



International Development and Application Trends of Value-Added Services in Geospatial Information

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Agenda



- Geospatial / location revolution
- The value of open standards, data...
- Case Studies on Geospatial Public-Private Partnerships
- Geospatial Trends
- Summary

My “geospatial” Background and Perspective



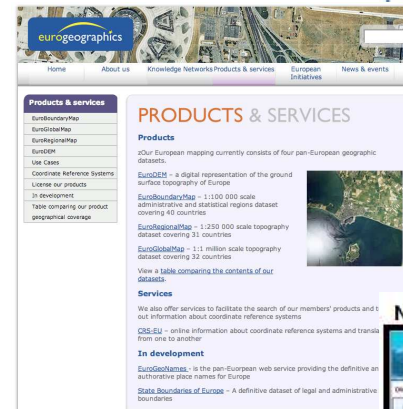
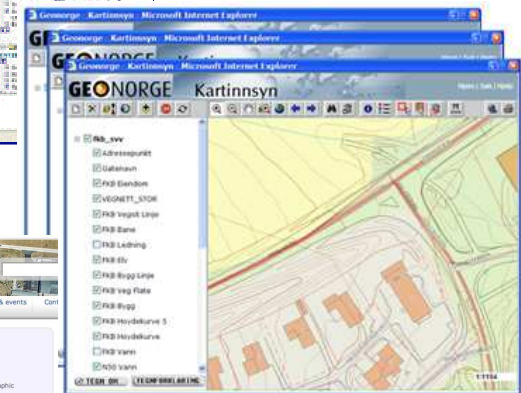
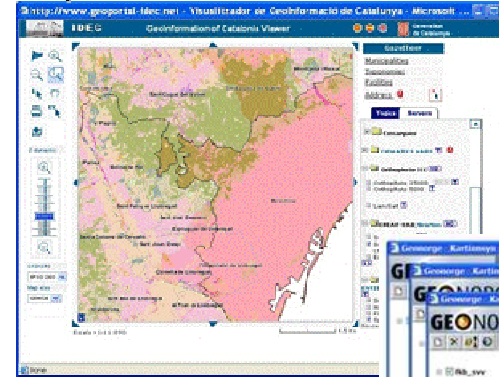
- Cartographer for the US Government (20 years)
 - Map production
 - Technology modernization
- Vice President Al Gore’s Partnership for Reinventing Government (1 year)
 - Promoting use of geospatial information for Sustainable Communities
- US Federal Geographic Data Committee (2 years)
 - International program to advance Spatial Data Infrastructure
 - Training, education, standards best practices
- Open Geospatial Consortium (13 years)
 - Open standards for location / geospatial

Society has rediscovered the power of location

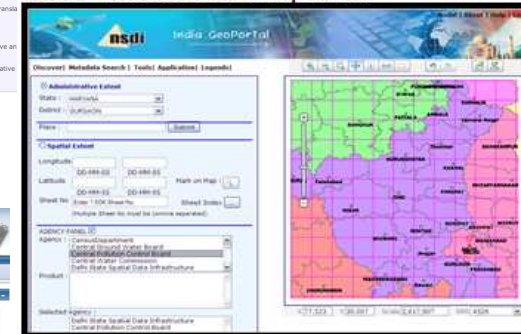


- Explosion of on-line mapping applications and data sources
- Integration of location in to business intelligence & science
- Emergence of 3-Dimensional geospatial modeling and augmented reality
- Integration of sensors in a geospatial and time context for improved situational awareness automated control

Geoportal of the Catalonia SDI



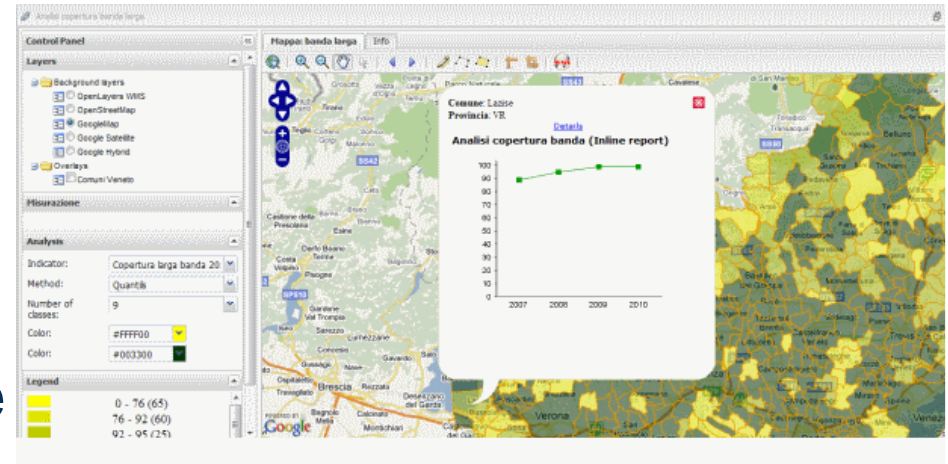
NSDI - India GeoPortal Map Viewer



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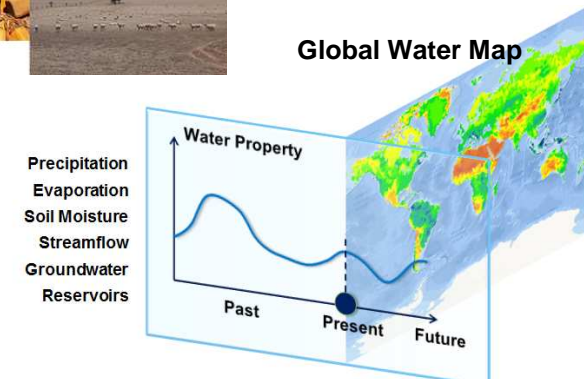


Source: www.spagoworld.org/xwiki/bin/view/SpagoBI/Geo

Extreme Weather & Climate Change



Global Water Map

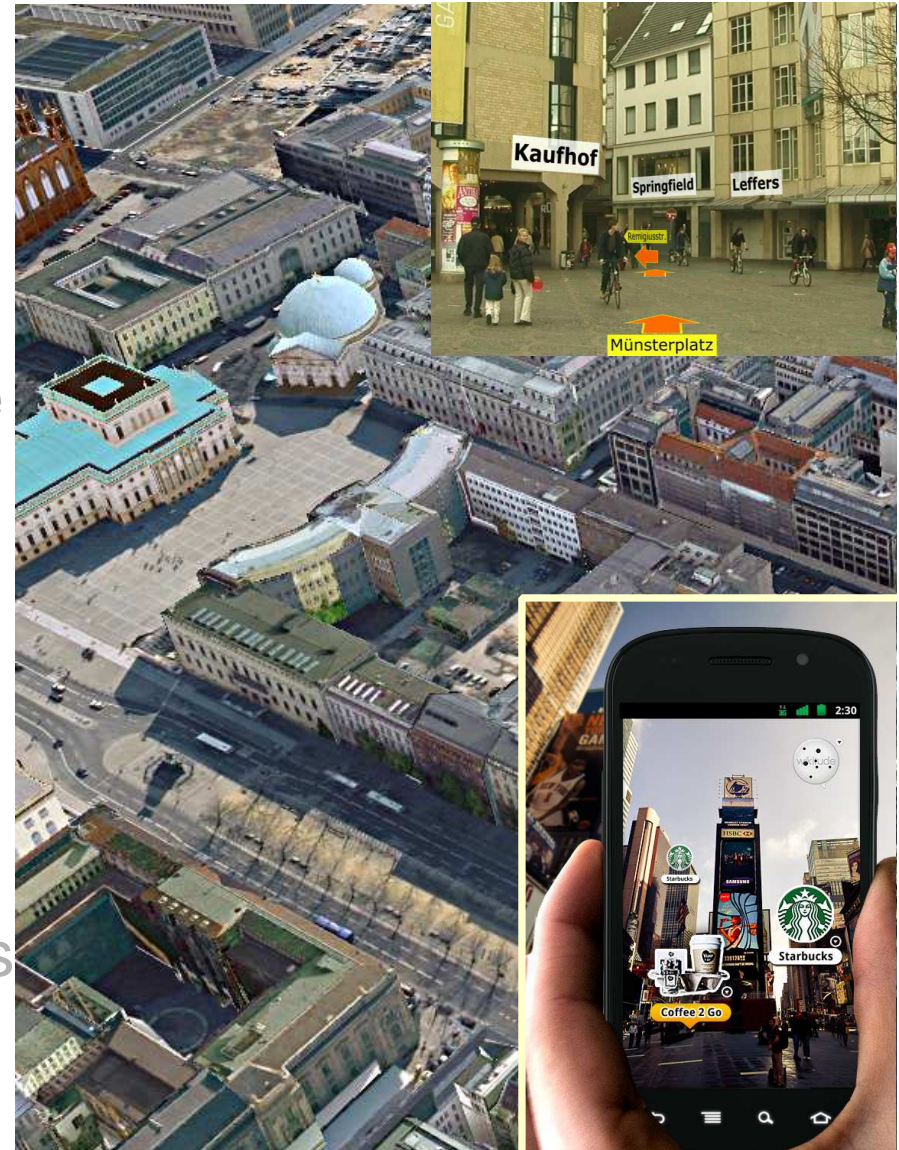


Making Location Count.

