The Role of the Internet of Things in the Development of Smart Cities-
Peter Knight PhD.

Why me?

Ecommerce Researcher/Course Developer for 7 years prior to coming to Parkside

Completed my PhD in the greater metro area with the highest percentage of IT Professionals of any city in North America (over 1 million residents)

Started my full time teaching career at Ontario's newest and most technologically enabled university

Smart Sustainable Cities

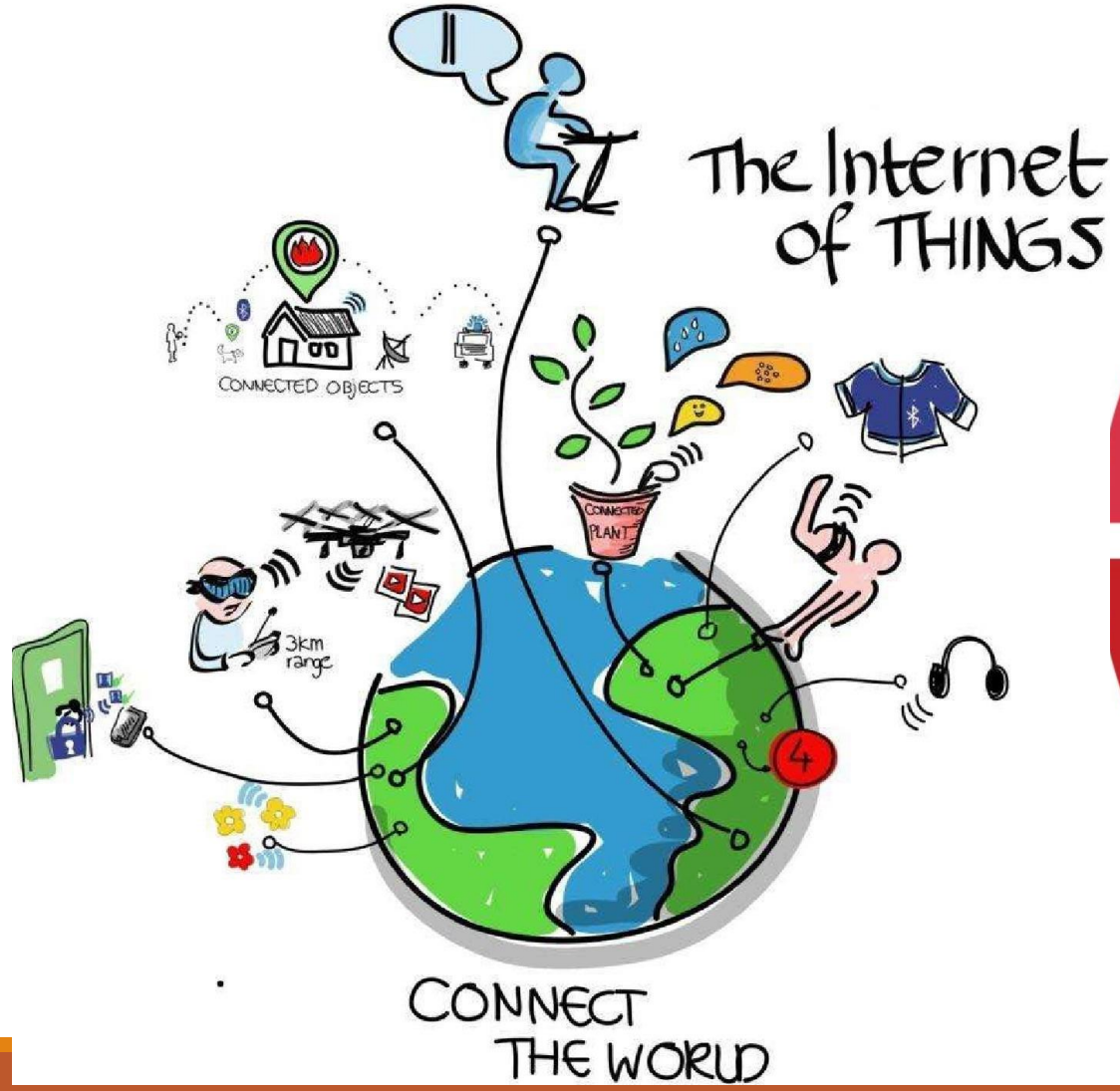
First internationally agreed definition…

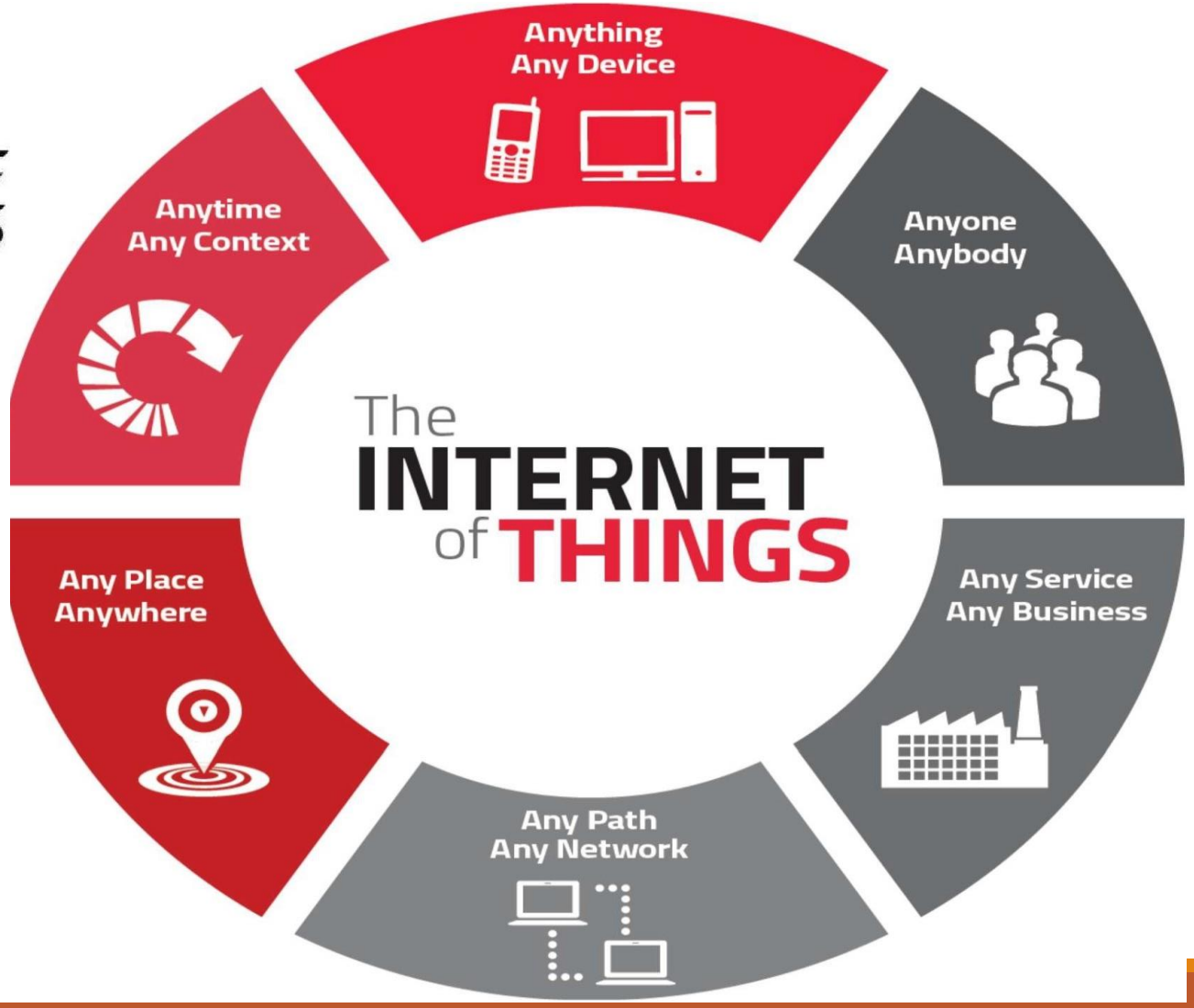
“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects”

