

Wireless Broadband Access with CDMA2000

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Africa

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CDMA Development Group

The CDMA Development Group (CDG), founded in December 1993, is an international consortium of companies who have joined together to lead the adoption and evolution of 3G CDMA wireless systems around the world.

The CDG is comprised of CDMA service providers and manufacturers, application developers and content providers.

CDG's Mission:

To lead the rapid evolution and deployment of 3G CDMA-based systems, based on open standards and encompassing all core architectures, to meet the needs of markets around the world.

More info: www.cdg.org



Why the Emerging Markets (Led by Africa)

Nokia's Jorma Ollila 3/06

80 percent of the next 1 billion wireless subscriber users will be from the Emerging Markets.

The Emerging Markets have very low penetration rates and the current battle is 2G, GSM vs. CDMA for voice.

The future battle is 3G, WCDMA vs. CDMA2000[®] for voice and data.



CDMA2000: Leading in the Delivery of Advanced Wireless Services

CDMA2000 has a robust, long-term evolution path that provides operators with significant technology and time-to-market leadership:

- 2-3 year lead in the commercialization of VoIP, multimedia and broadband technologies – the “Triple Play”
- EV-DO is the first “All-IP 3G network” to be deployed commercially in the world
- 1-2 year lead in delivering next generation “Ultra Mobile Broadband” services and the convergence of telecommunications, information technology, consumer electronics, and high-performance multimedia services with EV-DO Revision C
 - EV-DO Rev C commercial product availability is expected in 2008

Offers the broadest selection of 3G phones to meet the diverse needs of densely populated urban areas, as well as sparsely populated rural areas

WorldMode™ multi-mode, multi-band phones provide universal roaming across CDMA2000 and GSM/WCDMA networks

CDMA2000 generates positive results for operators



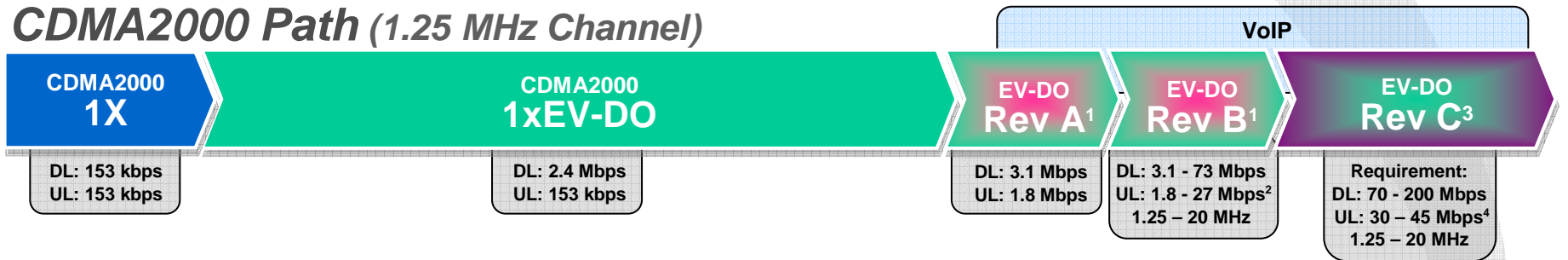
CDMA2000: Solid, Long-Term Evolution Path



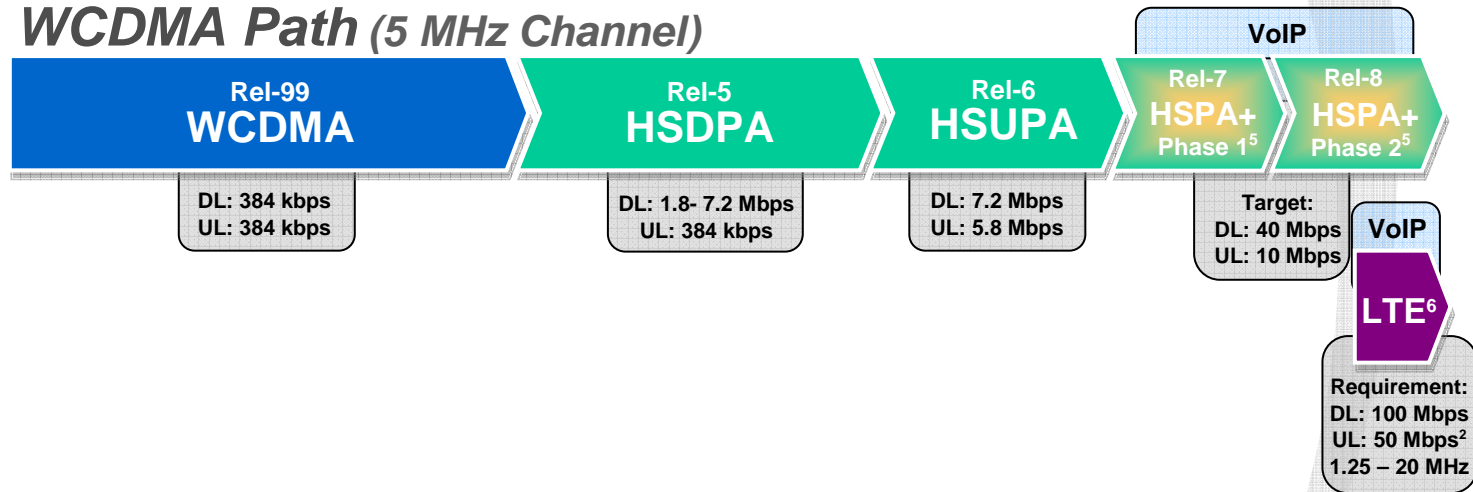
CDMA: Time-to-Market Leadership

■ CDMA
 ■ CDMA/TDM
 ■ OFDM
 ■ MIMO
 ■ OFDMA/MIMO/SDMA

CDMA2000 Path (1.25 MHz Channel)



WCDMA Path (5 MHz Channel)



Note: timeline depicts initial commercial availability of each technology. Those introduced beyond 2008 are under standardization and are subject to variability

¹ EV-DO Rev A and Rev B incorporate OFDM for multicasting

² Data rates of 73 Mbps for the DL and 27 Mbps for the UL figures are based on a 2 x 20 MHz allocation

³ May have multiple modes, with at least one mode being backwards compatible with EV-DO (all versions); will likely utilize CDMA/OFDM or a combination of OFDMA and CDMA; MIMO/SDMA; leverages EV-DO protocol stack

⁴ Data rate dependant on level of mobility. Data rates of 73 Mbps for the DL and 27 Mbps for the UL figures are based on a 2 x 20 MHz allocation