Society has rediscovered the power of location



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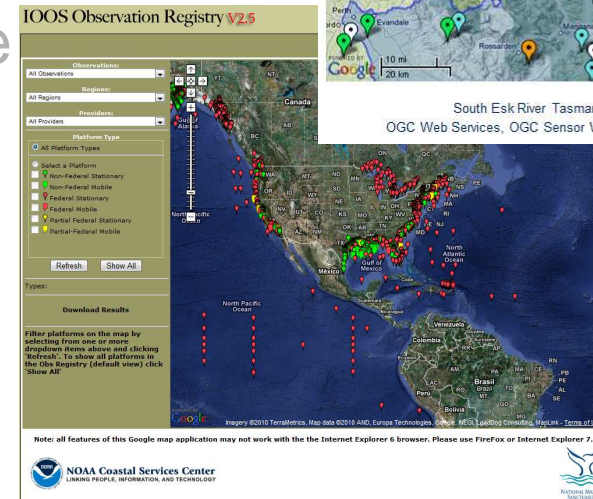
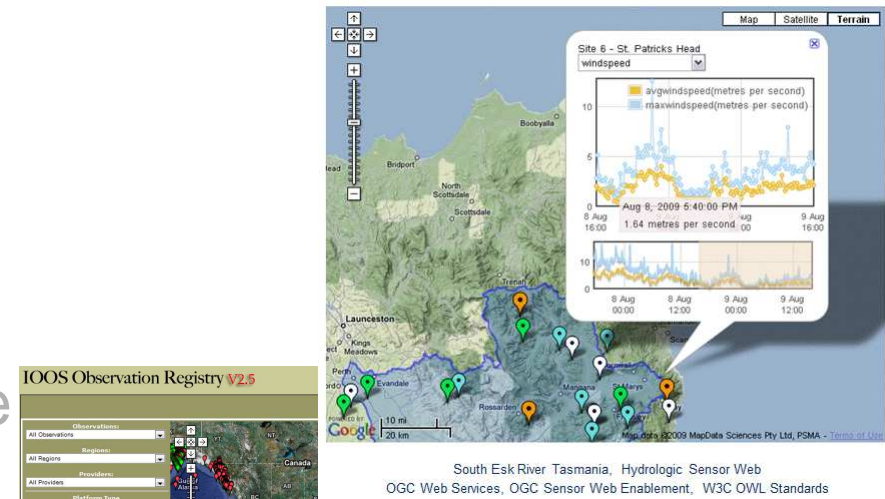


Making Location Count.

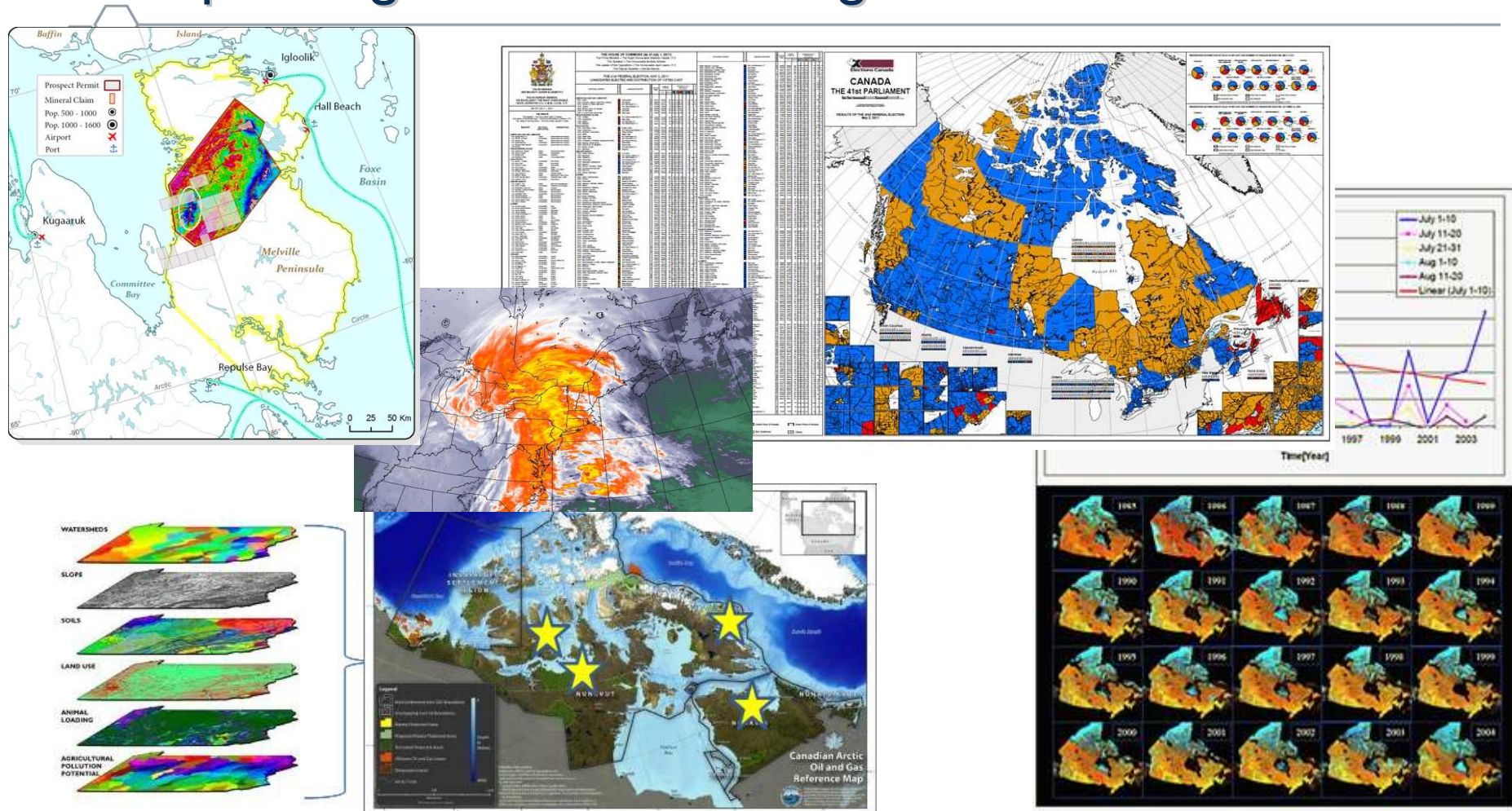
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Spatial Data Infrastructures Improving Decision-making Across Government



...to support broad national objectives such as economic growth, social cohesion and well-being, and environmental management

Growth of Geospatial - Some Evidence



- Geospatial Professionals and Mobile App Developers – Top IT Jobs for 2013. (www.careerealism.com/information-technology-jobs/)
 - According to the US Bureau of Labor Statistics, the number of GIS jobs will increase 35% between 2010 and 2020
 - “Typical [geospatial] implementations can create significant cost savings, increase efficiencies, empower decision making, improve communication”.
- Estimated global revenue of Geo services sector \$150B - \$270B USD (www.oxera.com/Oxera/media/Oxera/downloads/reports/What-is-the-economic-impact-of-Geo-services---summary_2.pdf)
- LBS market in North America expected to grow 24.5% from 2012-2016. Largely due to growth of smartphones and tablets (www.cnbc.com/id/100862455)

Power of Location – Advertising



- “Location targeting is **holy grail** that we as advisers on behalf of our clients are looking for”
 - Sir Martin Sorrell, WPP CEO, MWC 2011

<http://www.guardian.co.uk/technology/appsblog/2011/feb/15/wpp-sir-martin-sorrell-mobile-apps>



The Value of Open

Open International Standards

Benefits for Technology Developers and Users



- Enhance Return on Investment
- Reduce risk
- Improve choice in the marketplace
- Avoid proprietary “lock in”
- Reduce costs
- Extend the life of current systems
- Rapidly mobilize new services
- Increase market and revenue potential
- Compete in / export to international markets



Creating Economic Benefit

German DIN Study



Standards promote worldwide trade, encouraging rationalization, quality assurance and environmental protection, as well as improving security and communication. Standards have a greater effect on economic growth than patents or licenses.

- "Economic Benefits of Standardization"
- Benefits to German economy of 17 billion Euros in 2010!

http://www.din.de/sixcms_upload/media/2896/DIN_GNN_2011_engl_akt_neu.pdf

Open Data Policy Growing Worldwide

European Union Open Data Portal **BETA**

europa.eu

Europa > Open Data Portal > Applications

Home Data Applications Linked Data About [Data provider's area](#)

Visualisation applications

The datasets you can access via the EU Open Data Portal contain raw data. Since data in this format can be difficult to read, applications are used to visualise and to reuse them. Discover the potential of EU open data with the applications created by data providers: see the gallery below.

