Public Safety and Emergency Services

CDMA2000® Solutions
Wireless Technology and its Role in Public Safety

- Wireless technology plays an instrumental role in enhancing public safety by
  - Connecting local, state and federal agencies
  - Facilitating emergency services in daily life and in times of disaster

- CDMA2000® operators and vendors have developed a variety of wireless technologies and applications that focus on public safety. These include
  - Ensuring critical communications during emergencies via wireless priority service (WPS) capabilities
  - Position location technologies for location-based applications
  - Medical response solutions in a disaster
  - Fleet management and security
  - Secure handsets.
CDMA Support for Wireless Priority Service through the National Communications System (NCS)

In a time of crisis, authorized first responders and government users get priority use of the cellular infrastructure.

The NCS has two National Security/Emergency Preparedness (NS/EP) programs that contend with PSTN network congestion to assure NS/EP communications remain viable during NS/EP events.

The Government Emergency Telecommunications Service (GETS) overcomes the congestion in the landline local exchange and interexchange carrier networks.

The Wireless Priority Service augments the GETS landline capabilities by addressing the wireless congestion experienced on the radio channels.

Wireless Priority Service (WPS) addresses wireless congestion
Position Location Solutions

• Position location solutions available in CDMA2000® systems enable operators and service providers to offer location-based services to their customers.

• gpsOne technology
  – Hybrid approach to position location that combines a wireless network component with QUALCOMM’s Assisted-GPS (A-GPS) location solution on the chipset.
  – Most precise location solution available almost anywhere, at anytime.
  – Solution offers high accuracy, availability and coverage, even in concrete and steel high rises, convention centers, shopping malls and areas where other traditional GPS will not work.

• CDMA2000® Operators deploying gpsOne
  – Verizon Wireless, Sprint PCS, KDDI, J-Phone, NTT DoCoMo, SK Tel, KT-ICOM, LGT

• Application and Service Providers
  – Vindigo, POINTI, AI, First Gate Ventures, Webraska, TrackWell, HipnTasty, GETLiSa, Kivera, Neolink, Ahead Mobile, ImaHima, Navitime
Location-Based Services and their Role in Public Safety

- Public safety applications enabled by position location solutions:
  - **Emergency response:**
    • In situations of distress, caller locations can be sent to public safety or personal security firms for timely assistance.
  - **Personal location services:**
    • Location services for business enterprises, medical community, the family and persons with disabilities.
  - **Fleet and resource management:**
    • Location information can help to manage vehicle and taxi services, keep track of valuable assets and coordinate a company’s sales force.
  - **Navigation**
    • Access to real-time turn-by-turn driving, walking and mass transit directions
Wireless Enhanced 911 (E911) in the United States
The Role of CDMA2000® Technology and gpsOne

• The Federal Communications Commission has undertaken several programs to promote wireless E911 and public safety.

• Specifically, they have mandated that all wireless carriers must connect their customers to the emergency provider network (accessed by dialing 911) as well as identify their position location for rescue purposes in the case of an emergency.

• Today, CDMA operators in the United States- Alltel, Qwest, Leap, US Cellular, Western Wireless, Verizon Wireless and Sprint are providing public safety agencies with accurate E-911 position location information to locate wireless callers in emergency situations.*

• gpsOne technology gives the police and other public safety agencies the highest levels of accuracy (typically within 10 to 30 meters), to pinpoint the location of wireless callers to 911.

*These operators account for more than 40% of wireless users in the United States; EMC Database, September 2004.
## E911 Implementation

<table>
<thead>
<tr>
<th>Network</th>
<th>Phase 2 PSAPs</th>
<th># States covered</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verizon Wireless (CDMA)</td>
<td>1628</td>
<td>39 + DC</td>
<td>About 136 million pops covered</td>
</tr>
<tr>
<td>Sprint (CDMA)</td>
<td>1365</td>
<td>38 + DC + Puerto Rico</td>
<td>Expect to cover 95% of US population by 12/05</td>
</tr>
<tr>
<td>Nextel (IDEN)</td>
<td>771</td>
<td>??</td>
<td>Difficulty meeting FCC requirement by 12/05</td>
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*PSAP - Public Safety Answering Point: a physical location where emergency calls are received and then routed to the proper emergency services*
**E911 Success Stories…**

**Emergency:**

- **February, 2004** – In upstate New York, a snowmobiler lay in a snow bank with a broken back, barely conscious. He had an A-GPS-enabled cell phone and was able to dial 911.

- The cell phone’s global positioning system told rescuers the victim’s location and they were able to save his life.

Source: The San Diego Union Tribune, October 31, 2004; Kathryn Baliant, staff writer
E911 Success Stories…

Emergency:

• Syracuse, March 2004, a 5 year-old and a mother were critically injured in a fire. 911 was dialed on a mobile phone before the victims lost their consciousness.

• Position location capabilities on E-911 made it possible for firefighters to arrive at the scene, put out the fire, and rescue victims within 5 minutes.