⁵ Release 7 and Release 8 introduce enhancements such as MIMO and VoIP

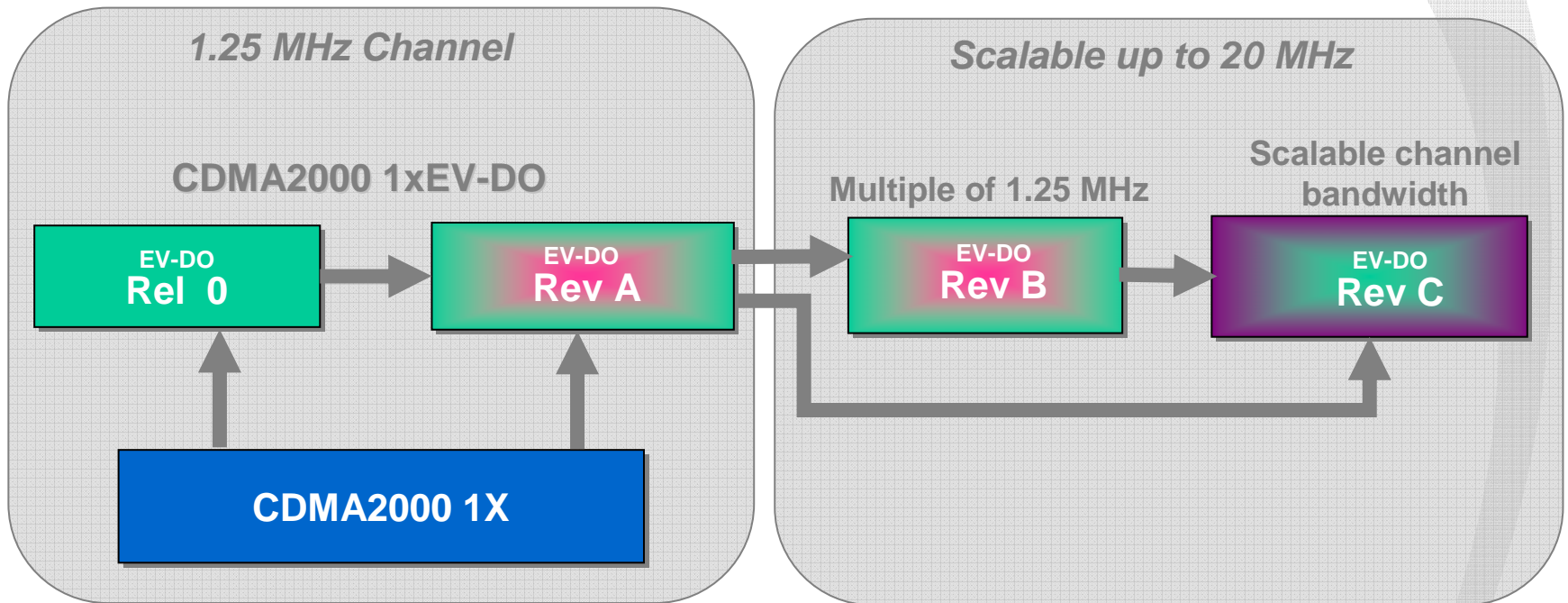
⁶ Utilizes OFDMA on the DL and SC-FDMA on the UL; MIMO



CDMA: Flexible Migration Path

CDMA2000 allows operators the flexibility to design an evolution path that meets their unique needs

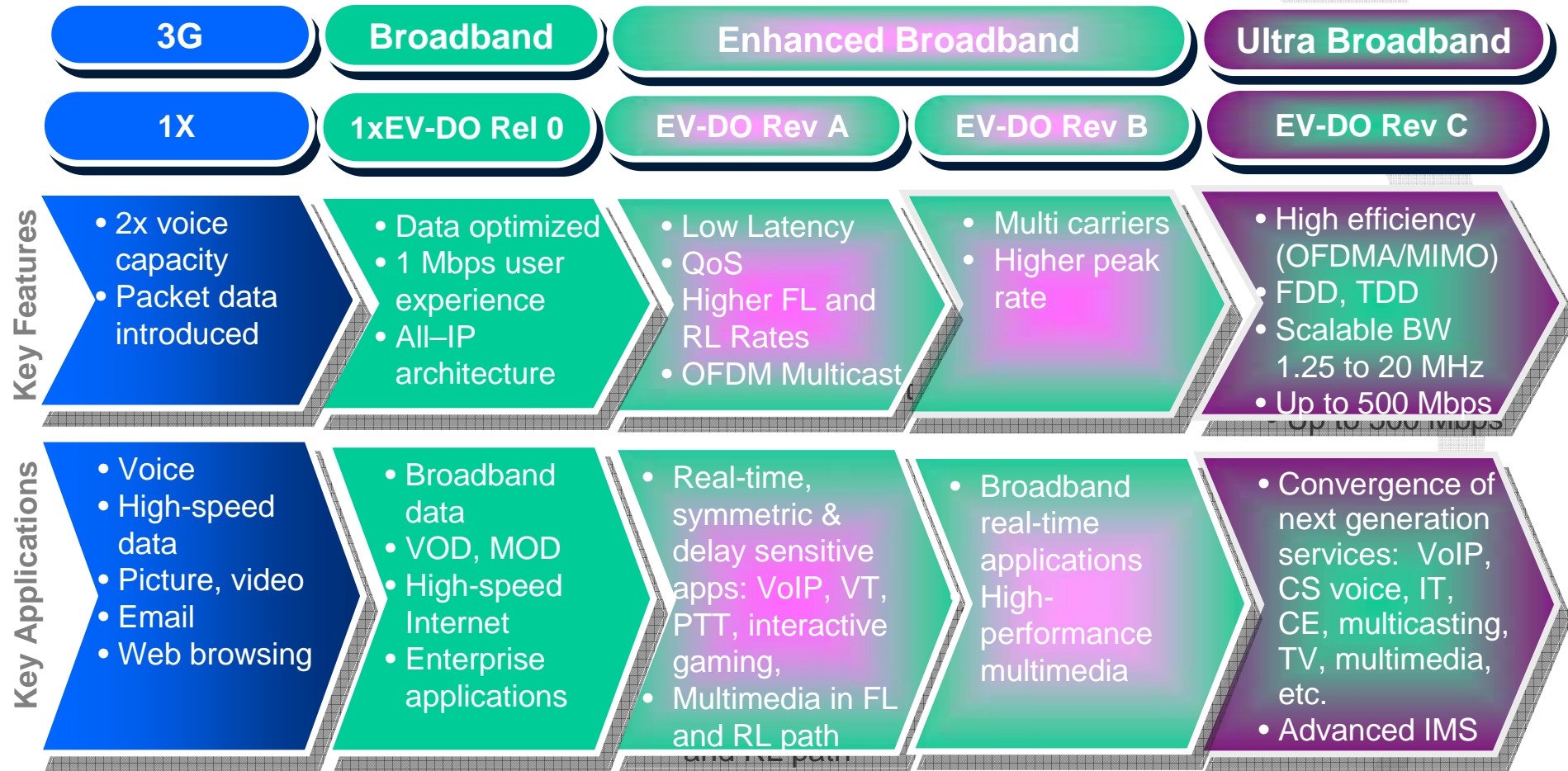
■ CDMA ■ CDMA/TDM ■ OFDM ■ OFDMA/MIMO/SDMA