Share your app
Have you used our data to create an application?
Please let us know!

- DG CONNECT**
The Digital Agenda Scoreboard
- JRC**
The European Forest Data Centre (EFDAC) Map Viewer
- JRC**
The European Forest Fire Information System

KENYA openData

Home About Kenya Open Data Data Catalogue

Unsaved View Save As... Revert

Based on Health Facilities in Kenya

Map locations: Maralal, Isiolo, Meru, Nanyuki, Nyahururu, Nakuru, Gilgil, Nyeri, Embu, Naivasha, Eldama Ravine, Maitani.

the WHITE HOUSE PRESIDENT BARACK OBAMA

BLOG PHOTOS & VIDEO BRIEFING ROOM ISSUES the ADMINISTRATION

Home • Briefing Room • Presidential Actions • Executive Orders

The White House
Office of the Press Secretary

For Immediate Release May 09, 2013

Executive Order -- Making Open and Machine Readable the New Default for Government Information

EXECUTIVE ORDER

Value of Open Data



- Improve government decision-making and accountability
- Encourage innovative applications by industry and citizens.
Some examples:
 - Health care cost reduction
 - Reduce crime
 - Identify and combat fraud
 - More efficient community / urban service planning
 - Stimulate broad innovation
- Stimulate commercial value-added information and services



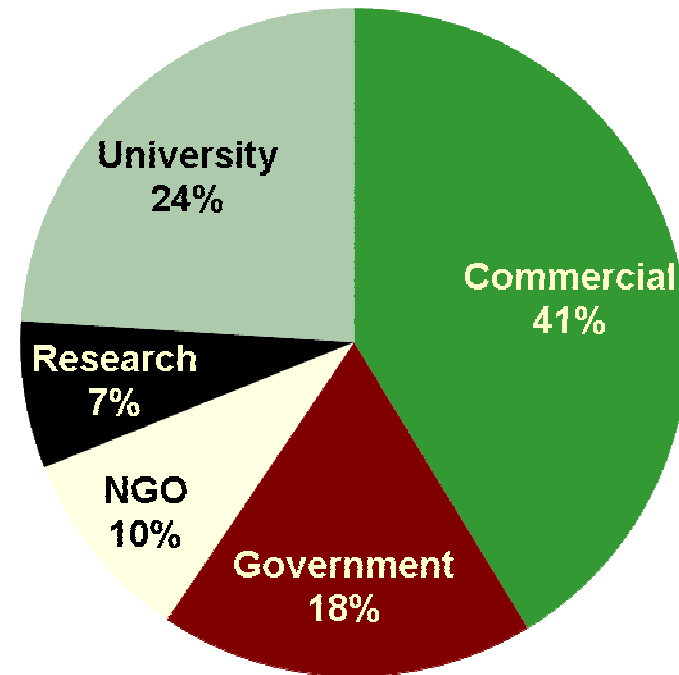
International Public – Private Partnerships in Geospatial

The Open Geospatial Consortium



Not-for-profit, international voluntary consensus standards organization; leading development of geospatial standards

- **Founded in 1994.**
- **475+ private and public sector members and growing**
- **39 standards freely available**
- **Hundreds of product implementations**
- **Broad user community implementation worldwide**
- **Alliances and collaborative activities with ISO and many other SDO's**

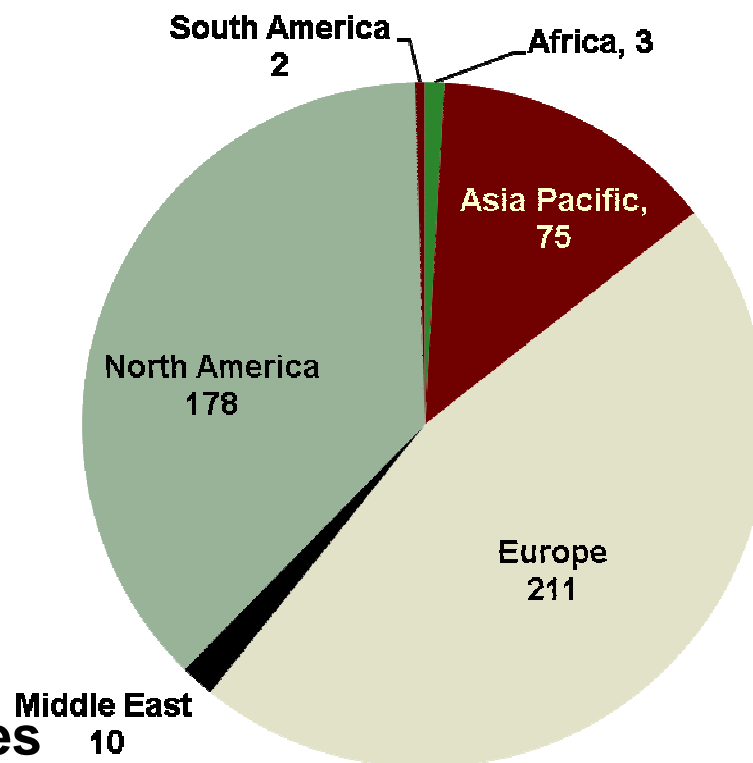


OGC at a Glance

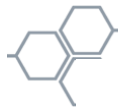


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Example Members (479)



LOCKHEED MARTIN



Geoscience Australia



United Nations



UK Met Office



SAAB

US Geological Survey



Ministry of Land, Transport and Maritime Affairs (S. Korea)



Autodesk



GE Energy



Natural Resources Canada



European Space Agency



OGC®

Leveraging The Power of Location Within and Across Disciplines



Education & Research



Sustainable Development



Infrastructure -
Transportation



Health



Energy



Aviation



Emergency Services,
Disaster Management



E -Government



Consumer Services,
Real Time
Information



Geosciences



OGC Supports a Full Range of Business Models



- Traditional Commercial Software
- Open Source Software
- Open Data
- Commercial data
- Value-added data



Case Study: Geospatial / Location Services in Mobile

Growing Emphasis on Mobile



- Mobile Growth
 - One GB per mobile user per day by 2020 – Y. Neuvo
 - Mobile device market to reach 2.6 billion units by 2016
 - App downloads to hit 56 billion in 2013
- Forecast Growth of LBS
 - LBS revenues in Europe to grow from € 325 million in 2012 at a compound annual growth rate of 20.5 % to € 825 million in 2017.
 - 40 percent of all mobile subscribers in Europe use LBS
- Geospatial services need to consider “the other end of the spectrum has customers who do not use laptops and computers. They use cell phones and tablets
 - Ola Rollen, President and CEO, Hexagon AB

http://www10.giscave.com/nbc/articles/view_article.php?section=CorpNews&articleid=1164623

<http://www.mobileworldlive.com/app-downloads-to-hit-56-billion-in-2013?elq=e035a906e35a4c289eebd3882c110c4e>

<http://www.berginsight.com/News.aspx>

<http://issuu.com/geospatialworld/docs/geospatial-world-annual-edition-january-2013>

The Mass Market -- Location Apps



Open GeoSMS Standard



Defines a short messaging service (SMS) encoding to exchange lightweight location information between different mobile devices or applications.

Open GeoSMS encoding for location is compatible with other OGC standards, such as those for sensor webs and earth imaging.

It is also compatible with other standards such as the OASIS Common Alerting Protocol (CAP) standard

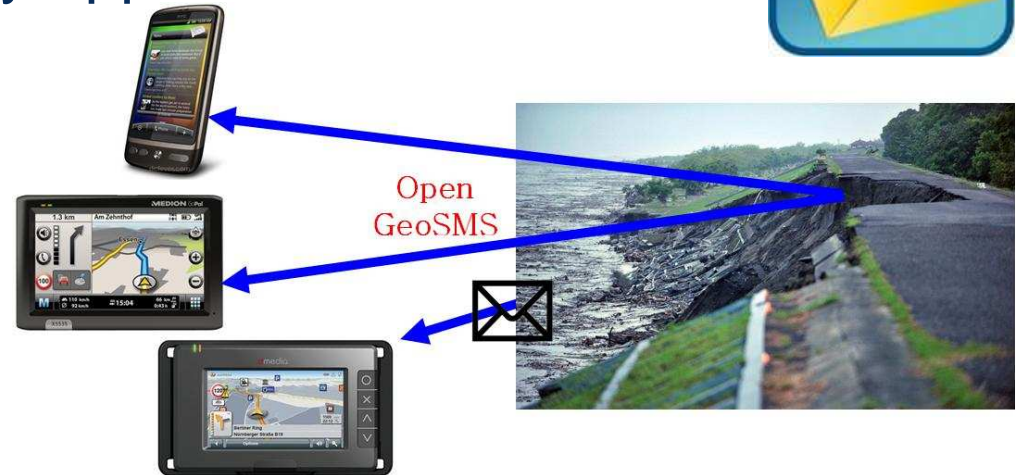
Location Enabling SMS Messaging: Open GeoSMS



- Significant potential for many applications

- Characteristics

- Multilingual
- Multi-device
- Harmonized with many existing applications
- Incorporates relevant ISO standards



Emergency Real-time Alert or Update

- Approved as an international Standard in 2011
- Submitted by ITRI, Taiwan. Core standards development team: ITRI, Hitachi, University of Alabama at Huntsville (USA), Beuth University for Applied Sciences Berlin, Germany.