Source: ITU-T Focus Group on Smart Sustainable Cities

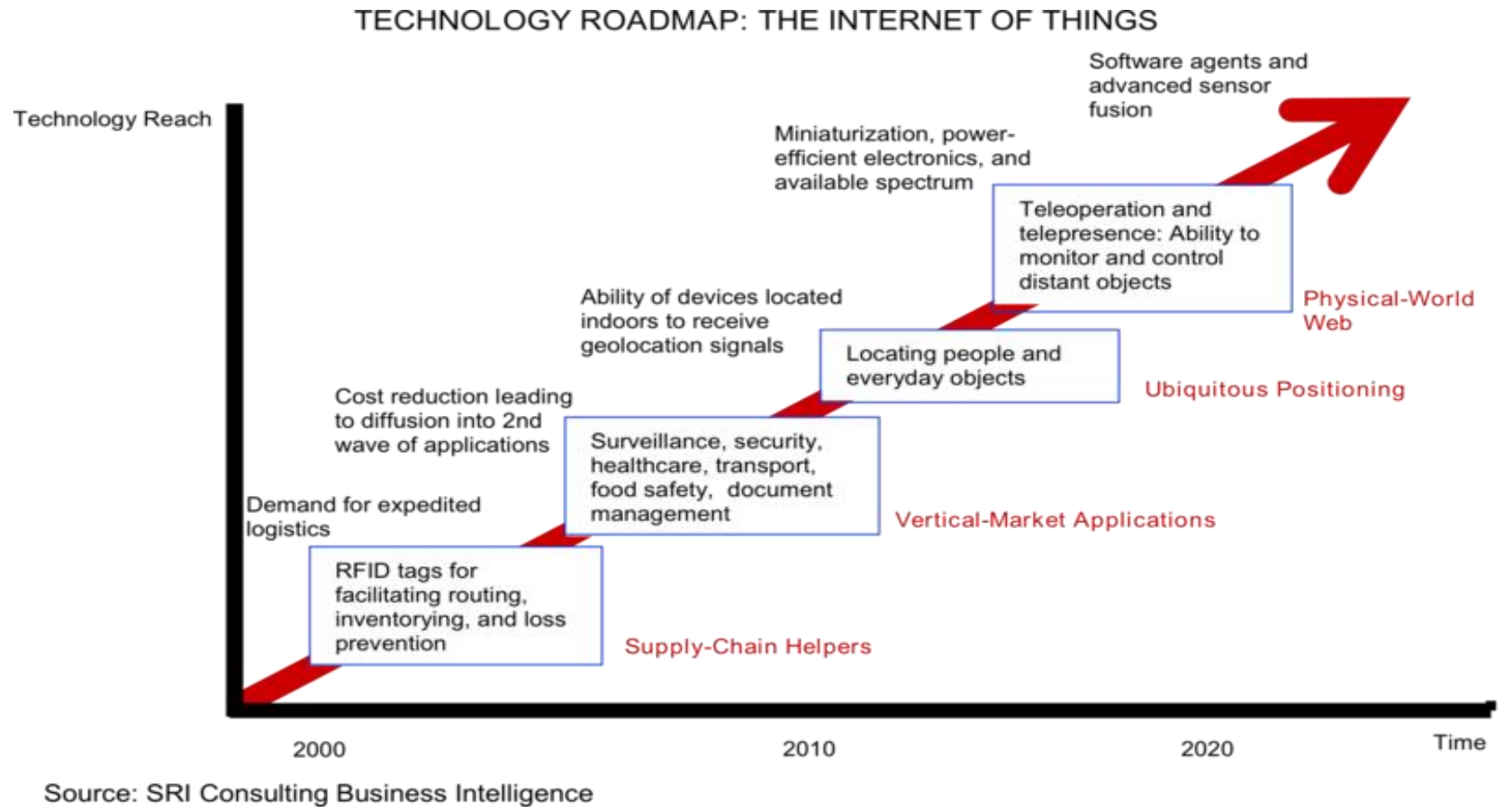
What is IoT

A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable ICTs





IOT TIMELINE



Source: SRI Consulting Business Intelligence

Key IOT Characteristics

– **Interconnectivity**: Anything can be interconnected with the global information and communication infrastructure.

