IPv6 based Emergency Rural Healthcare
Emergencies/Disasters and Cost - Worldwide

Source: CRED International Disaster Database, 2008
Note: Includes – Drought, earthquake, epidemic, extreme temperature, famine, flood, industrial accident, insect infestation, miscellaneous accident, slide, transport accident, volcano, wave/surge, Wildfire and windstorm
Information Technology for Disaster Reduction

Information systems

- Socio-economic data
- Hazard, vulnerability,
- Crisis maps
- Common geospatial
- infrastructure
- Web services
- Semantic web

Sensor Networks

- EO satellites
- In-situ sensors UAV
- HALE
- SensorWeb
- Smart dust

Preparedness
Early warning
Response
Recovery

Public Safety
Communications

- WiFi
- IP
- Wimax
- Analogue radio,
  Tetra, Tetrapol, GSM,
  3GPP…broadcasting
IPv6 is not only for IT industry, but for all industrial segments, by the improvement of RoI and by applying the Internet technology.

**Service development and deployment**
- Integration of real-space and cyber-space
- Apply to public service/security infrastructure
- Integration with broadcast business
- Deployment of peer2peer applications

**Architecture**
- True mobility supporting
- Unwired connectivity
- Provide IP layer end2end security (i.e., IPSec) and ease of operation and management
Emergency/Disaster Management
The Organization

IPv6 Based – Emergency/Disaster Management System

IPv6 Enabled Network Infrastructure

- Secure Environment
- Bi-directional communication
- IP Mobility
- Ad-Hoc Networks
- Traceability
- Community of Interest

Government | Public | Private
--- | --- | ---
Broadband | Cellular/ GPRS/3G | Satellite | Radio
Wi-Fi | Satellite | Wi-Max
IPv6 Emergency/Disaster Management System - Metropolitan Design – Real Space Internet with IPv6

Sensor Based – Early Warning System
Intelligent Buildings
Intelligent Transport
Tele-Medicine
Integrated Communication Network
Next Gen – Crisis Management Center
Using IPv6 in sensor networks

- Increases Network Connectivity
- Helps build intelligent monitor and control system
- Increases the flexibility of sensor node interaction
- Self Organized System
- Low power system
- Highly Secure System

Different Sensor Services

- Image
- Sound
- Radioactivity
- Humidity
- Luminosity
- Temperature
- Movement

IPv6 – Wireless Sensor Networks

Integrating

Sensor Networks

4G Systems

Supporting

Mobility

Using

Offering

Surveillance Systems
IPv6 based Tele-Medicine

Virtual Hospital
Based on IPv6 Communication Network

Virtual Telepathology Center
Based on IPv6 Communication Network

Tele-Diagnostics, Tele-Consultancy, Tele-Surgery, Tele-Monitoring
IPv6 communication Equipment – Enabling Next-Gen Rural Healthcare

<table>
<thead>
<tr>
<th>Network Equipment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruggedized – Emergency router</td>
<td>Router with redundant communication capabilities across GSM, CDMA, 3G, WiMax …etc</td>
</tr>
<tr>
<td>Cellular Diversity Antenna</td>
<td>An antenna, for diverse communication technologies, spanning, 3G, Wi-Max, CDMA …etc</td>
</tr>
<tr>
<td>IPv6 Bio-sensors</td>
<td>IPv6 based Bio-sensors which help in collecting information about vital signs</td>
</tr>
<tr>
<td>Medical Vital sign tracking Unit</td>
<td>Medical vital signs collection unit</td>
</tr>
<tr>
<td>Video Conf system</td>
<td>IPv6 based Video conf system, which will help in patient monitoring and treatment</td>
</tr>
<tr>
<td>Video encoder/Decoder Cards</td>
<td>Video Cards that would fit in the Emergency router</td>
</tr>
<tr>
<td>Tablet PC for Information Gathering and transmission</td>
<td>Emergency information gathering and collation unit</td>
</tr>
<tr>
<td>Multi-Frequency Mobile Phones</td>
<td>Mobile phones, which take care of the diverse communication technologies,</td>
</tr>
<tr>
<td>GPS Tracking system</td>
<td>Location and tracking of the ambulances</td>
</tr>
</tbody>
</table>
**Current Work Style**

Officers sent to Emergency/Disaster site report with telephone or Radios

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**IPv6 Emergency/Disaster Management System**

Officers are assisted with detailed information obtained via sensors and surveillance systems
IPv6 and EMRI
Background

- Geography: Majority of the areas are remotely located from cities and towns
- Poor medical resources in rural areas
- Lack of Hospitals in Rural areas
- Lack of doctors in Hospitals in Rural areas
- Medical help in case of Emergencies reaches very late

National Rural Health Mission (NRHM)

- Seeks to provide effective health care to the entire rural population in the country with special focus on 18 states which have weak public health indicators.
- Strengthen Rural hospital for effective curative care
- Seeks to improve access of rural people, especially poor women and children, to equitable, affordable, accountable and effective primary healthcare

Rural Emergency Healthcare – one of the key components to make NRHM Succeed
EMRI is a pioneer in Emergency Management Services operates under Public Private Partnership mode with Mahindra Satyam as Technological partner.

