Smart Devices and Services Connected by CDMA2000

CDMA Development Group

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We are approaching an inflection point in the wireless industry that will have repercussions across multiple industries.

M2M and enterprise mobile broadband connectivity delivers a host of new opportunities that can improve virtually every aspect of any industry.
Cellular M2M Market Growth

CDMA2000 is playing an important role in enabling M2M Connections

Total Cellular M2M Connections Worldwide

(The figure above depicts M2M connections for all WWAN technologies, including proprietary cellular networks.)

Source: Harbor Research, Inc., September 2010
M2M Market Growth by Vertical Market Segment

Consumer Electronics will be the leading application for M2M Connectivity

Source: Harbor Research, Inc., September 2010
## M2M Business Benefits

*The global market for M2M is expected to reach $57 billion by 2014*

<table>
<thead>
<tr>
<th>Business Benefit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost &amp; Service Time Reduction</td>
<td>Connected devices can automatically send out alerts, maintenance requests and be fixed remotely, reducing downtime and the number of service trips required.</td>
</tr>
<tr>
<td>New or Better Services</td>
<td>Smart products offer solution providers enhanced data about their products, leading to the development of new revenue streams.</td>
</tr>
<tr>
<td>Customer Relationship Building</td>
<td>Building relationships provides OEMs and solution providers the opportunity to create repeat customers.</td>
</tr>
<tr>
<td>Increased Sales</td>
<td>Connected products can cater to customer preferences, increasing the likelihood that a solution will be available to meet the needs of the user and providing more sales opportunities.</td>
</tr>
<tr>
<td>Differentiated Product Offerings</td>
<td>Selling services and end-to-end solutions is far more powerful than merely selling products; connected devices can generate service businesses that can become indispensable to the customer.</td>
</tr>
<tr>
<td>Better Customer Experiences</td>
<td>Connected devices enhance the user experience by providing real-time information and seamless access through familiar portals like Internet browsers.</td>
</tr>
<tr>
<td>Improved Information</td>
<td>A product development function can generate feedback on how a given product is used (e.g., which features are popular, which feature cause problems, etc.) which can lead to improved and updated products that are tailored to customers’ needs.</td>
</tr>
</tbody>
</table>

3G CDMA is the catalyst that will help revolutionize the world around us with the advent of M2M services

CDMA2000 Advantages for M2M Applications

There are numerous benefits derived from using CDMA2000 for M2M services

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<th>Business Benefit</th>
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<tr>
<td>Enhanced Security &amp; Privacy</td>
<td>Encrypted and randomly encoded IPsec transported data</td>
</tr>
<tr>
<td>Network Reliability</td>
<td>Mature technology, wide coverage and soft handoffs – “always-on” connectivity</td>
</tr>
<tr>
<td>Ubiquitous Coverage</td>
<td>Wide urban and rural coverage, with good in-building penetration</td>
</tr>
<tr>
<td>Network Capacity and Speed</td>
<td>Optimized spectral efficiency and network capacity - multi-mega-bit-per second speeds</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>Signal processing, paging and sleep modes optimize battery size and longevity</td>
</tr>
<tr>
<td>Low Total Cost of Ownership</td>
<td>Low cost-per-byte</td>
</tr>
<tr>
<td>Low Latency</td>
<td>Less than 35msec node-to-node, RTT</td>
</tr>
<tr>
<td>Future Proof</td>
<td>Networks to continue delivering telephony services, with backward compatibility</td>
</tr>
<tr>
<td>Accurate Position Location</td>
<td>A-GPS</td>
</tr>
<tr>
<td>IP-based Packet Data</td>
<td>Built-in TCP/IP and PPP protocols, with dynamic IP addressing</td>
</tr>
<tr>
<td>Global Roaming</td>
<td>Network connectivity available in 121 countries and territories</td>
</tr>
<tr>
<td>Private Network Option</td>
<td>Robust, secure VPN solutions with firewalls, isolating M2M from voice subscribers</td>
</tr>
</tbody>
</table>

In Europe, KPN chose to deploy a CDMA450 network exclusively for use with M2M devices and applications

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: All Industries will be Impacted

*M2M connectivity is propelling the Internet revolution*

We are approaching an inflection point in the wireless industry that will have repercussions across multiple industries.

