CDMA450 WORKSHOP

CDMA Development Group

June 6, 2006
Hanoi
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

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 battle is still 2G, GSM vs CDMA for voice and some data.

The New Emerging Markets (Southeast Asia, Russia, Middle East and Africa) have the largest CDMA opportunities with abundant 450 MHz spectrum available.
Emerging Market Opportunity
Subscriber Base Expected to Double in 5 Years

Emerging Market Wireless Subscriber Growth

- Africa
- CIS*
- Middle East
- SEA

* The Commonwealth of Independent States (CIS) is a confederation consisting of 11 former Soviet Republics: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine, and Uzbekistan. Turkmenistan discontinued permanent membership as of August 26, 2005 and is now an associate member, but has been included for the purpose of this analysis.

Source: World Cellular Information Service, April 2006
Global CDMA450 Subscribers

Expected to Surpass 10M by 2010

Opportunity in China Could Significantly Increase Estimate

Global Cumulative CDMA450 Subscribers

Source: Strategy Analytics, May 2006
Map of CDMA450 world

- commercial: 34
- deploying: 8
- pre-commercial: 4
- trial: 6
CDMA Time-to-Market Leadership
Commercial Introduction to Market

CDMA2000 Path (1.25 MHz Channel)

- **CDMA2000 1X**
  - DL: 153 kbps
  - UL: 153 kbps

- **CDMA2000 1xEV-DO**
  - DL: 2.4 Mbps
  - UL: 153 kbps

- **EV-DO Rev A**
  - DL: 3.1 Mbps
  - UL: 1.8 Mbps

- **EV-DO Rev B**
  - DL: 3.1 - 73 Mbps
  - UL: 1.8 - 27 Mbps

WCDMA Path (5 MHz Channel)

- **Rel-99 WCDMA**
  - DL: 384 kbps
  - UL: 384 kbps

- **Rel-5 HSDPA**
  - DL: 1.8-7.2 Mbps
  - UL: 384 kbps

- **Rel-6 HSUPA**
  - DL: 7.2 Mbps
  - UL: 5.8 Mbps

- **Rel-7 HSPA+ Phase 1**
- **Rel-8 HSPA+ Phase 2**

*Requirement:*

- **DL:** 70 – 200 Mbps
- **UL:** 30 – 45 Mbps

**Target:**

- **DL:** 40 Mbps
- **UL:** 10 Mbps

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 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. Higher end of data rates ranges 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

**June 6, 2006**
CDMA Evolution: Key Success Factors

Backwards Compatibility

- Rapid commercialization and deployment.
- Investment protection.
- Transparency for the end-users.
- Seamless service evolution building on top of existing 3GPP2 IMS Core and feature transparency.

Flexibility

- Requires small amount of spectrum, 1.25 MHz, and evolving in the future to scale up to 20 MHz with Rev B and Rev C in the future.
- Supports existing multiple frequency bands ranging from 450 MHz to 2100 capabilities to support future 1.7/2.1GHz ranges.
- Solid evolution path towards OFDM/MIMO.

Handset Availability

- A large selection of devices ranging from low-end to high-end and supporting multiple modes and multiple bands.
EV-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.
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 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.
EV-DO Rev C:
Next-Generation Multimedia

System Requirements:

• Highly scalable, backward-compatible evolution modes of the EV-DO Rev B standard.
• Higher Peak Data Rates and System Capacity.
  – Target peak data rates range from 70 Mbps to 200 Mbps, depending on mobility, for the FL and 30 Mbps to 45 Mbps for the RL
• Higher spectral efficiency (e.g., hot spots).
• Lower delay (10 msec latency).
• Higher mobility (up to 350 km/h).
• Enhanced VoIP capacity and user experience.
• Support for 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.
Conclusion

The Emerging Markets are a voice and data market.

The market needs affordable handsets, not cheap ones.

China’s potential 450 market will dramatically affect the CDMA450 Ecosystem.

Latin America, Southeast Asia and South Asia markets are not far behind.

The CDMA2000 evolution path is clear.

The CDG is here to support you.