

# **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  
Educa-  
tion



Smart  
Finance



Smart  
Tourism  
&  
Leisure



Smart  
Retail  
Logistics



Smart  
Manuf-  
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&  
Constr-  
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Smart  
Govern-  
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# **Technologies Advancing Public Safety and Critical Communications**



# 5<sup>th</sup> Generation of 3GPP (5G) Impact

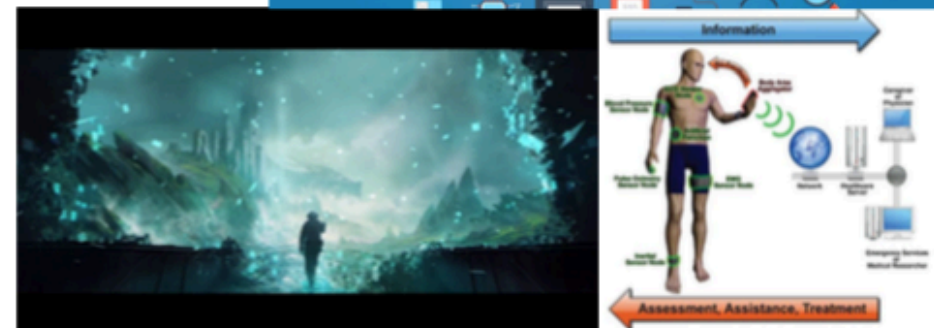
## Massive Capacity and Connectivity

## 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)

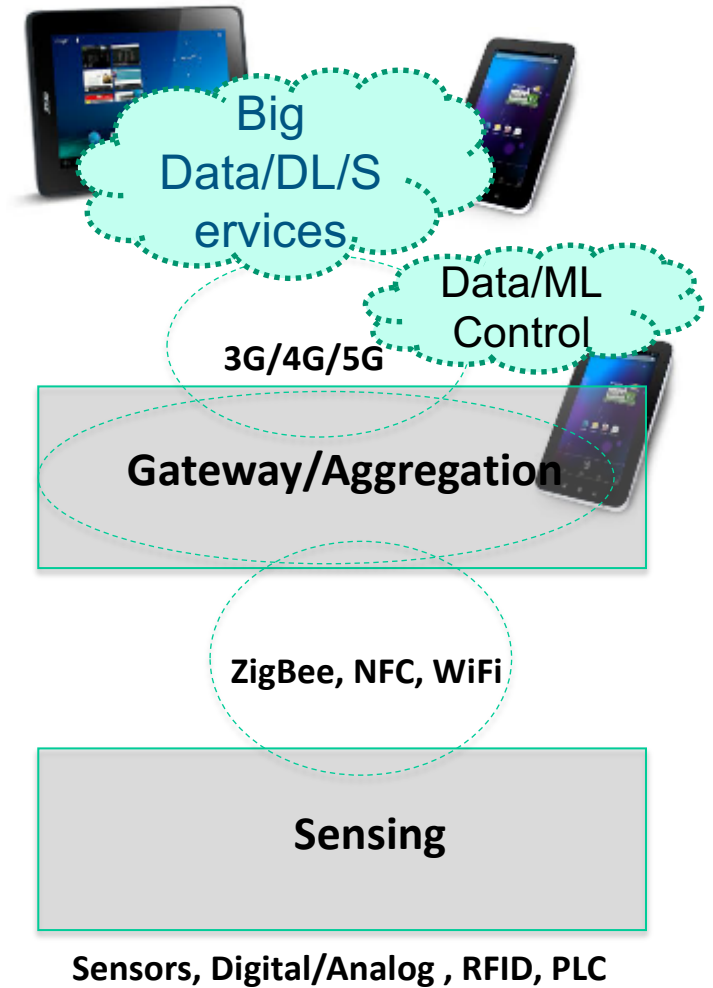
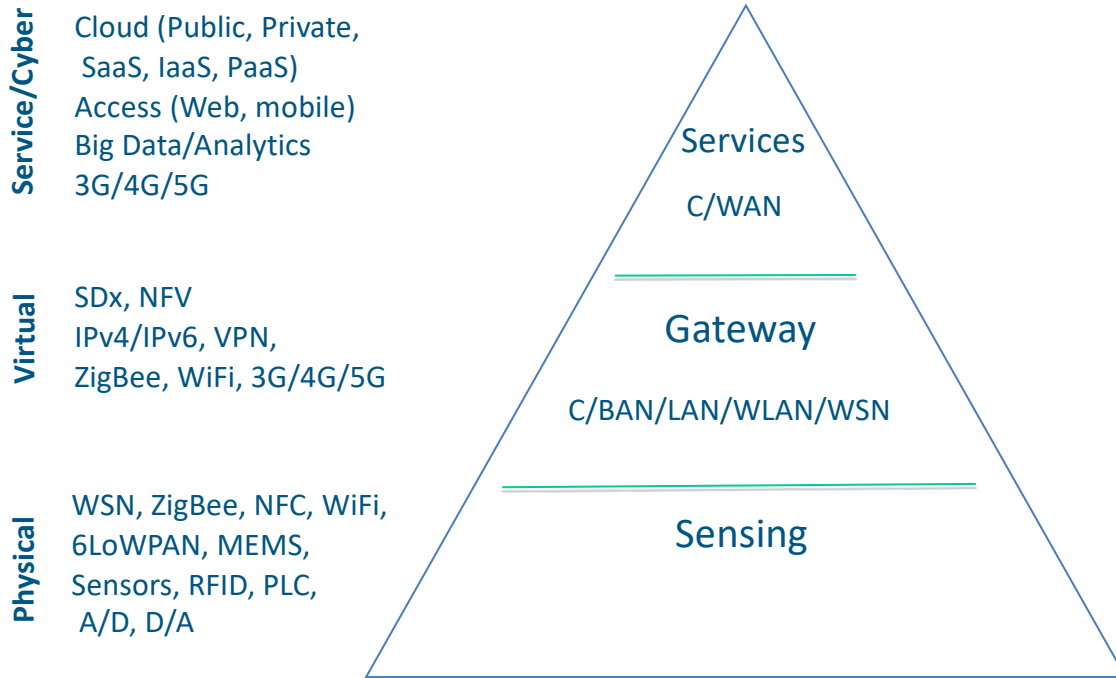
This layer enables the stream of data to move from one level to the next for additional processing

