Regional Workshop
On
Guidelines on the Smooth Transition of Existing Mobile Networks to IMT-2000 for Developing Countries
ARB Region
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Luigi Gasparollo
V.P. Business Development MENA
luigig@qualcomm.com

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Agenda

- **Status**
- **Opportunity provided by CDMA wireless technologies**
- **Considerations on the way forward**
- **Conclusions**

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Status

- The evolution of wireless technologies and the relative cost and ease of deployment have modified the telecom landscape of regions of the world.
- Fixed and mobile networks have had an independent development and to some extent the mobile networks have heavily attracted voice users often as replacement of the fixed voice.
- Evidence is emerging in several countries that even a large mobile penetration is not good enough to promote economic growth if the fixed infrastructure is lagging behind in its ability to provide voice and data across the country at the right price point as needed to support SMEs modernization/development
- Average of the African countries have mobile communication by far more developed than the fixed with the result that data and internet access are limited and expensive and therefore scarcely used

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Opportunity

- Wireless technology have reached a price point that enables communication at the lowest cost even in areas heavily underserved by communication
- Some of IMT 2000 solutions are flexible in use being able to support different services on the same network: fixed, mobile, internet and can work at convenient frequency bands to reduce the initial capital cost thus speeding up the economical development of country with low fixed line penetration.
- Solutions of this kind using CDMA 2000 have been used in several countries; India is a staggering example in terms of shifting of the cost paradigm;
  - phone services have become accessible to more people, and therefore quickly enlarging the market/customer base
  - the time needed to cover extremely large countries with voice and data service up to 2,4Mbs are very short
  - DSL like services become available at attractive prices.
- As result of volumes, and entry of new players in the market, the costs have sizably decreased enabling solution for more countries
- Regulators need to give suitable attention to the national priorities by allocating sufficient spectrum at lower frequencies where the cost of coverage is lower, hence higher telephone penetration because of lower costs.

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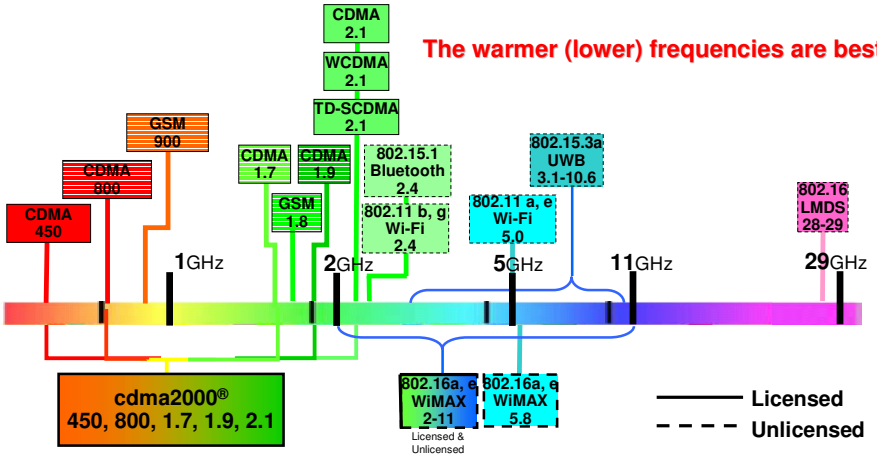
Spectrum Allocations

Providing affordable, ubiquitous, coverage is crucial in mobile communications



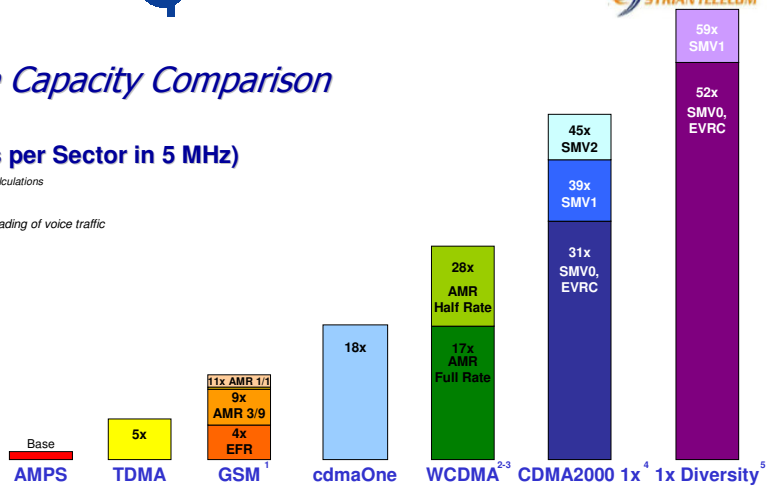
Using the lower frequency bands is preferable for providing Universal Access for voice communications, Internet access & multimedia services

