Experience in IPv6-transition for existing eGovernment infrastructure Brussels 2015

## IPv6 in Emergency Response and Disaster Relief Systems

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المينية Faculty





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### **GEN6 – Governments ENabled with IPv6**

- Project time frame
  - 1.1.2012 31.3.2015
  - 19 EU partners
    - 7 national pilots
    - 2 cross-border pilots
- EC reference

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- <u>http://ec.europa.eu/information\_society/apps/projects/factsheet/index.cfm?project\_ref=297239</u>
- <u>http://www.gen6-project.eu/</u>

### **Slovenian pilot – A-ERCS**

- Advanced Emergency Response Communication Solution
  - <u>http://www.gen6-project.eu/A-ERCS.html</u>
- A-ERCS System deployment name 6inACTION
  - http://6inaction.net/

Smart and compact mobile solution designed to provide first responders with reliable communications and IoT-driven situation surveillance and intervention management services in emergency situations



### **6inACTION** Vision

- Converged communications in emergency situations
- a distributed and robust overlay communication solution for data transport and rich multimedia service built across professional (e.g. DMR, TETRA, Satellite) and commercial networks (e.g. UMTS/HSPA, LTE)



IPv6 convergence layer and smart network enabler

### **6inACTION Vision – Technology**

• COTS terminals and equipment



IP67, Mil, Water Proof, Crush Proof, Drop Proof, Dust Proof,



## **6inACTION** system

First BB PPDR System by "CEPT ECC Report 199"



#### SYSTEM TODAY

#### **Backhaul**

- DMR
- Telco UMTS/HSPA

#### **On-site**

• DMR radio

Satellite

#### SYSTEM TOMORROW

#### Backhaul

- DMR, TETRA, satellite
- Telco UMTS/HSPA, LTE, WiFi
- xDSL/FTTH

#### **On-site**

• DMR radio, WiFi mesh, sensors

#### **6onMOBILE**





#### SERVICES TODAY

IPV6, NEMIO,

DSMIPV6

IPSec, ..

- Voice 1. priority
- Messages 2. priority

#### SERVICES TOMORROW

- Voice 1. priority
- Messages 2. priority
- Pictures 3. priority
- File 4. priority
- Video 5. priority
- Sensor & M2M services

**6inACTION System – High level system architecture** 



#### **6inACTION Deployment Architecture @ Telekom Slovenije**



### Mobile node/user provisioning – private APN

Phase 1.: LTE/UMTS AKA – mobile provider	
<ul> <li>USIM Authentication and Key Agreement in HSS/HLR server</li> </ul>	Mobile operator
<ul> <li>Phase 2.: Extended node/user authentication and author</li> <li>CHAP/PAP in Radius server</li> </ul>	ization – 6inACTION system
<ul> <li>Phase 3.: Additional encryption for the most critical servic</li> <li>IPSec for networking devices (6onCORE)</li> <li>SSL VPN for end user devices (6onMOBILE)</li> </ul>	ces – 6inACTION system
<ul> <li>DSMIPv6 for sensor gateway (6onFIRE)</li> </ul>	Public safety agency
etwork parameter assignment	
<ul> <li>RADIUS assigned and P-GW/GGSN enforced IPv4&amp;IPv6 pa</li> </ul>	arameters - 6inACTION system
LTE option	
<ul> <li>IPv6 EPS bearer</li> </ul>	
<ul> <li>IPv4 EPS bearer</li> </ul>	
<ul> <li>IPv4/IPv6 EPS bearer</li> </ul>	
HSPA/EDGE option	
<ul> <li>IPv6 PDP context</li> </ul>	
<ul> <li>IPv4 PDP context</li> </ul>	
SSL/TLS VPN option	
– IPv4/IPv6	
– IPv6	