## 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



# **Technologies Advancing Public Safety and Critical Communications**



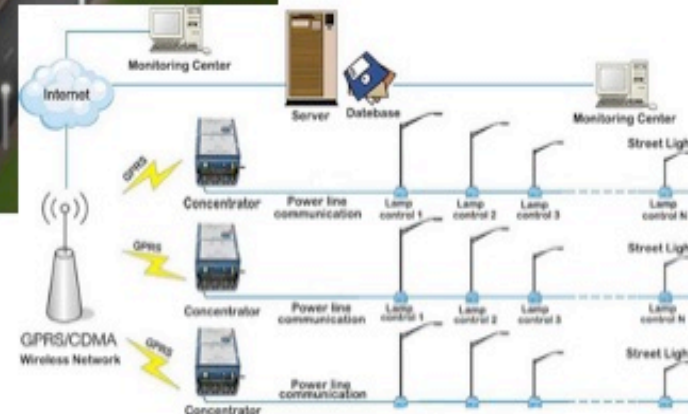
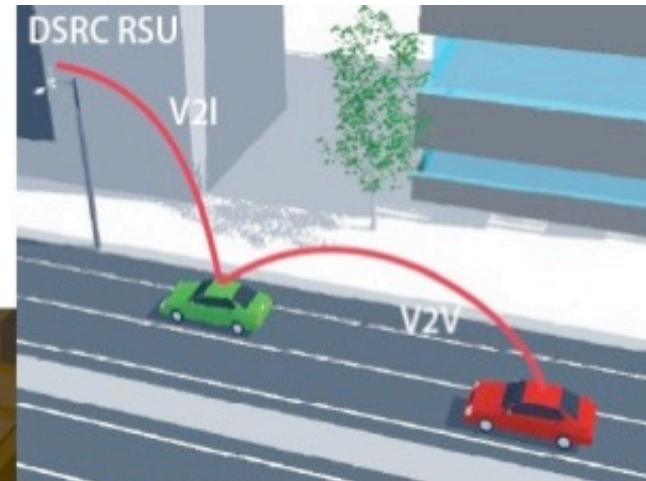
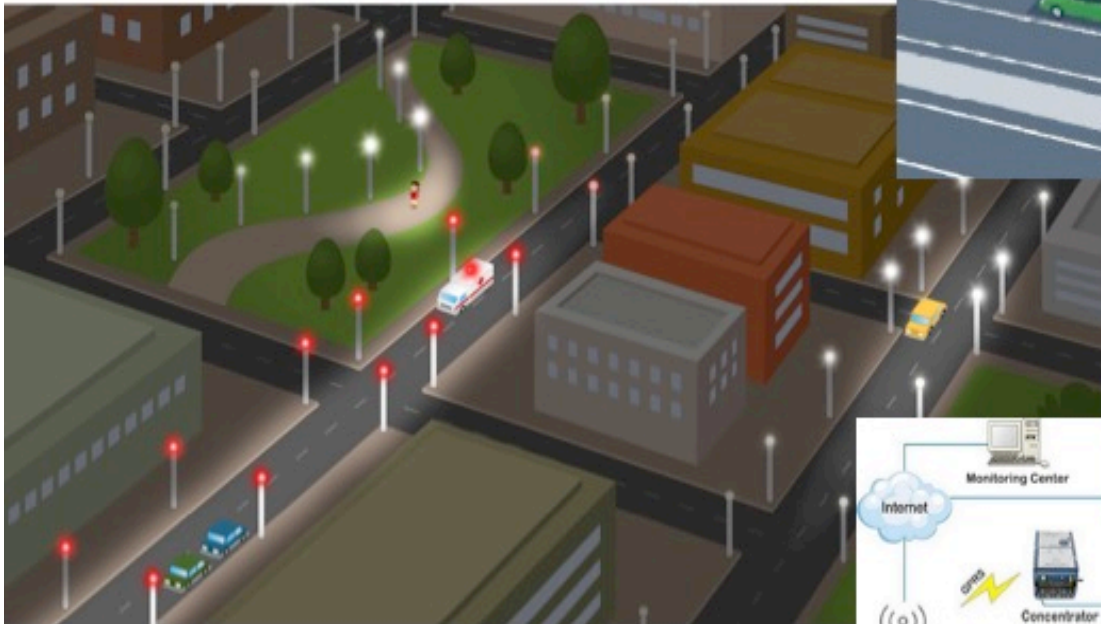
**Smart Cities Crossover with Public Safety  
Use Cases**

**IEEE**



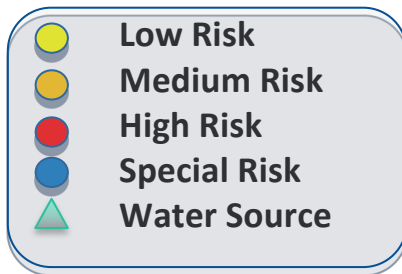
# Smart Cities with Intelligent Public Safety

- Saves lives
- Lowers damage of property/assets
- Lowers operating expenses (OPEX)