M2M connectivity is expected to improve virtually every aspect of any industry.
Case Studies
CDMA2000-based M2M Services
Drilling mobility into oil and gas

Oil and gas fueled the industrial revolution
Wireless connectivity is propelling the Internet revolution
CDMA2000 M2M: Oil and Gas Industry

Mobile technology is improving the flow of oil around the world at various levels

“Keeping America competitive requires affordable energy.”

“Yet, here we have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world.”

“The best way to break this addiction, is through technology.”

George W. Bush, 2004 State of the Union address

- Fleet management – Knowing when a tanker truck makes an unexpected stop
- Data acquisition – Knowing how much gas is passing through a pipe
- Vibration monitoring systems – Knowing when to replace a bearing in a pump
- Distributed control systems – Switching remote power generators in an emergency
- Remote terminal units – Opening and closing valves remotely
- Micro seismic sensors – Real-time monitoring of seismic activity during drilling
- Power monitoring systems – Reading energy consumption from smart meters
- Remote surveillance – Making sure no one tampers with a oil well
- Protective monitoring and alerts – Alerting workers of high-levels of toxic gas
- Supervisory control – Having instant communications and control

Source: “Drilling Mobility into Oil and Gas,” by Dan Kapko, RCR Wireless, October 2010.
CDMA2000 M2M: Healthcare
CardioNet pioneered remote healthcare monitoring using CDMA2000

The national average charge per hospital admission is $26,500 versus $1,300 for a CardioNet prescription

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: Transportation

DriveCam pioneered the business of consumer telematics with CDMA2000

DriveCam has helped save lives and reduce teen driving collisions by 70%

Source: Harbor Research, Inc., September 2010
On average, the SmartTrash system saves customers 25% on waste management costs.

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: e-Readers

Sony is breaking into the world of electronic publishing with CDMA2000

E-Readers eliminate approximately 50% of publishers’ operational expenditures

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: Remote Asset Monitoring

OmniLink is changing the way people live and work with location-based solutions

800,000 children go missing in the United States each year and over 5 million elderly adults are suffering from Alzheimer’s disease or dementia

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: Smart Grid

*Tata Teleservices is changing the way India is powered with electrical energy*

1. Modems talk to meters through optical ports
2. Meters send data to modems which store the data in memory
3. Modems then push data to a Centralized Data Center (Head End)
4. Head End processes data in a readable format and forwards it to a billing engine

*Tata’s CDMA2000 solution downloads data in 6-8 hours, whereas their GSM solution took 4-5 days to make the same data available*

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: Equipment Monitoring
The world of power and automation is being transformed by ABB with the Sentinel

For ABB, the cost of developing and deploying this system has had a very short pay-back period — less than eighteen months — primarily driven by on-line handling of over 70% of device alerts which has enabled a 50% reduction in overall service time

Source: Harbor Research, Inc., September 2010
Cities and companies often see 20-30% increases in parking revenue after installing digital payment stations.

Source: Harbor Research, Inc., September 2010
CDMA2000 M2M: Electric Vehicles

ECOtality Cellular Connected Electric Vehicle Charging Stations

The largest deployment of EVs and charge infrastructure

Charging Infrastructure Locations
EV-DO M2M: Public Transportation World Expo

Telemetry and real-time video: Safety, scheduling optimization and traffic control
CDMA2000 M2M: Satellite Connectivity

Mobile connectivity solutions supported by satellite connectivity

- Satellite M2M coverage
  - Nationwide outdoor mobile wireless connectivity
  - Connectivity when outside of terrestrial coverage

