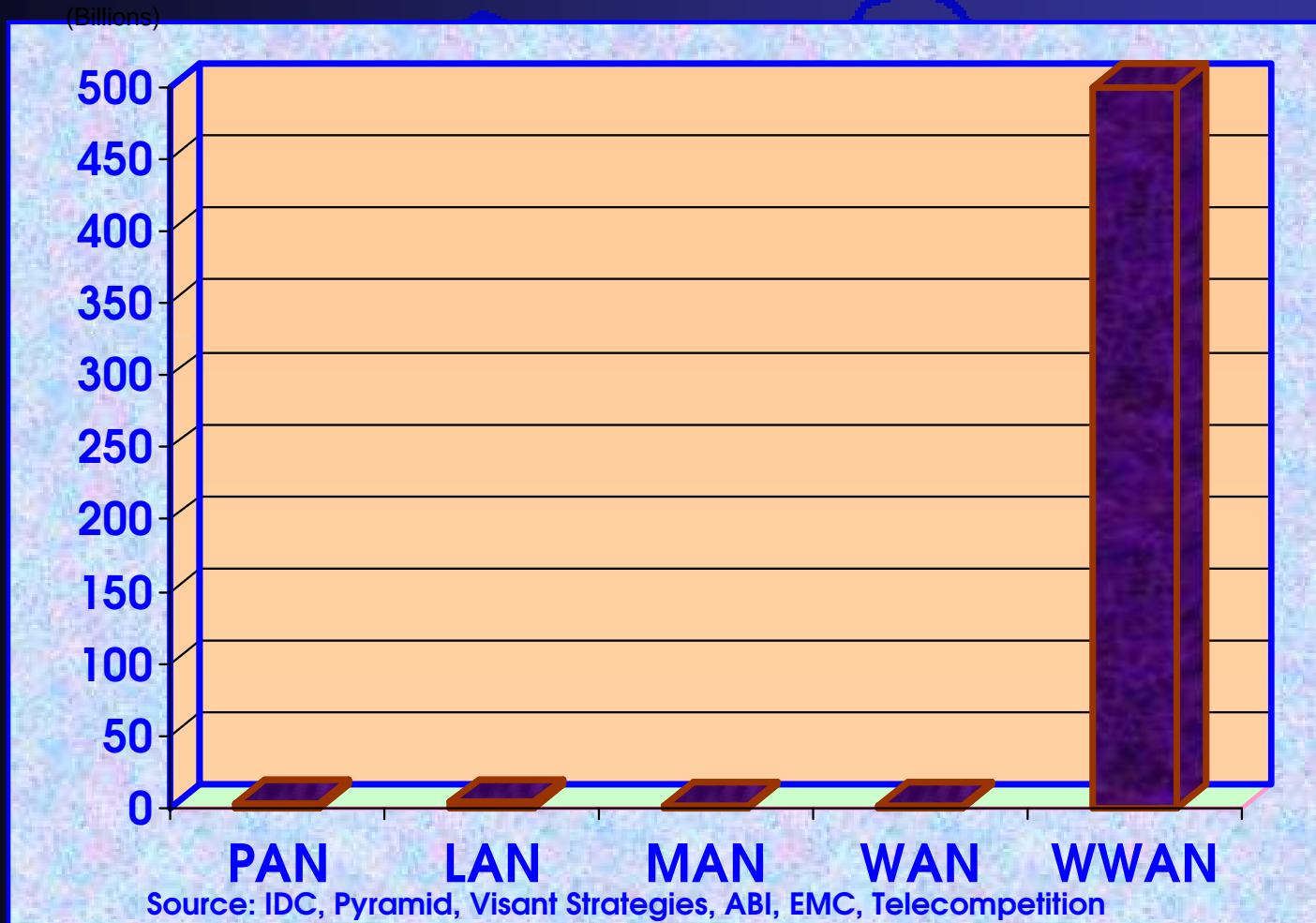
Wi-Fi®
Includes 802.11a/b/g. Products must be Approved for Interoperability by the Wi-Fi Alliance.





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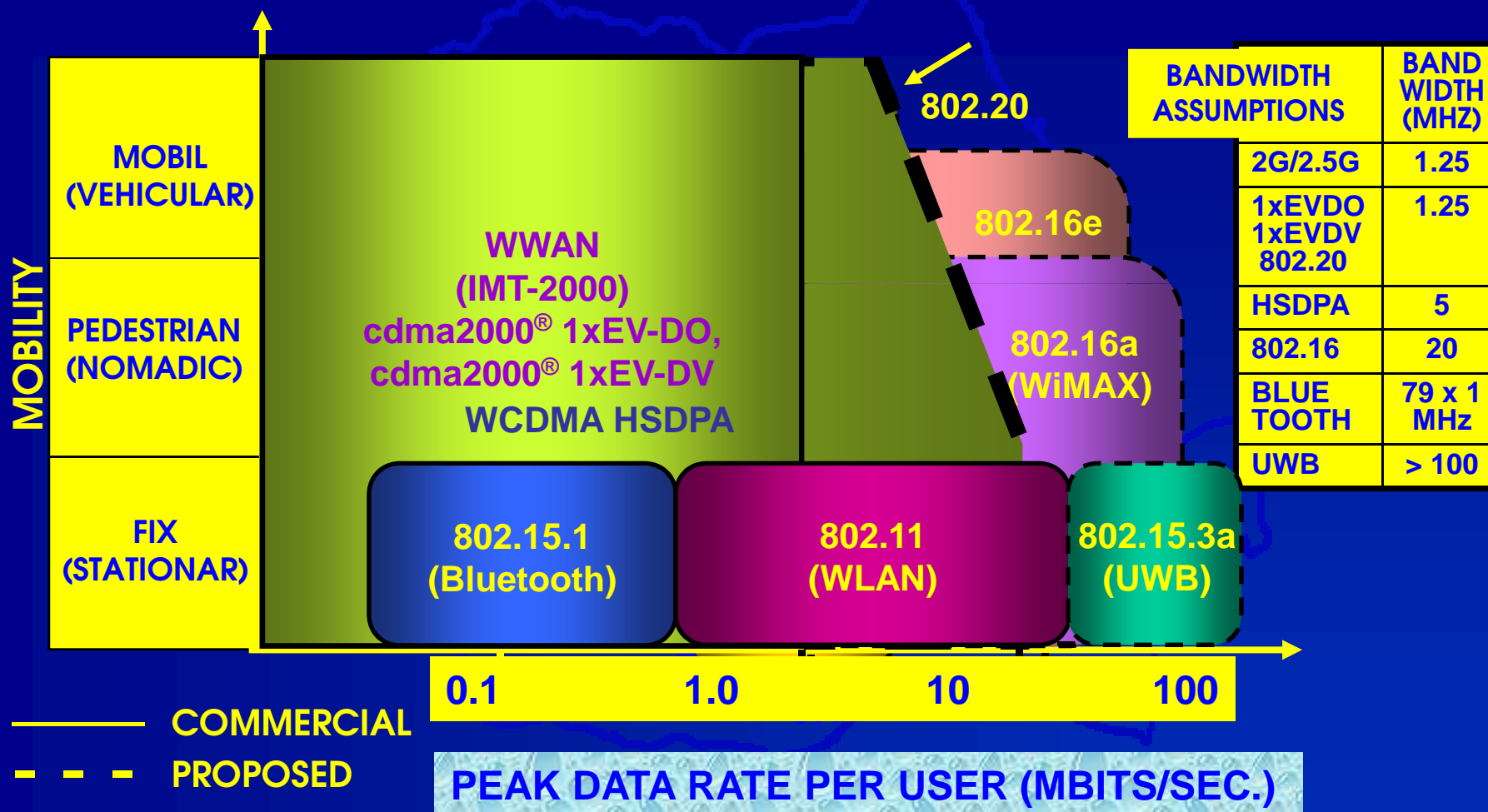
WORLDWIDE REVENUES SPLIT BY 2008