# Smart Cities with Intelligent Public Safety

## Situational Awareness and Risk Based Approach

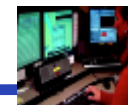


### Risk Attributes

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

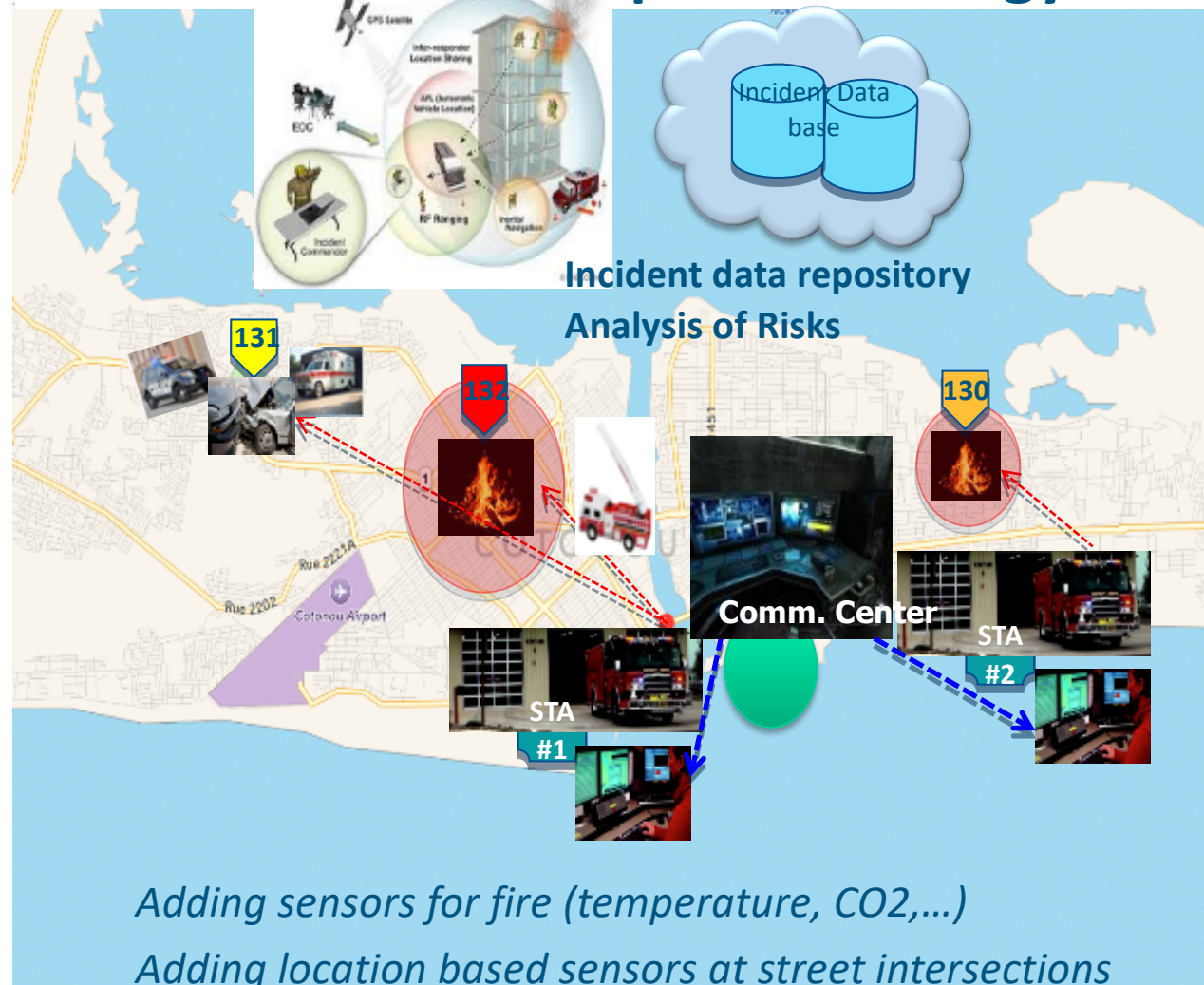
- *Fire sensor detection & real time reporting of accident location and associated risk (GIS based)*
- *Real time identification of PS vehicle & supplies*
- *Real time dispatch of PS vehicle & finding the fastest route*

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# 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,...)