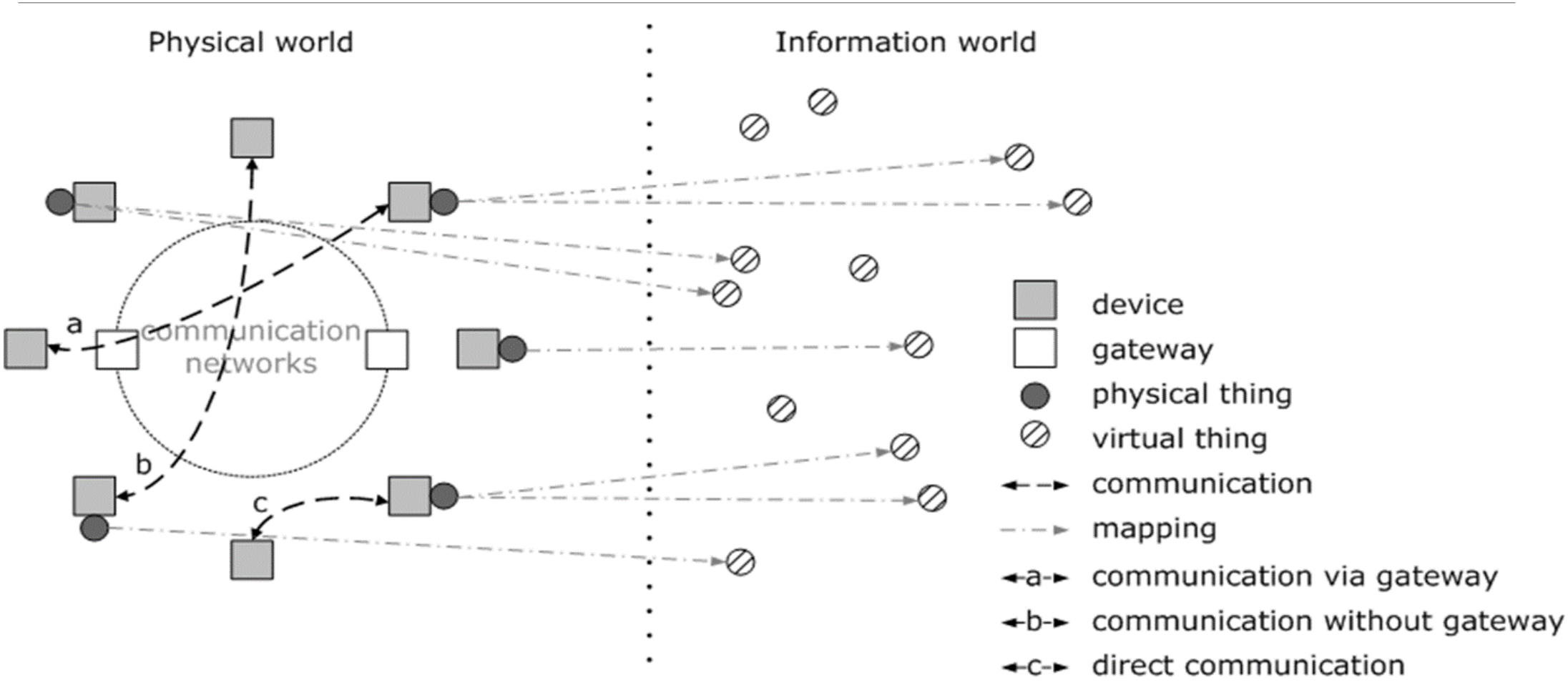
– **Things-related services**: Capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. .

– **Heterogeneity**: The devices in the IoT are heterogeneous as based on different hardware platforms and networks. They can interact with other devices or service platforms through different networks.

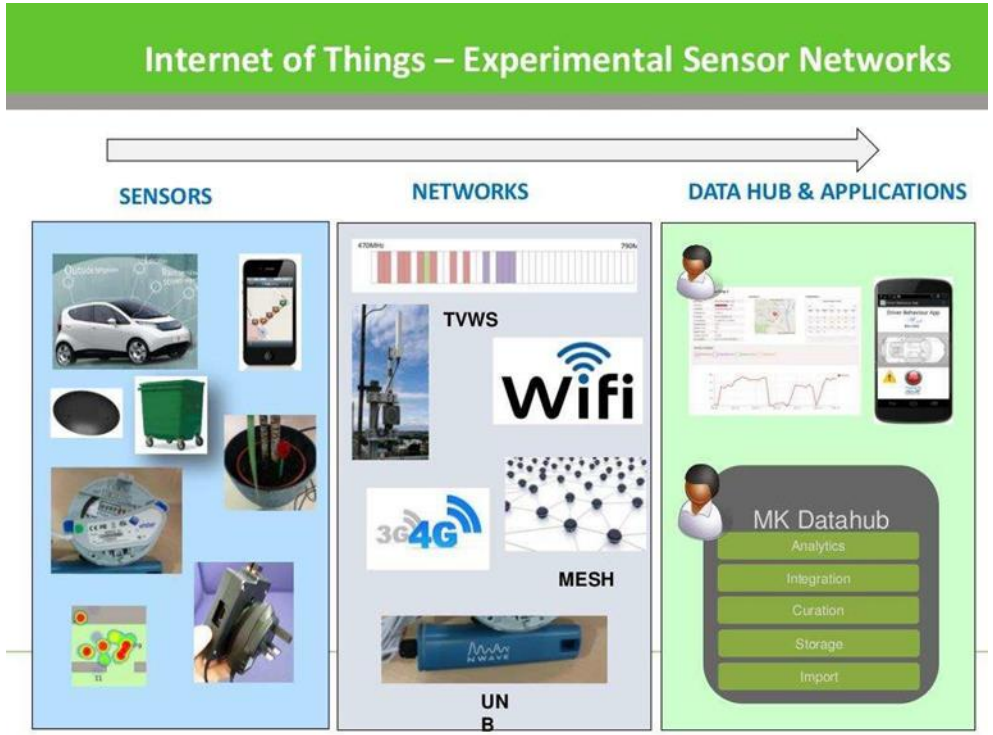
– **Dynamic changes:** The state of devices change dynamically, e.g., sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed. Moreover, the number of devices can change dynamically.

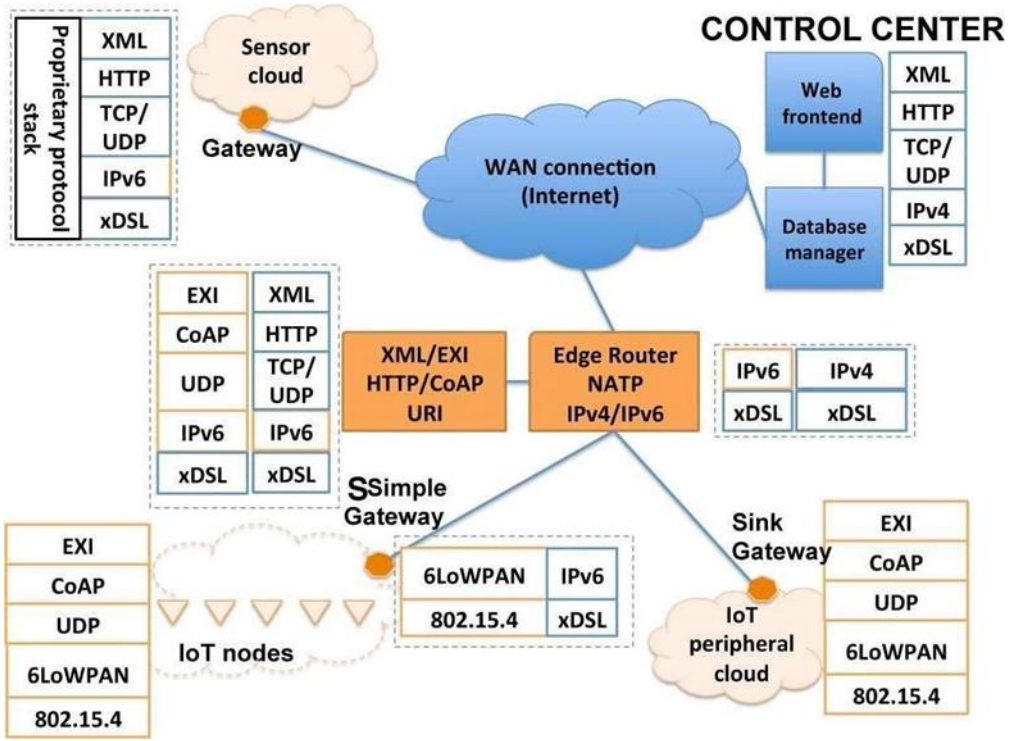
– **Enormous scale**: The ratio of communication triggered by devices as compared to communication triggered by humans will noticeably shift towards device-triggered communication. Even more critical will be the management of the data generated and their interpretation for application purposes.

