Municipalities and Smart Cities

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Making location count.

Overview

- *Why Smart Cities*
- *Definition of Smart Cities*
- *Smart City Indicators*
- *Spatial Information and Smart Cities*
- *Smart City Enterprise Framework*
- *About OGC*
- *Role of Standards*
- *Development of Spatial Frame work –Test Bed / Pilots*
- *Concluding Remarks*

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Why Smart Cities

- Today, urban population accounts for 54 percent of the total global population and is growing

- Space and funds for development/ maintenance of urban environment / recreation areas are at a premium

- Failure to retain a balance results in 'urban decay'

- A Smart City provides effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens

- To be successful, a Smart City must enable better choices for its citizens , organizations and governments.

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Smart Cities Environment

- Smart Cities are high-density generators of innovation and information
- Location information is a major enabler of Smart City technology benefits.
- Benefits of smart technology must be judged by benefits to residents
- Reuse and repurpose is vital to urban resilience
- Open standards are needed for interoperability, efficiency, application innovation and cost effectiveness.

(Graphic from Steve Liang, University of Calgary)
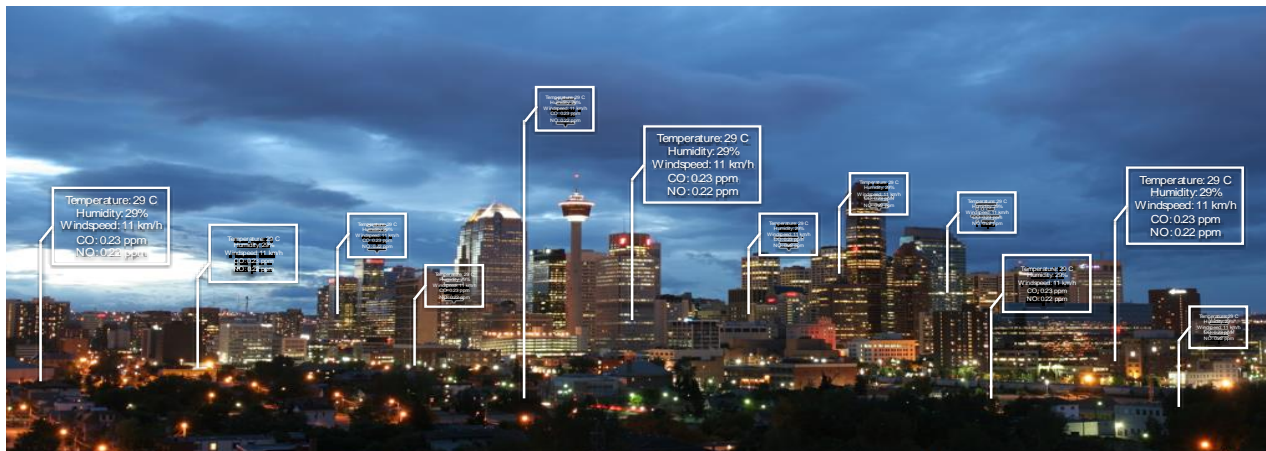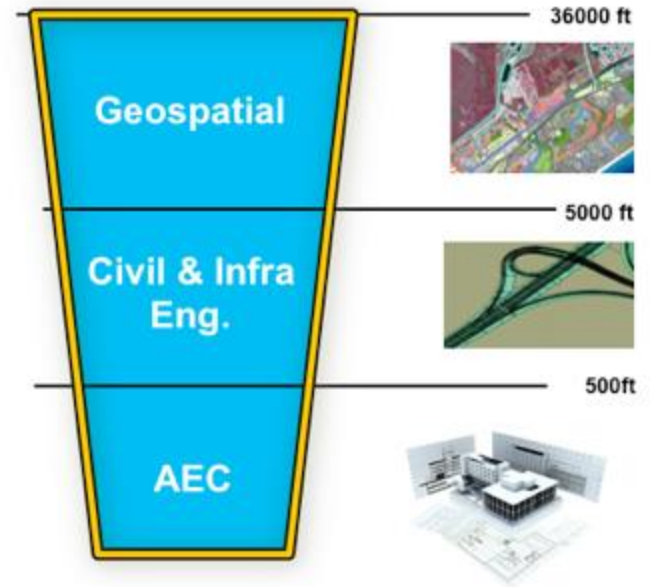
Smart City Indicators