Voice Capacity Comparison

(Erlangs per Sector in 5 MHz)

2% GOS for all calculations

Note:
Assumes 100% loading of voice traffic



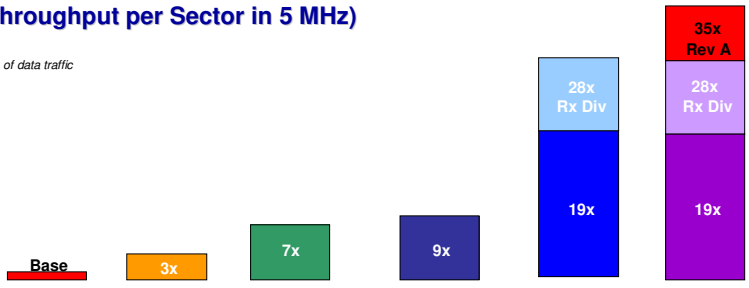
	AMPS	TDMA	GSM [1]	cdmaOne	WCDMA [2-3]	CDMA2000 1x [4]	1x Diversity [5]
Erlangs/Sector	3.0	15.8	13.2 – 32.8	52.5	51.5 – 83.1	92.8 – 133.9	154.5 – 175.3
Users/Sector	8	23	20 – 43	63	62-95	105-147	168-189
Re-use	7/21	7/21	3/9 – 1/1	1/1	1/1	1/1	1/1

1 Source: "GSM AMR VOCODERS: FACTS ABOUT INCREASED VOICE CAPACITY" QUALCOMM Internal Paper: Rao Yallapragada
2 Source: "WCDMA for UMTS" , Radio Access for Third Generation Mobile Communications, John Wiley & Sons, LTD., copyright 2000
3 Source: "The Rise of the 3G Empire", Deutsche Banc Alex Brown, September 2001
4 Source: "SMV Capacity Increases", Andy Dejaco (QUALCOMM) - reference: CDG-C11-2000-1016010, October 16, 2000. Assumes EVRC = 35users and 2dB power control factor
5 Source: "Further Capacity Improvements in CDMA Cellular Systems", QUALCOMM Inc, Roberto Padovani (Calculations based on 1% Blocking)

Data Throughput Comparison

(Average Throughput per Sector in 5 MHz)

Note:
Assumes 100% loading of data traffic
Pedestrian Mobility



	GPRS[1]	EDGE[2]	WCDMA[3]	CDMA2000 1X[4]	HSDPA[5]	1xEV-DO[6]
Average Throughput	128 kbps	430 kbps	900 kbps	1,050 kbps	2,400-3,600 kbps	2,400-4,500 kbps
Re-use	3/9	3/9	1/1	1/1	1/1	1/1

1 Assumes 4 time slots @ 12kbps per slot, 3/9 reuse, CS-3 coding scheme maximum (average C/I of 12dB)
2 Source: "EDGE TECHNOLOGY: AN ASSESSMENT" QUALCOMM Internal Paper: Rao Yallapragada
3 Source: "Understanding the Capacity - Coverage Trade-off" Peter Muszynski, Senior Research Manager, Nokia Networks - The GSM World Congress 2000
4-6 QUALCOMM Simulations

