Safe, Resilient Future Cities
77% of the surveyed IoT experts claimed that Interoperability is the biggest challenge currently facing the Internet of Things

(IoT Nexus, 2015)
Open standards in IoT deployments would accelerate growth by 27% and reduce deployment costs by 30%
Handbook: Internet of Things Alliances and Consortia

Location, semantics and a focus on coordination (Arrows indicate OGC Alliance Partners)

CC Attribution: Postscapes.com – Version 1.0 Updated March 2015
SWE today

Image courtesy of opensensorhub.org

Data Center with extended processing capabilities

Local Workstation

Mesh Sensor Network

UAV carrying video camera

Aircraft with air quality sensors

Field Operator with Tablet

Processing Capabilities

OSH instances

Image courtesy of opensensorhub.org

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OGC SensorThings API

The OGC SensorThings API is an OGC candidate standard for providing an open and unified way to interconnect IoT devices, data, and applications over the Web. The SensorThings API is an open standard, builds on Web protocols and the OGC Sensor Web Enablement standards, and applies an easy-to-use REST-like style. The result is to provide a uniform way to expose the full potential of the Internet of Things.

Learn More
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
Urban Platform

ESPRESSO and European Innovation Partnership for Smart Cities and Communities

The Urban Platform as an enabler for Smart Smart City initiatives, based on open standards, avoiding vendor lock-in and increased competition

Connect, Collect, Comprehend, Create

ESPRESSO has on board:
4 Standard Developing Organisations: DIN, ETSI, OGC, bSI
2 Cities: Rotterdam and Tartu

Urban Platform to be used by developers, decision makers, procurement, ...
Urban Platform

**ESPRESSO and European Innovation Partnership for Smart Cities and Communities**

- Capability Map
- Information Systems Architecture

Based on:
- Open standards, Market & vendor agnostic
- No prescription of solutions nor technologies
- Modular, Incrementally achievable
- Capability and layered based

Existing city architectures
EIP SCC WS2 (See later today)
ITU-T WG20, ISO/IEC JTC1, ETSI, ...
Information Architecture

Access Services and Domain Services

Data Lake

IOT/CPS

Device Zone

Data Zone

Appl Zone
FutureCities Pilot

- Coordinated effort between OGC and buildingSMART 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

http://www.opengeospatial.org/pressroom/pressreleases/2290
Future Cities Pilot – Phase 1

• Youtube link to the video shown
• https://www.youtube.com/watch?v=aSQFIPwf2oM
Adding Dynamic Processes to Urban Models

Dynamizers

- Enhance properties of city objects by overriding static values
- Time-variant values from sensors, simulations, and external files
Future City Pilot 1 Scenario: Health

• Building Humidity and Heat during weather extremes
  – Dynamize: Override static CityGML properties with dynamic observations from SOS
  – Identify residents of senior living facility at risk

Visualization of and interaction with 3D building geometries

Real-time temperature, humidity accessed from SOS
Future City Pilot 1 Scenario: Energy

- Provide better services to the citizens and the energy planners by making sophisticated solar potential analysis.
- Visualization of solar energy production for roofs and facades of building.
Plans for FCP Phase 2

- Call for Sponsors & Requirements 2017
- Also in the Geospatial, Civil Engineering & BIM
- Requirements are coming in
- Worldwide scope
- Include Indoor & Facility Management
  - VR, AR?
- Interested to sponsor or participate?
  - Let me know!
Location Powers: Underground

Tuesday 5\textsuperscript{th} September 2017 0900 – 1700

http://www.locationpowers.net/

Geovation Hub, London, UK
OGC Mobile Location Services Working Group

• Mission of MLS WG: to broaden the use of location-aware technologies in mainstream consumer and business IT infrastructures.
  – Identify MLS technology requirements and solutions
  – Encourage OGC WGs to progress key services and encodings
  – Make recommendations for adoption of mass-market, mobile location services standards.

• Focal point for complementary organizations, such as
  – W3C, OSGeo, Web3D Consortium, Eclipse Foundation
  – Open Mobile Alliance (OMA), Small Cell Forum, GSMA, CTIA
  – Location Based Marketing Association (LBMA)
  – In Location Alliance (ILA)
OGC Tech Trends – March 2017

Geo Tech Trends

The Power of Location
- Location as an indicator of intent
  - Statistics and Geography
  - Human Geography
- Point clouds
  - SLAM
- 3D Geo model creation
- BIM and GIS integration
- Indoor venue maps
- Indoor Positioning
- Dynamic Datums
- Time stamps to support analytics
- Dynamic Features: 4D Models and positioning
- Multiscale

Spatial and Temporal Models
- Cloud and HPC
- Artificial Intelligence
- Workflow and provenance
- Big Data Analytics
- Modeling, Simulation and Prediction

Big Data
- Machine Learning
- Image processing
- Uncertainty, Veracity
- Conflation analytics
- Spatial-Temporal

Data Science Analytics

Spatial Data on the Web
- Web Trends
  - Map projections fit for purpose
  - APIs for the Web
- Linked data
  - Text Analytics
  - Semantics

New Geo Sources
- IoT and Sensor Webs
- Opportunistic Sensing
- Crowdsourcing
  - Volunteered Geographic Information
- UAVs and drones
  - Smallsats
  - Open Data
  - Increasing mobile device capabilities
  - Immersive Geo viz: VR, AR and Mixed Reality
  - Software patterns, e.g., federation, pub sub
  - Software development trends affecting geospatial
  - Blockchain and distributed ledger

User platforms and networks - HSI
- Connectivity and bandwidth
- Automotive
- Ambient Services
- Intelligent devices/IA

Software development
How to get involved?

• Ask for your solutions to be “open” standards compliant
• Become a member
• Join an OGC Forum
• Follow a Domain Working Group
• Visit us at the Technical Meetings in September in Southampton, UK
• Don’t be passive, be part of standards innovation!
Standards should be driven by innovation and achieved through collaboration
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