- ISO 37120 defines methodologies for a set of indicators to steer and measure the performance of city services and quality of life

- **Economy / Education / Energy / Environment**
- **Recreation**
- **Safety /Shelter /Solid waste Management**
- **Telecommunications**
- **Finance**
- **Fire and emergency response**
- **Governance**
- **Health**
- **Transportation**
- **Urban planning**
- **Wastewater management**
- **Water and sanitation**
- **Disaster Response Plan /Infrastructure**

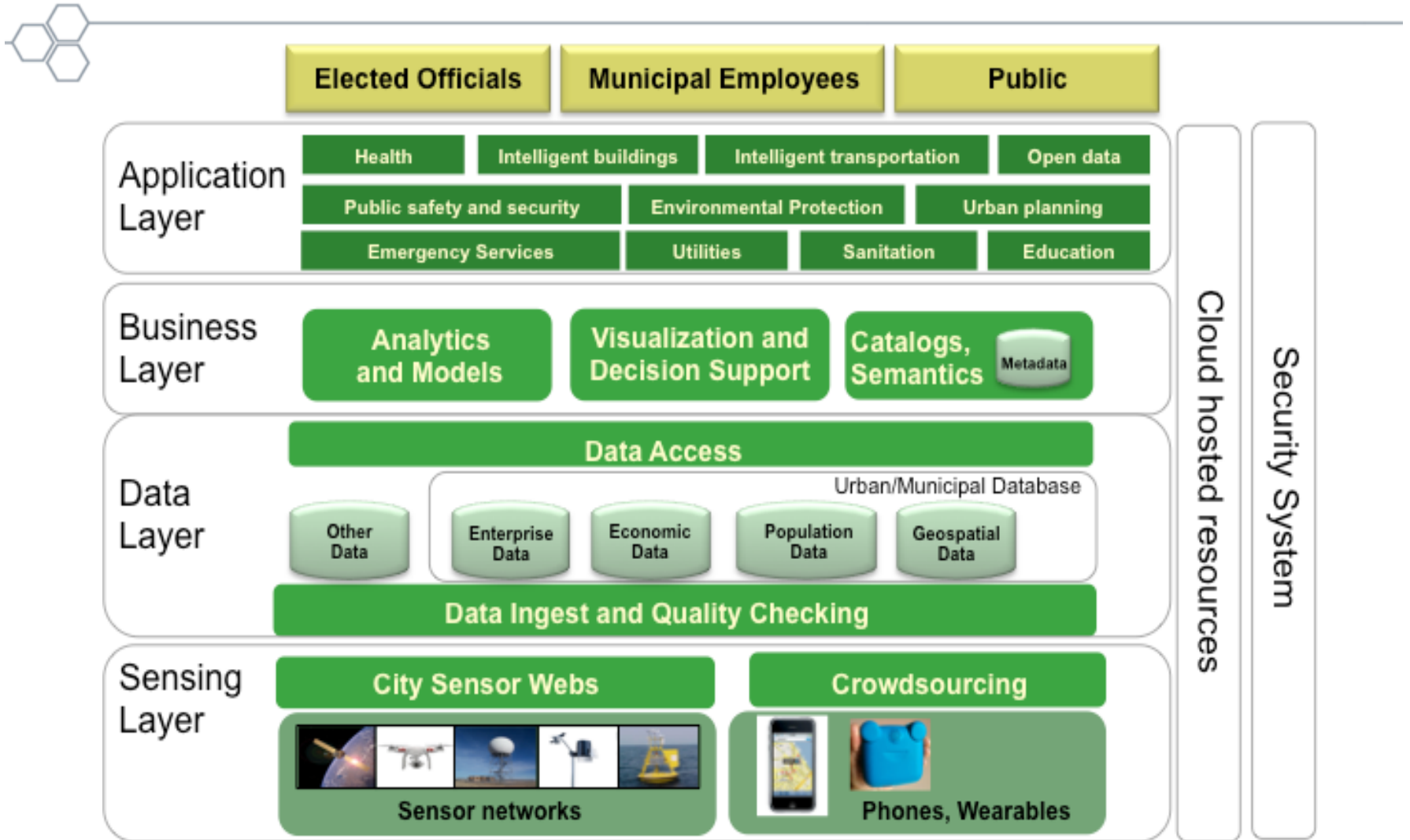**OGC**®

Location Services for Smart Cities

- **Citizen Services**
  - Location-aware municipal services using open data and standards
- **Energy and Utilities management**
  - Smart Energy
  - Smart Water Management
- **Disaster and Emergency Response**
  - Common Operational Picture

  Very important: eg. Chennai Floods

- **Intelligent Urban Maps**
  - 3D City Models
  - Indoor Venue Maps
  - Interoperability with BIM
- **Sensor Webs**
  - Situational awareness from fusion of sensor observations