IOT Architecture for D******ies



Web Service Approach to IOT





Smart City Functionalities Provided by IOT

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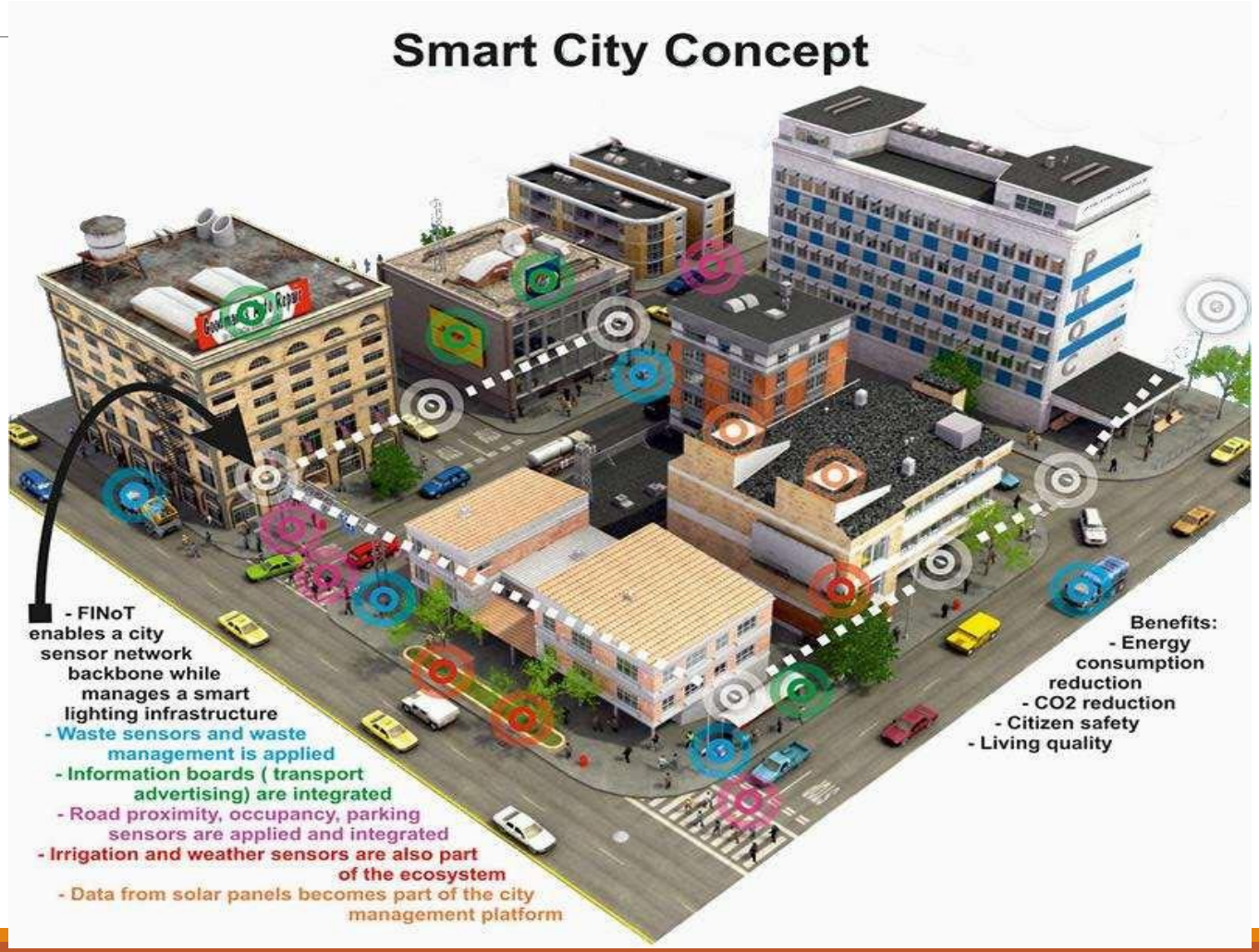
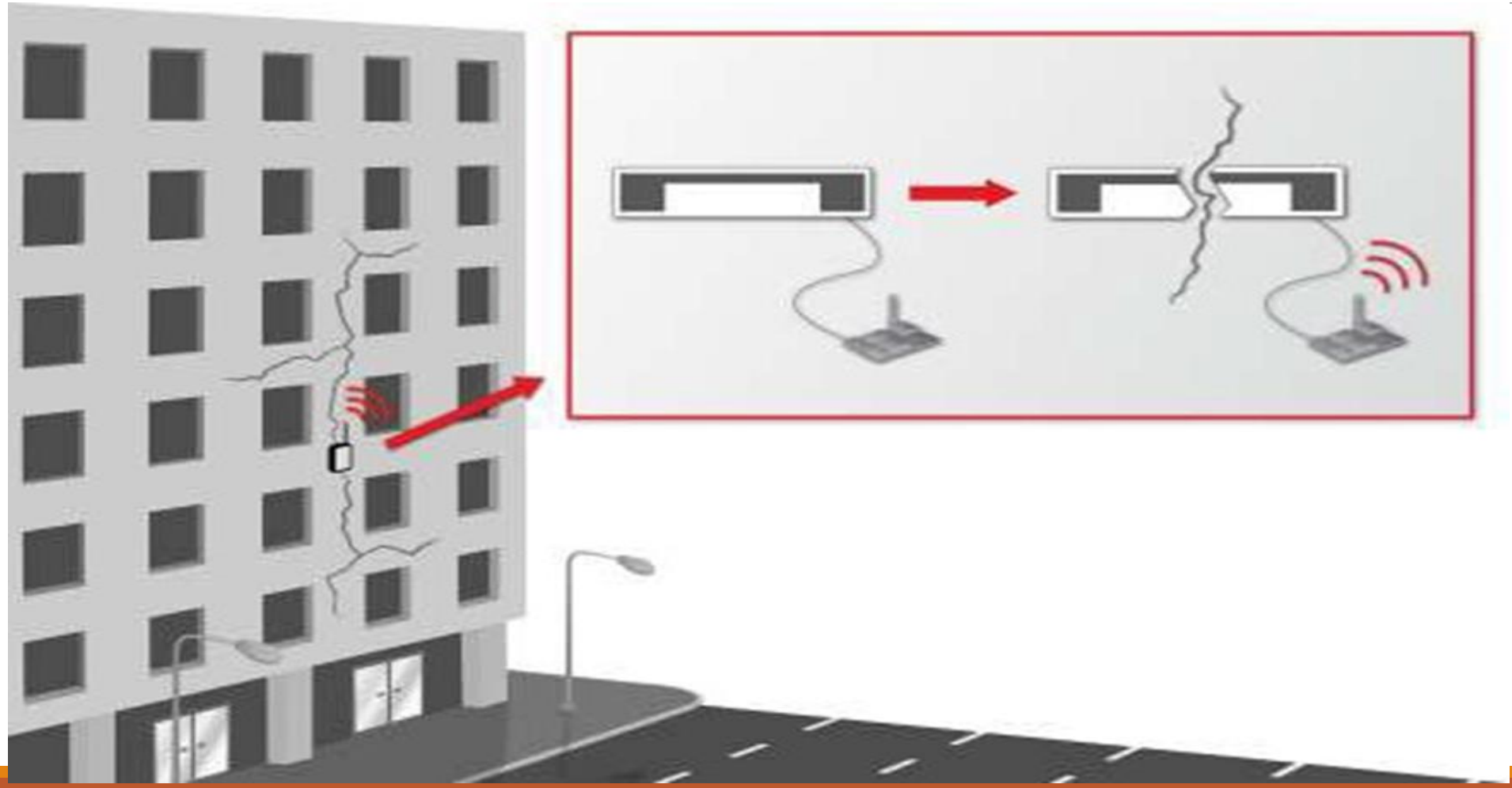