CDMA Evolves to Further Enhance Value

New revenue-generating, high-performance capabilities and services are enabled through the CDMA2000 evolution path

■ CDMA
 ■ CDMA/TDM
 ■ OFDM
 ■ OFDMA/MIMO/SDMA



1xEV-DO Rev A

Higher Rates, Lower Latency and Higher Spectral Efficiency

New peak rates for better user experience

- 3.1 Mbps peak data rate on forward link
- 1.8 Mbps peak data rate on reverse link

Higher Spectral efficiency

- Increased rate quantization on both forward and reverse link enables more efficient use of air link resources
- 1.2 times Rel 0 forward link sector capacity
- 3.4 times Rel 0 reverse link sector capacity

Reduced latency and optimized QoS enables delay sensitive applications

- Support for delay sensitive applications such as Push to Talk, Video Telephony, Instant Multi-Media (IMM), VoIP and low-delay gaming

DO Platinum Multicast

- 1.5 Mbps capacity with > 98% coverage
- Configurable based on market needs

Backward compatibility

- Continued support for existing Rel 0 devices



1xEV-DO Rev B

Scalable Bandwidth for Higher Performance

Rev B aggregates multiple EV-DO channels for higher performance

- Gradual upgrades to existing Rev A networks will support all-IP applications at broadband rates
- Allows deployment in “hot-zones” with high data demand

Higher peak data rates

- Aggregate carriers for linear gains in peak rates
 - 2 RFs - 6.2 Mbps, 3 RFs - 9.3 Mbps
- Likely configuration of 5 MHz (standard supports up to 20 MHz)

Increased bandwidth

- Support for wider bandwidth to address portable data and visual centric devices
- Existing applications supported at higher rates

Network flexibility

- Allocation of bandwidth for new devices depends on application needs and network availability

Higher capacity

- Improved spectral efficiency on both FL and RL due to Multi-carrier TX

Backward compatibility

- Co-existence of Rev A and B devices in the same network



1xEV-DO Rev C

Next-Generation Multimedia

System Requirements:

- Higher Peak Data Rates and System Capacity:
 - Forward Link: 70 Mbps to 200 Mbps, depending on mobility
 - Reverse Link: 30 Mbps to 45 Mbps for the RL
- Lower delays: 10 msec latency
- Higher mobility: Up to 250 km/hr
- Enhanced VoIP capacity and user experience
- Support flexible and dynamic channel bandwidth scalability:
 - Bandwidth allocations up to 20 MHz in 1.25 MHz blocks
- Support flexible spectrum allocation options including possible operation on non-contiguous carriers
- Minimize control and signaling overhead
- Decrease terminal power consumption and improve battery life

Key technologies:

- OFDMA, CDMA, TDM and LS-OFDMA air links
- MIMO and SDMA antenna techniques
- Interference Cancellation and Avoidance techniques
 - Edge-of-cell rate improvement
- Support for FDD, TDD spectrum options



CDMA Evolution Path: Key Success Factors

The success of CDMA is predicated on several indispensable factors

Performance

- Technology leadership in voice, multimedia, multicasting and broadband data
- Economic leadership to enable the affordability of these advanced services

Backward compatibility

- In-band frequency evolution
- Rapid commercialization and deployment
- Investment protection; lower CapEx and OpEx, and improved ROI
- Service transparency for existing and new end-users
- Seamless service evolution building on top of existing 3GPP2 IMS core and IP feature transparency

Flexibility

- Requires small, incremental amounts of spectrum of 1.25 MHz and evolves to scale up to 20 MHz with Rev B and Rev C
- Supports existing multiple frequency bands ranging from 450 MHz to 2.1 GHz and has capabilities to support 1.7/2.1 GHz ranges and 2.5 GHz in the future
- Solid evolution path towards OFDM/OFDMA/SDMA/MIMO

Handset availability

- A large selection of devices ranging from low-end to high-end
- Supports multiple modes and multiple frequency bands, plus WorldMode™