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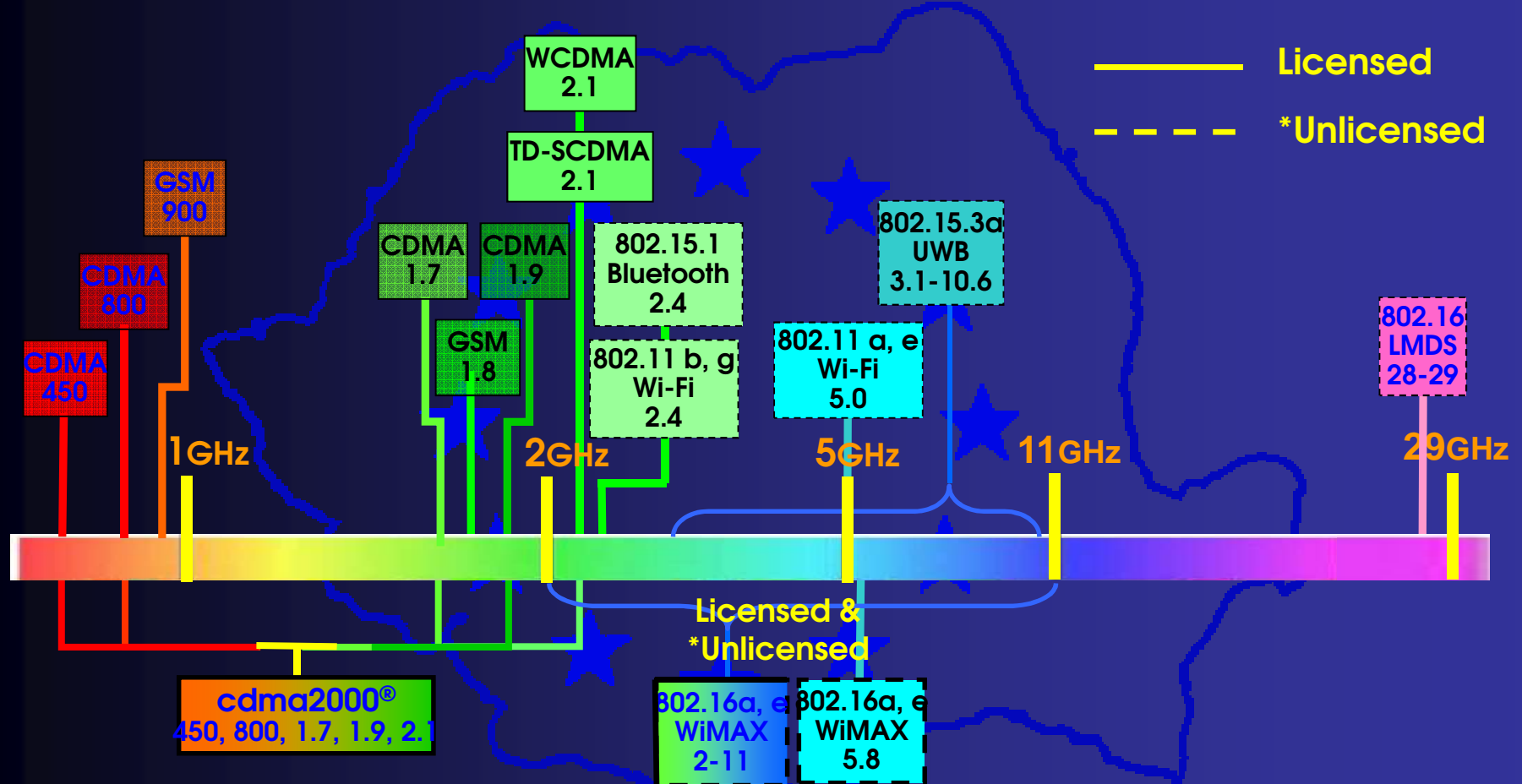
Wireless Data Standards





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SPECTRUM ALLOCATIONS CRITERIA