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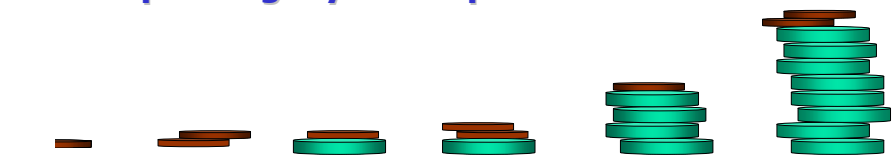
Cost per Megabyte Comparison



EV-DO (Platinum)	1xEV-DO	1X	WCDMA	EDGE	GPRS
$0.005	$0.02	$0.06	$0.07	0.11	$0.42

Spectral efficiency affects cost

Cost = Network Operations Expense + 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

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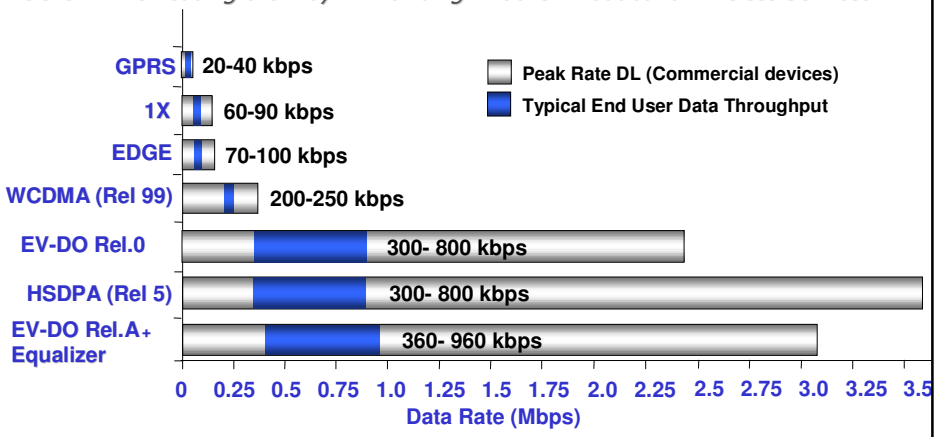
End User "Unicast" Data Rate Comparison

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-DOrA data rate includes the implementation of an "equalizer" and reverse link peak data rate enhancement to 1.8 Mbps

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Considerations on the way forward

- Most of the countries today have at least two Mobile operators and the key issue is fixed penetration and Internet access at the right price point
- CDMA 2000 1x has been installed in several countries and the EVDO overlay is being installed on a large majority of the networks, many of which are WLL
- CDMA networks are no longer to be seen as an alternative to GSM but in this contest can well be considered as a complementary wireless extension of existing networks either fixed or mobile of any standard
- Both fixed and mobile operators can benefit by extending their business by adding CDMA complement to provide wider bandwidth services
- CDMA networks properly planned can reach breakeven in a relatively short time even with networks of relatively small scale
- Full IP configuration are becoming available thus further reducing the operating cost and giving more flexibility in network deployment and integration of fixed/mobile services
- CDMA All IP network are in general SW upgradeable to Rel. A version that enhances performance and further lower costs of delivery
- No alternative technology of similar performance has the same economy of scale, maturity and an industrial echo system able to adjust to the different local reality: it is there today!!!

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What is CDMA2000 1X?

First IMT-2000 Standard

More Voice Capacity (more than 6 times capacity of GSM):

- 26 to 29 Erlangs/sector/1.25 MHz (35 to 38 TCH/sector/1.25 MHz)
- Capacity gains are directly attributed to:
  - Fast forward link power control
  - Lower vocoder rates (rate 1/4 code can be used)
  - Coherent reverse link

Always On Packet Data Rates:

- 153.6 kbps peak data rate (Release 0)
- 307.2 kbps peak data rate (Release A)

Offers a 50% increase in standby time:

