U2010 & IRMA Results

THE NEXT GENERATION SAFETY NETWORKS
<table>
<thead>
<tr>
<th>Safety Generations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st Gen.</strong></td>
</tr>
<tr>
<td>RADIO</td>
</tr>
<tr>
<td>Pioneers</td>
</tr>
<tr>
<td>Radio Voice only</td>
</tr>
<tr>
<td>One Way</td>
</tr>
<tr>
<td>No Interoperability</td>
</tr>
<tr>
<td>Silo Solutions</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>2nd Gen.</strong></td>
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<tr>
<td>TETRA...</td>
</tr>
<tr>
<td>Innovators</td>
</tr>
<tr>
<td>GSM-based</td>
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<tr>
<td>Voice, 2-Way...</td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>IP(v6) Based</strong></td>
</tr>
<tr>
<td>Everyone</td>
</tr>
<tr>
<td>Everything</td>
</tr>
<tr>
<td>Wireless, Media,</td>
</tr>
<tr>
<td>LTE, SAT, GPS,...</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>End 2 End</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Global</td>
</tr>
<tr>
<td>Networked</td>
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<tr>
<td>Solutions</td>
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</tbody>
</table>

IPv6 Forum

Vision & Way Forward
Internet Generations

<table>
<thead>
<tr>
<th>ArpaNET</th>
<th>Inter”NAT”</th>
<th>New Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCP</td>
<td>Innovators</td>
<td>Everyone</td>
</tr>
<tr>
<td></td>
<td>NAT Engineers</td>
<td>Everything</td>
</tr>
<tr>
<td>Telnet, FTP,</td>
<td>WWW</td>
<td>Wireless, Media,</td>
</tr>
<tr>
<td>Email</td>
<td></td>
<td>P2P, Grid</td>
</tr>
<tr>
<td>Gov. internet</td>
<td>Public Internet</td>
<td>Global Internet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Telnet, FTP, Email
- WWW
- IPv4/NAT
- IPv6

Vision & Way Forward

IPv6 Forum

www.ipv6forum.com
The IPv4 Address Exhausting Debate 😊

Tony Hain, Geoff Huston

2010-2030

IPv4 Exhaustion Counter

10%

2010

26/256
TETRA: Silo-Fragmented Safety Communication

- Fire Brigade
- Ambulance
- Police
- Civil Protection

Best Effort

Infrastructure
Narrow-Band
Poor Media
Legacy Technologies
Not agile for smarter ways
IPv6: For Most Advanced Safety Technologies

- Fire Brigade
- Improved Response
- Efficient Police
- Efficient Government

Better Safe Than Sorry

Use new technologies in smarter ways

IPv6

Infrastructure
Broadband
Multimedia
GOVERNMENT AND INDUSTRY
EMERGENCY & CRISIS MANAGEMENT
Global Networking Solution

U-2010 – an IPv6 Public Safety Framework

Bio-Ecological
Terrorism
Health
Rescue
Transportation disaster
Natural disaster

First Responders
Public Information
Crisis Management
Risk Profiles
Voice
Sensors
Directory services
Video
Time Synchronisation
Localisation
Instant Messenger
Management

IPv6 - Common Networking Infrastructure Enabler

Fixed Network Infrastructures
- Secure environment
- Bi-directional communications

Public
Private
Government

U-2010

Wireless Network Infrastructures
- IP Mobility
- Ad-Hoc Networks
- Traceability
- Community of interest

Fixed
WIFI
GPRS/3G
Radio
Satellite
WiMax

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IPv6 - BASED PUBLIC SAFETY COMMUNICATION

IPv4 address exhaustion: 10% left  D-Day: 10/10/10

The benefits of IPv6-based services are numerous:

- Commercial Off The Shelf products (COTS)
- Cost savings in deployment of public safety networks
- Proliferation of innovative safety products (networked RFID, Sensors)
- Interoperable IP capable networks nation-wide and worldwide
- Enablement of Trusted End-to-End IP based Network Security
- Enablement of IP based Network Management
- Enablement of IP based Seamless Network and Node Mobility
- Enablement of Next Generation Network Application Services to Users
- Common open standards communication protocol to support multiple wireless networks configuration and integration (e.g. Sensor, Link, Internet)
IPv6-BASED PUBLIC SAFETY COMMUNICATION

