

# Smart Public Safety: Advanced Sensors, Automation and the Internet of Things (IoT) in NG9-1-1

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**MOTOROLA SOLUTIONS**

# The Need for Smarter Cities

## Challenges cities face today

Growing population

Traffic congestion

Space – homes and public space

Resource management (water and energy use)

Global warming (carbon emissions)

Tighter city budgets; aging infrastructure

Public Safety Challenges

## Some stats

More than 50% of the world's population live in cities

In China alone, **300-400 million** people will move to cities in the next 15 years

In the 21<sup>st</sup> century, cities will account for

90% of population growth

80% of global CO2 emissions

75% of energy use

# What are Smart Cities?

- A Smart City is:
  - The integration of technology into a strategic approach to sustainability. The 21st Century has brought with it a new global trend of “sustainable urban development” and this concept adds new dimensions to urbanization which require a quick need to upgrade existing cities’ infrastructure.
  - A smart city uses digital technologies to enhance performance and wellbeing, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens

# What are Smart Cities?

## Vision of smarter cities

- Environmental sustainability and efficiency
- Sustainable homes and buildings
- Efficient use of resources
- Efficient and sustainable transportation
- Better urban planning - livable cities
- Enhanced public safety

*A smart city should be able to **respond faster to city and global** challenges than one with a simple 'transactional' relationship with its citizens. The term encompasses a vision of an urban space that is **ecologically friendly, technologically integrated and meticulously planned, with a particular reliance on the use of information technology** to improve efficiency.*

# What is Smart Public Safety?

**Smart Public Safety is characterized by using information and communications technology (ICT) to predict, prevent, and reduce crime; address new and emerging threats; improve emergency / disaster planning and response; reduce the cost of operations; and allocate resources more effectively**

*It is important for public safety organizations to recognize that a robust, interoperable communications system should provide not only reliable data but assist in organizing and analyzing the data in a meaningful way so that officials can make real-time decisions.*

# Sensor Technology, Applications and the Internet of Things (IoT)

# Sensor Networks

- **(Electronic) sensor:** Measures physical properties and converts signal into electronic signal.
  - “Interface between the physical world and world of electrical devices, such as computers”
- **Actuator:** Converts electronic signal into physical property - displays information for humans to interpret
  - e.g. Speedometer, thermostat temperature reader
- **Integration with ICT**
  - Store, aggregate and organize data for analysis
  - Advanced analytics capabilities, based on widely available inexpensive computing power and complex analytics algorithms, is key

# Sensor Networks

- Data captured through sensors
  - Movement
  - Temperature
  - Force
  - Acceleration
  - Flow
  - Position
  - Light
  - Etc



# Sensors and IoT Architecture



Source: <http://www.libelium.com/partners-ecosystem/>

# Sensor Applications - Smart City Examples

- **Smart parking:** Monitoring of parking spaces availability in the city.
- **Structural Health:** Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
- **Noise Urban maps:** Sound monitoring in bar areas and centric zones in real time.
- **Smartphone detection:** Detect smart phones and in general any device which works with WiFi or Bluetooth interfaces.
- **Electromagnetic field levels:** Measurement of the energy radiated by cell stations and WiFi routers.
- **Traffic Congestion:** Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.
- **Smart lighting:** Intelligent and weather adaptive lighting in street lights.
- **Waste management:** Detection of rubbish levels in containers to optimize the trash collection routes.
- **Smart roads:** Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Source: 50 Sensor Applications for a Smarter World

[http://www.libelium.com/resources/top\\_50\\_iot\\_sensor\\_applications\\_ranking/](http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/)