- AFFORDABLE COVERAGE IS KEY IN WIRELESS TELECOMMUNICATIONS
- LOWER FREQUENCIES ARE BEST POSITIONED

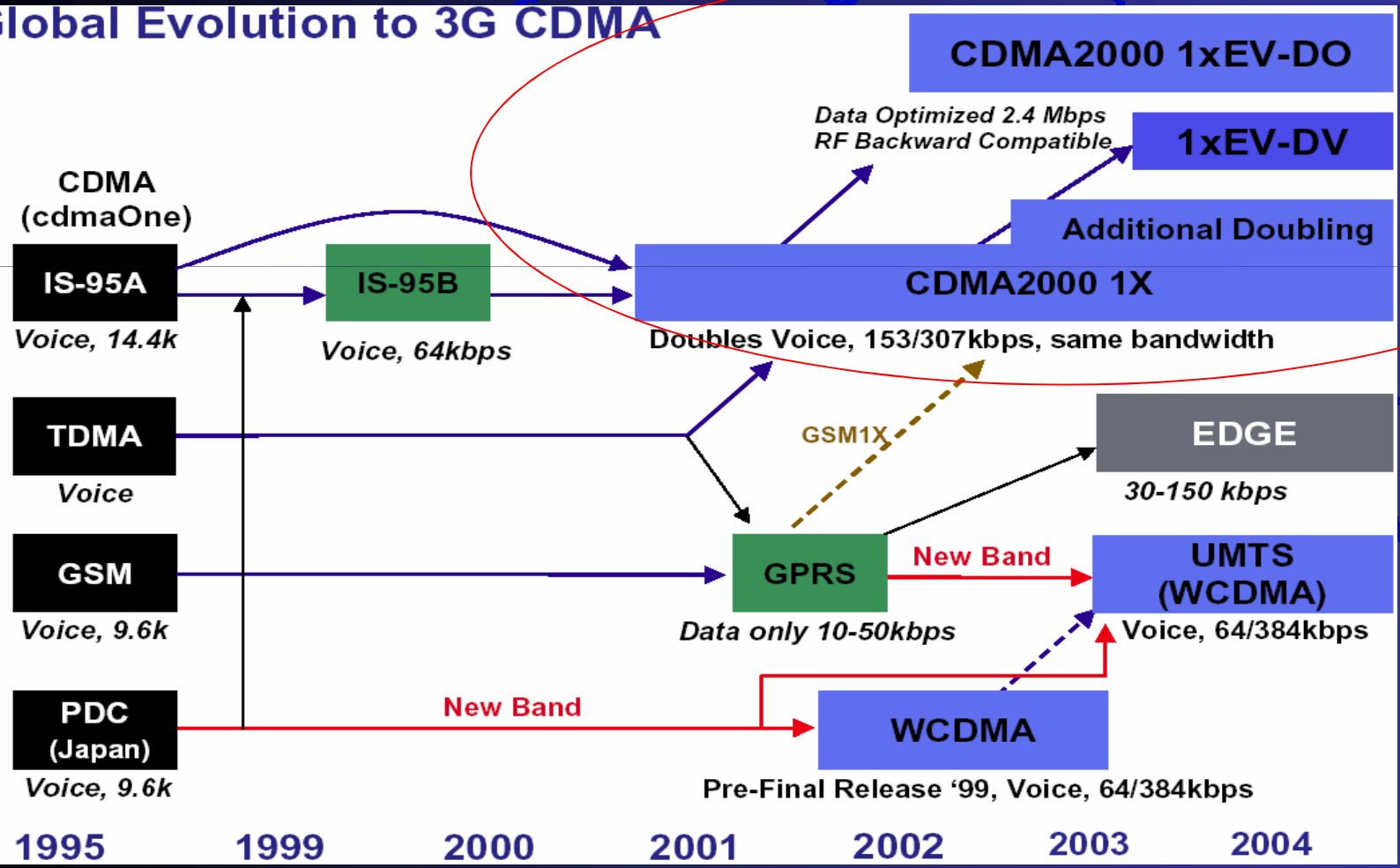
•THE USE OF UNLICENSED SPECTRUM CREATES INTERFERENCE ISSUES



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TECHNOLOGY CHOICES

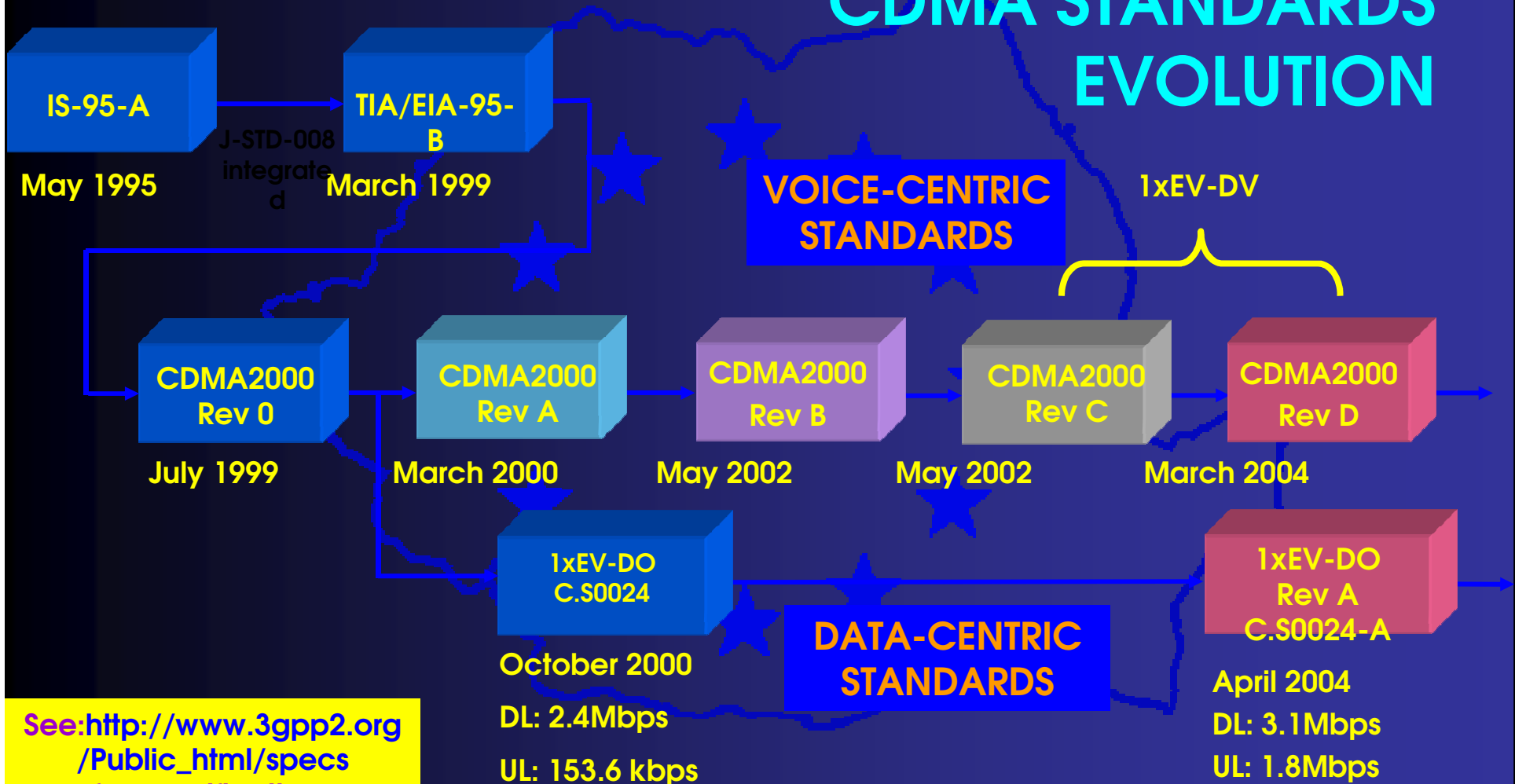
Global Evolution to 3G CDMA





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CDMA STANDARDS EVOLUTION

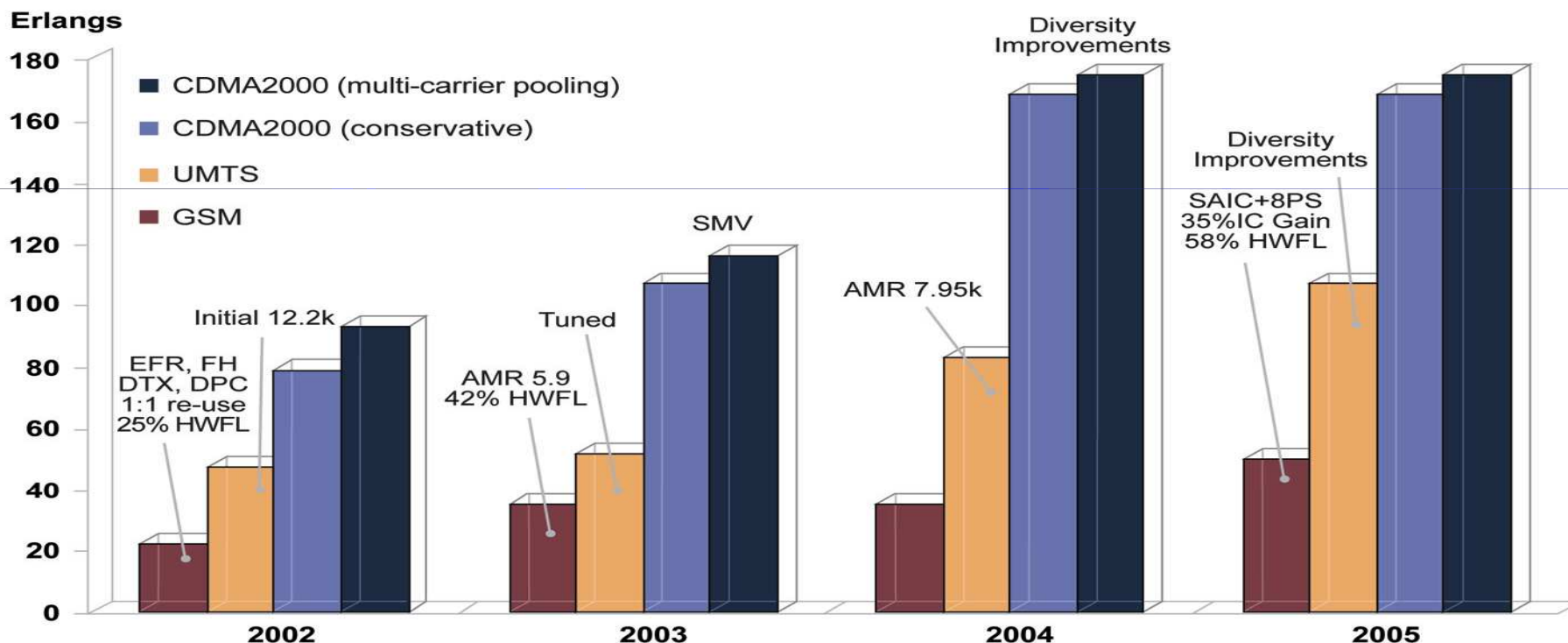