CDMA2000: Global Overview – Today

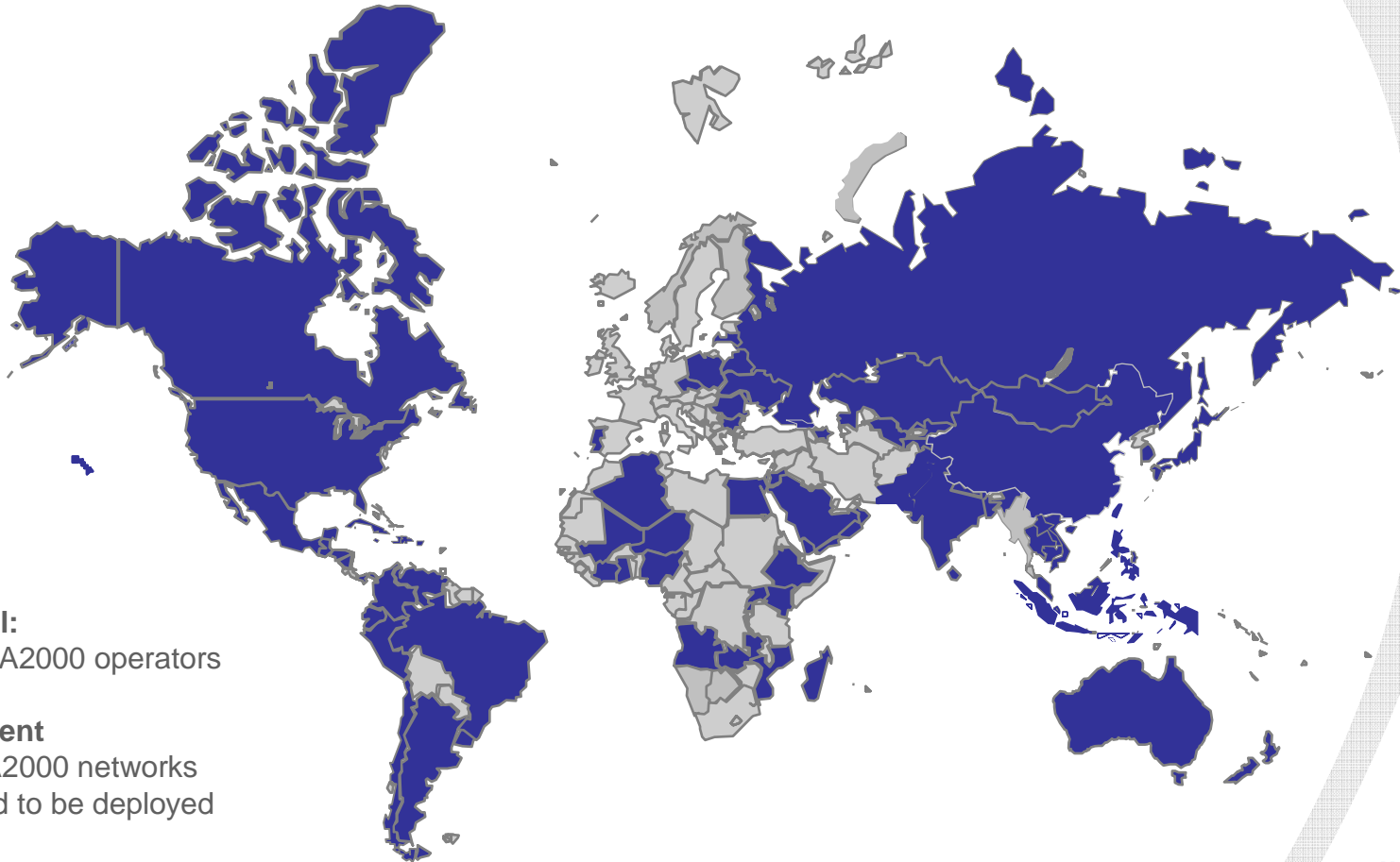


CDMA2000: A Global 3G Technology

The global presence of CDMA2000 offers enormous economies of scale

CDMA2000 Countries

191 operators have deployed or are deploying CDMA2000
72% of all CDMA (CDMA2000 and cdmaOne) operators



Commercial:

- 165 CDMA2000 operators

In Deployment

- 26 CDMA2000 networks scheduled to be deployed

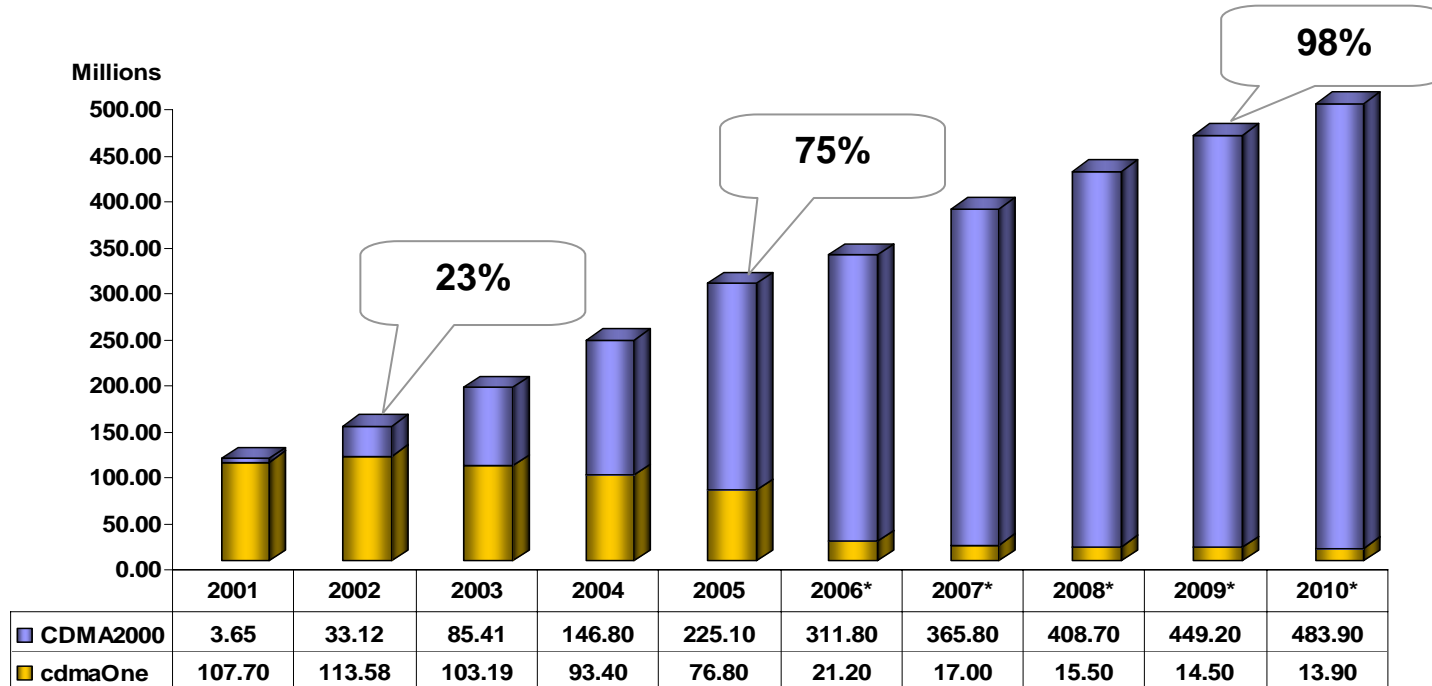


CDMA2000: The Leading 3G Technology

275 million CDMA2000 subscribers worldwide

Cumulative CDMA Subscriber Growth

98% of all CDMA subs will be paying for 3G services by 2009



* Strategy Analytics, 2006

CDMA2000 Global Perspective:

- Currently, 82% of total CDMA base
- Currently, 80% of entire 3G market
- Currently, 11% of total wireless users worldwide
- 500 million CDMA2000 users by 2010