Source: The Post Standard/Herald-Journal, March 22, 2004; Jim Reed, staff writer
Location-Based Public Safety Applications
Child and/or Elderly Finder Application

- Position location application using CDMA and LBS
- Safety – automatic location in case of an emergency
- Peace of mind – applications enable parents to automatically track children or receive alerts when “geo-fences” are crossed
- Convenience – “Why is my son late from the bus stop – I’ll find out where he is ....
Location-Based Public Safety Applications

Child and/or Elderly Finder Application

- SECOM Co., Ltd., the largest security company in Japan, launched CoCo SECOM, a nation-wide location-based security service that uses gpsOne technology.

- A seven-year-old boy was found 6.3km away from his school (Tokyo)
  - 11:03am: A mother asked SECOM to search her son’s location with CoCo SECOM. He was pinpointed in the city 6.3km away from home.
  - 11:12am: The mother requests follow-up on son’s location.
  - 11:38am: Repeat location requests by the mother prompt SECOM to ask her if they can provide more assistance.
  - 11:44am: A teacher was guided to the child at the N-Station some 6.3km away from school.
  - 12:03pm: The teacher was contacted by SECOM and told that the child was located 250m to the North-east of the station.
  - 12:07pm: The teacher found the child, and returned him to his mother, safe and sound.

- “We were in panic when he was gone. SECOM did a great job, thank you very much!”
Location-Based Public Safety Applications
Kid Tracker Application

• Kid Tracker devices used at the Beijing School for the Blind enhance mobile communications among students, teachers and parents and improve the quality of life of a particularly disadvantaged group in Chinese society.

• The Kid Tracker devices enable the visually impaired students to seek help in the case of an emergency, and will provide a safer environment for the school, family and society in general.

• Location-based services allows parents/emergency services to track loved ones’ locations via the Internet.

• Device equipped with three preset keys: one which dials a parent’s cell phone, one dials the home number and one dials emergency services.
Public Safety Solutions
The Secure Truck

1. Satellite Mobile Communications System
   - Real-time, Two-way Data
   - Position Location
   - Over-the-air Vehicle Sensor and Emergency Alert Transmission
   - Driver Authentication

2. Wireless and In-cab Emergency Panic Buttons
   - Over-the-air Emergency Notification
   - Audible Alarm
   - Integration with Proximity Device

3. Vehicle Shutdown
   - Tamper Detection
   - Driver-Initiated Shutdown
   - Carrier-Initiated Shutdown

4. Cargo Security
   - Wireless Electronic Seal
   - Trailer Lock
   - Door Sensor
   - RFID Tag
   - Audible Alarms
Vehicle Tracking Service in Peru Enabled by CDMA
Federal Police: Motor Vehicles Division

Original situation:
• Limited access to vehicle information
  – Dependent upon paper listings, calls to HQ, or in the best case, local databases on laptops in police cars (no online access)
• Slow process where driver would have to wait till information was accessed by the officer

Current situation:
• Online, real time access to vehicles database through the cellular network, using WAP interface with a Microsoft NT server, SQL database
  – System name: DATATRAN
Push-to-Talk Services on CDMA2000® networks

VoIP-based, push-to-talk, “walkie-talkie” technology solutions

One-To-One

… and One-To-Many

• Always-on
• Virtually instantaneous
• Reducing latency is the driving factor
Push-to-talk (PTT) - QChat

- QChat is a PTT offering available on CDMA networks.
- QChat is a pure IP-based dispatch communications solution
  - Operates as an adjunct to the infrastructure
  - Uses standard packet data service options
  - Uses the Internet Engineering Task Force (IETF) standard VoIP protocols
  - Off-the-shelf hardware for server components
  - Mobile phone and PC client applications
  - BREW-based handset application

- Features
  - Group and private calls
  - Multiple priority levels and talker arbitration algorithms

- User Experience
  - “Always On”
  - Instant Communication
MOXXI is a Canada-based research project that is testing the potential benefits of wireless electronic drug prescribing. In addition, it is investigating drug and disease management systems for primary care physicians, pharmacists and their respective patients.

- Bell Mobility’s CDMA2000® network is utilized for connectivity to an integrated database with secure access to patient information and pharmacy records.
- The wireless prescription service allows physicians and pharmacists to cross-check for correct drug prescription and dosage.
- **Improved Safety**
  - Decreases number of adverse drug reactions
  - Provides alerts and reminders about prescription drug reactions and drug disease interactions
- **Results**
  - 90% reduction in prescription errors in one hospital study
  - 50% reduction in prescription errors across the clinic network

Wireless Internet Information System for Medical Response in Disasters: A UCSD Initiative

• At the University of California, San Diego, Cal-(IT)² researchers [www.calit2.net](http://www.calit2.net) equipped the inside of a standard campus commuter bus with an 802.11b (Wi-Fi®) local area network and connected it to Verizon’s wide area CDMA2000® network so that passengers could have Internet access during the entire duration of their ride.