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VOICE CAPACITY COMPARISON

Voice Capacity Evolution
(Compared in 5 MHz bandwidth)



Footnotes:

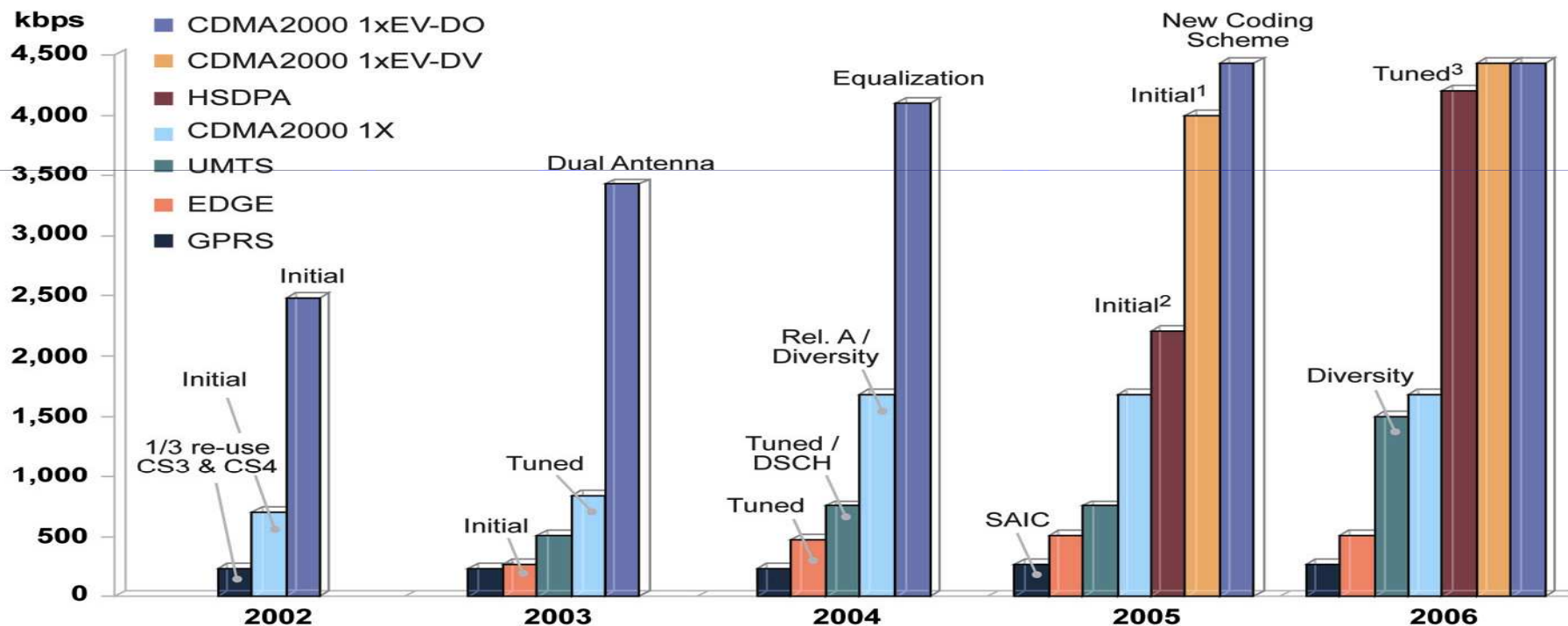
Assumes 100% loading of voice traffic.
Assumes 2% blocking.
Gains assume 100% of users using latest technology.
Actual gains would depend on handsets penetration.



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DATA RATES COMPARISON

Average Aggregate Throughput
(Compared in 5 MHz bandwidth)