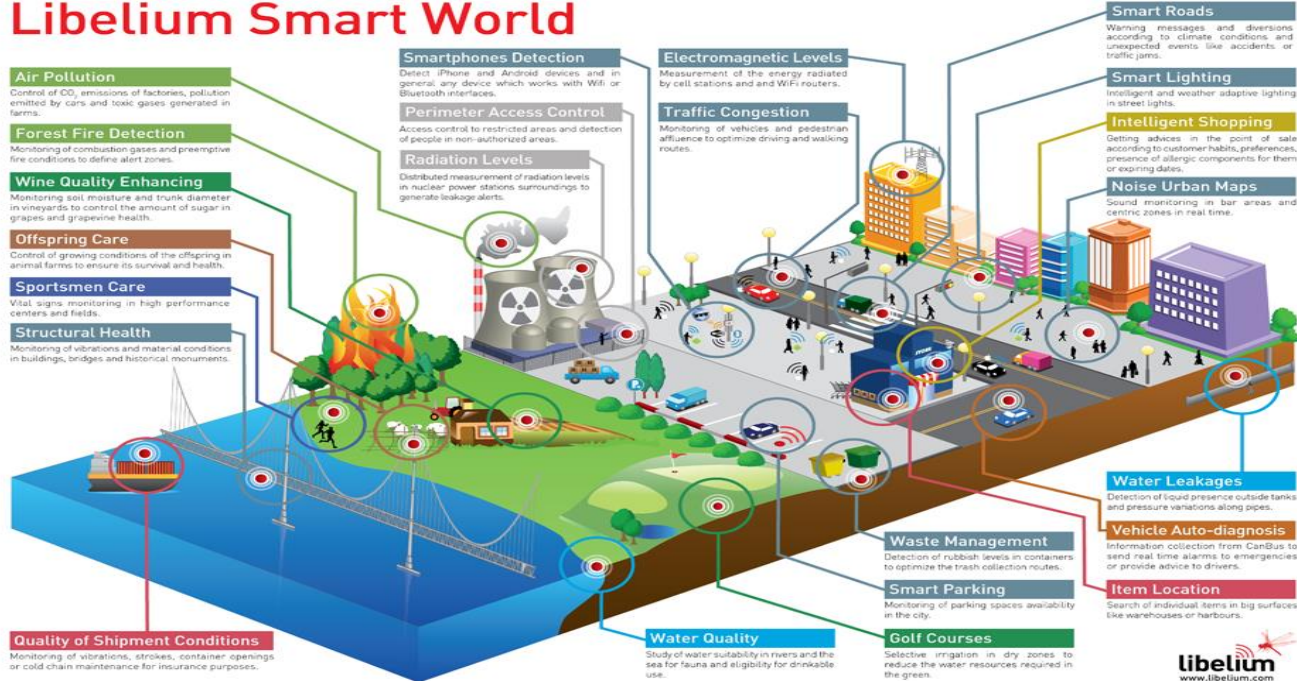
## Sensor Applications – Smart Environment / Security & Emergencies Examples (“Smart Public Safety”)

- **Landslide and Avalanche Prevention:** Monitoring of soil moisture, vibrations and earth density to detect dangerous patterns in land conditions.
- **Earthquake Early Detection:** Distributed control in specific places of tremors.
- **Forest Fire Detection:** Monitoring of combustion gases and preemptive fire conditions to define alert zones.
- **Perimeter Access Control:** Access control to restricted areas and detection of people in non-authorized areas.
- **Liquid Presence:** Liquid detection in data centers, warehouses and sensitive building grounds to prevent break downs and corrosion.
- **Radiation Levels:** Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.
- **Explosive and Hazardous Gases:** Detection of gas levels and leakages in industrial environments, surroundings of chemical factories and inside mines.

Source: 50 Sensor Applications for a Smarter World

[http://www.libelium.com/resources/top\\_50\\_iot\\_sensor\\_applications\\_ranking/](http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/)

## Libelium Smart World



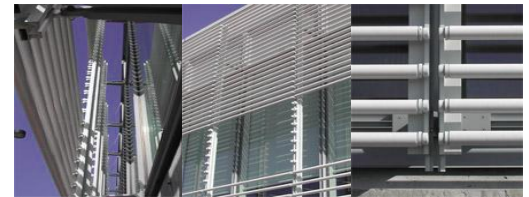
# Smart City Applications with Public Safety Implications

