CDMA2000: Leading 3G

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CDMA Development Group

CDMA Worldwide

CDMA2000: Leading 3G
To lead the rapid evolution and deployment of CDMA-based systems, based on open standards and encompassing all core architectures, to meet the needs of markets around the world in an emerging, information-intensive environment.

**Information Distribution**
- Conferences
- Emails
- Website
- Etc.

**Technical Service Development**
- System Testing
- Advanced Systems
- Evolution
- Etc.

**Deployment Assistance**
- Time-to-Market
- Int’l Roaming
- Interoperability
- Etc.
The CDG is a consortium of over 113 member companies from around the world. Members are involved in many aspects of CDMA system deployment and support.
CDMA is the present and future of advanced wireless services

Code Division Multiple Access (CDMA) is a spread spectrum technology used in second and third generation wireless networks.

cdmaOne™ identifies 2G and 2.5G cellular, PCS and wireless local loop (WLL) services based on the IS-95A and IS-95B CDMA air interface standards. IS-95A supports data delivery up to 14.4 kbps while IS-95B offers up to 115 kbps.

CDMA2000 is an ITU-approved, IMT-2000 (3G) standard

CDMA2000 1X can double voice capacity and delivers data rates up to 307 kbps

CDMA2000 1xEV is optimized for high-speed data:

- CDMA2000 1xEV-DO (Data Only) uses a designated channel for data at speeds of up to 2.4 Mbps in a single carrier
- CDMA2000 1xEV-DV (Data Voice) integrates voice and data on a single channel with speeds of up to 4.8 Mbps
# CDMA Benefits

As the most advanced digital technology, CDMA offers significant benefits to operators and their subscribers.

<table>
<thead>
<tr>
<th>Operators</th>
<th>Subscribers</th>
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<tr>
<td>• Greater voice capacity</td>
<td>• Better voice quality</td>
</tr>
<tr>
<td>• Simplified system planning through the use of the same frequency in every sector</td>
<td>• Longer talk time</td>
</tr>
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<td>• Improved coverage characteristics resulting in fewer cell sites</td>
<td>• Improved privacy and security</td>
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<tr>
<td>• Data ready; uses standard IP commands and protocols</td>
<td>• Advanced data services</td>
</tr>
<tr>
<td>• The platform for 3G</td>
<td></td>
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CDMA technologies deliver superior capacity for voice and data

Number of users per 5MHz of spectrum

- **CDMA is the most spectrally efficient technology**
  - cdmaOne delivers 14x increase in voice capacity over analog and more than 2x more than GSM and TDMA
  - CDMA2000 doubles voice capacity of cdmaOne systems making it the most spectrally efficient technology available today

*Source: Deutsche Bank, May 2002*
CDMA is the fastest growing technology, serving more than 127 million subscribers worldwide...

Source: CDMA Development Group
...and it will continue to be the fastest growing technology platform

Source: EMC, Morgan Stanley, 2002
CDMA is one of the leading technologies with presence across all continents

North America
- 56 million subscribers
- Dominant technology with 47% market share

Caribbean and Latin America
- 24 million subscribers
- 20% market share
- Growing at 7 million subscribers per year

Europe, Middle East and Africa
- 2 million subscribers
- The first 3G technology launched in Europe

Asia Pacific
- 45 million subscribers
- Birthplace of 3G
- Now deployed in China

As of June, 2002
The dominant 3G standards are based on CDMA

Although there are five terrestrial standards, most of the attention and energy in the industry has been directed toward the CDMA standards.
<table>
<thead>
<tr>
<th>CDMA Development Group</th>
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<tbody>
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<td>CDMA Worldwide</td>
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<tr>
<td>CDMA2000: Leading 3G</td>
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</table>
Delivers services to consumers and revenues to operators

Why CDMA2000 is so successful
There are eighteen CDMA2000 1X and two 1xEV-DO networks deployed today.

Europe / Russia
- Romania – Telemobil – 4Q 2001
- Russia – Delta Telecom – 4Q 2002
- Russia – Moscow Cellular Communications – 2H 2002
- Ukraine – CST Invest Limited – 2Q 2002

Asia Pacific
- Australia – Telstra – 3Q 2000
- China – China Unicom – 1Q 2002
- Indonesia – PT Radio Telepon Indonesia – 3Q 2002
- Indonesia – PT Wireless Indonesia – 1Q 2003
- Japan – KDDI – 2Q 2002
- Korea – KT Freetel – 2Q 2001
- Korea – KT Freetel – 2Q 2002
- Korea – LG Telecom – 4Q 2000
- Korea – SK Telecom – 4Q 2000
- Korea – SK Telecom – 1Q 2002
- New Zealand – Telecom Mobile Limited – 3Q 2002
- Taiwan – Asia Pacific Broadband Wireless Communications Inc. – 1Q 2003
- Thailand – Hutchison CAT – 4Q 2002
- Vietnam – Saigon Postel – 2H 2002

Latin America / Caribbean
- Brazil – TCO – 3Q 2002
- Brazil – Telefonica Celular – 2Q 2002
- Brazil – Telesp Celular – 4Q 2001
- Brazil – Vesper – 2H 2002
- Chile – SmartCom PCS – 3Q 2002
- Dominican Republic – Centennial Dominicana – 2H 2002
- Ecuador – BellSouth – TBA
- Guatemala – SERCOM (Telgua) – TBA
- Jamaica – Centennial Digital Jamaica – 3Q 2002
- Mexico – Pegaso PCS – 2Q 2002
- Puerto Rico – Centennial de Puerto Rico – 2Q 2002
- Venezuela – Movilnet – 3Q 2002
- Venezuela – Telcel – 1H 2001