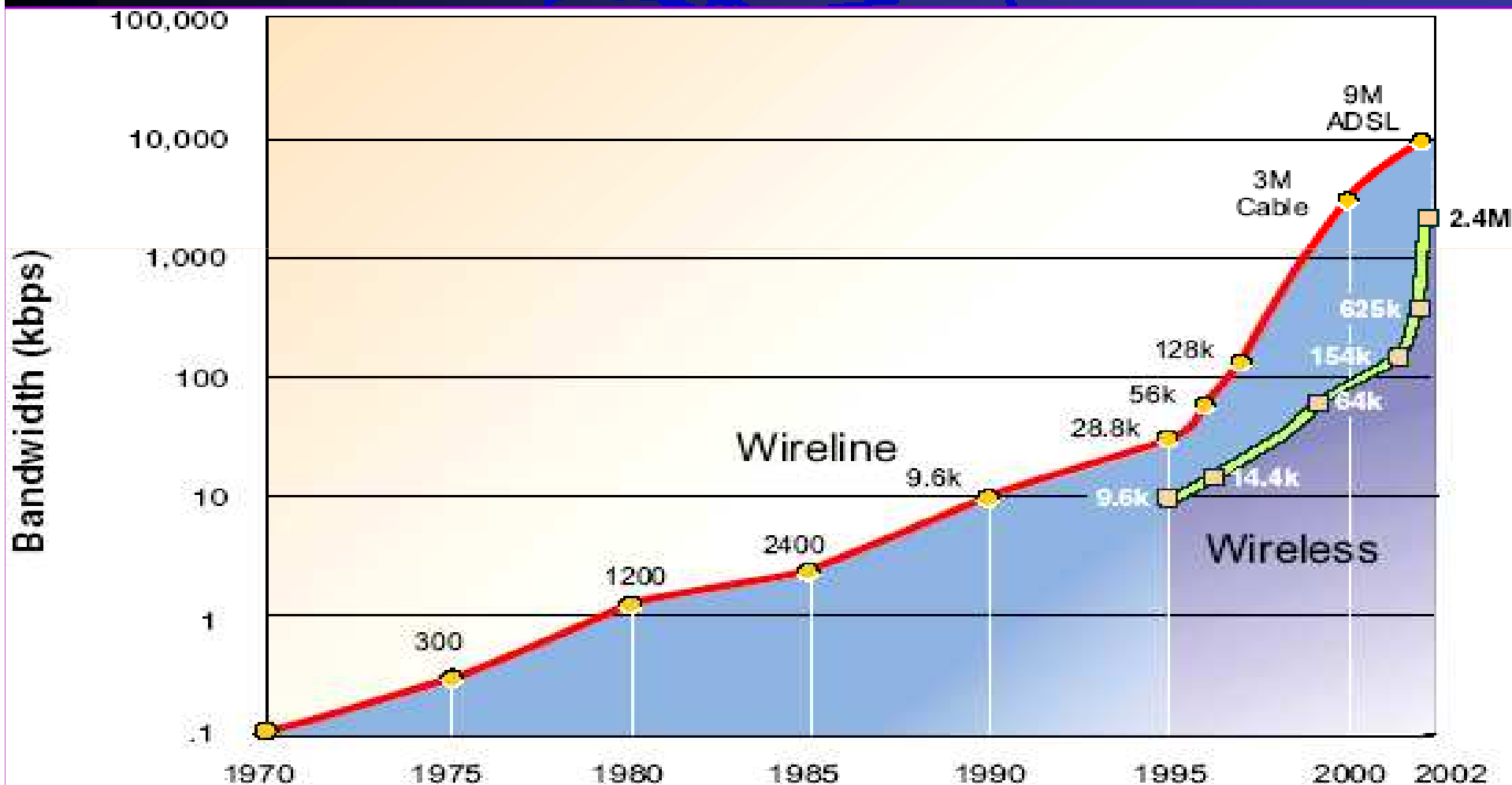
Footnotes:

- ¹ Assumes initial version of 1xEV-DV will support Mobile Diversity and Equalization.
- ² Assumes 2005 HSDPA devices will be class 12 (support 5 out of 15 codes and only QPSK modulation).
- ³ Support for Mobile Diversity, Equalization and higher data rates.



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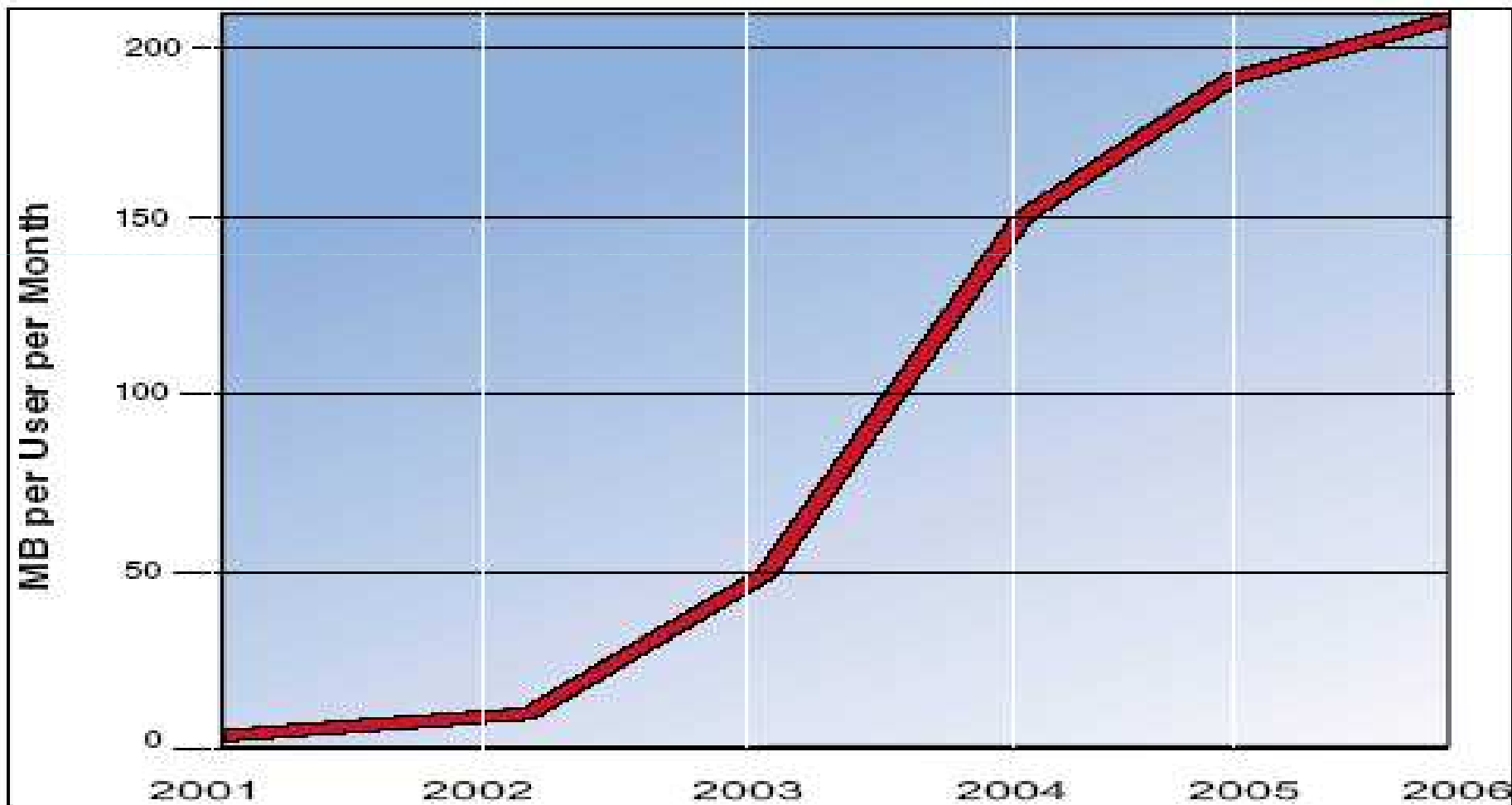
WIRELIN VS. WIRELESS DATA RATES