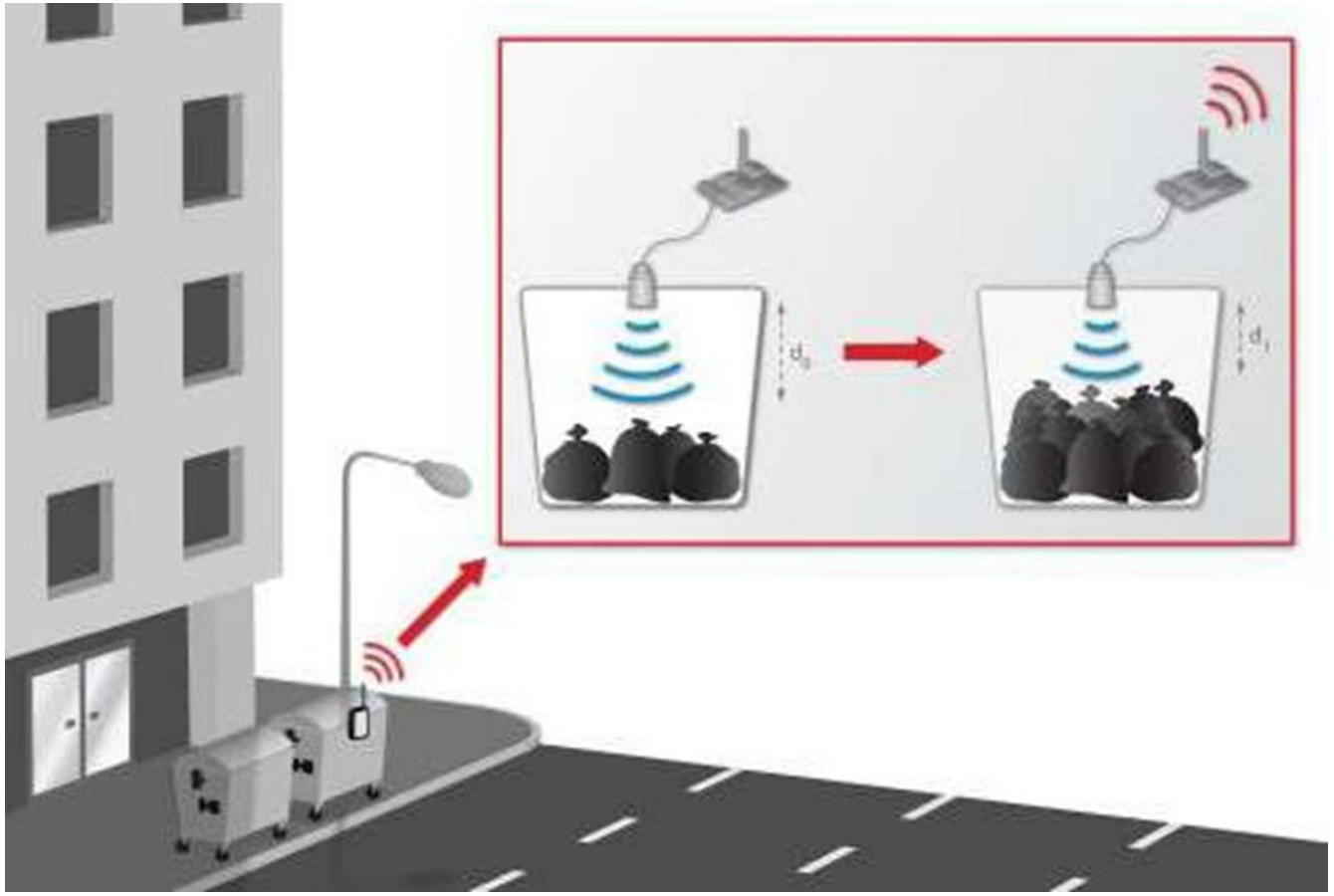
- Structural Health of Buildings
- Waste Management
- Air Quality
- Noise Monitoring
- Traffic Congestion
- City Energy Consumption
- Smart Parking
- Smart Lighting
- Automation of Public Buildings