EMRI is the only professional Emergency Service Provider in India today.

EMRI provides free service delivered through state-of-art emergency call response centers and has over 2056 ambulances across Andhra Pradesh, Gujarat, Uttarakhand, Goa, Chennai, Rajasthan, Karnataka, Assam, Meghalaya and Madhya Pradesh.

Vision 2010

1) To provide Free emergency response services for Medical, Police and Fire emergencies across India by 2011 in PPP (Public Private Partnership) framework
2) To respond to 30 million emergencies and save 1 million lives annually by 2011
3) To deliver services at global standards through Leadership, Innovation, Research & Training and Technology
4) To be recognized as best-in-class and become 1 of 8 wonders of the World

EMRI has bagged the NASSCOM-CNBC TV 18 IT User Award- 2008 for using technology for saving lives.

EMRI bagged the first prize in the health care category at the Computer World Honors Laureate award -2008
Rural Emergency Healthcare – Current Process

Caller in distress

Dial 108

Public Switching Telephone Network (PSTN)

Dispatch Officers (DO)

Doctor

Central Co-ordination Contact Center

Ambulances nearest to caller located and guided to destination

Ambulances located at strategic places in districts

Challenges in Today’s – Rural Emergency Healthcare scenario

- Patient Vital sign information provided offline by phone – Blood pressure, ECG, Temperature .. Etc.
- Patient condition and scenario explained over the phone – Doctor lacks the ability to see the patient’s visual condition

- Doctor provides Offline Healthcare – Based on Vital sign info conveyed over phone
- Effective Emergency Healthcare hampered by lack of continuous vital sign info.

- Dispatch officer locates nearest Ambulance to caller – manually by calling Ambulances
- Dispatch Officer manually guides Ambulance over the phone to the destination
IPv6 Enabled Rural Emergency Healthcare

Caller in distress
Dial 108

IPv6 Backbone
Dispatch Officers (DO)

Central Co-ordination Contact Center

Doctor

GPS helps Locate Ambulance, guides Ambulance driver To destination

Ambulances located at strategic places in districts

Bio-sensors help collect Vital sign info which is transmitted in real-time helping doctor provide effective healthcare

3G Wi-Max

IPv6 Technologies – Rural Emergency Healthcare

• Bio-Sensors
• IPv6 based Real-time Vital signs data transfer
• IPv6 based Real-time Vital signs data transfer
• Seamless Video-Conference

• VoIP enabled Telephony
• Automatic Vehicular Location System
• Real time Inventory Asset and Inventory tracking using IPv6

Benefits – IPv6 Rural Emergency Healthcare scenario

✓ Patient Vital sign information collected on a continuous basis by Bio Sensors– Blood pressure, ECG, Temperature .. Etc,
✓ Patient’s condition is seen in real time Video by Doctor – Providing effective healthcare to patient
✓ Doctor provides Effective Emergency Healthcare, based on Real-time Vital sign info
✓ Dispatch officer locates nearest Ambulance to caller – by using GPS
✓ Ambulance driver reaches destination faster via automatic guidance using GPS

IPv6 simplifies and enhances Rural Emergency Healthcare
EMRI - Vision – IPv6

108 Call

Sense

CTI
VoIP
Voice Calls
Fax
SMS
Email
Chat
Sensor based switches
Hot Lines

Reach

IPv6 backbone Network, Internet

Emergency Response Centre

Remote Site Operations with seamless fully automatic BCP

Fleet and Inventory Management

Automation using RFID, Barcode Readers, AVLT, PC in Ambulance, Vehicle Telematics, Tripsheets, Dynamic location of Ambulances based on the incidents history, Traffic Sensors

Telemedicine

Online streaming of Vitals, Video, Medical Images to Emergency Response Centre, Online Hospital Networks, Bio-Sensors

Care

Emergency Response Centre – Field Crew Communication Channels

CTI, VoIP, Voice Calls, Fax, Two way SMS, email, Hot Lines, any combination of origin and destination with PSTN, GSM, CDMA, 3G and Radio

Emergency Response Centre – Other Agencies Communication Channels

any combination of origin and destination with PSTN, GSM, CDMA, 3G and Radio

Caller Location Identification

Location Based Sensing with Geocoded information of Buildings, Landmarks, Fixed Lines, and by Triangulation for calls originating from Mobiles

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EMRI Statistics

- 12,000 + EMRI Associates
- 6,800 + Private Hospitals / Nursing homes
- 2,000 Police / Fire Stations
- 280 M population covered in 11 States
  - 100+ Lakh calls received till date
  - 500,000 emergencies handled
  - 6,500 emergencies in a day (2.4 Million annualized)
  - 1,900+ Ambulances - 6+ trips a day
  - < 3 minutes Ambulances assigned
  - < 14 minutes (urban) and < 21 minutes (rural) Ambulances reached
  - 100% virtual handholding (in ambulance) by EMTs and physicians
- 100+ lives are saved each day (46,000+ till now) and 6,370 victims receive timely, high-quality pre-hospital care
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THANK YOU