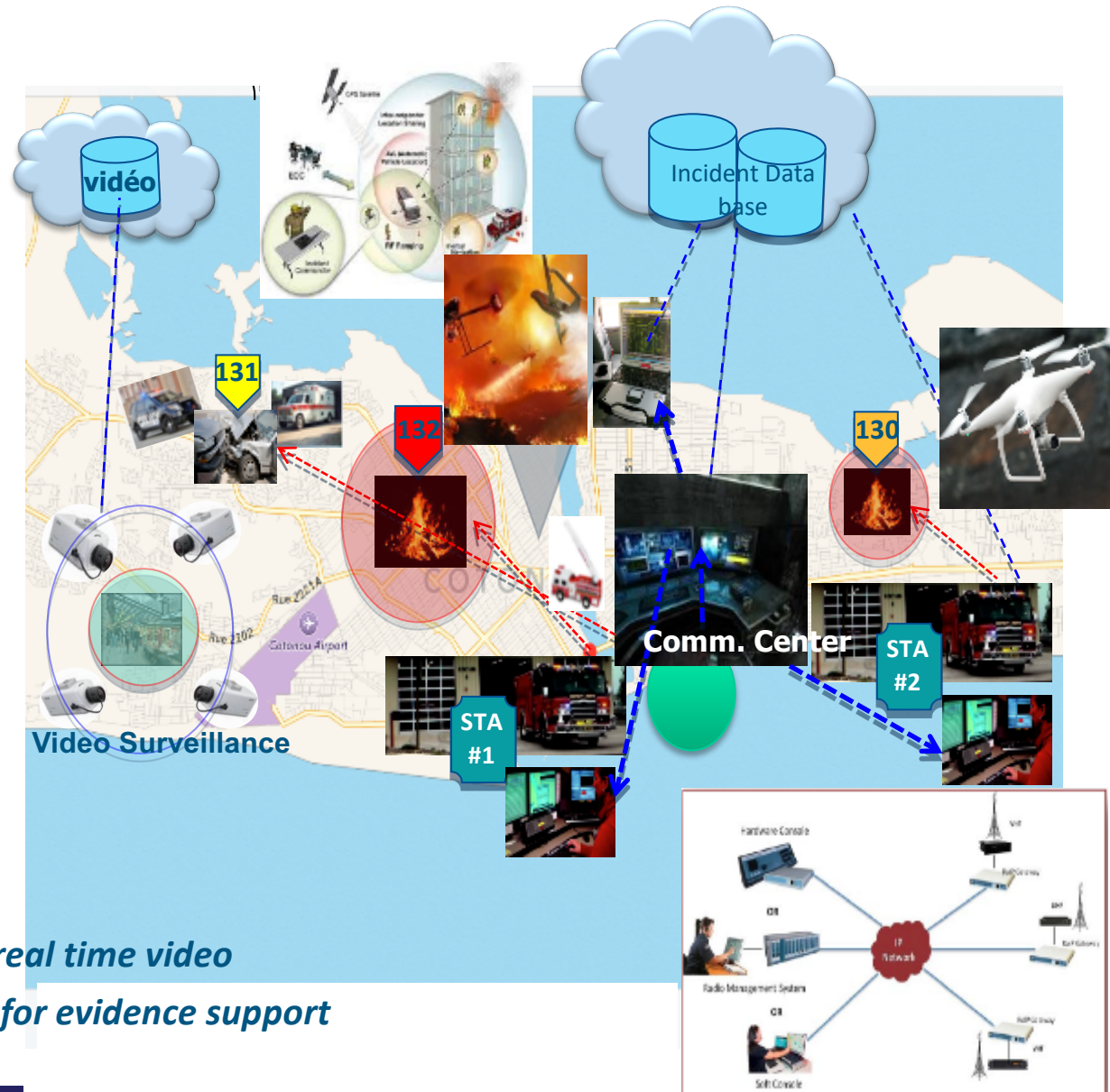
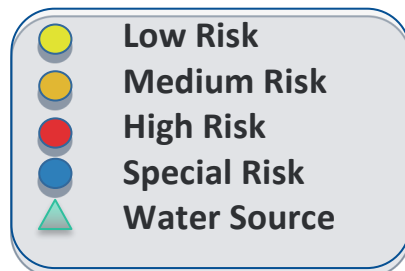
## Adding location based sensors at street intersections

