Geospatial Services

Outline

- Geospatial standards and formats
- Web Services
- Open Geospatial Consortium (OGC)
  - Web Map Services (WMS)
  - Web Feature Service (WFS)
  - Web Coverage Service (WCS)
  - Web Terrain Service (WTS)
  - Web 3D Service (W3DS)
- Federating Geo Services
- Open Web APIs
- GeoRSS
- Final Remarks

Geospatial Standards & Formats, I

- National (or military/intelligence) mapping agencies (NMA) have developed their own standards, or adopted (and adapted) from other (bigger) NMAs
- US standards have dominated the scene
- Some large vendors, have also developed standards that are widely used, e.g., the ESRI Shapefile.
- International standards are emerging
- Simple APIs are also emerging

Geospatial Standards & Formats, II

- 1980s
  - SDTS (US), NTF(UK), DIGEST (NATO), Digital Mapping Format (JP), etc.
  - **To avoid the complexity of GI transformation**
- 1990s
  - FGDC (US), CEN/TC187 (EU), "NSDI Committee" by ministries related to GIS (JP)
  - **To establish the national or regional spatial data infrastructure and to realize the interoperability of GI**
- 1994
  - TC211 (ISO)
  - **To establish global standards concerning GI**

ISO/TC 211 Geographic Information/Geomatics

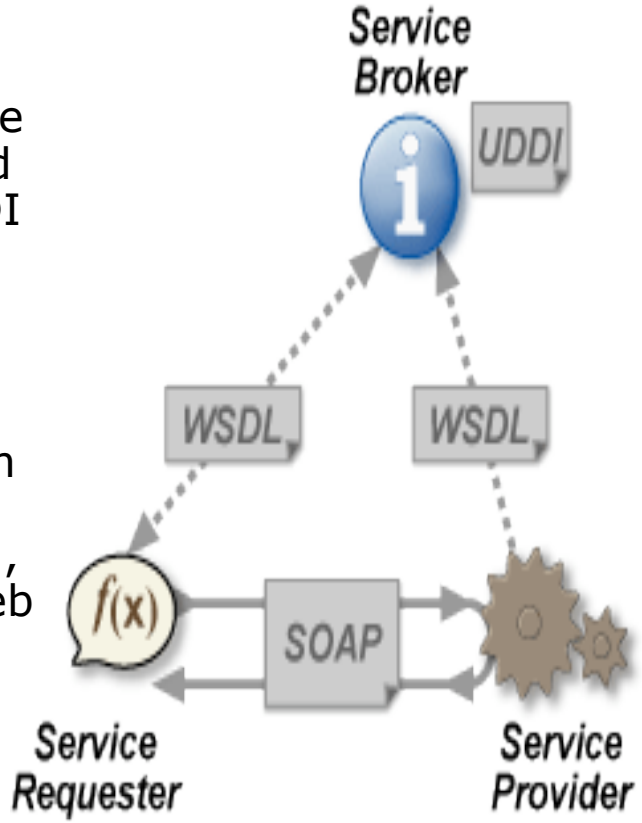
- Standardization in the field of digital geographic information. This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.
- These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.
- The work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

SOSI:
Samordnet Opplegg for Stedfestet Informasjon

- SOSI-standarden ble første gang utgitt i 1987 (Versjon 1.0). Standarden revideres og utvikles kontinuerlig. Det foretas en tilnærming til internasjonale standarder som er under utvikling.
- SOSI-standarden omhandler teknikk for
  - datadefinisjoner av geografisk informasjon, herunder standardiserte beskrivelser av
    - geometri og topologi,
    - datakvalitet,
    - koordinatsystemer,
    - metadata i form av informasjon om eier,
    - opplesning på data,
    - områdeavgrensning osv.
  - Den omfatter også konkrete databeskrivelser for ulike datatyper eller anvendelsesområder, noe som utgjør en vesentlig del av omfanget.
- Et vesentlig bidrag, først i europeisk standardisering (CEN), deretter internasjon standardisering (ISO/TC211)

Web Services

- *Web services* describes a standardized way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone.
- XML is used to tag the data, SOAP (*Simple Object Access Protocol*) is used to transfer the data, WSDL (*Web Services Language*) is used for describing the services available and UDDI (*Universal Description, Discovery and Integration)* is used for listing what services are available.
- The applications interface, not the users.
- Web services allow different applications from different sources to communicate with each other without time-consuming custom coding, and because all communication is in XML, Web services are not tied to any one operating system or programming language. For example, Java can talk with Perl, Windows applications can talk with UNIX applications.