Geospatial — 36000 ft
Civil & Infra Eng. — 5000 ft
AEC — 500ft

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Smart City Enterprise framework

Elected Officials	Municipal Employees	Public

Application Layer
- Health | Intelligent buildings | Intelligent transportation | Open data
- Public safety and security | Environmental Protection | Urban planning
- Emergency Services | Utilities | Sanitation | Education

Business Layer
- Analytics and Models
- Visualization and Decision Support
- Catalogs, Semantics | Metadata

Data Layer
- Data Access
- Urban/Municipal Database: Other Data | Enterprise Data | Economic Data | Population Data | Geospatial Data
- Data Ingest and Quality Checking

Sensing Layer
- City Sensor Webs — Sensor networks
- Crowdsourcing — Phones, Wearables

Cloud hosted resources

Security System

Deployment of sensors /inputs from sensors vital inputs for smart city management
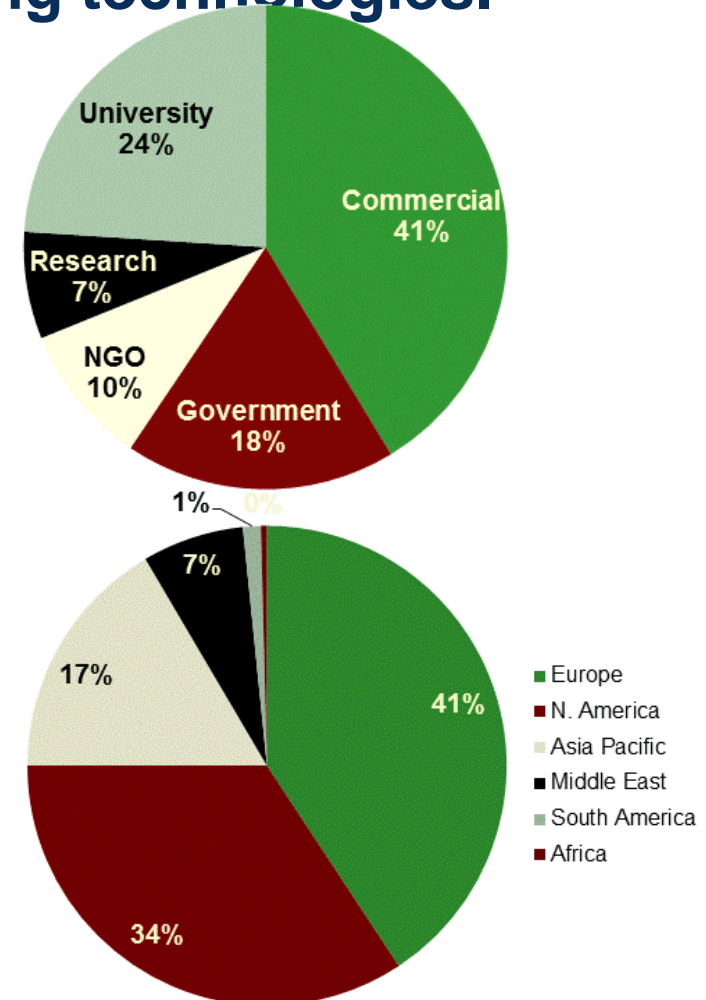
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Importance of Open Standards