#### 6inACTION System – Detailed deployment architecture (mobile part)



#### 6inACTION – Architecture for Cross-border Operations over 3G/4G



#### 6onCORE IPv6 INTELLIGENT NETWORK ENABLER



Set up on-site intervention command center using 6onCORE

- Compact mobile network node
- Installed in first responder vehicle or fully portable
- Provides communication services for intervention management by selecting best available networks for the required services
- Connects to 6onFIRE sensor deplyoments on site

### **6inACTION FOR LIFE**

#### IPv6 network intelligence

- NEMO with MCoA and IPSec
  - secure and transparent 6onCORE node mobility
- SLAAC and DHCPv6
  - host and network nodes auto configuration



#### **Technical design**

Cisco ISR819 M2M router



- Multicast with MLD, PIM-SM and scope options support
  - flexible live multimedia streaming on-site and globally
- IPv6 hierarchical addressing
  - fast unit, user and sensor provisioning
- BGP and OSPFv3

#### **PA** addressing

IPv6 PA and IPv4 PA addressing



### **Tactical Smart Devices**

### TACTICAL&MISSION SMART DEVICES AND APPS

#### • COTS TERMINALS + IP67/MIL enclosure

• Dust proof, water proof, drop/crash proof

#### • INTEGRATING CUSTOM TACTICAL AND IT APPS

- Tracking, contextualized on-site triage, live video streaming
- Mail, file share, video, picture, cloud apps

#### • IPv6 PDP Context / EPS bearer support?

- Android: 🗹 🗶 🗶
- iOS: **\*\*\***







### **IoT-Driven Intervention Management**

### **IOT-DRIVEN INTERVENTION MANAGEMENT**

#### • Real-time common operational picture

• Mash up of sensor and user events, live unit tracking, live video streaming and remotely captured on-site high resolution pictures



### **IOT-DRIVEN INTERVENTION MANAGEMENT**

#### • Contextualized real-time triage reporting

• User notes + site map + on-site captured high resolution picture + unit track



Smart IoT Manage	HI	Edit Device	Group
NATIONAL L./32 Mun	Administrator	Add groups	
	Devices 2 >	Group name:	EPV-SENSORS
└──→ MOL	. (2a Sensors 2 >	Description:	Sensor LAN
	Alarms 3 >		h
256 Municipalities	Users	Group network address:	2a00:1368:ff03:0202::
	API Keys	Prefix: /	
	Documentation		64
		Add devices to group:	Select device \$ Add to group
			MerilnaPostajaSava ×
			Lukas Weather Station ×
			eHealth_test ×
		→ EPV2 /56 (2a(	00:1368:ff03:02::/56)
			LAN1 /64 (2200:1368:ff03:0201/64)
			2E6 Sogments
			Sensor LAN2 /6 (2a00:1368:ff03:0202/64)



### System piloting and testing



## System performance measurements: results for densely populated city area – 5MHz BW (HSPA&LTE)



- CDF (line) and histogram (bar) graph - Blue line (IPv4) and green line (IPv6)