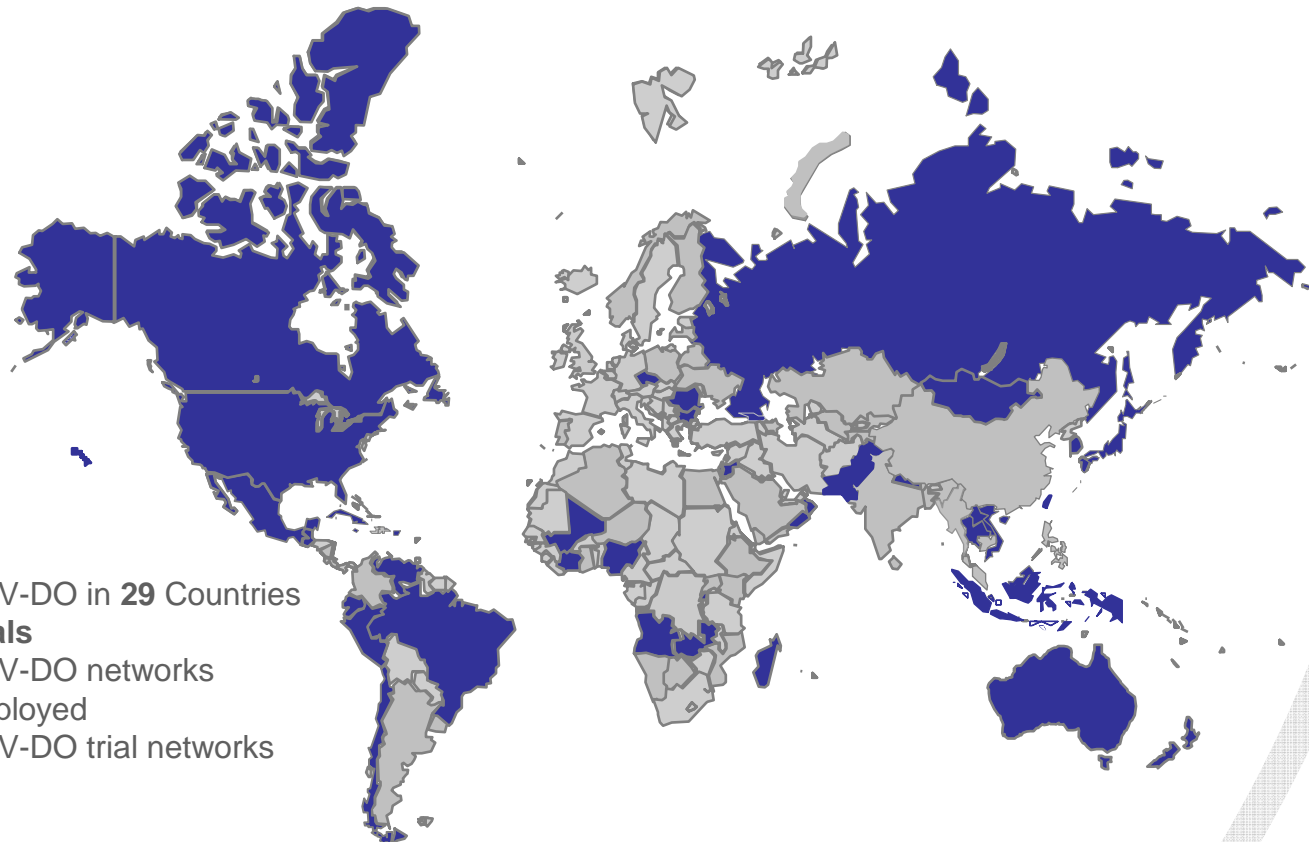


CDMA2000 1xEV-DO: Leading the Adoption of Wireless Broadband

1xEV-DO is the most widely commercially deployed wireless broadband technology today

Countries with CDMA2000 1xEV-DO

95 operators have deployed or are deploying CDMA2000 1xEV-DO



Commercial:

- 44 CDMA2000 1xEV-DO in 29 Countries In Deployment or Trials
- 41 CDMA2000 1xEV-DO networks scheduled to be deployed
- 10 CDMA2000 1xEV-DO trial networks

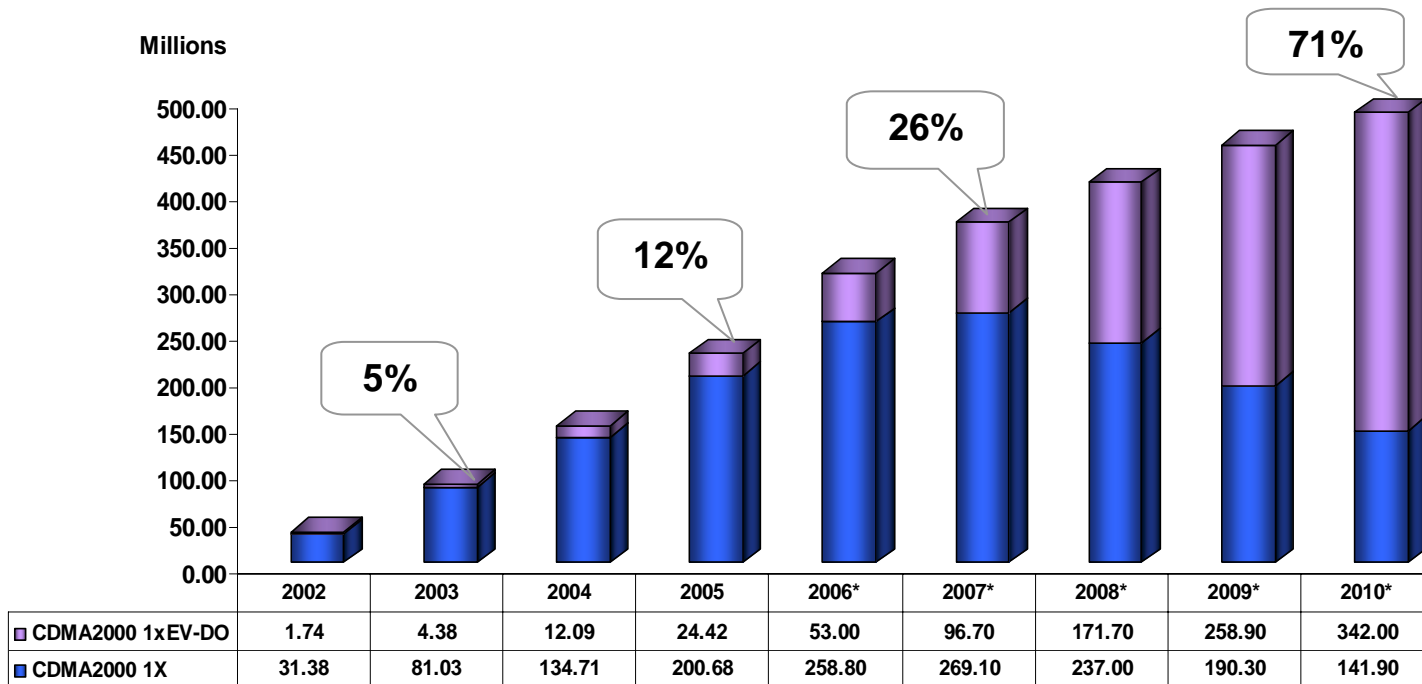


36 Million CDMA2000 1xEV-DO Users

Evolutionary 1xEV-DO adoption is exceeding industry expectations

Migration to CDMA2000 1xEV-DO Subscribers

6 million new 1xEV-DO subscribers per quarter, and growing



* Strategy Analytics, 2006

Currently, 13% of CDMA2000 base use broadband

- 46% for SK Telecom
- 28% for KDDI

By 2010, the majority (71%) of CDMA2000 users will access broadband



CDMA2000 Networks: Driving down the Total Cost Ownership (TCO)



Total Cost of Ownership (TCO)