- Location is a primary method for organizing Smart City services
- Communicating anything about location *requires standards*
- Smart cities require standards that enable data and apps to easily interoperate, but this requirement is often overlooked
- OGC CityGML has been implemented in many cities including Berlin and Abu Dhabi, and it has been implemented countrywide in the Netherlands, Bahrain and Germany
- The Berlin 3D City Model represents one of the world's largest municipal city models
- The OGC IndoorGML Encoding Standard specifies an open abstract data model and XML schema for indoor spatial information, specifically for modeling indoor spaces for navigation purposes.
- IndoorGML is designed to work with CityGML.

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The Open Geospatial Consortium

Vision: A world in which everyone benefits from the use of geospatial information and supporting technologies.

- International voluntary consensus standards organization leading development of geospatial standards and best practice

- 21st year

- 500 + member organizations

- 40+ standards

- Thousands of product implementations

- Broad user community implementation worldwide

- Alliances and collaborative activities with many other organizations

University 24%
Commercial 41%
Research 7%
NGO 10%
Government 18%

1%
0%
7%
17%
41%
34%

Europe
N. America
Asia Pacific
Middle East
South America
Africa

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An OGC Framework for Smart Cities

- "OGC Smart Cities Spatial Information Framework"
  - https://portal.opengeospatial.org/files/?artifact_id=61188

- Influenced by:
  - OGC's geospatial, sensor, processing, mobile standards work
  - Survey of Smart City Standards Activities:
    - JTC 1, ITU, ISO, BSI, DIN, others
  - Survey of OGC CityGML implementations

- Goals:
  - Pilot Smart Cities Spatial Framework in select cities (http://www.opengeospatial.org/blog/1886)
  - Advance an OGC Best Practice for Location Enabled Smart Cities

  There are OGC white papers , I would be happy to share with you

OGC Smart Cities Spatial Information Framework
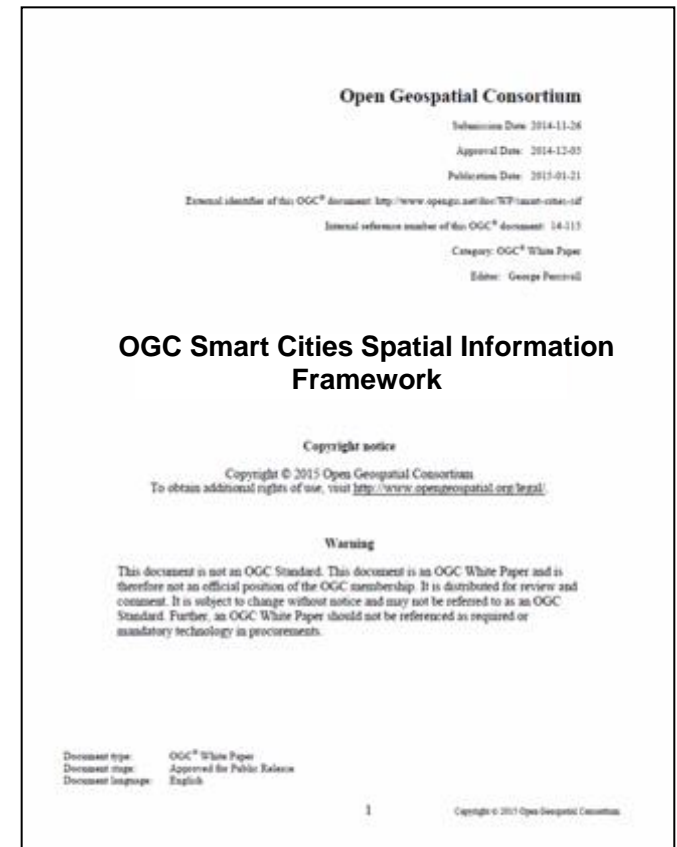
3D Information Management:
Integration of 3D Built / Geospatial Worlds