Structural Health of Buildings



Waste Management

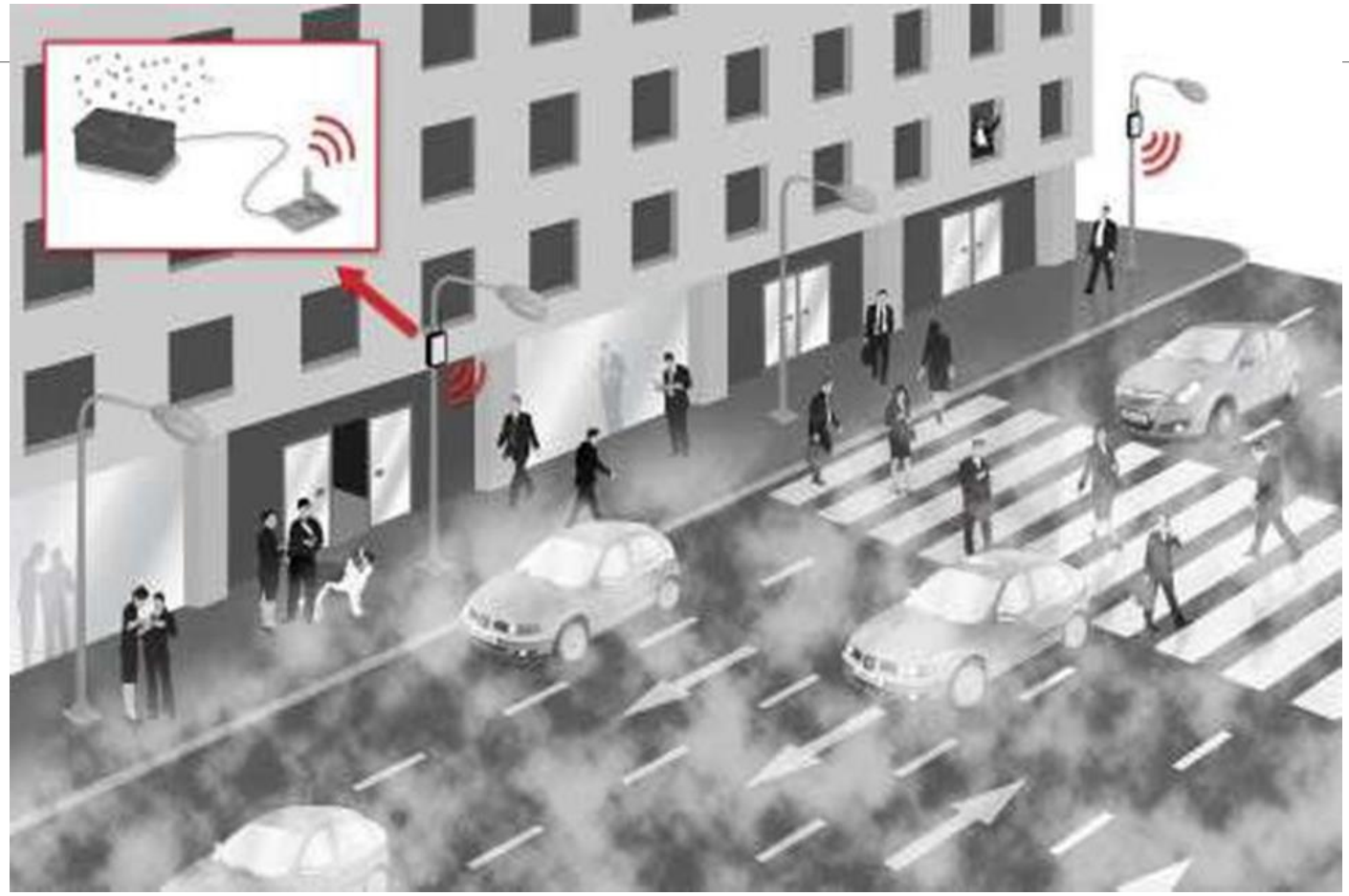


Air Quality

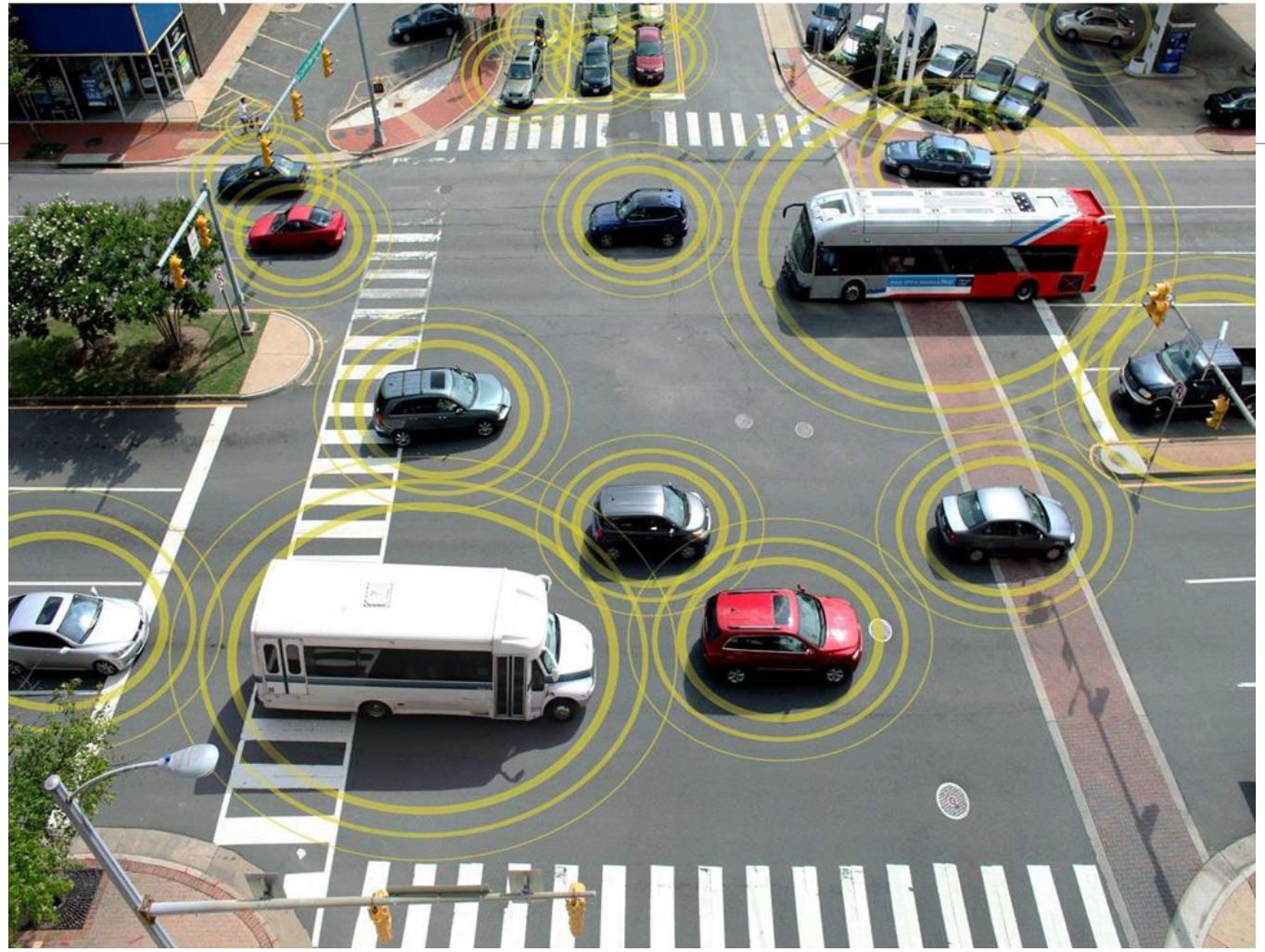
Smartphones as Personal, Real-Time Pollution-Location Monitors