Open Geospatial Consortium (OGC)

- OGC is a non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services. Through our member-driven consensus programs, OGC works with government, private industry, and academia to create open and extensible software application programming interfaces for geographic information systems (GIS) and other mainstream technologies.
- Vision**:**
  - A world in which everyone benefits from the use of geospatial information and supporting technology.Approximately 80% of business and government information has some reference to location, but until recently the power of geographic or spatial information and location has been underutilized as a vital resource for improving economic productivity, decision-making, and delivery of services. We are an increasingly distributed and mobile society. Our technologies, services, and information resources must be able to leverage location, (i.e., my geographic position right now) and the spatial information that helps us visualize and analyze situations geographically.
  - Products and services that comply to OGC's open interface specifications enable users to freely exchange and apply spatial information, applications and services across networks, different platforms and products.
- Mission**:**
  - To lead the global development, promotion and harmonization of open standards and architectures that enable the integration of geospatial data and services into user applications and advance the formation of related market opportunities.

WMS I

- An easy way to request a map image from a server, by a
  - http key/valye request, or
  - XML formatted request
- Two mandatory requests:
  - The GetCapabilities request returns an XML doument describing what the server offers
  - The GetMap request, yes, you guessed right, returns a map (raster image) from a specified area, in a specified size, whith specified content (layers), etc.

WMS II

- http://www.demis.nl/mapserver/request.asp?Service=WMS&Version=1.1.0&Request=GetMap&BBox=-20,-40,60,40&SRS=EPSG:4326&Width=400&Height=400&Layers=Countries,Borders,Coastlines&Format=image/gif



Web Feature Service (WFS)

- The basic WFS allows querying and retrieval of features.
- Get or Query features based on spatial and non-spatial constraints
- The WFS-T(ransactional) specification defines interfaces for describing data manipulation operations of geographic features. Data manipulation operations include the ability to:
  - Create a new feature instance
  - Delete a feature instance
  - Update a feature instance
- Delivers GML formatted vector data

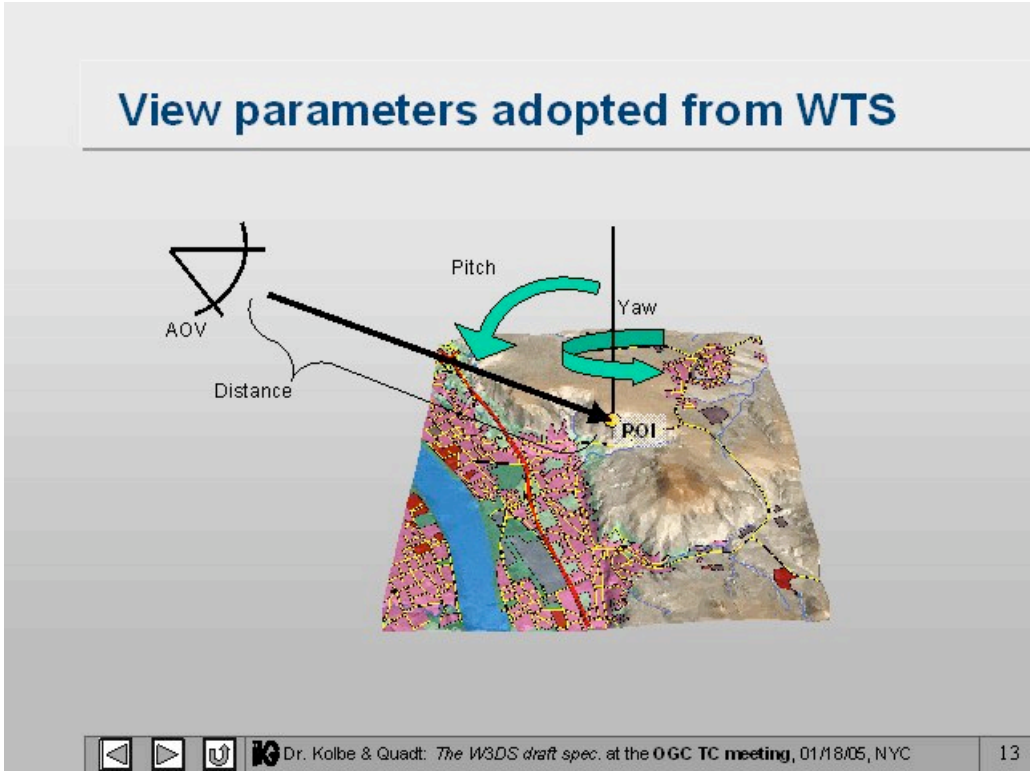
Geographic Markup Language (GML)