- Interoperation across the AEC / CAD / Geospatial domains
  - 3D City Models
  - 3D Visualization and Portrayal Services
  - Location Services
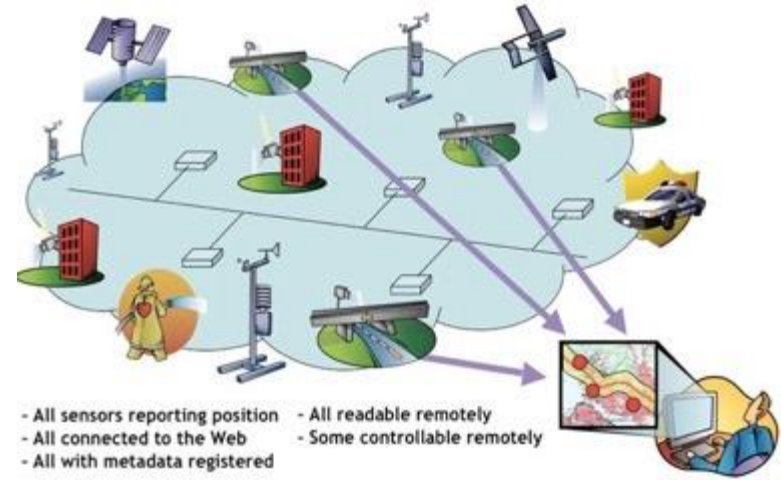 - Indoor Location / Navigation
  - CityGML Discussions

Adapted from BuildingSmart Alliance presentation

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Spatial Architecture for Smart Cities

- Integration of Geo-information, Sensor Webs, Built Environment using open standards

- Interoperability of independent software implementations in an open framework

- Market opportunities through innovations in open standards

- Vendor-neutral best practice reusable in any Smart City

- All sensors reporting position
- All connected to the Web
- All with metadata registered
- All readable remotely
- Some controllable remotely

OGC Sensor Web Enablement

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# Some Examples of OGC CityGML Adoption

- Europe

  - European INSPIRE (Infrastructure for Spatial Information in Europe)

- The Netherlands National 3D standard
  - CityGML part of Dutch 3D Standard

- CityGML based urban Models:
  - Berlin, Germany and other cities
  - Kingdom of Bahrain
  - Finland
  - Singapore
  - Austria (Vienna, Salzburg), France (Paris), Switzerland (Geneva)

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Integrated Outdoor / Indoor location/navigation