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WIRELESS MOBILE DATA FORECAST





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DOWNLOAD TIME REQUIRED FOR 3MB

Air interface	Peak Data rate	Download time in minutes
GSM	9.6 kbps	41.7 minutes
IS-95-A CDMA	14.4 kbps	28 minutes
GPRS	40 kbps	10 minutes
IS-95-B CDMA	64 kbps	6.3 minutes
cdma2000 1x (implemented)	307 kbps*	1.3 minutes
cdma2000 1x (standard)	625 kbps*	0.6 minutes
WCDMA (implemented)	384 kbps	1 minute
WCDMA (standard)	2.0 Mbps	0.2 minutes
cdma2000 1xEV (HDR)	2.4 Mbps	0.15 minutes



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COST PER MEGABYTE COMPARISON

	Data Traffic Density		
	Low	Medium	High
Cost per Mbyte			
cdma2000 1x	\$ 0.153	\$ 0.064	\$ 0.059
cdma2000 1xEV	\$ 0.074	\$ 0.025	\$ 0.022
WCDMA	\$ 0.214	\$ 0.074	\$ 0.069
GPRS	\$ 0.472	\$ 0.417	\$ 0.415
Based on:			
kpbs per Square Kilometer	764 kpbs	3,818 kpbs	7,635 kpbs
Users per Square Kilometer			
...if 205 Mbytes/User/Month	200 users	1,000 users	2,000 users
...if 102 Mbytes/User/Month	400	2,000	4,000
...if 41 Mbytes/User/Month	1,000	5,000	10,000

1. Data traffic only.
2. 5 MHz spectrum available for data services
3. 15% of data traffic volumes at busy hour.
4. Includes network operating costs and depreciation on capital investments specific to each network technology; excludes common Internet interconnect cost.
5. In-building penetration loss: 15 dB; pedestrian environment.
6. Greenfield deployments.
7. Assumes normalized throughput per 5 MHz bandwidth, based on the pedestrian model
8. Assumes 7 year straight line depreciation of all capital.



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... THE MARKET

➤ GENERAL CONSIDERATIONS

- ✓ 100.000 BROADBAND SUBSCRIBERS (BUSINESS & RESIDENTIAL)
- ✓ AVERAGE EXPENSES IN 2004
 - ✓ DIAL – UP CONNECTION : 19 USD
 - ✓ BROADBAND CONNECTION : 86 USD

➤ BUSINESS SEGMENT (I)

- ✓ ABOUT 1,500 COMPANIES: AT LEAST MIN. 1 ADDITIONAL POINT OF PRESENCE
- ✓ ABOUT 11,000 POINTS OF PRESENCE NATIONWIDE
- ✓ REQUIRES BIDIRECTIONAL TRAFFIC FOR VPN's
- ✓ 24,868 COMPANIES: "ALWAYS-ON" CONNECTIONS
- ✓ 41% OF COMPANIES WITH DIAL-UP CONNECTION ⇨ "ALWAYS-ON";
63.6% OF THOSE ⇨ "BROADBAND" (BB)
- ✓ 35.2% OF COMPANIES WITH "ALWAYS-ON" CONNECTION (7.8%
FROM TOTAL No. OF COMPANIES) - "BROADBAND" USERS



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... THE MARKET – BUSINESS SEGMENT (II)

INTERNET PENETRATION	59.2%	66,197
DIAL-UP	35.2%	39,360
FIXED TELEPHONY	25.0%	27,955
GSM/GPRS/CDMA	5.3%	5,926
ISDN	4.9%	5,479
ALWAYS-ON	24.0%	26,836
CABLE	10.4%	11,629
RADIO	4.5%	5,032
FO	4.3%	4,808
LEASED LINES	3.2%	3,578
xDSL	1.2%	1,342
VSAT	0.4%	447

SOURCE: ANRC - 2004

No of. Companies – from YELLOW PAGES



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... THE MARKET – RESIDENTIAL & MOBILE USERS (I)

➤ RESIDENTIAL MARKET

- ✓ 37% RESIDENTS WITH DIAL-UP ⇒ “ALWAYS-ON”
- ✓ ABOUT 15 PC's / 100 INHABITANTS
- ✓ POOR ACCES TO TELECOM INFRASTRUCTURE FOR 50% OF RURAL POPULATION
- ✓ BOOM FOR LOCAL METROPOLITAN & NEIGHBORHOOD DATA TRANSMISSION
- ✓ 35% OF SUBSCRIBERS USING “ALWAYS-ON” CONNECTION (34.560 REZIDENTS) HAVE BROADBAND CONNECTIONS

➤ MOBILE USERS MARKET

- ✓ MAINLY BUSINESS PEOPLE WITH LAP-TOP
- ✓ ZAPP: EV-DO TECHNOLOGY
 - ◆ ONLY INTERNET
 - ◆ SPEEDS UP TO 2.4 Mbps – NON-GUARANTEED TRAFIC
- ✓ MOBIFON, ORANGE: GPRS, HSCSD & EDGE TECHNOLOGIES
 - ◆ LIMITED AVAILABILITY FOR SPECIFIC AREAS
 - ◆ HIGH COSTS; SPEEDS UP TO 100 Kbps



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... THE MARKET – RESIDENTIAL & MOBILE USERS (II)

INTERNET PENETRATION	12.2%	495,074
DIAL-UP	81.4%	396,331
FIXED TELEPHONY	74.3%	353,832
GSM/GPRS/CDMA	8.6%	40,935
ISDN	0.3%	1,564
ALWAYS-ON	18.6%	98,743
CABLE	14.1%	76,631
RADIO	0.8%	3,840
FO	2.9%	14,012
LINII INCHIRIATE	0.4%	2,096
xDSL	0.3%	1,564
VSAT	0.1%	600