## 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*

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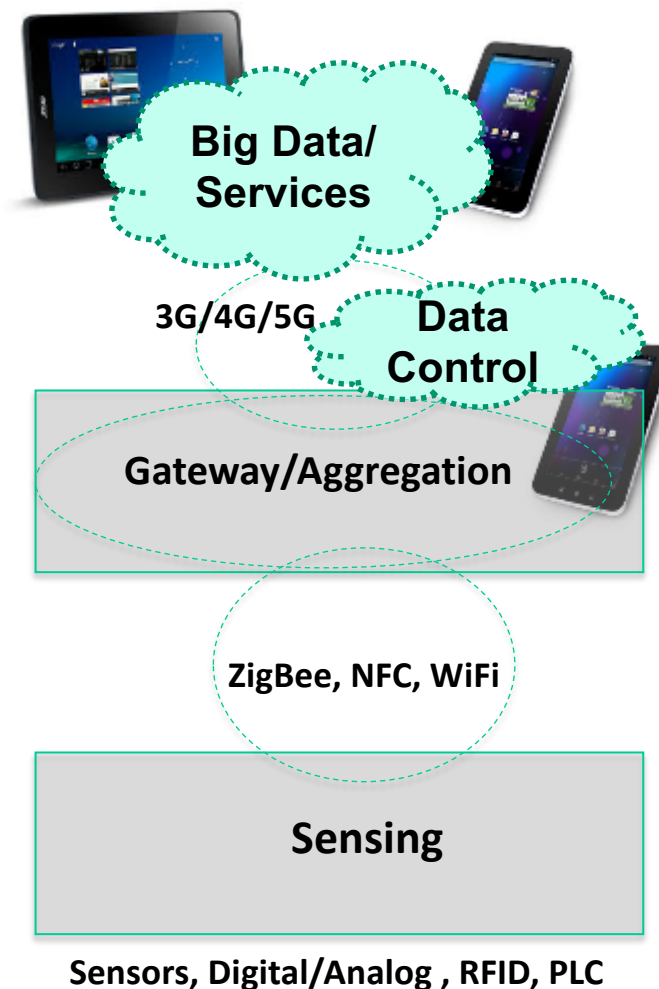
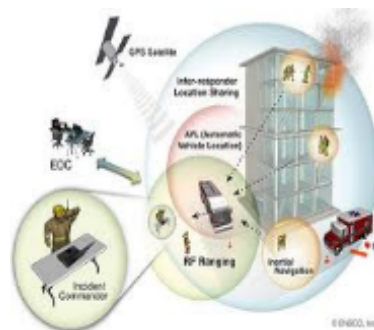
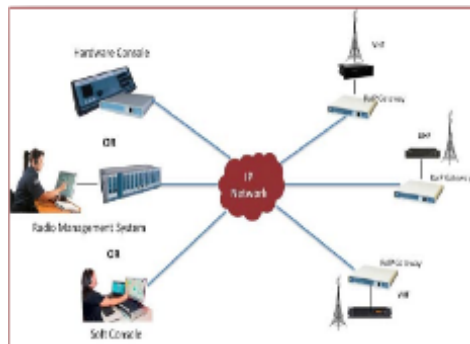
# Public Safety Response Model

## 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:

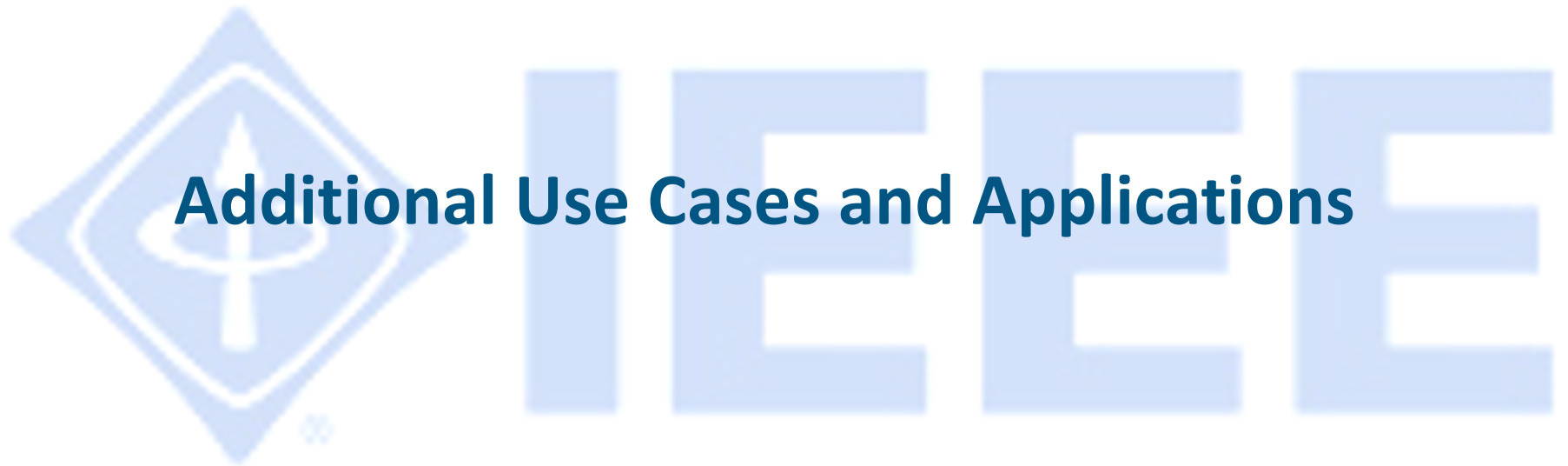
- Fire detection sensors
- Smoke detection
- Heat detection
- Flame detection
- Multi-sensor detection
- Optical smoke detection
- Video fire detection
- Gas fire detection
- Video Surveillance
- Drone assistance