- IndoorGML Approved Sept 2014
- Public Release soon after final edits

OGC IndoorGML

http://www.opengeospatial.org/projects/groups/indoorgmlswg

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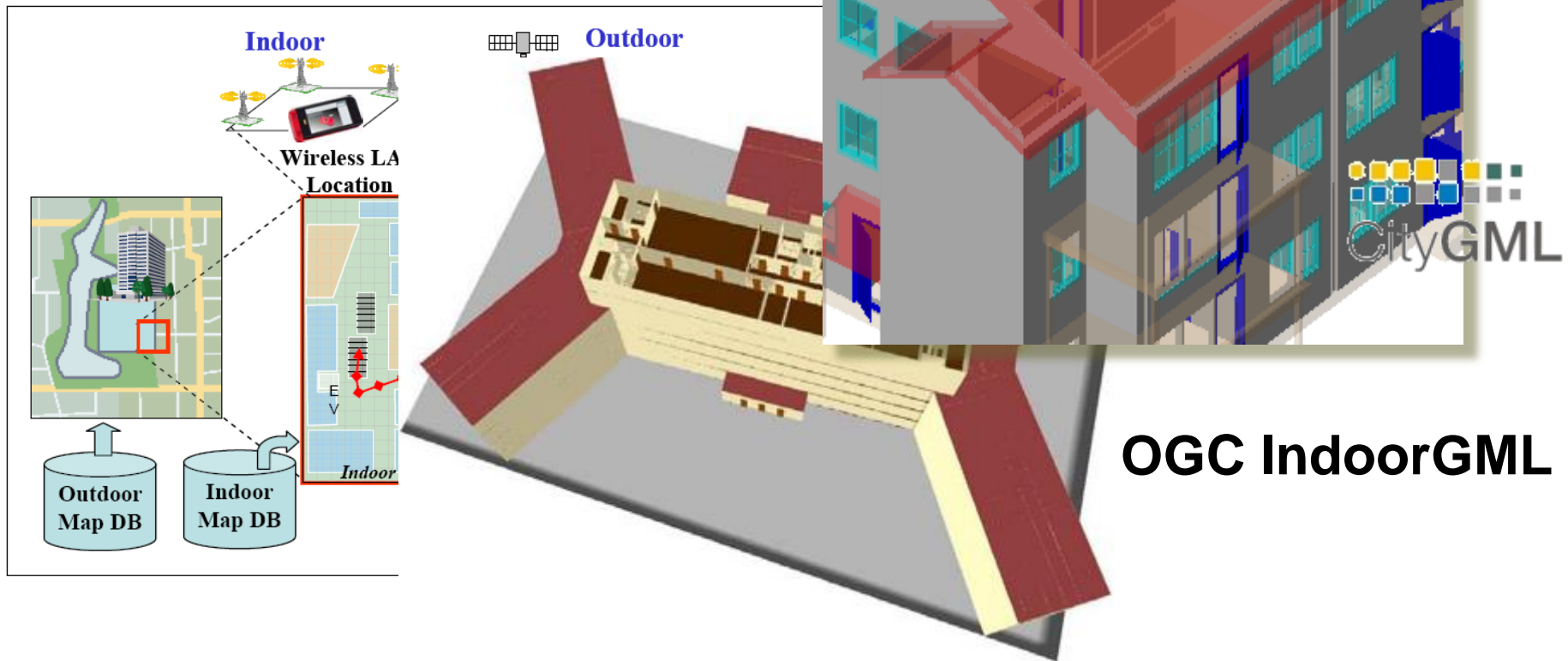
Interoperability of Services for Smart Cities

OGC Web Services

- **Geospatial Data - OGC Web Service Standards**
  - Integrate and share all types of geospatial and remote sensing data about a city

- **Sensor feeds - Sensor Web Enablement Standards**
  - Discover, Task, Access and Process Observations from all types of sensors

- **Leverage Social Media / Crowdsourcing**
  - Geo-enabled Social Media
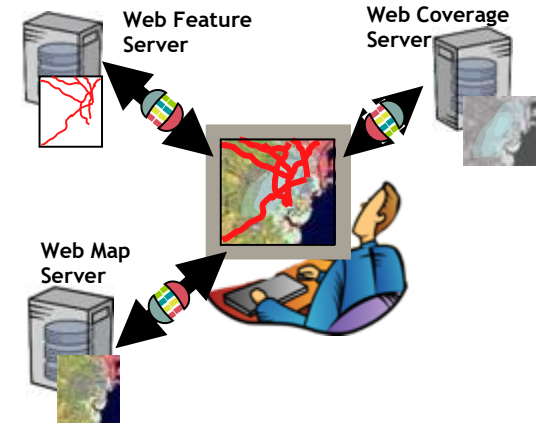 - SensorThings for Internet of Things

- **Support Analysis and Processing**
  - Model city processes

- **Visualization and Augmented Reality**

- **Open Data and Mobile Applications :**

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OGC Smart City Interoperability Initiatives – Testbeds, Pilots etc.