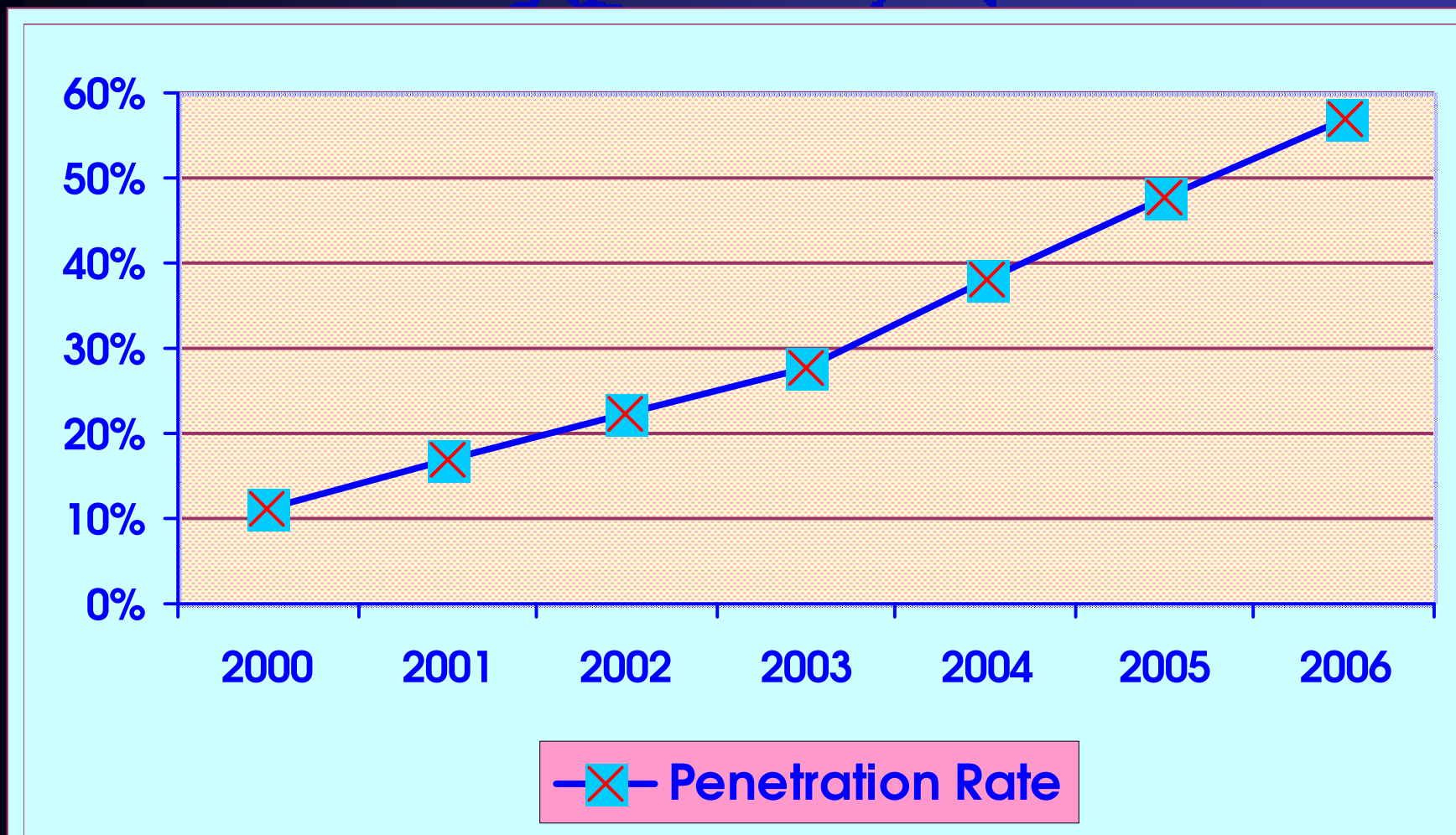
Source: ANRC - 2004

Only urban households



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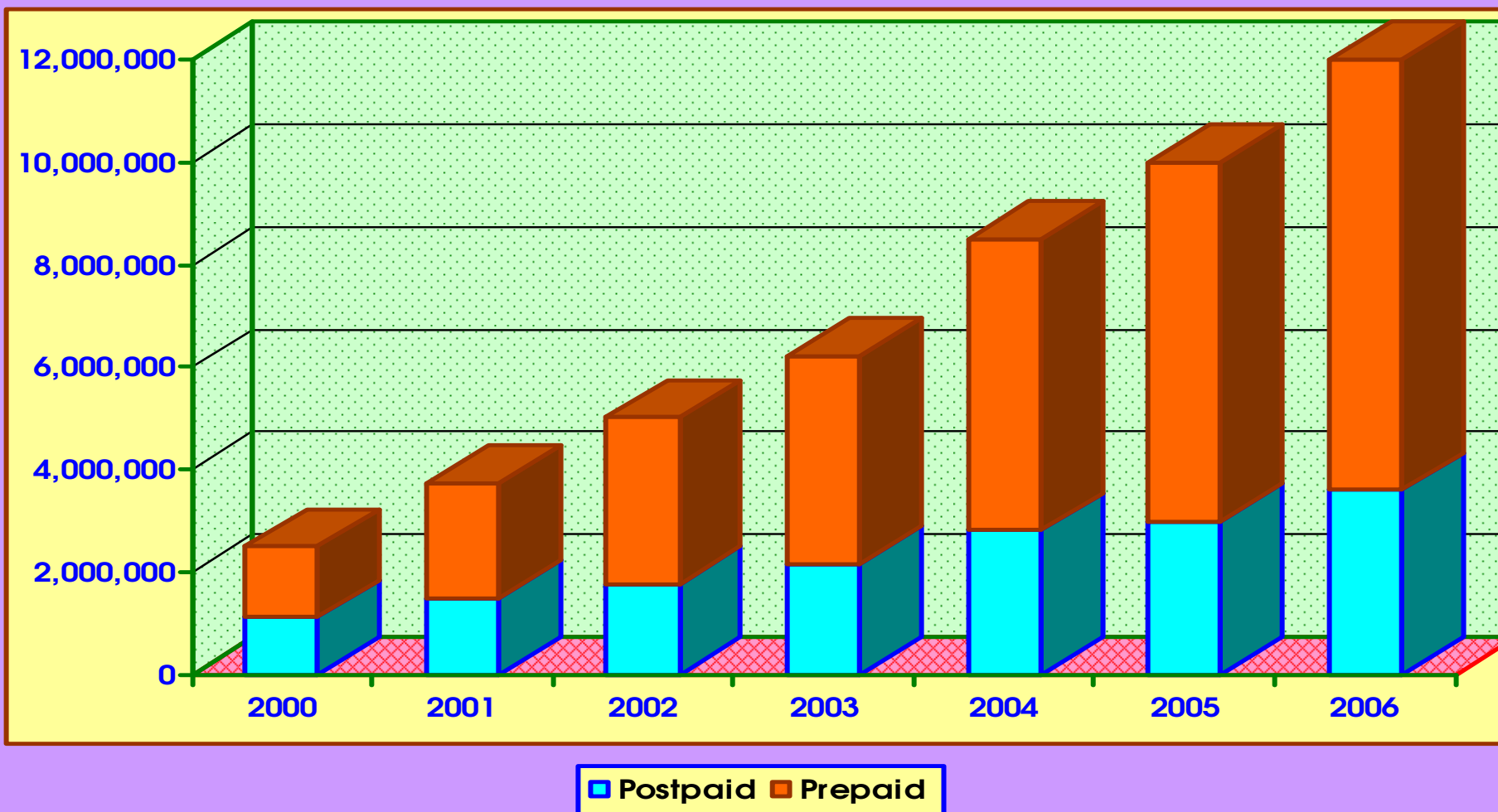
MOBILE MARKET PENETRATION





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"POSTPAID / PREPAID" SEGMENTATION





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TELECOMMUNICATION MARKET SEGMENTS