OGC[®]

Open GeoSMS Adoption



Source: <http://www.usahidi.com/>



Source: Erik (HASH) Hersman. Flickr

- Ushahidi
- Sahana
- Commercial Apps



Sahana Technology and Features

- Environments
 - Linux, Windows, Portable App
 - VM, LiveCD, LiveUSB

Translation & Localization

- Pootle, Character sets
- Right-to-left scripting

Messaging:

- SMS, GPRS, e-mail

GIS & Open Standards:

- KML, WMS, GeoRSS, WFS
- EDXL, CAP, JSON, XML

Mobile Accessibility

- Android, iPhone, iPad
- Blackberry, NetBooks, Cellphones

May 2010 <http://www.SahanaFoundation.org>



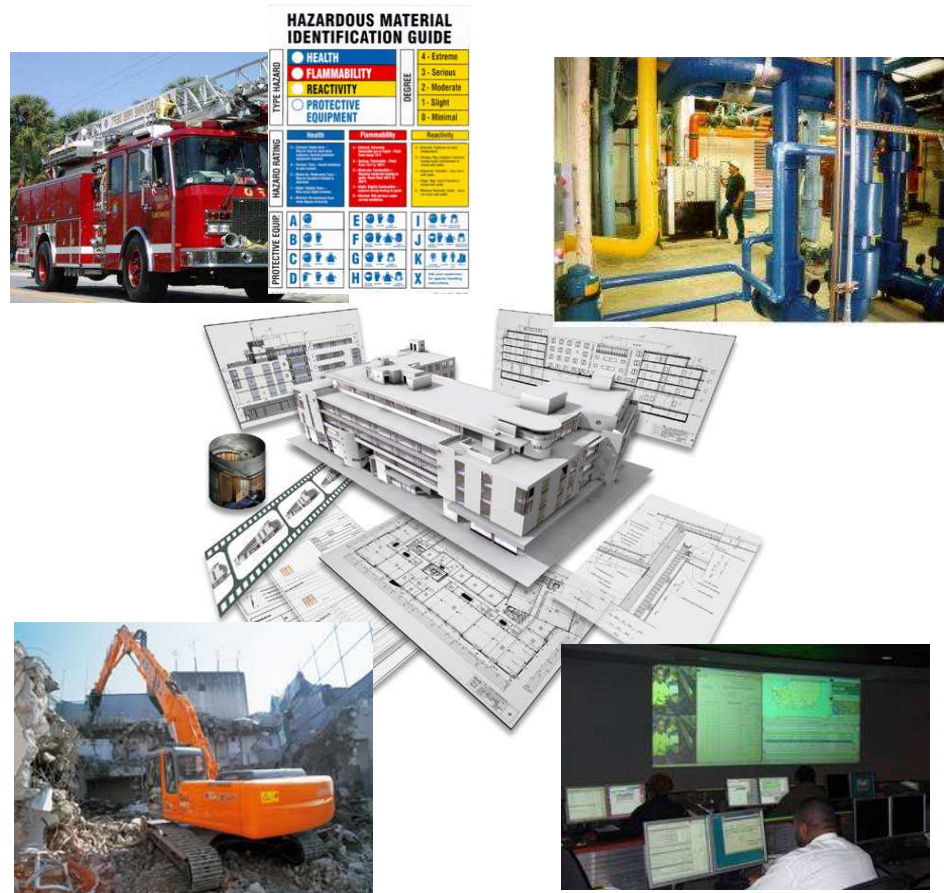


Smart Cities

Integration of Geospatial and Build Infrastructure



- Smart Cities
- Integration of Public and Private Sector Data Sources
 - 3D City Models
 - 3D Visualization Services
 - Location Services
 - Indoor Location / Navigation

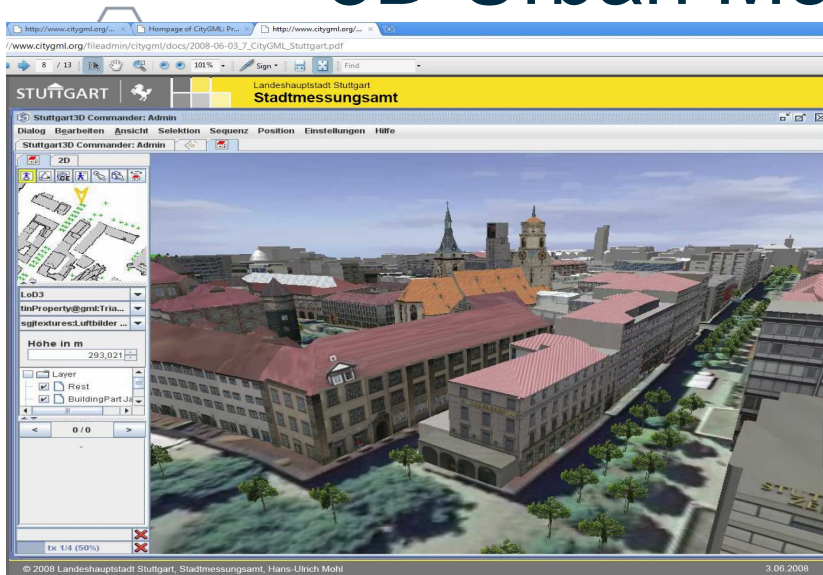


Adapted from BuildingSmart Alliance presentation

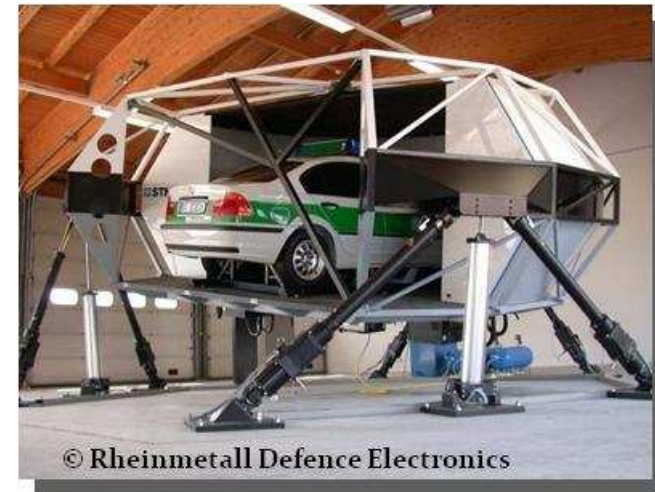
OGC CityGML

3D Urban Models / Applications

Emergency Responder Training



Source; Thomas Kolbe, Berlin TU



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

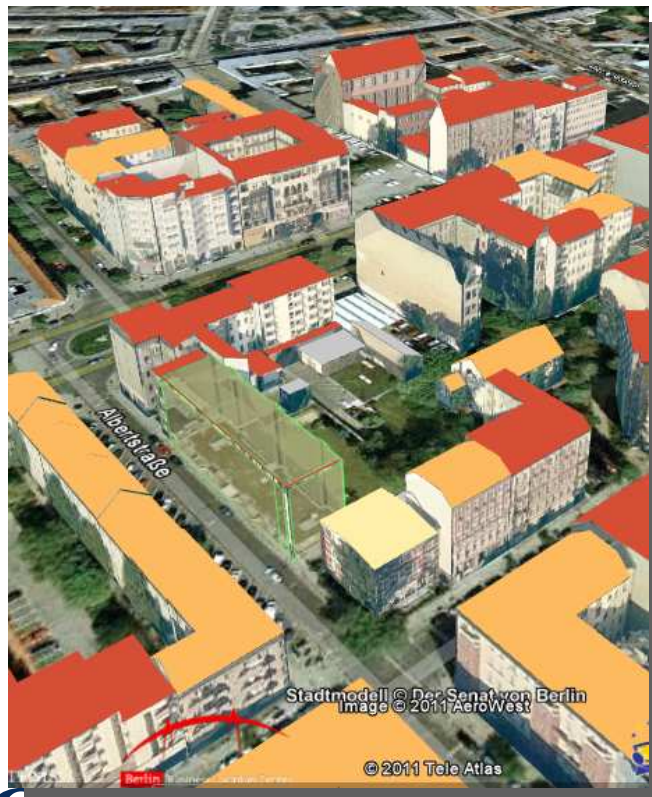
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Solar Potential Analysis / Solar Atlas Berlin