In a study of air pollution, a small pollution sensor was used to measure black carbon level continuously, combined with an Android smartphone with CalFit software for recording GPS information on user location. The indoor/outdoor study of 54 Barcelona schoolchildren was associated with BREATHE, an epidemiological study of the relation between air pollution and brain development. The researchers conclude that mobile technologies could contribute valuable new insights into air pollution exposure. Source: Kurzweil AI
http://www.kurzweilai.net/turning-smartphones-into-personal-real-time-pollution-location-monitors

Noise Monitoring

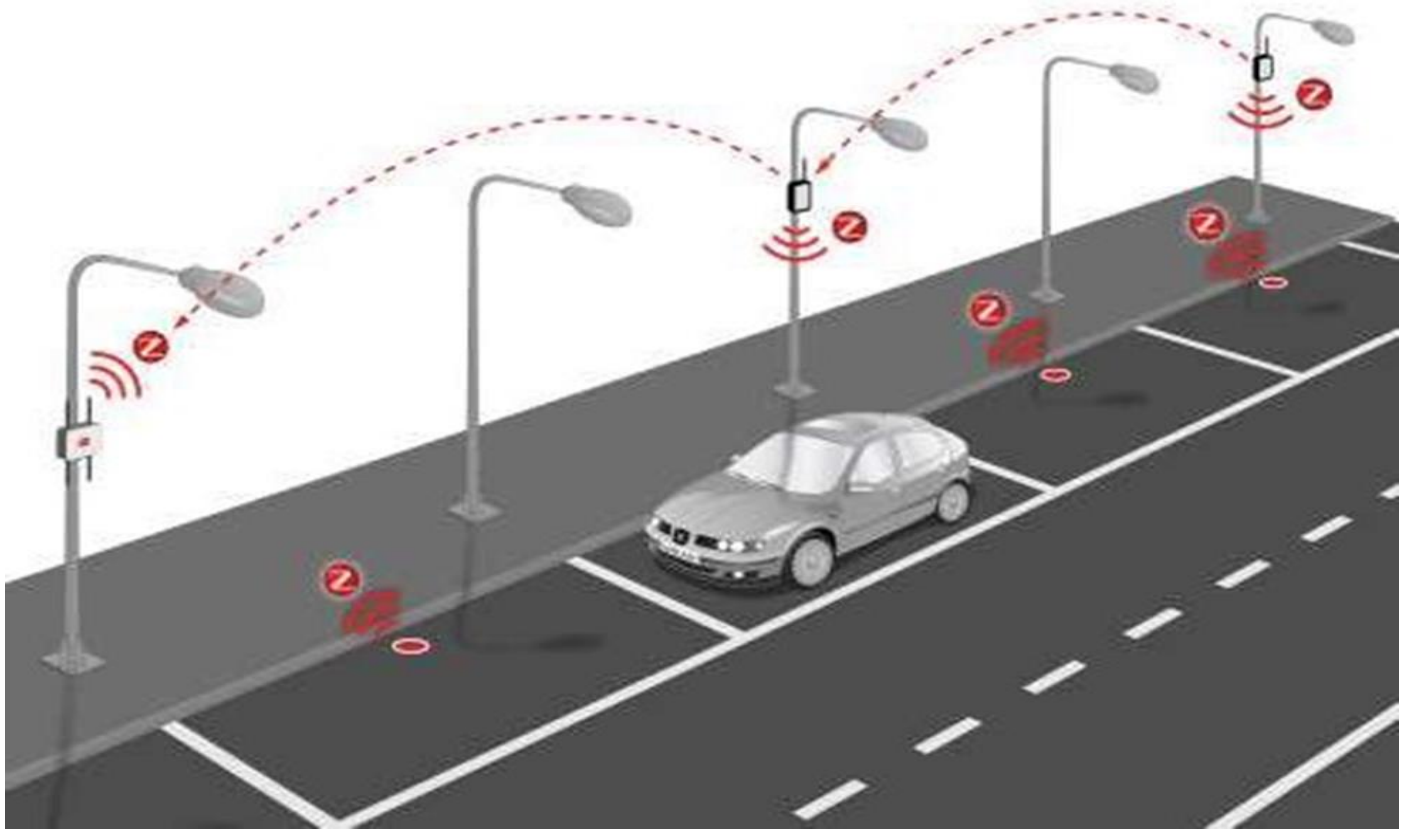


Traffic Congestion

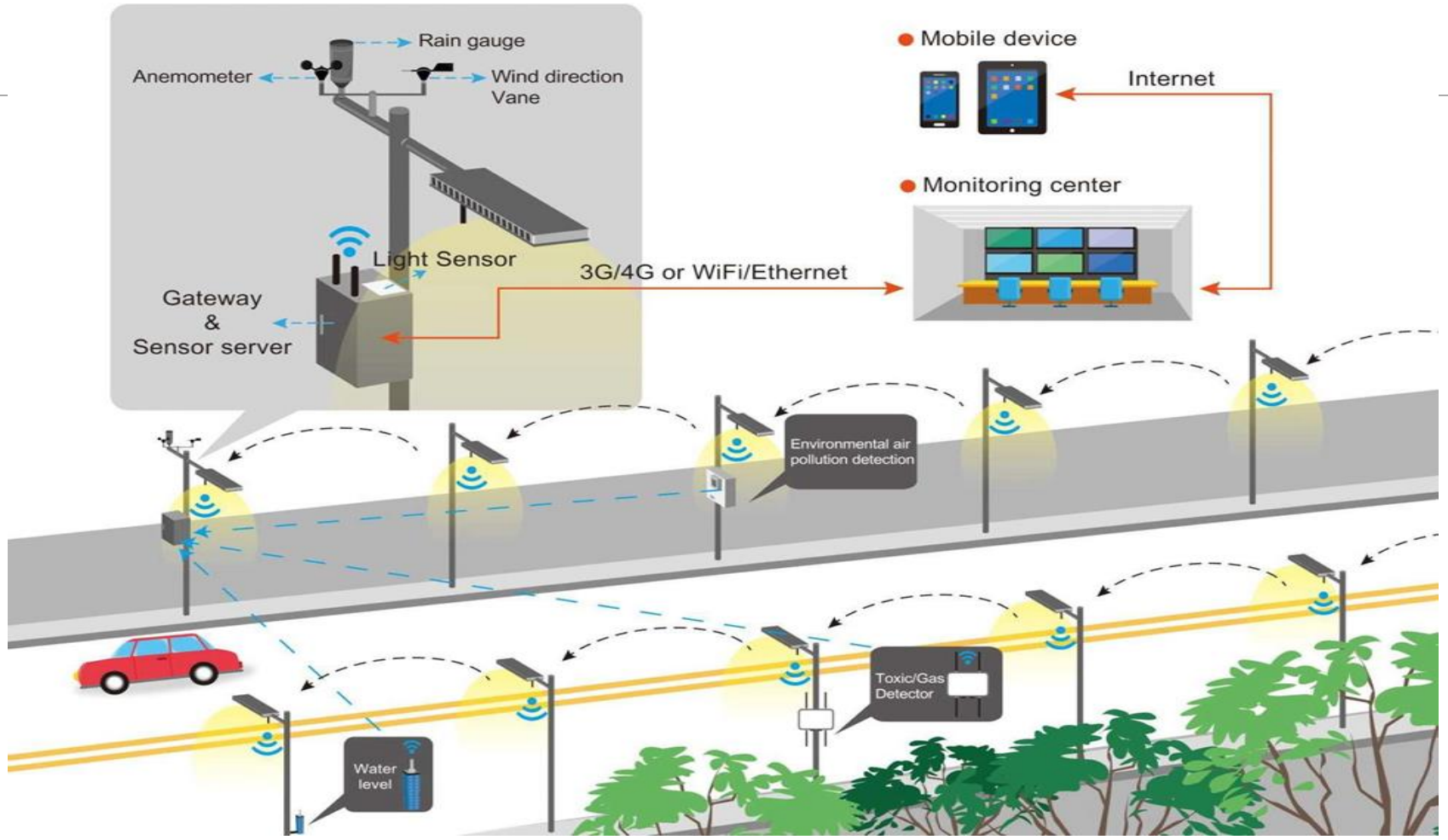


City Energy Consumption

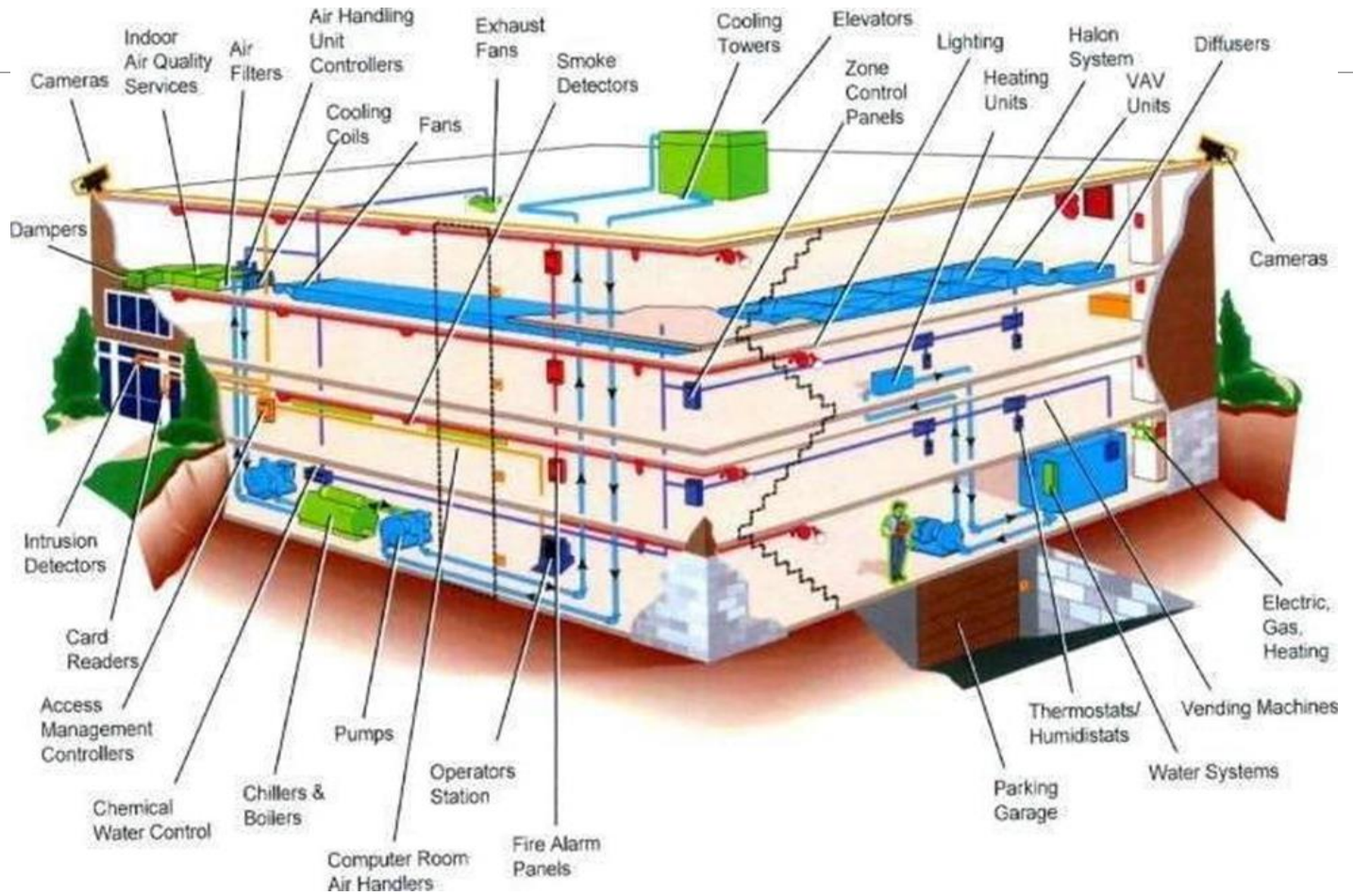
Smart Parking



Smart Lighting



Automation of Public Buildings



IoT applications for smart sustainable cities and citizens

- Smart cities are projected to use 2.7 billion connected things in 2017

Challenges of IOT

Compatibility: Currently, there is no international standard of compatibility for the tagging and monitoring equipment.

Complexity: As with all complex systems, there are more opportunities of failure.

Privacy/Security: With all of this IoT data being transmitted, the risk of losing privacy increases.

Safety: As public sector services like water supply and transport, and many other devices all are connected to the Internet, a lot of information is available on it. This information is prone to attack by hackers. intruders.

Widening of the Digital Divide

Technology Takes Control of Life. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology.

Widening of the Digital Divide-

Those regions with highest concentrations of IT talent will develop smart cities fastest

Disadvantages SE Wisconsin

- Bay Area, Seattle, DC, Toronto and New York City largest pools of IT talent while Chi-Waukee corridor ranks well down (Toronto fastest growing)
- College graduation WI ranks 24th, Minnesota 10th, Illinois 8th
- Ohio leading in Midwest IT skill growth
- Historical/cultural context of making "things"

Advantages SE Wisconsin

- Foxconn and spin off likely to add 1k> IT jobs
- Foxconn moving business model from smart phones to AI/Machine learning platforms for production
- Good expertise in the technologies of moving people and things as a growing and major logistics hub

Success Factors for IOT supported smart cities

IoT involves many manufacturers, spans multiple industries, and differs widely in application scenarios and user requirements.

Standardization can create the necessary framework for any large-scale IoT deployment and ensure commercial revenues in future.