Smart District Data Infrastructure (SDDI)

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The Smart District Data Infrastructure
Challenges

• Many strategies – very technology-focused
• Smart City initiatives are often Top-Down & Proprietary
  • A (IT) company together with city is setting up the system
• Incompatibility of services due to a lack of well-designed information infrastructure
• There are many other stakeholders who are interested in being involved
  • Municipality (incl. Planning office, Environmental agency, security and emergency services) and their service providers
  • Citizens; Owners (companies); policy makers
  • Utility service provider; Transportation service providers;
Current situation

- Satellite sensors
- Citizens
- Real estate firms
- City Dashboard
- Solar potential analysis
- Municipalities
- Weather sensors
- Energy demand estimation
- Virtual 3D City model
- Flood simulation
- Networks
- Energetic building refurbishment
- Transportation service providers
- Air quality monitoring
- Utility service providers
- Crowd management
- Pedestrian flow simulation

The Smart District Data Infrastructure
Key aspects for data integration

• A uniform and standard data framework
• Consideration of roles and interests of various stakeholders
• Use of open standards to guarantee the interoperability
• Avoiding data redundancy
• Vendor neutral & based on international standards
• Consideration of Security and privacy
• High degree of flexibility and extendibility
• Usage of Open Source & Commercial Off-The-Shelf components
• Scalability and Transferability
Complex Distributed System

- Satellite sensors
- Citizens
- Solar potential analysis
- Municipality
- Weather sensors
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- Energetic building refurbishment
- City Dashboard
- Citizen engagement
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- Transportation service providers
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- Utility service providers
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The Smart District Data Infrastructure
Smart District Data Infrastructure (SDDI)

**Actors**
- Citizens
- Municipality
- Utility service providers
- Real estate firms
- Transportation service providers

**Applications**
- Citizen engagement
- Air quality monitoring
- Energetic building refurbishment
- City Dashboard
- Crowd management

**Sensors and Sensor data**
- Satellite sensors
- Weather sensors

**Virtual District Model**
- Networks
- Virtual 3D City model

**Urban Analytics Toolkit**
- Energy demand estimation
- Solar potential analysis
- Pedestrian flow simulation
- Noise dispersion simulation
- Flood simulation

**The Smart District Data Infrastructure**
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**Virtual District Model**
- Virtual 3D City model
- Networks

**Catalogue Service CS/W**
- Registry

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Smart District Data Infrastructure Process

ISO 10746 – “Information technology — Open Distributed Processing – Reference model“ (ODP-RM)
Case Study
Queen Elizabeth Olympic Park (QEOP)
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► A sporting complex built for the 2012 Summer Olympics
► Four key themes:
  ● Resource Efficient Buildings
  ● Energy Systems
  ● Smart Park / Future Living
  ● Data Architecture and Management
SDDI Process – Listing data items (QEOP)

- Energy Systems
  - Building Models
  - Energy Demands
  - Energy Networks
- Resource Efficient Buildings
  - Road Networks
  - 3D Visualization Model
  - PV Energy Production Meters
- Visitor Traffic Management
  - Utility Networks
  - Noise Quality
  - Visitor Tracking
  - Air Quality
  - Crowd Density Meter
  - Current Events
  - Weather Data
  - Technical & Cost Data
  - Future Events
  - Energy Consumption Meter
  - Venues
  - Temperature
  - Temperature Meter

The Smart District Data Infrastructure
SDDI Process – Listing data items (QEOP)

- Energy Systems
  - Building Models
  - Energy Demands
  - Energy Networks
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  - 3D Visualization Model
  - Utility Networks
- Visitor Traffic Management
  - Road Networks
  - Venues

Virtual District Model

Agents/Environment

- Energy Networks
  - Temperature Meter
- Temperature

- PV Energy Production Meters
- Crowd Density Meter
- Visitor Tracking
- 3D Visualization Model
- Air Quality
- Visitor Tracking
- Technical & Cost Data
- Future Events
- Weather Data
- Park Visitors
- Noise Quality
- Current Events
- Visitor Tracking
- Weather Data
- Visitors

Sensors
Example SDDI Configuration

Sensor Type A
- Software API (Proprietary A)
  - SOS

Sensor Type B
- Software API (Proprietary B)
  - SOS

Sensor Type C
- Software API (Proprietary C)
  - SOS

App #1
- Pedestrian Flow Simulation
  - Proprietary API
  - CS/W API

WFS B (e.g. Roads)
- Proprietary Software API
  - Ordnance Survey Data

WFS A (e.g. Buildings)
- Proprietary Software API
  - 3DCityDB

Catalog Service CS/W
- Proprietary or Open source solution
  - Registry

Data
- OGC Observation & Measurement
  - Query
  - Register
  - Metadata

OGC CityGML

Proprietary or Open source solution

The Smart District Data Infrastructure
Example SDDI Configuration

- Consider a network of distributed systems
- Interoperable access to proprietary data resources, sensors and systems
- Access to the registered districts resources (databases, sensors, services, etc.)
- Standard-based solution
- Plug and play ready applications
- Cloud-based implementation possible
- Data and functionalities remain by their owners