CDMA2000 offers enormous economies of scales

- The CDMA2000 migration path minimizes CapEx relative to the GSM/GPRS/EDGE path and over ten years, CDMA2000 offers:
 - A **26% cost savings** over GSM/UMTS/HSDPA @ 2100 MHz in moderate growth and usage markets
 - A **18-23% cost savings** over GSM/GPRS/EDGE @ 900 MHz in high growth and usage markets
- CDMA2000 is a very compelling solution for affordable voice and broadband data services
 - **Spectral efficiency matters:** When selecting a broadband technology, operators must consider the migration to spectrally efficient, next-generation, 3G technologies to reduce their TCO
 - **Technology matters:** Voice capacity and broadband data sector throughput capabilities impact cost the most. CDMA2000 offers the highest capacity advantage compared to other technologies
 - **Frequency matters:** The use of lower frequency bands significantly reduces costs. CDMA2000 in the 450 MHz and 800 MHz frequency bands offers a significant cost advantage
 - **Backward compatibility matters:** CDMA2000 offers the smoothest and least expensive migration path to next-generation services – which preserves an operator's investments
 - **All-IP and VoIP matters:** For new deployments, VoIP over an All-IP Rev A network offers the most cost-effective solution for voice and data
 - EV-DO Rev A (All-IP) core network CapEx is **70% lower** than circuit switched implementations over a ten year period
- **Network Cost:** Lower non-hardware costs, such as site acquisition, preparation, operations and maintenance strengthen the CDMA2000 business case
- **Device Cost:** Declining 3G handset ASP trends and increased revenue opportunities also strengthen the CDMA2000 business case



**CDMA2000 Devices:
Driving innovation and delivering
solutions to meet diverse market
needs**



CDMA2000: The Largest Selection of 3G Devices

More than 1250 CDMA2000 devices have been introduced to the market

Entry-level
Voice-centric
Handsets



Personal
Messaging
Mobile Phones



Fixed Wireless
Phones



PDA's



EV-DO
Fixed Wireless
Terminals



Interactive
Multimedia
CE Devices



EV-DO
PC Cards



EV-DO
USB modems



WorldMode™
Global Roaming
Phones



EV-DO
PCexpress
Embedded Modules
for PC Notebooks

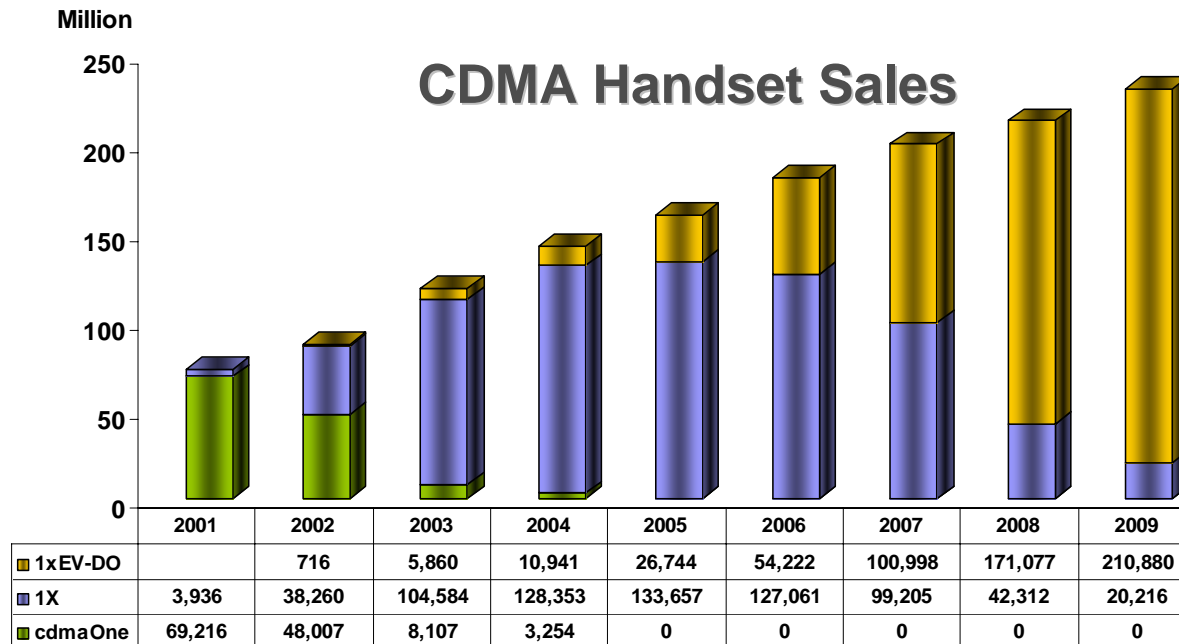


956 CDMA2000 1X devices
282 CDMA2000 1xEV-DO devices
81 Manufacturers and vendors



All CDMA Devices are 3G Capable

CDMA2000 offers enormous economies of scales



Source: Deutsche Bank, February 2006

Over 160 million CDMA2000 phones were sold in 2005

- CDMA2000 accounts for 20% of total handset sales and its market share will grow to 26% of the handset market and nearly 50% of the 3G market by 2009

Sales of 1xEV-DO handsets grow at 100% per year

- 1xEV-DO handsets represented 17% of total CDMA2000 devices sold in 2005 (up from 8% in 2004) and unit sales will double again to 55 million or 30% in 2006
- Over 90% of CDMA2000 devices will be 1xEV-DO and Rev A capable by 2009



Industry Initiatives to Further Reduce Time-to-Market and Cost of CDMA2000 devices

The CDG Global Handset Requirements for CDMA (GHRC) team has developed common requirements to reduce cost and time-to-market

- Operators have already used the requirements to obtain handsets at a significant price discount (below \$50)
- Currently, teams of operators and manufacturers are working on:
 - Ultra-low-cost devices for developing markets
 - Mid-tier 1xEV-DO data cards
 - Mid-tier WorldMode multimode devices for interstandard roaming between GSM/GPRS and CDMA2000 1X/1xEV-DO
 - Low-tier handset and mid-tier EV-DO card for CDMA450

CDMA Certification Forum (CCF) is streamlining the test process to bring CDMA2000 devices to market quickly and at lower cost

- First phones submitted to CCF were certified in three weeks with increased test coverage and at a cost of 20% of the traditional test process
- CCF test facilities are operating in North America and Asia
- Gaining momentum with the tier-one manufacturers, including Nokia and Motorola



Entry-level Handset Availability in India

CDMA2000 offers a larger selection of entry-level (sub-\$50 wholesale) handsets from more suppliers than GSM