## Disruptive technologies applied to public safety ecosystem contribute to:

- **Saving lives**
- **Lower damage of property/asset**
- **Lower OPEX**

# **Technologies Advancing Public Safety and Critical Communications**



# Voice/Data

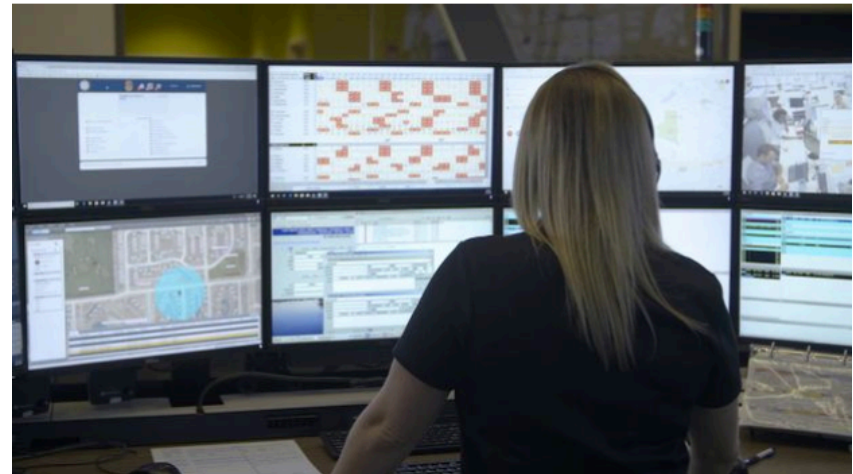
- Two way “land mobile” radio
- Telephone interconnect via radio
- Talk groups with priority
- Security and encryption
- License plate checks
- National criminal databases

# 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



Picture by Motorola Solutions

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# Smart Cities Smarter Buildings

## Connected Buildings

### Sensors

- WMD
- Chemicals
- Traffic Lights

### Alarm Reporting

### Situational Awareness

- Location of Hazardous Materials
- Location of Standpipes



Picture by Exchange Communications

## IOT for Buildings

### Power savings

### Heating/Air conditioning

### Security

### Alarms

### Sensors



Picture by Excellent Webworld

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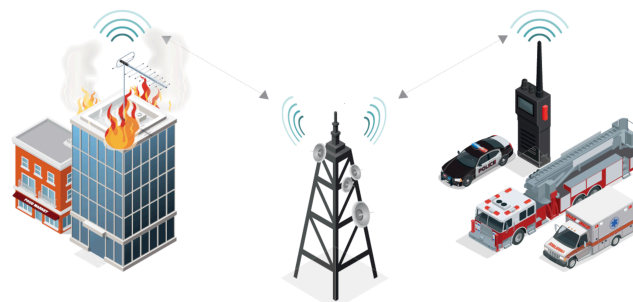




# Emergency Responder Radio Coverage

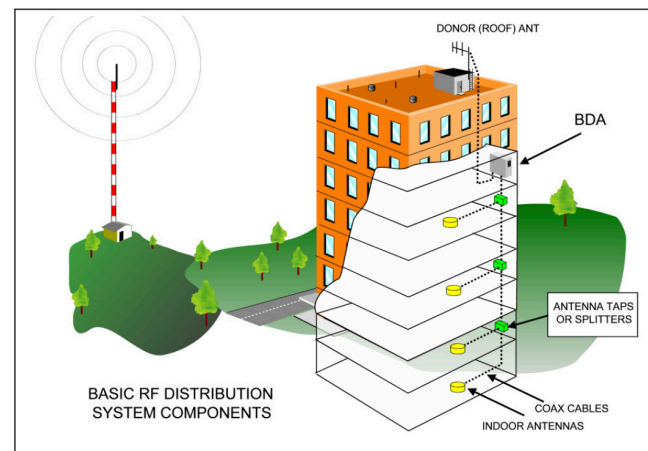
## Considerations

- 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

# Technologies Advancing Public Safety and Critical Communications



**Thank you!!!**

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