- Focused examples:
  - Smart buildings
  - Transportation
    - Intelligent Transportation Systems (ITS)
    - Traffic Management



# Smart Buildings

- Sensors technology used in buildings for monitoring and control
- Increase energy efficiency, user comfort, and security
  - Heating, ventilation and air conditioning systems
  - Lighting/shading
  - Air quality and window control
  - Systems switching off devices
  - Metering
  - Access control (security)
  - Automatic incident notification



# Transportation (ITS)

Figure 10: Overview of ITS applications and examples

<b>Intelligent Transportation Systems</b>		
<b>Intelligent Infrastructure</b>		
<b>Arterial and Freeway Management</b> <ul style="list-style-type: none"> <li>Traffic Signal Control, Lane Management</li> <li>Surveillance, Enforcement</li> </ul>	<b>Crash Prevention and Safety</b> <ul style="list-style-type: none"> <li>Warning Systems</li> <li>Pedestrian Safety</li> </ul>	<b>Traffic Incident Management</b> <ul style="list-style-type: none"> <li>Surveillance, Detection</li> <li>Response, Clearance</li> </ul>
<b>Emergency Management</b> <ul style="list-style-type: none"> <li>Hazardous Material Management</li> <li>Emergency Medical Services</li> </ul>	<b>Electronic Payment and Pricing</b> <ul style="list-style-type: none"> <li>Toll Collection</li> <li>Multi-Use Payment</li> </ul>	<b>Roadway Operations</b> <ul style="list-style-type: none"> <li>Asset Management</li> <li>Work Zone Management</li> </ul>
<b>Transit Management</b> <ul style="list-style-type: none"> <li>Operations and Fleet Management</li> <li>Transportation Demand Management</li> </ul>	<ul style="list-style-type: none"> <li>Traveller Information</li> <li>Pre-trip and En-Route Information</li> <li>Tourism and Events</li> </ul>	<b>Road Weather Information</b> <ul style="list-style-type: none"> <li>Surveillance and Prediction</li> <li>Traffic Control</li> </ul>
<b>Information Management</b> <ul style="list-style-type: none"> <li>Information Warehousing Services</li> <li>Archived Data Management</li> </ul>	<b>Commercial Vehicle Operations</b> <ul style="list-style-type: none"> <li>Carrier Operations, Fleet Management</li> <li>Credentials Administration</li> </ul>	<b>Intermodal Freight</b> <ul style="list-style-type: none"> <li>Freight and Asset Tracking</li> <li>International Border Crossing</li> </ul>
<b>Intelligent Vehicles</b>		
<b>Collision Avoidance</b> <ul style="list-style-type: none"> <li>Obstacle Detection</li> <li>Collision-Avoidance Sensor Technologies</li> </ul>	<b>Driver Assistance</b> <ul style="list-style-type: none"> <li>Navigation, Route Guidance</li> <li>On-Board Monitoring</li> </ul>	<b>Collision Notification</b> <ul style="list-style-type: none"> <li>Advanced Automated Collision Notification</li> <li>In-Vehicle Crash Sensors</li> </ul>

Source: OECD based on RITA, 2009 and Alberta Transportation, 2009.

# Transportation (Traffic Mgt)

- Example with Public Safety Implications –
- IBM Smart Cities project - Traffic Management solutions
  - Analyzing traffic patterns of buses, trains, traffic lights to:
    - Improve travel times
    - Minimize impacts during emergencies, special events, etc



# Recommendations for Public Safety

- Public safety organizations need to be on the lookout for new Smart City capabilities that can be used to enhance:
  - Situational Awareness – Better “universal” view during incidents
  - Prediction and Notification – Use of emerging smart city sensor technology to provide better notification of when something “might” happen
- Taking advantage of Smart Cities technology to enhance public safety will require:
  - More coordination than perhaps done in the past with other city departments / regional entities
  - “Outside the box” thinking to enable viewing “non-traditional” technologies deployed in other sectors that may be of use to PS

# CONTACT INFORMATION

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**THANK YOU**