- A large population of machines and consumers live in un-served areas
  - Consumer Telematics
  - Public safety & Homeland Security
  - Machine to Machine
  - Fleet management
  - Aeronautical
## M2M Economic Benefits and ROI

Most every CDMA2000-based M2M service comes with a significant ROI

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Vertical Market</th>
<th>Key Benefit</th>
<th>2014 Vertical Market Potential (Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Trash Management</td>
<td>Transportation</td>
<td>Saves customers 25% on waste management costs</td>
<td>$6.5</td>
</tr>
<tr>
<td>DriveCam</td>
<td>Consumer Telematics</td>
<td>Reduces teenage driving car accidents by 75%</td>
<td>$6.0</td>
</tr>
<tr>
<td>CardioNet</td>
<td>Healthcare</td>
<td>Reduces cost of treating cardiac arrhythmia by over $20,000 per patient</td>
<td>$4.0</td>
</tr>
<tr>
<td>Sony E-Reader</td>
<td>Consumer Electronics</td>
<td>Eliminates roughly 50% of publishers’ expenses</td>
<td>$10.0</td>
</tr>
<tr>
<td>OmniLink</td>
<td>Remote Asset Monitoring</td>
<td>Can potentially track the location of 800,000 children that go missing each year and 5 million senior citizens with Alzheimer’s</td>
<td>$4.2</td>
</tr>
<tr>
<td>Tata Teleservices</td>
<td>Smart Grid and Metering</td>
<td>Saves the utility 15-20% on bill collection alone</td>
<td>$2.0</td>
</tr>
<tr>
<td>ABB</td>
<td>Industrial and Energy Asset Management</td>
<td>Enables utilities to reduce service time by 50%</td>
<td>$7.0</td>
</tr>
<tr>
<td>Digital Payment Technologies</td>
<td>Retail</td>
<td>Achieves 20-30% increases in parking revenue</td>
<td>$1.3</td>
</tr>
</tbody>
</table>

ROI for M2M applications is primarily based on productivity and efficiency improvements

Source: Harbor Research, Inc., September 2010
M2M Business Benefits

*In general, there are several compelling impacts produced by M2M solutions*

Measures that drive investments in M2M vary greatly across different industries and applications.

Source: Harbor Research, Inc., September 2010
A robust global ecosystem has emerged around providing CDMA2000-based M2M products and services

Source: Harbor Research
CDMA2000 M2M Chipset Market Segments

All ASICs support consumer grade vibration and temp ranges (-30 ºC to +70ºC)

- Portable Navigation Devices, Gaming Devices, Media Players, eReaders
- OEM Transportation, Trucking, Security, Retail Point-of-sale, etc.
- OEM Transportation, Heavy Equipment, Health Care, Tracking, etc.
- Utility (Smart Grids), Industrial, Vending Machines, Health Care, etc.

• All GPS enabled ASICs support E911
To help aggregate the demand for CDMA2000-based wireless modules and devices, the CDG has created an M2M marketplace.

It’s called the Device Corner

www.devicecorner.com

This online portal enables sellers to post products for sale, and buyers to post their solution requirements.
The M2M Opportunity

M2M communications represents a market opportunity of enormous scale

• CDMA2000 has proven that its capabilities are extremely well-suited for M2M applications
  – Security, privacy, reliability, coverage, capacity, speed, low latency, “always-on” IP- connectivity, energy efficiency, accurate position location, roaming, network longevity and a low total cost of ownership

• A robust global ecosystem has emerged around providing CDMA2000 M2M products and services
  – Modules, connectivity devices, system integrators, network operators, virtual network operators, software developers and solution providers

• CDMA2000 M2M applications are being deployed on a global scale across multiple industries
  – Energy, transportation, healthcare, consumer, retail, security, military, etc.

CDMA2000 has become a leading network choice for smart devices and services

“Mobility is about empowering businesses to make better, faster and more informed business decisions.”

Ben Gibson
Director of mobility solutions
Cisco