- Attributed to Quick Paging channel

Backward compatible with cdmaOne

Voice quality rated as excellent

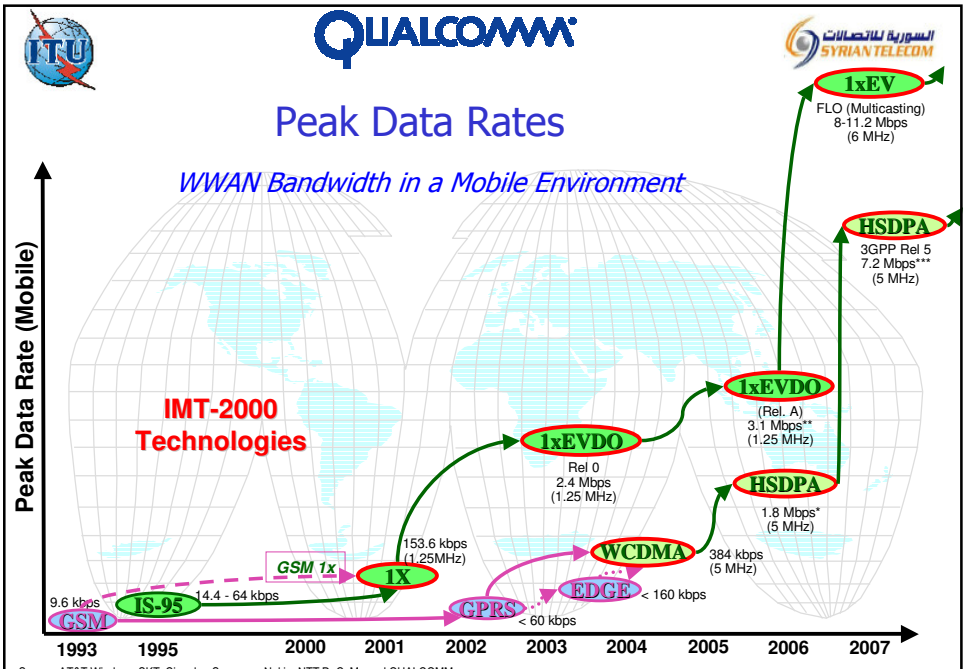
Improved coverage:

- 1X provides better coverage due to improved link budget

Note: Compiled with input from three CDMA operators

Peak Data Rates

WWAN Bandwidth in a Mobile Environment



Source: AT&T Wireless, SKT, Cingular, Samsung, Nokia, NTT DoCoMo and QUALCOMM
Note: Peak data rates are "not to scale" and dependent upon different bandwidths

* Based on QUALCOMM's 1st HSDPA chipset (MSM6275)
** Based on QUALCOMM's chipset (MSM 6800)
*** Based on QUALCOMM's 2nd HSDPA chipset (MSM6280)

CDMA provides a platform for a number of services

Services & Market	Next - Generation PAMR(*)	Mobile Data	Wireless telephony ♦	Public Cellular	Wireless internet ♦
Technology & Standards	CDMA2000-family of technologies *All supported by BREW Platform and A-GPS*				

- High Spectrum Efficiency
- Maximum site capacity use
- Ubiquitous coverage
- Efficient data transmission
- Lowest cost per Mbs

•PAMR - Private Access Mobile Radio

Being used in several counties to increase telephone internet penetration as fixed line and DSL replacement technology

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1xEV-DO Applications Range Across All Segments up to 2,4 Mbs

Enterprise	Consumers	Fixed Residential
		
Extend Desktop Experience • Corporate VPN • Large E-mail Attachments • Rich Web Browsing • Graphical Stock Quotes	*Entertainment Focused* • Pictures/Imaging • Video/Audio Streaming • Video-on-Demand • Broadcast Video/Audio • Multimedia Messaging • Games	*Between Dial-up & Cable/DSL* • Churn Away from Dial-up • Replacement for Cable/DSL, where Not Available • Self-installable Devices

Being used in several countries to increase Internet penetration as DSL replacement technology

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Wireless modems – DSL performance

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Conclusions

- **CDMA represents an opportunity for increasing telephone and internet penetration in developing countries at the right price point**
- **CDMA has time to market and size of market advantage over other technologies in the coming few years for these markets**
- **Each technology has to find the suitable slot to enhance communications in the emerging markets without unnecessary constraints**
- **Choice of spectrums made available for Wireless solution and licensing policies have a direct impact on economic development**

Thank you!!!!!

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