• The Cal-(IT)² researchers later expanded upon the wireless capabilities of the CyberShuttle to create a wireless Internet information system for medical response in disaster situations.
**Wireless Internet Information System for Medical Response in Disasters: A UCSD Initiative**

- The *CyberShuttle*, comes equipped with cameras as well as computing and display capabilities. At a disaster site it is the hub for wireless data transmission, victim tracking and vital-signs monitoring.
  - The researchers and industry partners set up an ad hoc, multi-hop 'mesh' video transmission network.
  - Each camera is equipped with wireless transmission capabilities, and each video feed is transmitted to the command center over the shuttle’s Wi-Fi®/CDMA hybrid network.
  - Video feeds give emergency officials the ability to "see" the disaster site remotely, prior to dispatching hazmat and other crews to the scene.
  - The medical response system greatly enhances the ability of emergency response personnel to evaluate and respond to disaster situations.
Wireless Internet Information System for Medical Response in Disasters (WIISARD)

- The UCSD initiated project WIISARD uses sophisticated wireless technology to coordinate and enhance care of mass casualties in a terrorist attack or natural disaster.

- WIISARD’s goal is to provide emergency personnel and disaster command centers with medical data to track and monitor the condition of hundreds to thousands of victims on a moment-to-moment basis.

- WIISARD is based primarily on 1xEVDO and 802.11 technologies which can provide adequate support for high-speed transmission of medical and other data from local fire fighters, hospitals and emergency medical responders to a command center operated by the County of San Diego. WIISARD has interlocking software/hardware systems linked by a location-aware system and an advanced wireless Internet networking infrastructure.
Wireless Internet Information System for Medical Response in Disasters (WIISARD)

- Partners in the development and testing of a WIISARD prototype
  - The UCSD/Veteran Affairs team
  - The California Institute for Telecommunications and Information Technology [Cal-(IT)²] research team
  - Faculty from the UCSD Jacobs School of Engineering
  - San Diego Supercomputer Center
  - Verizon Wireless
  - QUALCOMM
  - Ericsson
  - PhilMetric
  - Space and Naval Warfare Systems Command (US Navy)

- The WIISARD prototype has been tested in simulated disaster drills.
Wireless Internet Information System for Medical Response in Disasters (WIISARD) Cont…

WIISARD will:

- Utilize radio-frequency (RF) tags placed on all patients to track the location of victims and healthcare providers. The most severely ill patients will also receive a medical sensor, a finger-tip pulse oximeter which monitors the degree of blood oxygen saturation and pulse rate. Data from the RF tags and sensors will be sent to a collector unit that buffers, compresses and wirelessly forwards data to a central database.

- Equip frontline emergency responders with hand-held devices such as Personal Digital Assistants (PDAs), which will provide location-based access to patient medical data and enhanced communications via instant-messaging with field healthcare providers and the disaster command center.

- Monitor the location of toxic plumes from chemical or nuclear attacks, via a component of the PDA which displays a map of the immediate region, so that providers can avoid entering a "hot zone" while caring for patients. This technology is based on use of sensors monitoring local weather conditions and advanced mathematical models for prediction of weapons' effects.

- Maintain a record of medical care with a disaster database based on an electronic medical record system designed by UCSD emergency physician James Killeen, M.D. and nurse Donna Kelly.

- Transmit medical data from the field to hospitals in a secure manner, and provide a record of patient transfer to specific hospitals.
Cal-(IT)² and UC San Diego Select Entrée Wireless to Supply EV-DO / Wi-Fi® Mobile Gateways for High-Speed Connectivity on Homeland Security Communications Project

• Entrée’s Mobile Area Network solution -- dubbed the MANPack -- is a battery-powered, briefcase-size device that integrates a high-speed wireless Wi-Fi® access point with access to EV-DO. It can be easily transported to any location within the coverage of an EV-DO network, and instantly extends the reach of the EV-DO system to Wi-Fi®-enabled devices nearby.

• In crisis response situations, the MANPack will enable communication with, and tracking of, first responders, resources and casualties at locations where permanent Wi-Fi® access is not available.

• The first commercial shipments of Entrée hardware and software will be deployed as part of the Wireless Internet Information System for Medical Response in Disasters (WIISARD), a project based at UCSD and funded by the National Library of Medicine. The $4.1 million project will explore and test the use of sophisticated wireless technology to coordinate and enhance care of mass casualties in a terrorist attack or natural disaster.
Deployable Cellular System

OA&M Computer
BTS
BSC Server
Power Panel
Power Amp
Mobile Switch and Media Gateway
PDSN (Packet Data)
Power Panel
Switch OA&M Server
Asynch Data IWF

Radio Access Node Case
Network Switch Center Case
Summary

- Wireless technology plays an instrumental role in enhancing public safety by facilitating emergency services in daily life and in times of disaster.
- QUALCOMM and its CDMA operator partners have developed a variety of wireless technologies and services that focus on public safety through global positioning applications and a variety of wireless business system initiatives. This contributes to saving lives in emergency situations.
- Public agencies all over the world are looking to implement these types of applications on mobile networks to enhance their ability to react in times of urgent need.
Thank You!