- Assessing energy production potential for photovoltaic and solar thermal heating. Required investments and achievable CO₂ reductions have been computed for each of the 550,000 buildings based on the roof surface segments, and were added to the 3D city model



BLDG_0003000a000afa2d

Photovoltaic suitability **3**

Address:
Albertstr. 14
Berlin

Available area for photovoltaic installations: 139,20 m²
Average solar radiation in a year: 1126,30 kWh/m²
Solar electricity yield: 18,81 MWh/a
Maximal installable power: 19,90 kW/m²

CO₂ Savings: 11,74 t per year
Investment volume: 69.650 €

CityGML

Stadtmodell © Der Senat von Berlin Image © 2011 AeroWest

Solar Atlas - Berlin Partner Project



- Berlin Partner represents a unique model that combines **sustainable business development and city marketing.**
- **55 percent** of the agency is in the hands of representatives from private business.
- **Roughly 170 companies** work together as part of a public-private partnership to support city marketing and promote Berlin's economic future.
- Focus on:
 - business development / investor services
 - foreign trade advice and consulting
 - city marketing

Source: Karin Teichmann, Head of Business Location Center, Berlin Partner GmbH



RENEWABLE ENERGY

CLEAN TRANSPORTATION

ENERGY EFFICIENCY & CONSERVATION

SURPRISE!

POI

You are here: [Home](#) / [Clean Energy](#) / Germany - 26% of Electricity from Renewable Energy In 1st Half of 2012

- Prior year renewable rates

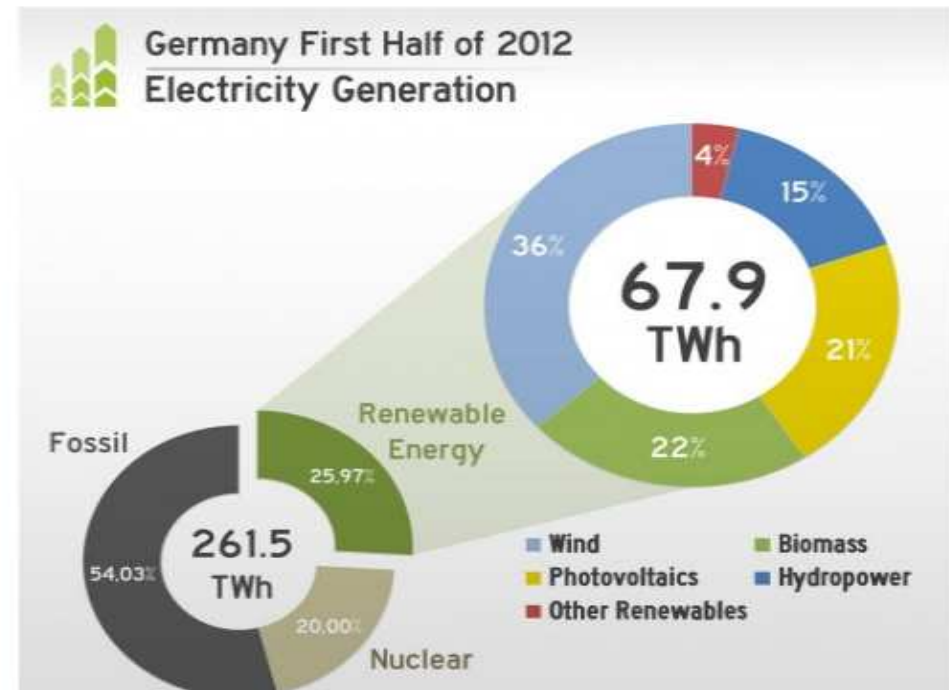
- 2011 20.56%
- 2010 18.3%

- Geospatial information and technologies are key

- Policy tools:
 - Feed-In Tariffs

Germany — 26% of Electricity from Renewable Energy in 1st Half of 2012

JULY 26, 2012 BY THOMAS 17 COMMENTS



<http://cleantechnica.com/2012/07/26/germany-26-of-electricity-from-renewable-energy-in-1st-half-of-2012/>



A Software Developer's Perspective

Use case: AFRICOM geospatial imagery distribution



 AFRICOM disseminates USB drives with portable HiPER LOOK™ WMS servers & nation-sized imagery

- Portable WMS software turns a laptop into a WMS server
- No software installation needed
- Enables GIS services on locally established networks
- Thick or thin clients exploit imagery on a variety of devices



  Portable WMS Server

Slide Source: Pixia

Pixia on Standards and OGC



“By implementing OGC WMS 1.1.1 and later OGC WMS 1.3.0, in one single swoop, PIXIA Corp enabled their enterprise HiPER LOOK™ web services to support all major GIS exploitation products.”

Rahul Thakkar
Vice President, Technology
PIXIA Corp

OGC®

Partial List of Implementers WMS 1.1.1, WMS 1.3



ABB

ABS Informatica S. L.

airGmap Aerospace Tech. Ltd

Autodesk, Inc.

Azavea

BELGIS Ltd.

Bentley Systems Inc.

BILGIGIS

Cadcorp

CARIS

Carmenta AB

CCI Co. Ltd.

CCI co. Ltd.

Chunghwa Telecom Co., Ltd.

CmWorld

Computer Vision Labs Pvt. Ltd.

con terra-Applied Info. Tech. Ltd.

CPA Systems GmbH

CubeWerx, Inc.

DACorp

Demis bv

Envitia

ERDAS Inc.

ESRI

G-Inno Systems Inc.

Galdos Systems Inc

GDSK

GE Smallworld

Generic Logic, Inc.

Geomatys

GEOMEX SOFT Co., Ltd.

Geotwo Co., Ltd

gvSIG association

HermeSys

IBL Software Engineering

interactive instruments GmbH

Intergraph

isIran

Itacasoft

JEOBROWSER

KSIC (Korea Geosp. Info. & Com. Co.)

lat/lon GmbH

LBS Plus co. Ltd.

Liquid Technologies

Luciad NV

M.O.S.S. Computer Grafik Systeme GmbH

Manifold Net Ltd

Maps@

MilSOFT ICT

NETCAD

Newgrove

NTT DATACORPORATION

Omniscale GmbH & Co. KG

PiriReis Bilisim Teknolojileri LTD.

Pitney Bowes Business Insight

Pixia Corporation

Politem LLC

Powel AS

Rolta India Ltd.

RSI SOFTECH India Pvt. Ltd.

Samsung SDS

Scanpoint Geomatics Ltd.

Skyline Software Systems, Inc.

Social Change Online Pty Ltd

SRP GmbH

STAR-APIC

SuperGeo Technologies Inc.

SuperMap GIS Technologies Inc.

