Technologies Advancing Public Safety and Critical Communications

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First Responders – Public Safety and Smart Cities

Cities today are tasked with managing

- An ever-increasing human population
- Proactive urban planning: housing, transportation, healthcare, education, security, public services (utilities, environment, safety)
- Preparation for disasters and increasing terrorist threats

Requiring greater performance

- Need for real-time response (rule of thumb is 6 minutes or less)
- Increasingly advanced measures to control

Given

- Limited resources
- Tight budgets
- Raised expectations
Need of Smart Ecosystem Solutions
Across Government Departments Based On:

- Economic Growth
- Quality of Life
- Ecological Footprint, Sustainability

Across Multiple Sectors

- Smart Mobility
- Smart Safety
- Smart Energy, Water, Waste
- Smart Building & Living
- Smart Health
- Smart Education
- Smart Finance
- Smart Tourism & Leisure
- Smart Retail Logistics
- Smart Manufacturing & Construction
- Smart Government
Technologies Advancing Public Safety and Critical Communications
5th Generation of 3GPP (5G) Impact

Massive Capacity and Connectivity
Efficient Use of Spectrum and Network Utilization
Flexible and Scalable Infrastructure
Value added services affecting following use cases
(3GPP defines about 70 use cases)

- Internet of Things
- Wireless Sensor Networks
- Smart Homes and Buildings
- Smart Grid
- Intelligent Transportation Systems
- Virtual Reality/Online Gaming
- Medical Sensors
Internet of Things (IOT) – High Level Model Across all Markets

Service Layer
This layer provides insight to the data collected from all layers and offers the information as a service to individuals, industries or infrastructures.

Gateway/Aggregation Layer (Edge or Fog Computing)
This layer enables the stream of data to move from one level to the next for additional processing.

Sensing Layer
This layer enables interface to objects that are currently passive, where tapping into these objects will generate a stream of pertinent data and information.
IoT/5G - Communication Protocol Enablers

- **Service/Cyber**
  - Cloud (Public, Private, SaaS, IaaS, PaaS)
  - Access (Web, mobile)
  - Big Data/Analytics
  - 3G/4G/5G

- **Virtual**
  - SDx, NFV
  - IPv4/IPv6, VPN, ZigBee, WiFi, 3G/4G/5G

- **Physical**
  - WSN, ZigBee, NFC, WiFi, 6LoWPAN, MEMS, Sensors, RFID, PLC, A/D, D/A

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**Gateway**

- C/WAN
- C/BAN/LAN/WLAN/WSN

**Sensing**

- ZigBee, NFC, WiFi

**Gateway/Aggregation**

- Big Data/DL/S services
- 3G/4G/5G Control

**Sensing**

- Sensors, Digital/Analog, RFID, PLC

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Smart Cities Crossover with Public Safety Use Cases
Smart Cities with Intelligent Public Safety

- Saves lives
- Lowers damage of property/assets
- Lowers operating expenses (OPEX)
Smart Cities with Intelligent Public Safety

Situational Awareness and Risk Based Approach

Risk Attributes

Classification:
- Commercial
Type of construction:
- Concrete
Usage:
- Dwelling
No of Floors:
- 4
Danger:
- Gas
Secure Access:
- Unknown
Surrouding:
- Exposed

- Fire sensor detection & real time reporting of accident location and associated risk (GIS based)
- Real time identification of PS vehicle & supplies
- Real time dispatch of PS vehicle & finding the fastest route
Smart Cities Intelligent Public Safety

First Responder Risk Based Response Strategy

- Smart information about the incident (Risk based)
- Fast response
- Real-time network for communications and response
- State of the art supplies
- Response strategy

Adding sensors for fire (temperature, CO2,...)
Adding location based sensors at street intersections
Adding data repository for all incidents + Analytics
Smart Cities Intelligent Public Safety – Cognitive Approach

- Real-time Response
- Risk-Based Approach
- GIS-Fast Route
- Smart network connectivity
- State of the art supplies
- IoT Sensing/analytics
- Response strategy

Adding drones to capture real time video
Adding Video surveillance for evidence support
Public Safety Response Model

Analytics/Machine Learning Control:
- Real-time Response
- Risk-Based Approach
- GIS-Fast Route
- Smart network connectivity
- State of the art supplies
- IoT Sensing/analytics
- Combat strategy

Examples of Fire Sensors:
- Fire detection sensors
- Smoke detection
- Heat detection
- Flame detection
- Multi-sensor detection
- Optical smoke detection
- Video fire detection
- Gas fire detection
- Video Surveillance
- Drone assistance

Disruptive technologies applied to public safety ecosystem contribute to:
- Saving lives
- Lower damage of property/asset
- Lower OPEX
**Voice/Data**

- Two way “land mobile” radio
- Telephone interconnect via radio
- Talk groups with priority
- Security and encryption
- License plate checks
- National criminal databases

**Situational Awareness**

- Sensors; WMD, chemicals, pressure, traffic
- Cameras used to locate personnel & assets
- Voice/Data/Video
- Mapping of personnel/assets
- Augmented Reality
- Virtual reality for Training

**Video**

- Cameras; fixed, vehicular and body
- License plate and facial recognition
- Peer to peer, Vehicle to Vehicle
- Night vision
- Camera resolution
- File storage for evidence
Smart Cities Smarter Buildings

Connected Buildings

Sensors
- WMD
- Chemicals
- Traffic Lights

Alarm Reporting

Situational Awareness
- Location of Hazardous Materials
- Location of Standpipes

IOT for Buildings

Power savings
Heating/Air conditioning
Security
Alarms
Sensors
Emergency Responder Radio Coverage

Considerations

Local guidelines and laws
Regional/National
Minimum acceptable signal strength
Enforcement
Inspections
Budget and who pays?

Distributed Amplifier Systems (DAS)

Access point
Donor antenna
Right of Way
Drop antennas or leaky cable
Radio frequency link budget
Cable Junction points

Pictures by National Public Safety Telecommunications Council
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Thank you!!!

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