North America
- Canada – Aliant Telecom Mobility – 4Q 2002
- Canada – Bell Mobility – 1Q 2002
- Canada – MTS – 2H 2002
- Canada – SaskTel Mobility – 2Q 2002
- Canada – Telus Mobility – 2Q 2002
- United States – ALLTEL – 2002
- United States – Leap – 4Q 2001
- United States – MetroPCS – 1Q 2002
- United States – Monet Mobile Networks – 4Q 2001
- United States – NTELOS – 3Q 2002
- United States – Sprint PCS & Affiliates – 3Q 2002
- United States – U.S. Cellular – 4Q 2002
- United States – Verizon Wireless – 1Q 2002
- United States – Western Wireless – 3Q 2001

Countries with CDMA2000
- 1X Commercial
- 1X Deployment
- 1X Trial
- 1xEV-DO Commercial
CDMA2000 dominates the 3G market...

- CDMA2000 has more than 99% of the 3G market
- Over 15 million CDMA2000 subscribers as of July 2002
- More than 1.8 million are being added every month

Source: CDMA Development Group
... and will continue to lead the 3G market
CDMA2000 delivers greater value to consumers and increased revenue to operators

- Multimedia messaging
- Game downloads
- Telematics
- Camera and motion video

CDMA2000 delivers a nearly five-fold increase in data revenue and more than 50% higher total revenue per subscriber

Source: Morgan Stanley, June 2002
Why CDMA2000 is so successful

More than 120 CDMA2000 terminal products are available in the market
Why CDMA2000 is so successful (cont.)

...at competitive prices

Wholesale Prices, World Market 2000-2005

- cdmaOne phone prices will continue to decline and will reach $53 by 2005
- CDMA2000 1X phone prices will decline at a faster rate to reach $58 by 2005
- UMTS phones, especially dual mode, will remain at least 3 times more expensive than CDMA2000

Source: Shosteck, 2002
CDMA2000 is not constrained to only the IMT-2000 band. It is defined to operate in existing and IMT-2000 spectrum:

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

Why CDMA2000 is so successful (cont.)

CDMA2000 can be deployed in any existing cellular, PCS and IMT-2000 spectrum

CDMA2000 can be deployed in a small amount of spectrum
Why CDMA2000 is so successful (cont.)

Requires only minor enhancements to the existing cdmaOne network...

The network architecture is designed to deliver Internet and advanced services seamlessly, and without the need to build-out a new packet network.
### Why CDMA2000 is so successful (cont.)

...and relatively small capital investment

<table>
<thead>
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<th>Total CapEx (US$ billion)</th>
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<tr>
<td><strong>Korea</strong></td>
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<tr>
<td>SKT (CDMA2000 1X and 1xEV-DO)</td>
<td>2.4</td>
</tr>
<tr>
<td>KTF (CDMA2000 1X and 1xEV-DO)</td>
<td>1.2</td>
</tr>
<tr>
<td>LGT (CDMA2000 1X)</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td></td>
</tr>
<tr>
<td>KDDI (CDMA2000 1xEV-DO)</td>
<td>2.5</td>
</tr>
<tr>
<td>DoCoMo (W-CDMA)</td>
<td>10.9</td>
</tr>
<tr>
<td><strong>U.S.</strong></td>
<td></td>
</tr>
<tr>
<td>Sprint PCS (CDMA2000 1X and 1xEV-DO)</td>
<td>2.4</td>
</tr>
<tr>
<td>AT&amp;T Wireless (GSM/GPRS/EDGE/WCDMA)</td>
<td>4.4</td>
</tr>
</tbody>
</table>

*Sprint PCS will spend $8 per POP to migrate to CDMA2000*
*AT&T Wireless will spend $15 per POP for the GSM/GPRS overlay*

Source: Morgan Stanley, June 2002
**TDMA to 3G: Practical solution to CDMA2000**

**As with AMPS, benefits of this path include:**
- Re-use of the core network
- Ability to deploy 3G in-band, without the cost of buying new spectrum
- Ability to deploy 3G in only a small amount of spectrum

* Usually co-located with TDMA equipment, requires separate interface protocols
AMPS to 3G: Practical solution to CDMA2000

New off-the-shelf CDMA2000/AMPS Terminals

New Equipment with 1X Channel Card

This path is particularly compelling due to:
• Re-use of the core network
• Ability to deploy 3G in-band, without the cost of buying new spectrum
• Ability to deploy 3G in only a small amount of spectrum

* Usually co-located with AMPS equipment, requires separate interface protocols
GSM to 3G: Practical solution to CDMA2000

Adding CDMA2000 1X

New Terminals (GSM/GPRS)

GSM/ GPRS BTS

Upgrade

A/Iu Interface

MSC

Modem Pool

Commercial IP Router Packaged by Vendor

PSTN

GSM/ GPRS BTS

CDMA2000 BTS*

1X Channel Card

New Terminals (CDMA2000 1X or multimode GSM/GPRS/CDMA2000 1X)

GPRS and CDMA2000 are Complementary

CDMA2000 BSC*

New Equipment

SGSN

New Equipment

GPRS Backbone

Commercial Server

RADIUS Server

IP Backbone

IP

WWW

VPN

Enterprise Network

* Usually co-located with 2G/2.5G equipment, requires separate interface protocols