First Responder Visible Benefits

- Improved Situational Awareness: Real-time communications allow officers to make better decisions more quickly resulting in safer communities and a more efficient public safety workforce.
- Network Reliability: Redundant wireless network connections ensure reliable communications while on scene or in motion.
- Office network extension to the incident: Offers real-time access to remote broadband applications for first responders in the field.
- Confidentiality of Information: Ensures information shared between an Emergency Operations Centre and first responders is secure and dedicated for public safety use only.
- Interoperability: Provides a standards-based network platform which enables communications interoperability.
Safety and Security is a large and complex discipline with many dimensions:

- Multiple organizations with different backgrounds are involved and need to collaborate.
- Each country, region, or city has specific requirements and particular ways of addressing them.
- An influential Research & Development community brings many new technologies to maturity year after year, such as artificial intelligence, video analytics, IPv6, mobility, sensors, biometrics, etc.
- A variety of systems integrators and technology providers offer very advanced solutions, while the equipment in place is often old and outdated.

This diversity hardens the task of IT Architects who must fulfil increasingly stringent operational requirements with an ever evolving set of technical solutions.
Specifically, the Communication Challenges in Public Safety are:

- Lack of interoperability within and across agencies
- Limited communication based on narrowband, proprietary networks
- Limited access to criminal or medical records while on scene
- Reliance on office resources to report field results
- Need for secure, standards-based networks to facilitate interoperability
SCOPE OF THE ANALYSIS

Communication to/from and between first responders

Key Services:
- Secure communications (end-to-end encryption)
- Creation of teams (group call) and control hierarchy
- Prioritisation (Emergency call)
- Broadcasting (e.g., evacuation signal)
- Direct mode communication (no base station)
- Open channel
- Listen-in
- Access to the public network

Networks:
- GSM, UMTS, Satellite
- PMR
- TETRA portable radio terminals
- TETRA terminals with IP capabilities

New multi-mode TETRA-compatible terminals with multiple interfaces (see Annex 2)

Operational Procedures:
- Fire
- Police
- Ambulance
- Civil Protection

Communication with first responders

Scope of the report

Devices:
- Bluetooth, WLAN, WMAX, GPRS
- Adapter

IP-based voice, video and data on smartphones, laptops, PDAs, etc.
Situation in Europe

- Migration towards nation-wide dedicated digital networks started end of 90s
  - Availability of Europe wide 2 * 5 MHz (380-400)
  - Europe coverage completion expected before 2015

- Special purpose technology
  - TETRA or TETRAPOL
  - Used everywhere in the world except in North-America

- Competitive environment

- Limited data capability
ICT Systems are vital to Public Safety

**BIGGEST ACHIEVEMENTS**

- Not v4 but IPv6

**AUTHORITIES**

- Call reception, localization & mapping
- Information gathering, govt forces coordination
- Call dispatch

**FIRST RESPONDERS**

- Command Share

**CITIZENS**

- ALERT
  - Emergency Call 112

- WARNING
  - Emergency Notification

**Information Inter-operability**

- IP Based Architecture
  - Not v4 but IPv6

**Net Inter-operability**

- Mobile High Speed
  - Satellite

---

Citizen Warning Syst Satellite

PSCE – September 22nd 2009 – page 3
Vision: Interoperability between heterogeneous networks

- IP based networking – but this is not good enough
- Standardized protocols for multi-media communications & end to end security
WHY IP ? AND WHY IPV6 ?

Why IP ?

- Standardized Platform for all applications, independent of underlying technology
- Seamless Network and Node Mobility
- End-to-End Management
- Commercial Off The Shelf products (COTS)
- Service-orientation and Common open standards communication protocols
- Proliferation of innovative safety products (networked RFID, Sensors)

Any issues with IPv4 ?

- Warning: IPv4 public address pool runs out in 2010 !!!
- IPv4: ok for the enterprise ➔ IPv6: internet of things

Why IPv6 ?

- 128-bit Addressing [RFC 2460]
- End-to-End Addressing [RFC 2460]
- Network Layer IPsec [RFC 2460, 4301]
- New QOS Support [RFC 2460]
- Auto configuration [RFC 2461, 2462]

- Security Addressing [RFC 3041, 3979]
- Enhanced Multicast [RFC 2460, 3306]
- Multihoming Features [RFC 4291]
- Simplified Header [RFC 2460]
- Advanced Network Services [RFC 2460, 3775]
QUESTIONS AND ANSWERS

Thank you for your attention.