SuperMap Software Co., Ltd

TatukGIS

University of Alabama

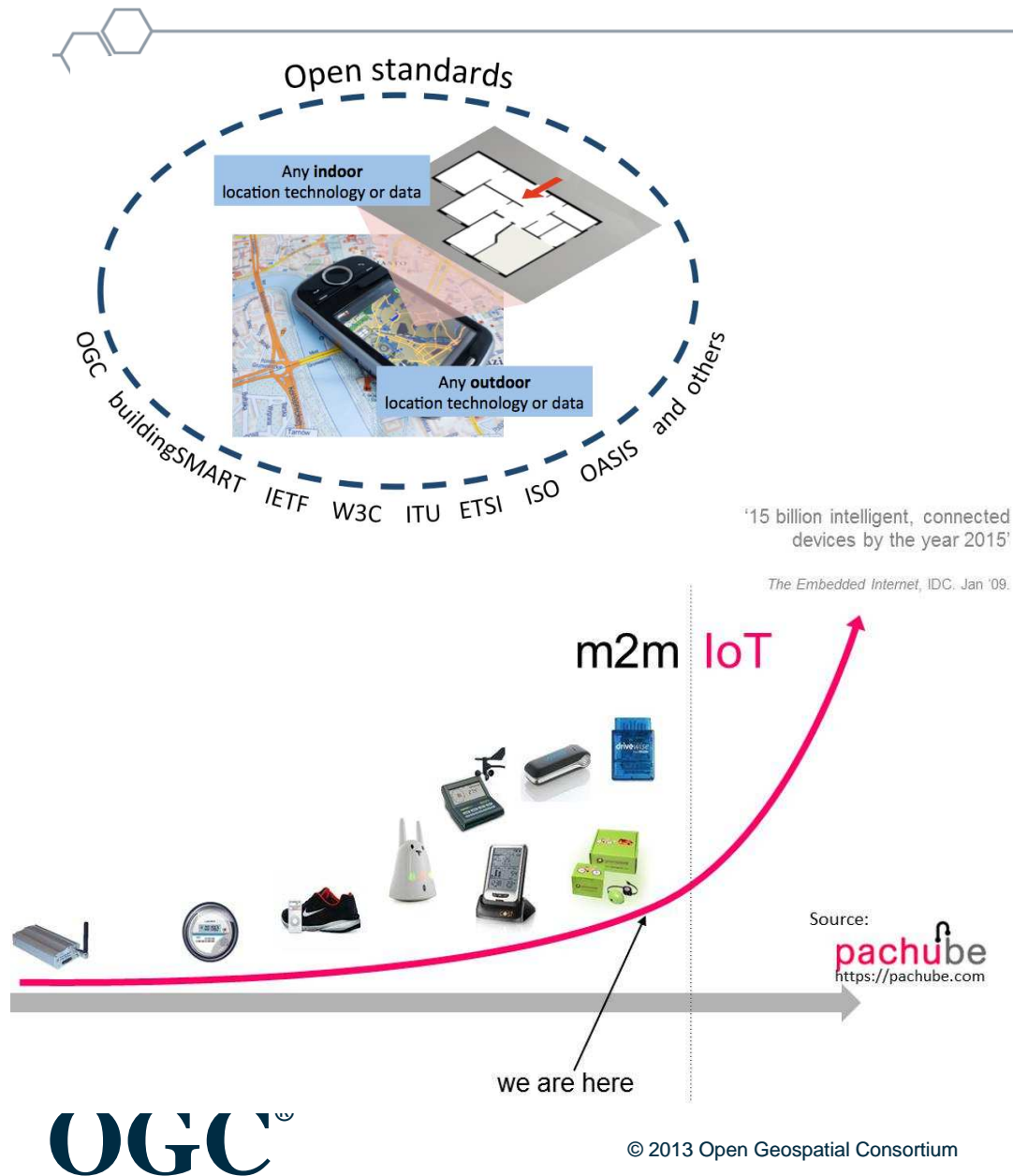
University of Reading

WaveGIS Technology Co.Ltd



Emerging Trends: Looking Further Down the Road

Emerging Emphasis Areas



- Open Mobile
 - Augmented Reality
 - Indoor Location
 - Embedded & Dynamic Sensors
- Internet of Things (IoT)
- Data Modeling
 - Predictive Analytics
 - Semantic Mediation
 - Linked Data
- Data Quality
 - Fitness for Use
 - Uncertainty
 - Provenance
- Cloud Computing



Location Enabling the Internet of Things

IoT is finally beginning to take shape



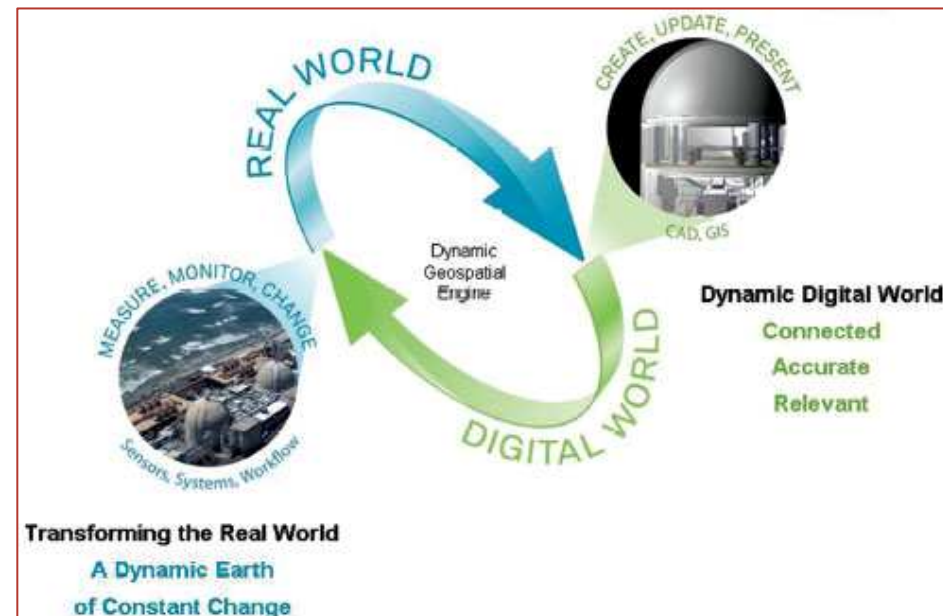
- IoT: long-prophesied phenomenon of everyday devices talking to one another — and us — online
 - Back in the '90s, big companies built systems to do tricks like this, but they were expensive, hard to use, and vendor-specific.
- Hackers now using increasingly inexpensive sensors and open source hardware, add intelligence to ordinary objects.
 - Sensor prices going down; sizes going down. Only limit is your imagination.
 - Cloud services – “If This Then That” or Cosm - let devices interact in unexpected ways
- IoT has reached the “Apple II stage”
 - when a new technology finally becomes easy enough to use that thousands of people start using it.

http://www.wired.com/opinion/2012/12/20-12-st_thompson/

Major industrials have been preparing for IoT

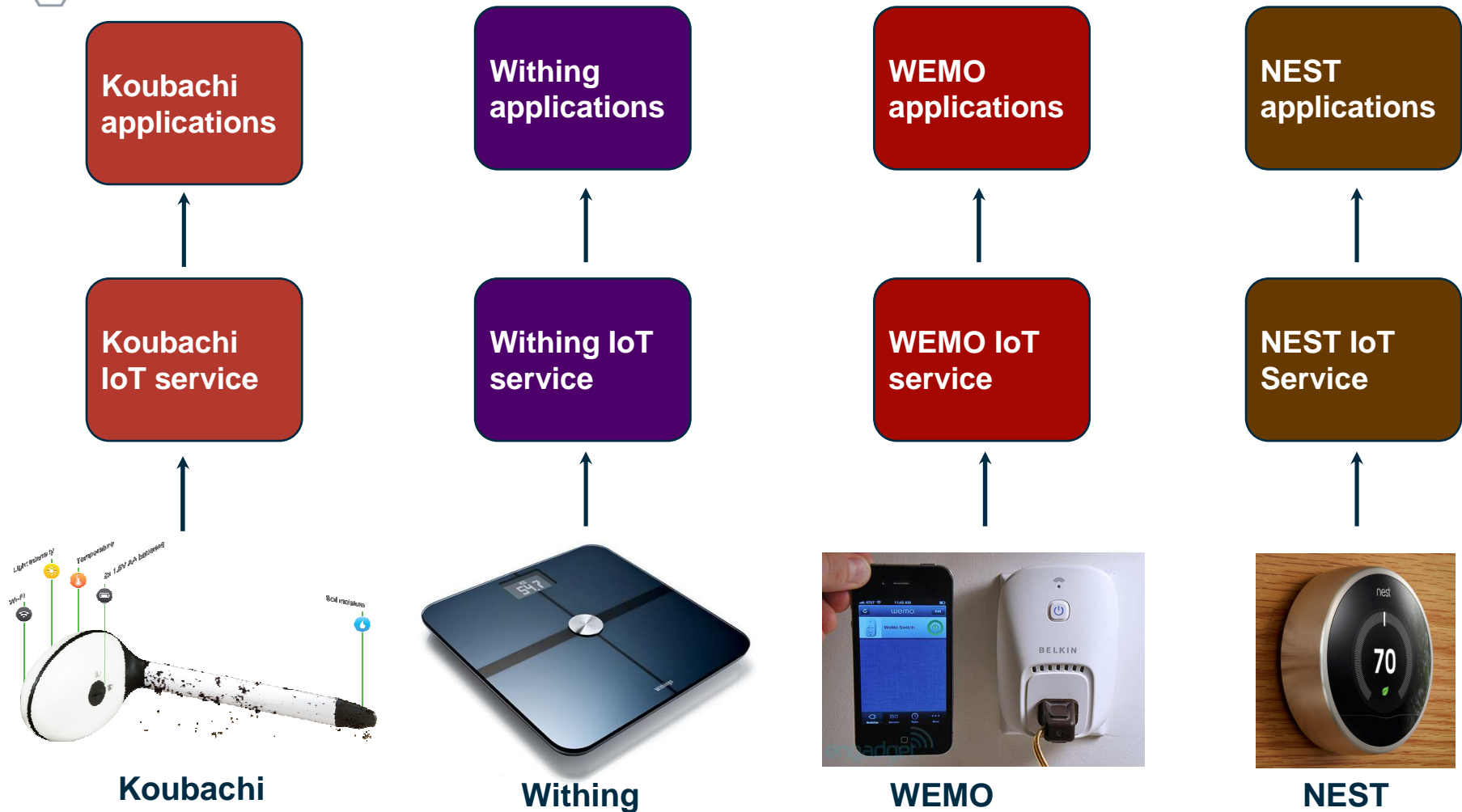


- “In 2008, the number of devices connected to the Internet exceeded the number of people on Earth. By 2020, there will be 50 billion devices connected” - CISCO
- Internet of things to give \$10-15 trillion boost to global economy:
General Electric



"Redefining the language of geospatial industry"
Ola Rollen, President and CEO, Hexagon AB.