- ...
- <Feature fid="142" featureType="school" >
  - <Description>Balmoral Middle School</Description>>
  - <Property Name="NumFloors" type="Integer" value="3"/>
  - <Property Name="NumStudents" type="Integer" value="987"/>
  - <Polygon name="extent" srsName="epsg:27354">
    - <LineString name="extent" srsName="epsg:27354">
      - <CData>
        - 491888.999999459,5458045.99963358
        - 491904.999999458,5458044.99963358 491908.999999462,5458064.99963358
        - 491924.999999461,5458064.99963358 491925.999999462,5458079.99963359
        - 491977.999999466,5458120.9996336 491953.999999466,5458017.99963357
      - </CData>
    - <LineString>
  - </Polygon>
- </Feature>
- ...

Web Coverage Service (WCS)

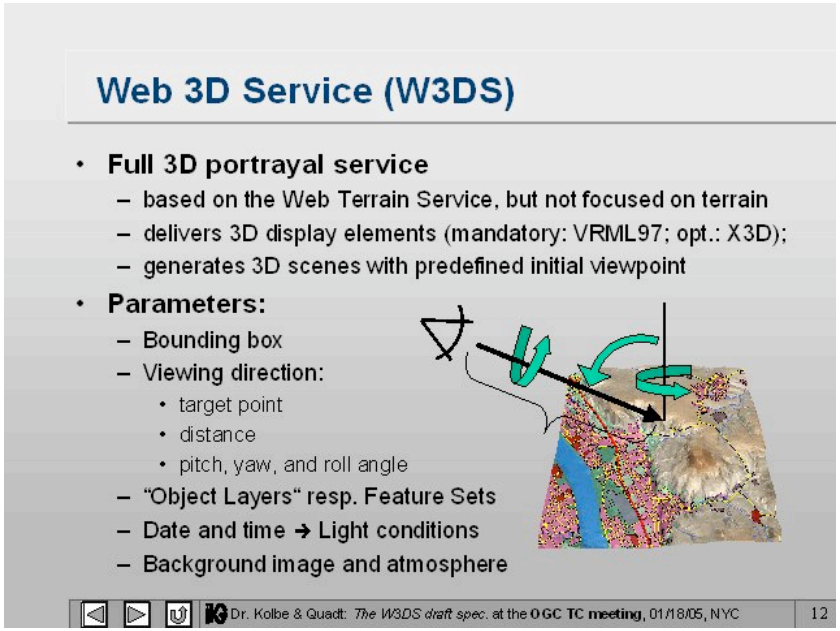
- Terrain data
- Elevation Models

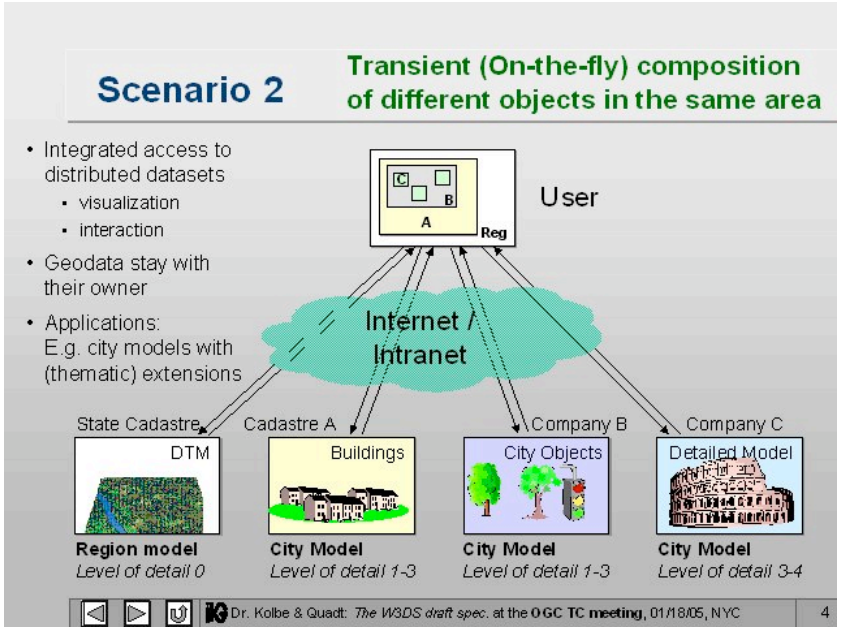
Web Terrain Service (WTS)



Web 3D Service (W3DS)