November&December 2013

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eam Status - The 17th International Rescue Dog Exercise Liubliana 2015										
	can otatas The Tr International Nescue Dog Exercise, Ljubijana 2015									
Team	Members	Status	Last change	Changed at						
MOL	Borut Modic, Dusan Weber, Spela Bergant	Base ready	2h ago	6:45:33 16:5:201						
HGSS	Neven Putar, Hrvojs Domazetovic, Stjepan Gal	Base resting	44min ago	8 20:01 16.5 201						
Gruppo cinofilo il Gelso-2	D'Alo' Sandro, Fedenco Zelandi, Lugino Lambranzi	Driving	8min ago	8.56.05 16.5.201						
ERPS-2	Tilen Skraba, Eve Hrncic, Blaz Verbic	Persons missing	63min ago	8:00:49 16:5:2015						
DVRPS	Primoz Bięł, Stasa Vosnjak, Luka Matjaz	Drwing	34min ago	8 29 22 16 5 2015						
Gruppo cinofilo il Gelso-1	Mirko Borsato, Claudio Canzian, Chiara Coro	Base ready	89min ago	7 34 39 16 5 2015						
Mestna obcina Celje	Eva Gologranc, Tamana Jager, Nevenka Stor	Base ready	56min ago	8 07 35 16 5 2015						
OHU Suchhundestaffel	Wolfgang Pftzner, Roland Polster, Michaela Riedler	Driving	17min ago	8 46 58 16 5 2015						
ERPS-1	Janez Toni, Blaz Matkota, Maja Balon	Driving	33min ago	8 31 13 16 5 2015						
ASB-Esslingen	Melane Holzer, Silke Vogt de Silva, Inna Khakma	Base ready	18min ago	8 45 26 16 5 2015						
ERP KD Ljubljana	Zuonko Majeren, Primcz Kanic, Bostjan Klatic	Base ready	67min ago	7 58 42 18 5 2015						
Drustvo za resevalne pse Burja	Roman Starman, Moreno Drink, Martina Kobal	Base resting	15h ago	17:49 11 15:5 2015						
Enota resevalnih psov Ljubljana	-1 Sava Zibler, Edita Modic, Tomaz Dzuban	Driving	361s ago	8 58 20 18 5 2015						
KOSSP Zagreb	Petra Covic, Gorana Smoljanovic, Petra Hajdukovic	Orwing	2h ago	6 31 32 16 5 2015						
KD REPS Maribor	Emil Urbanci, Hojka Kraighor, Matej Kavnik	Persons missing	8mm ago							
NAMES OF TAXABLE PARTY OF TAXABLE PARTY.	Khamis Nasser Al Danhani, Musebeh Saeed Al Maznu, Kalite Salem Mohammed Al Faresi	Base resting	95h ago							
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Abu Dabhi Police Enota resevalnih psov Ljubljan THAI RDÁ	a-2 Sana Smienkit, Danis Gregoroc, Unia Valentinoc Ictok Stager, Sue Redmond, Andy Redmond	Base resting	95h ago	9 57 47 12 5 2015						

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### International Rescue Dog Exercise, Ljubljana 2014 & 2015



### International Rescue Dog Exercise, Ljubljana 2014 & 2015



### **Conclusion – IPv6&LTE for public safety?**

- Pros: "All IP" proven commercial technologies IPv6 inherited by default!
  - High mobile performance
    - up to 150 Mbps and 10 ms data plane (RTT delay using LTE)
  - 3G/4G bullet proof system integrated security
    - AKA authentication, AES/3G SNOW user and control plane encryption
    - Extended authentication (i.e. RADIUS) for central user control and provisioning
    - For the most critical services, additional IPSec, SSL VPN and HTTPS security services
  - Standardized QoS support
  - Deployment options and system virtualization: business APNs, MVNO, national roaming
  - Standardized interfaces: various networking and handheld equipment vendors/providers
  - Open and powerful ecosystem for service (multimedia, sensors, M2M) development
    - Easy integration between custom services and existent IT services
- Easy cross-border and international on-site cooperation
  - based on international roaming (GRX/IPX)
- Cons: immature technologies in mission critical situations
- 3GPP public safety standardization not finished, missing "TETRA like" features
- BB PPDR frequency band is in a process of EU allocation
- Missing IPv6 support on "some" mobiles/tablets
- Missing added value features on routing gear (i.e. NEMOv6 McA)
- Huge investments were made in TETRA/TETRA POL system

#### Lead by ULFE, official GEN6 partner

#### **Powered by partners**

- Go6 Institute federating and consultancy role,
- Ministry of Education, Science and Sport integration of project in Slovenian government,
- Water Institute Pilot system requirements and pilot testing,
- Municipality of Ljubljana (MOL), Department for Protection, Rescue and Civil Defense (OZRCO) – pilot system requirements and pilot testing, live emergency response environment & infrastructure,
- Telekom Slovenije, d. d. fixed and mobile network provider
- Cisco System Slovenia&Global networking equipment support.
- Academic and Research Network of Slovenia (ARNES)





Mestna občina Ljubljana



#### TelekomSlovenije

cisco





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Powered by partnership

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