OGC Sensor Web Enablement Internet of Things

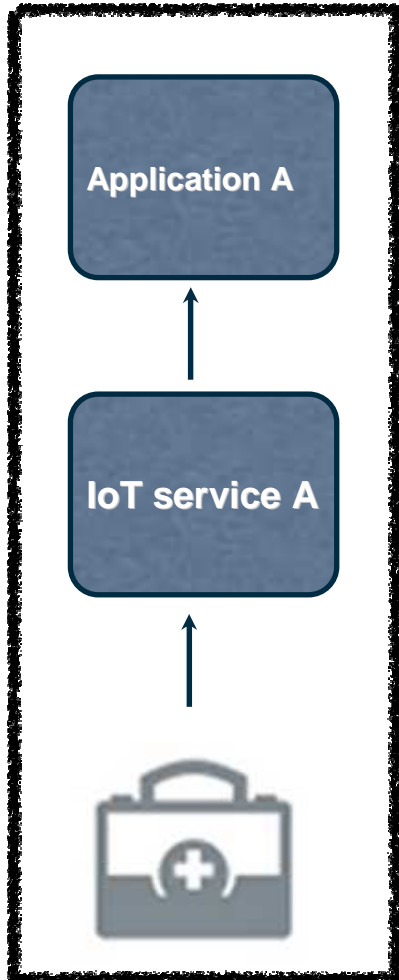


Today: Proprietary sensor data formats and service interfaces

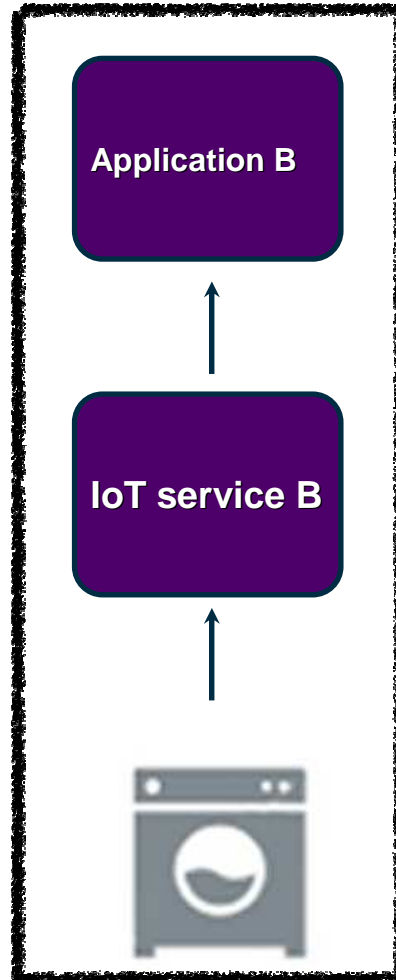
No “World-Wide Web of Things”



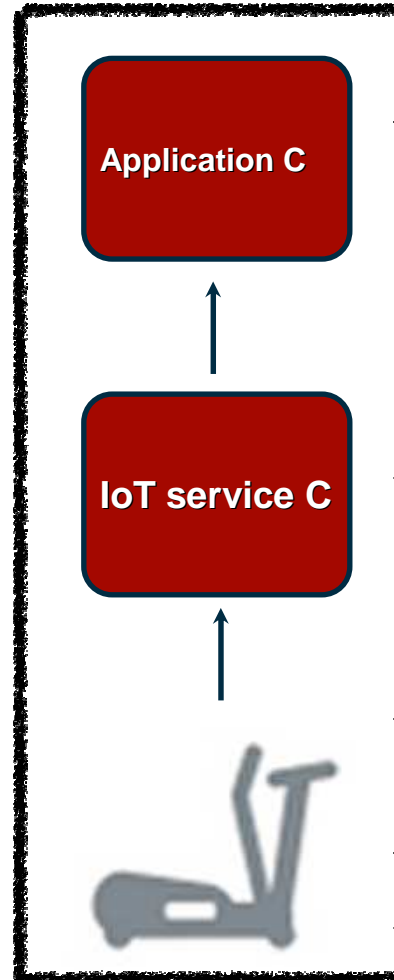
Silo A



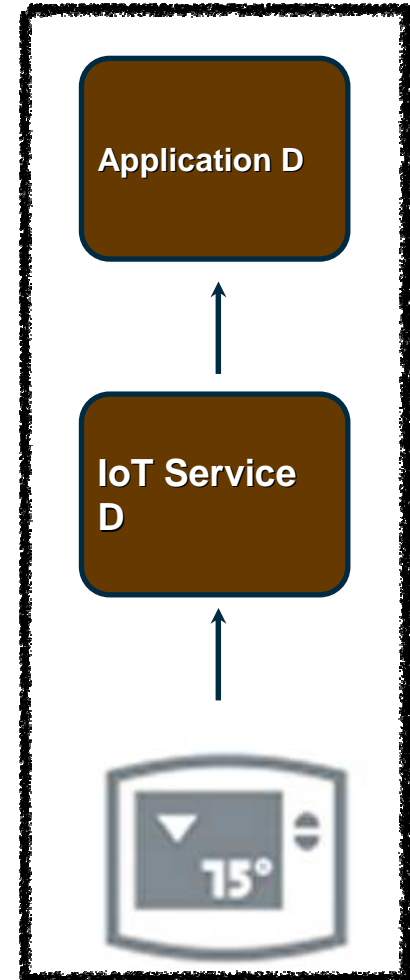
Silo B



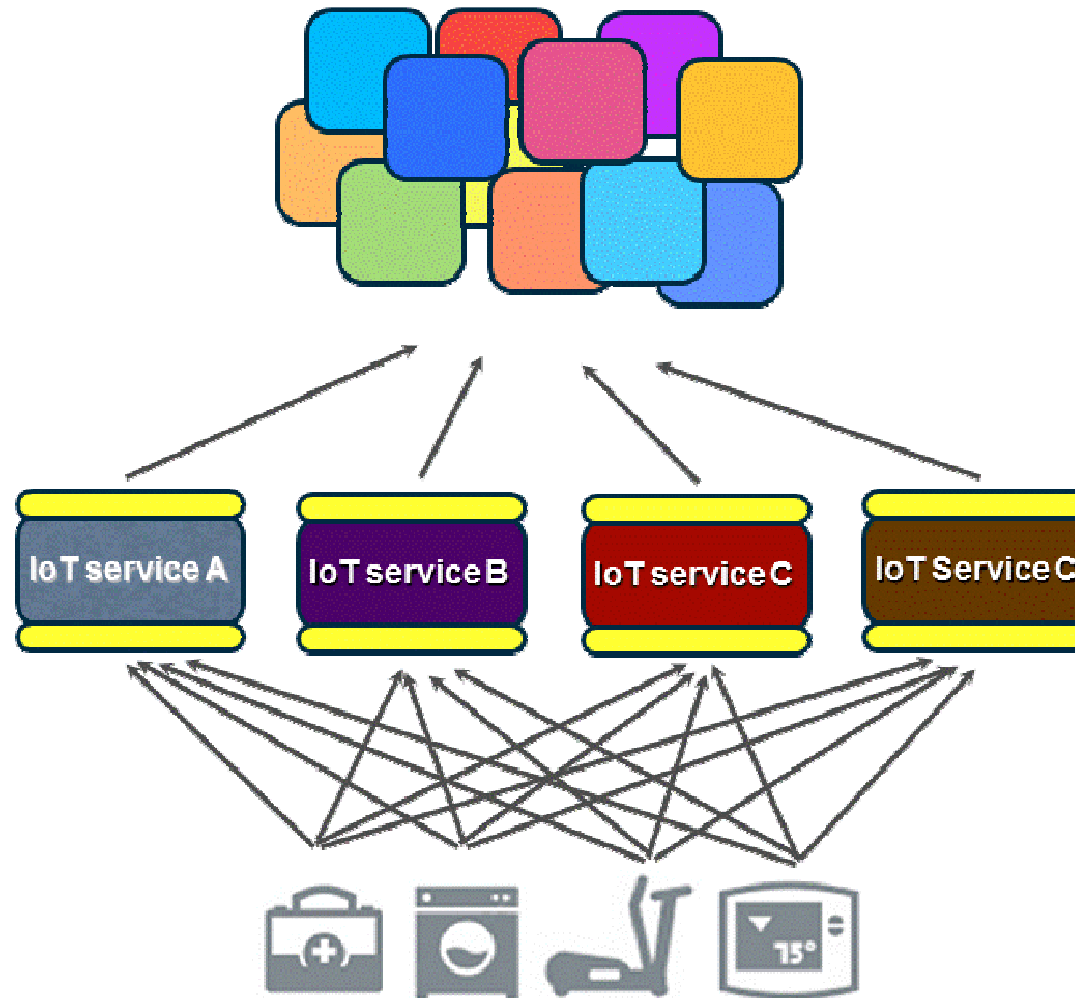
Silo C



Silo D



Interoperability / Innovation - Mashing-up the IoT Data Infrastructure



Source: OGC Sensor Web Enablement Internet Of Things Standards Working Group
<http://www.opengeospatial.org/projects/groups/sweiotswg>



