IoT Activities by OGC

George Percivall
Open Geospatial Consortium
SWE/IoT Ad Hoc meeting
March 21, 2012
OGC's IoT Activities

- OGC GeoMobile Concept Development study identifies OGC standards are relevant to IoT, November 2010
- Expanding GeoWeb to an Internet of Things - a workshop at COM.Geo, May 2011
- “Applying SWE to IoT” Presentation to SWE WG, June ‘11
- OGC liaisons established with IoT activities
  - ITU Joint Coordination Activity on Internet of Things (JCA-IoT)
  - IERC-European Research Cluster on the Internet of Things
- IoT in OGC Mobile Internet and Location Services page
- OGC Standards for the Internet of Things – a workshop at OGC TC, Nov 2011
**IoT: An introduction**

Mark Weiser, Xerox 1988

“They weave themselves into the fabric of everyday life until they are indistinguishable from it”

Kevin Ashton, 1998, cofounded the Auto-ID Center:

“Adding radio-frequency identification and other sensors to everyday objects will create an Internet of Things, and lay the foundations of a new age of machine perception”

UN report, 2005

“We are heading into a new era of ubiquity, where the users of the Internet will be counted in billions, and where humans may become the minority as generators and receivers of traffic. Changes brought about by the Internet will be dwarfed by those prompted by the networking of everyday objects “

**ITU, 2005**

“Connections will multiply and create an entirely new dynamic network of networks – an Internet of Things”

Viviane Reding, 2007

“... a new phase of the Information Society – the Internet of Things in which the web will not only link computers but potentially every object created by mankind.”

*August 22-24, 2011, ITU-T Geneva*
“In 2008, the number of devices connected to the Internet exceeded the number of people on Earth. By 2020, there will be 50 billion devices connected” - Cisco

“Applications developed by our In-Q-Tel companies are focused on...driving the Internet of Things”, CIA Director David Petraeus, March 2012

Several studies call for OGC SWE to be used in IoT

– AutoID Labs; European Commission FP7 projects
Supply Chain integrating SWE and EPC [AutoID 2010]

Case Study: Fresh Meat Traceability

This research was supported in part by the EU IST Sixth Framework (FP6) project BRIDGE (Building RFID Solutions for the Global Environment)

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An OGC workshop at COM.Geoweb 2011, May 2011

Expanding GeoWeb to an Internet of Things

Session 1. Scope and Vision
- Planetary Skin Institute ALERTS - CISCO
- Physical World as an Internet of Things - GWU
- QR codes in crisis scenarios - Ushahidi
- National Broadband Map - US FCC

Session 2. Enabling Technology
2a. Object location
- Geolocation and Location-Based Apps - BBN
- Geolocating things on the Internet - Quova,
- What to do with 500M Location Requests a Day? - Skyhook

2b. Location/navigation in Small Spaces
- Location /navigation inside small areas - MobileGIS
- Navigation-to-thing and highly-context-focused ‘around me’ use cases – Navteq
- Building model information - Autodesk
- Read/Write for building information - Microsoft

2c. User applications
- Live Viz on 3D City Models - Hasso-Plattner-Institut,
- Internet of Places: navigating the Web in Space-Time - 1Spatial
- NGC Sensor Web Enablement for IoT - NGC

Session 3. From R&D to commercialization
- Let’s Move E911 Indoors – Telecordia
- Beyond check-in; fragmentation and consolidation in the emerging geoweb industry - GeoWeb Forum
- Collaborative development w/ open standards - OGC

http://www.ogcnetwork.net/COMGeoWorkshop
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<td>ITU Overview of Internet of Things (IoT)</td>
<td>Yong-Woon KIM, ITU</td>
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<td>FI-Ware Architecture for IoT</td>
<td>Dénes Bisztray, Nokia Siemens Networks</td>
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<td>Requirements for IoT from the Environmental and Geospatial domain</td>
<td>Denis Havlik, AIT and ENVIROFI</td>
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<td>SenseBox and IoT recommendations for OGC SWE</td>
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<td>Bringing IoT to the mass market - what should a standard do?</td>
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• Promote OGC standards in IoT activities of other organizations
  – Participate in industry events relevant to IoT to increase awareness of OGC, e.g., Mobile World Congress, M2M/ETSI, IoT Meet-ups.

• Initiate OGC activity tuned to IoT and Web of Things (WoT)
  – Initiate OGC WoT standardization for consumer IoT devices, e.g., REST. Involve existing IoT companies for broad adoption
  – Apply OGC information models to IoT “thing-level” abstraction
  – Develop eMobility GML schema based on the Ballade data model.

• Increase OGC implementation activities to advance in IoT
  – Coordinate with other standard developing organizations, e.g., ITU, W3C, OMA.
  – Participate with projects implementing IoT, e.g., FI-Ware, SenseBox
  – Investigate requirements to implement IoT in OGC Testbeds.
Research Fields: IoT / WoT

**IoT**
- Low-level protocols for smart things (e.g. 6LoWPAN, MQTT)
- Naming services for things (e.g. EPCGlobal)
- Identification (e.g. RFID)
- ... 

**WoT**
- Utilizes HTTP
- REST APIs for things
- Mash-up applications
- ...

Arne Bröring, 52°North - OGC TC Brussels
Web Of Things References


• Web of Things: A Research Project of the Distributed Systems Group - ETH Zurich
  – Dominique Guinard, Vlad Trifa, Matthias Kovatsch, Simon Mayer
Why am I here?

• because I want to make sure devices are not tied to one specific data service but can be used anywhere

• because with a well-adopted standard we can kickstart the growth that has been talked about (billions of devices, yada, yada..)

• because I believe consumer IoT devices will massively outnumber scientific IoT devices in the next 10 years but want to make sure that they can still interoperate

• to try to help define the next generation of standards for the internet of things
Edge devices – making smart objects

- Open source electronic platforms
- Must add sensors, comms, positioning
- $35 and dropping

52North SenseBox light
Arduino + Ethernet + GPS → ~ 100 €
Need for lightweight protocols

mbed.org  ARM® Cortex™-M0

Twine
WiFi, temperature and vibration sensors, $100+ plus cloud service

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Concepts for an OGC Testbed

Functional

- Location: Building, campus, ecosystem?
- Domains
  - Electricity, Health, Home, Transport, (GSMA)
  - What is good for OGC?
- Use Cases
  - Deploy, register, discover, access, social networks, mashup,

Technical

- Edge devices
  - Several types
  - ~10’s of devices
- GPS and indoor positioning
- Communications:
  - TCP/IP to the device
  - Ethernet, cellular, WiFi, ZigBee, 6LoWPAN
- Fixed and mobile clients

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IoT is cool!
Because you can read the comic book!
Watch the Big Bang video “How to turn on a lamp”
1 minute version
3 minute version
Industry examples

• Postscapes provides good summary of IoT industry activities.

http://postscapes.com/
Challenge: Numbering and Addressing

• **How to address 50 billion objects?**

• **Different technical solutions proposed:**
  – Electronic Product Codes (RFID tags)
  – ‘Traditional’ Uniform Resource Identifiers (URI)
  – IPv6: address space supports $2^{128}$ addresses

• **Issues beyond technology:**
  – Standards for numbering and addressing schemes (ITU-T)
  – Harmonization, policies, regulation
  – All countries should be involved in the development and benefit from the IoT