GSM



17 low-end handset models from 5 suppliers

CDMA2000



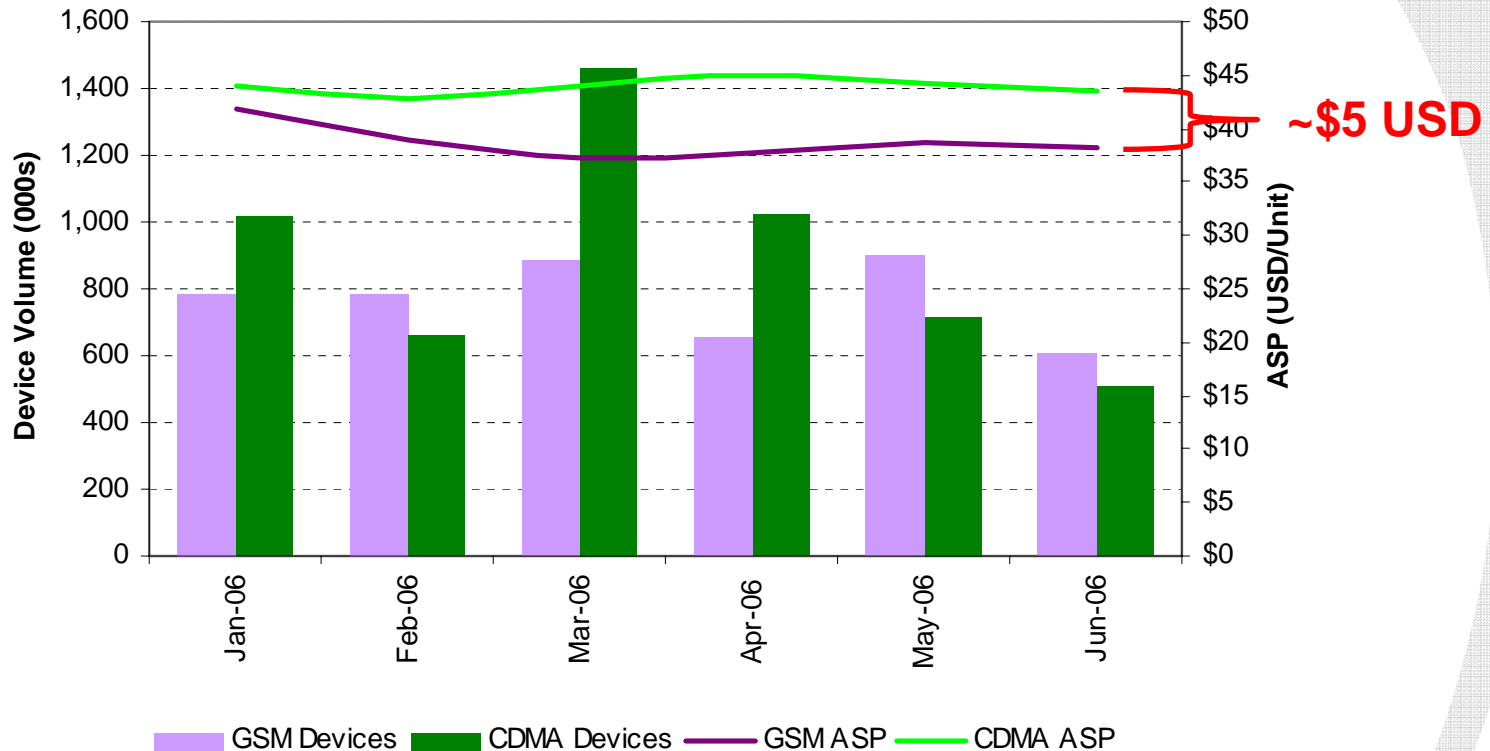
22 low-end handset models from 10 suppliers

Notes: 1. Mobile devices that are sold at an ex-factory wholesale cost that is less than US\$50 are considered low-end devices.
2. Only devices shipped in volumes above 10,000 units are shown.
3. Low end devices enabled with BREW offer additional functionality, such as downloading ringtones and wallpaper.

Entry-Level Handset Pricing in India

CDMA handsets are approaching price parity with GSM in India

India Low-end (Sub-\$50 USD) Handset Shipments and Average Selling Price (Wholesale) of Low-end Handsets



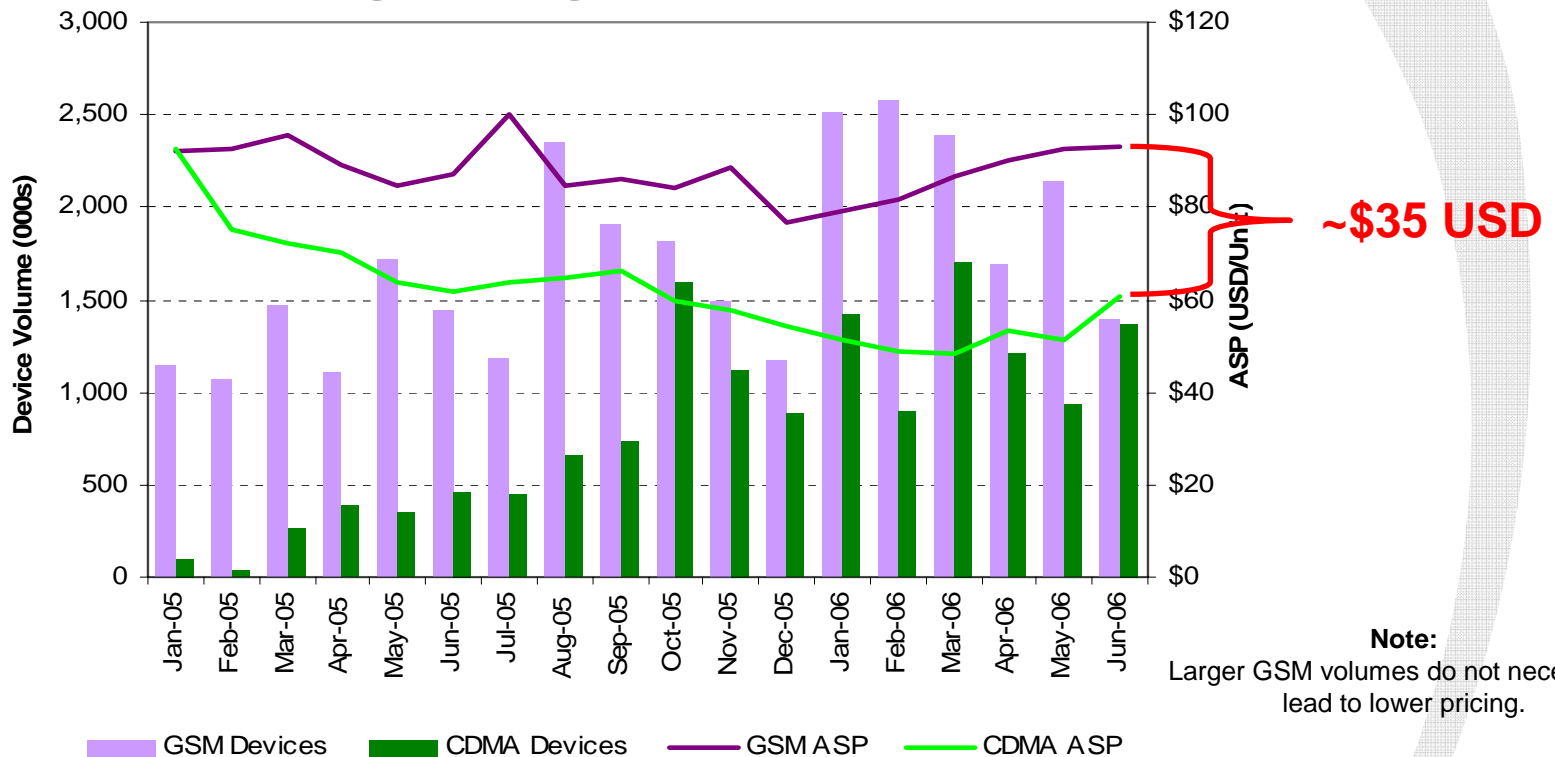
The price gap between GSM and CDMA2000 low-end handsets has narrowed to ~ \$5 USD