The Indoor Location Challenge

Indoor Frontier



- The simple reason LBS has not quite yet lived up to the promise: people spend nearly 90% of time indoors
 - Joep van Beurden, CEO CSR Plc
- Indoor location brings a new dawn in mapmaking
 - Christof Hellmis, Vice President-Map Platform, Nokia
- Indoor infighting means technology companies are duplicating their efforts at great expense - The Economist

<http://informedinfrastructure.com/2668/interior-location-and-mapping-prompted-by-innovations-that-improve-position-and-navigation/>

<http://issuu.com/geospatialworld/docs/geospatial-world-annual-edition-january-2013>

<http://www.economist.com/news/technology-quarterly/21567197-navigation-technology-using-satellites-determine-your-position-only-works>

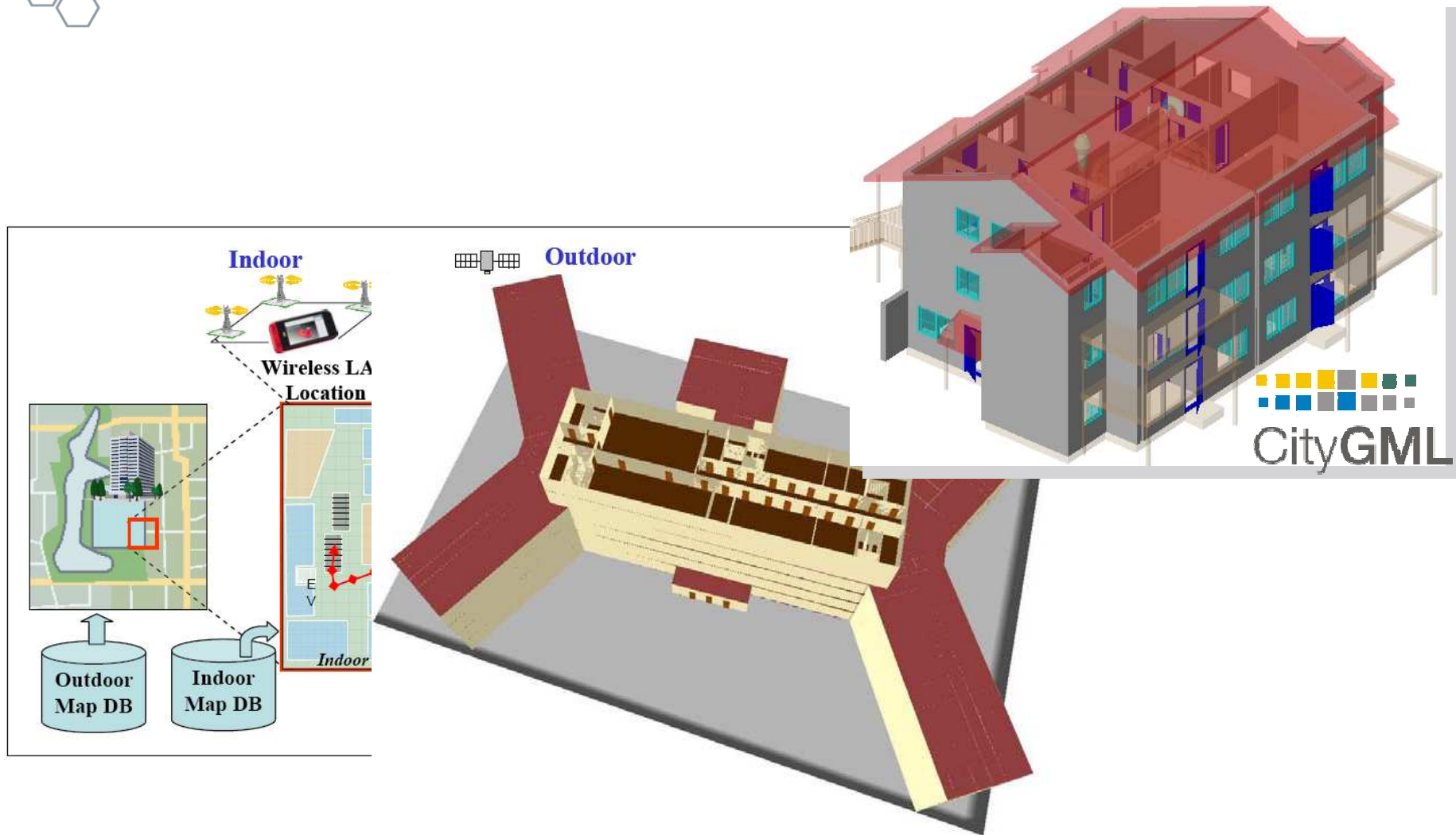
Indoor location Focus Areas



Develop framework for Indoor Location and Navigation
Testbed

1. Position Determination
2. Indoor Maps
3. Navigation and Routing
4. Indoor location quality

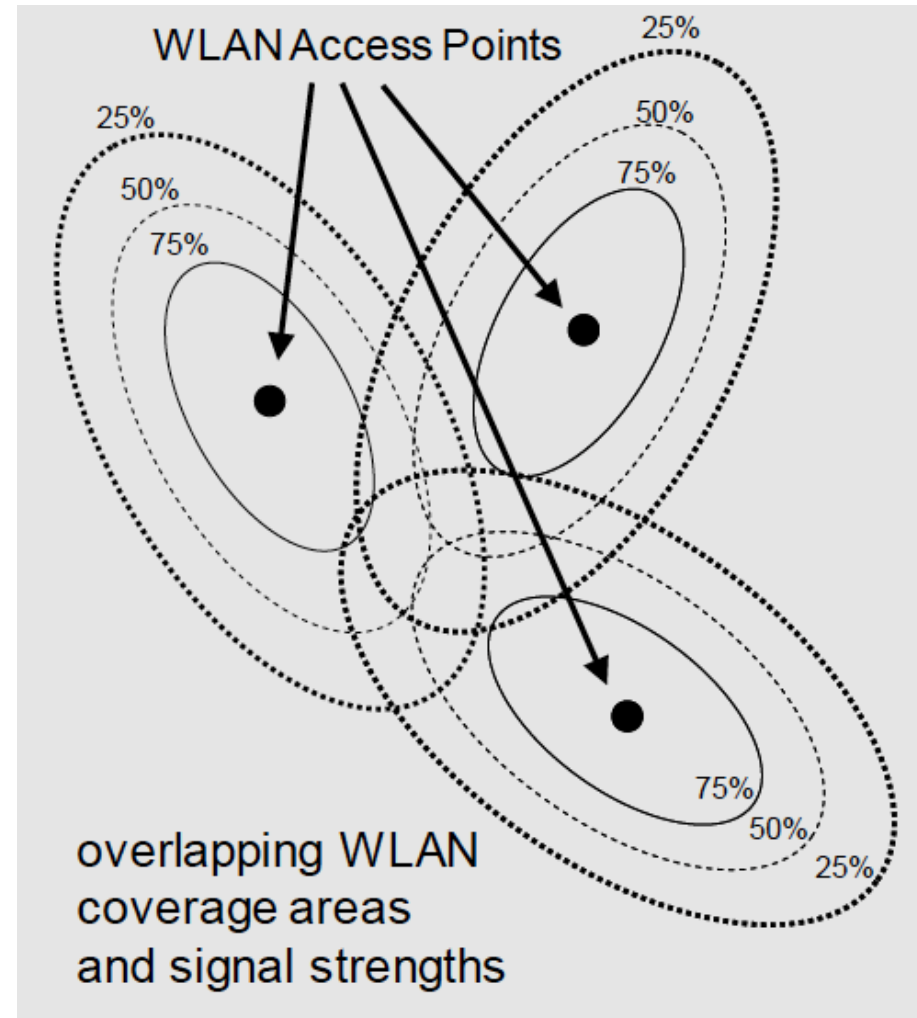
Integrated Outdoor / Indoor location/navigation



Indoor Location Technologies



- Barcodes
- Radio Frequency ID (RFID)
- Infrared beacons
- Ultrasound
- Bluetooth
- Wireless LAN (WLAN)
- Pseudo-GPS
- Cellular radio network
- Video and photo localisation
- Other sensors on device



Graphic from Thomas Kolbe.

In Summary



- Geospatial information and technologies are experiencing significant market growth
- Open standards provide an excellent mechanism to integrate technologies quickly and lower costs and effort for both technology providers and users
- Open standards help technology providers move quickly into new markets internationally
- Seek processes that unite technology users and providers to work collaboratively to develop, test, validate new geospatial technologies, standards and best practices

Thank You



OGC Technical Committee Meeting
United Nations, 2005

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OGC[®]



OGC Technical Committee Meeting
Taichung, Taiwan. June 2011