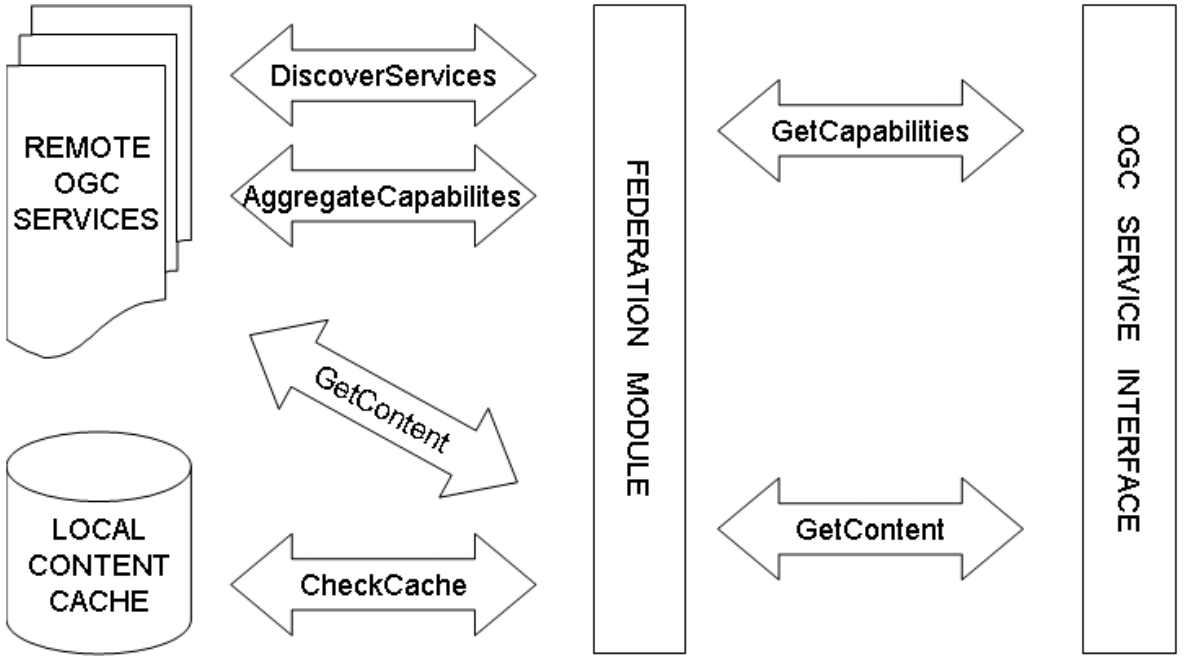
- Proposed specification
- http://www2.ikg.uni-bonn.de/kolbe/vortraege/W3DS_OGC_NYC_2005/sld001.htm
- *Global Models and the W3DS Specification - Solutions and Challenges*
- http://www.ia.hiof.no/~gunnarmi/papers/misund_nextgencity05.pdf





Federating Geo Services

- *OneGlobe - Building and Browsing a Transient Digital Earth from Distributed, Heterogeneous Sources*. http://www.ia.hiof.no/~gunnarmi/papers/scangis05misund.pdf



Open APIs

- http://www.ia-stud.hiof.no/~arneehan/sar/map_services_module.html
  - Google Maps
  - Google Earth
  - Yahoo! Maps
  - MS Map Point
  - ESRI ArcExplorer

GeoRSS

- Plain vanilla RSS extended with location information
- Comes in several flavours
- GeoRSS clients typically pins the RSS entries on a map, and by clicking on a pin you get to the entry URL

Summary

- Standardized service oriented protocols (e.g. the OGC stack):
  - Make it possible to build a variety of clients with unlimited functionality and on any suitable platform.
  - Open gateways to a variety of services.
  - Many services – Many clients
- Vendor specific APIs (Google and the rest of the pack):
  - Make it possible to build a variety of clients, in general with strict limitations regarding functionality, platform and deployment.
  - The serviced information originates from one single source. Simple third party features, such as POIs, may be overlayed the core model.
  - One service – Many clients
- Why don't Google et. al. offer services complying to relevant international standards, such as the OGC stack? Or, when are the going to do it? And, what's in it for the big guys, going OGC compliant?
  - If we don't get the data, we buy it, ...the company providing the data, ...
  - And, why follow standards, when we can make them ourselves?

A Dream…

- An open content rival to Google Maps
- Based on the Federating Geo Services Paradigm, wrapped as a WMS compliant service
- One entry point to detailed map data on a global scale
- And after that, a corresponding Federating Web Map Feature…, based on collaborative efforts.
- This is more or less the main rationale behind Project OneMap

- Who want to contribute?
- Excellent topics for master projects!