- The OGC Interoperability Program provides an agile, rapid engineering environment to accelerate development and testing of standards based on real world use cases

- OGC testbeds have repeatedly demonstrated success at transitioning research into operations based on open standards

- The OGC Interoperability Program is carrying out a strategy for Smart Cities

- *In India a Plug Fest in the area of Smart Cities is in planning phase for implementation later in the year*

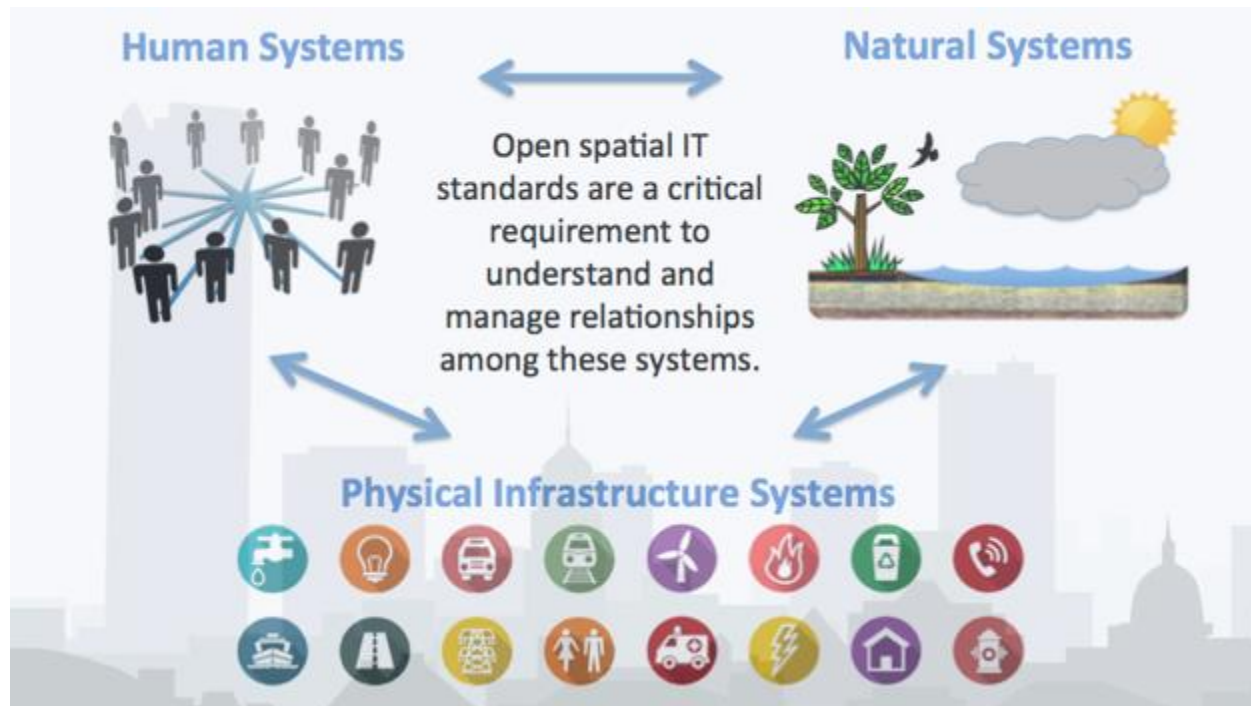**OGC**®

CityGML - 3D Urban Models

- Urban Planning / Operations
- Emergency Mgt / Response
- Public Safety
- Transportation / Routing / Logistics
- Indoor navigation
- Retail Site analysis
- Sustainable / Green Communities
- City Services Management
- Noise abatement
- Telecommunications placement
- Many other uses…

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FutureCities Pilot

- Coordinated effort between OGC and building SMART International
- Seeking sponsors, most of work is intended to occur in Europe
- Pilot will demonstrate and enhance the ability of cities to use diverse, interoperating spatial technologies to deliver improved quality of life, civic initiatives, and resilience

Human Systems ↔ **Natural Systems**

Open spatial IT standards are a critical requirement to understand and manage relationships among these systems.

Physical Infrastructure Systems

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Concluding Remarks

- As pressures on urban areas grow , the rationale for adopting the Smart Cities model would be compelling

- Spatial information based on Smart City indicators need to planned

- Implementation of Open standards from OGC / ISO for Smart City Enterprise a vital requirement

- Interoperability of services key for smart city environment

- Test Beds / Pilots / Plug Fests play a vital role in establishing interoperability between different systems/organizations in a smart city environment

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