Overall Handset Pricing in India

CDMA2000 handsets are more affordable than GSM across the entire product portfolio offered in India

India Total Handset Shipments and Average Selling Price (Wholesale)



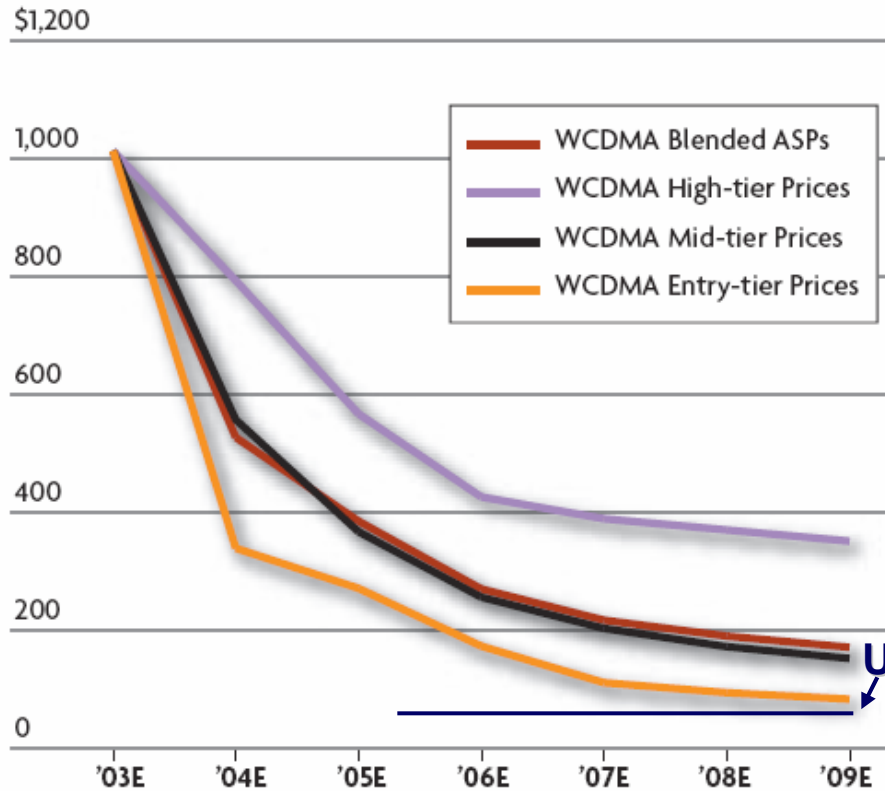
The price gap between all GSM and CDMA2000 handsets shipped into India widened to ~ \$35 USD



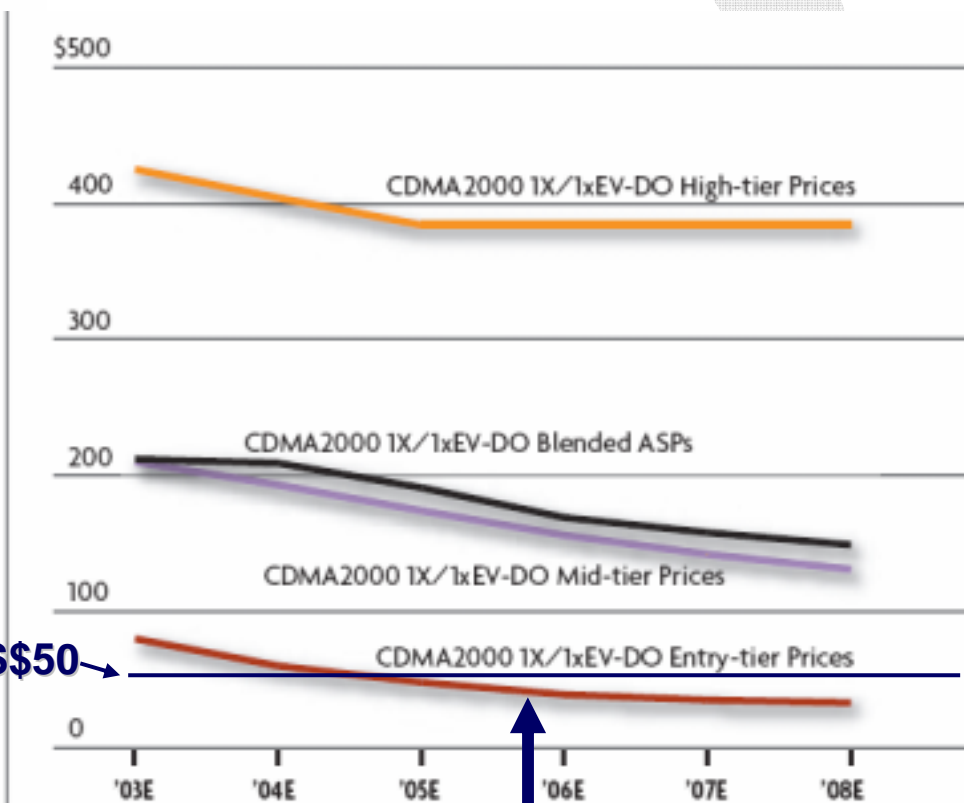
CDMA2000 1X/1xEV-DO devices will remain more affordable than WCDMA

CDMA2000 is leading in the delivery of affordable 3G voice/data devices

WCDMA Handset ASP Forecast



CDMA2000 1X/1xEV-DO Handset ASP Forecast



US\$50

Affordable telephony and broadband data devices



Conclusion

Both telephony penetration and Internet connectivity is essential for economic growth.

The CDMA2000 evolution path is clear, robust and forward/backward compatible.

CDMA2000 supports both mobile and wireless local loop deployments in emerging markets.

CDMA2000 networks offer the lowest total cost of ownership (TCO).

The Emerging Markets need affordable handsets, that offer value, not necessarily the cheapest ones.

The future is in your hands and the CDG is here to support you.



Thank You