MARKET SEGMENTS	COUNT	EXPECTATIONS	NICHES FOR NEW OPERATORS
CORPORATE >200 EMPLOYEES	3.100	EXTREMELY CHEAP OFFERS	<u>MOBILE DATA POSTPAID SERVICES</u> (COMPETITION ON VOICE SERVICES BEING OBSTRUCTED BY THE INTERCONNECT FEES)
MEDIUM SIZE CO. 50-200 SALARIATI	7.700	CUG OFFERS CHEAPER PRICES THAN RESIDENTIAL	<u>VOICE & DATA POSTPAID & PREPAID SERVICES</u>
SMALL SIZE CO. 6-50 EMPLOYEES	52.400		
HOME OFFICES < 6 EMPLOYEES	720.000		
RESIDENTIAL	11.000. 000	PREPAID OFFERS	<u>FIXED BROADBAND DATA</u> (GROWTH POTENTIAL FOR VOICE & DATA PREPAID SERVICES)



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MAJOR PROVIDERS (I)

➤ CONNEX (MOBIFON)

- ✓ OFFERS: MOBILE TELEPHONY, VPNs & INTERNET
- ✓ USE MAINLY GPRS, HSCSD, FO, FIXED WIRELESS 3,5 & 26 GHZ
- ✓ STRENGTHS: FO BACKBONE FO, MOB. TELEPHONY BASE OF CLIENTS
- ✓ CLIENTS: BUSINESS (31.1% DIN NR TOTAL Co) & RESIDENTIAL MARKET
- ✓ DATA CLIENTS: > 1,000; 31.1% OF ALL COMPANIES (all connections)
- ✓ 3.9% OF ALL: "ALWAYS-ON" CONNECTION

➤ ORANGE (MOBIROM)

- ✓ OFFERS: MOBILE TELEPHONY, VPNs, INTERNET
- ✓ USE MAINLY GPRS, EDGE, FIXED WIRELESS 3,5 & 26 GHZ
- ✓ STRENGTHS: FO BACKBONE, MOB. TELEPHONY BASE OF CLIENTS
- ✓ CLIENTS: BUSINESS & RESIDENTIAL MARKET



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MAJOR PROVIDERS (II)

➤ ZAPP

- ✓ OFFERS: MOBILE TELEPHONY, MOBILE DATA & INTERNET
- ✓ USE MAINLY CDMA 2000 & EV-DO
- ✓ STRENGTHS: MOBILE SUBSCRIBERS DATA BASE
- ✓ CLIENTS: BUSINESS & RESIDENTIAL MARKET
- ✓ 8.2% FROM TOTAL No. of COMPANIES (ALL CONNECTIONS)
- ✓ 10% FROM THE TOTAL No. OF DIAL-UP CONNECTIONS

➤ ROMTELECOM (ARTELECOM)

- ✓ OFFERS: TELEFONIE FIXA, VPNs, INTERNET, LEASED LINES
- ✓ USE MAINLY WIRED SOLUTIONS, ISDN – 4.1M LINII TELEFONICE
- ✓ PUNCTE TARI: NATIONAL WIRE & WIRELESS BACKBONE, FIXED TELEPHONY BASE OF CLIENTS
- ✓ CLIENTS: BUSINESS & RESIDENTIAL MARKET
- ✓ 2.3% FROM TOTAL No, OF COMPANIES (ALL CONNECTIONS)
- ✓ 3.2% FROM THE TOTAL No. OF DIAL-UP CONNECTIONS



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MAJOR PROVIDERS (III)

- **TELECOMUNICATII CFR (ROMANIAN RAILWAYS Tc)**
 - ✓ **OFFERS:** VPNs, INTERNET, FIXED TELEPHONY, INT'L CARRIER
 - ✓ **USE MAINLY FO BACKBONE & SYNCHRO NETWORK** with Cesium Atomic Clock
 - ✓ **STRENGTHS:** MODERN O.F. NATIONAL BACKBONE & ATM
 - ✓ **CLIENTS:** MAINLY CFR COMPANIES - 40,000 SUBSCRIBERS
 - ✓ **NATIONAL CARRIER NATIONAL FOR STATE & PRIVATE INSTITUTIONS**
 - ✓ **BORDER-TO-BORDER CARRIER FOR INT'L TELCO's**
- **S N R (NAT'L RADIOCOMMUNICATIONS COMPANY)**
 - ✓ **OFFERS:** VPN's, INTERNET, LOCAL & INT'L TELEPHONY
 - ✓ **USE MAINLY FIXED WIRELESS IN 3,5 GHZ AND 26 GHZ**
 - ✓ **STRENGTHS:** W/LESS BACKBONE & ATM
 - ✓ **CLIENTS:** BUSINESS MARKET



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MAJOR PROVIDERS (IV)

➤ RDS/RCS & PCNET

- ✓ OFFERS: VPN's, INTERNET, LOCAL & INT'L TELEPHONY
- ✓ USE MAINLY O.F. & CATV
- ✓ STRENGTHS: 3,000 KM O.F. BACKBONE, NAT'L CATV NETWORK
- ✓ CLIENTS: BUSINESS & RESIDENTIAL MARKET
- ✓ 53.8% FROM ALWAYS-ON CONNECTIONS FOR RESIDENTIAL MARKET
- ✓ 37.1% FROM ALL CLIENTS WITH ALWAYS-ON CONNECTION
- ✓ 28.2% FROM TOTAL No. OF COMPANIES (ALL CONNECTIONS)

➤ ASTRAL TELECOM

- ✓ OFFERS: VPN's, INTERNET, LOCAL & INT'L TELEPHONY
- ✓ USE MAINLY O.F. & CATV
- ✓ STRENGTHS: O.F. BACKBONE, NATIONAL CATV NETWORK
- ✓ CLIENTS: BUSINESS & RESIDENTIAL MARKET
- ✓ 28.5% FROM ALL ALWAYS-ON CONNECTIONS PT. FOR RESIDENTIALS
- ✓ 25.1% FROM ALL CLIENTS WITH ALWAYS-ON CONNECTION
- ✓ 20.5% FROM TOTAL No. OF COMPANIES (ALL CONNECTIONS)



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MAJOR PROVIDERS (V)

- **accessNET INTERNATIONAL**
 - ✓ OFFERS: VPN's, INTERNET & CLOSED-GROUP TELEPHONY
 - ✓ USE MAINLY FIXED WIRELESS IN 3,5 GHZ SI 26 GHZ
 - ✓ STRENGTHS: LOCAL LOOP IN > 150 MUNICIPALITIES & CITIES
 - ✓ CLIENTS: BUSINESS MARKET
 - ✓ DATA CONNECTIONS: > 1,300
- **EQUANT**
 - ✓ OFFERS: VPN's, INTERNET
 - ✓ USE MAINLY O.F. & FIXED WIRELESS IN 3,5 GHZ
 - ✓ STRENGTHS: NATIONAL COVERAGE
 - ✓ CLIENTS: BUSINESS MARKET



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**THANK YOU FOR
YOUR KIND ATTENTION!**