CropBase/GRASP
AgriGIS Workshop

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The NGI Team

Jeremy Morley [NGI Geoscience Theme Leader]

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To be appointed [Researcher focussed on system development]

Suchith Anand [Researcher – open source / e-Learning]

Amir Pourabdollah [Researcher – quality control of crowd-sourced data]

PhD + student contributors

NGI covers a range of core disciplines such as geography, surveying, remote sensing, computer science and mathematics.

For GRASP we will provide geospatial science + IT skills - the thematic science comes from Sutton Bonington colleagues.

The NGI contribution falls under the umbrella terms of “Spatial Data Infrastructures” and spatial modelling.

Spatial Data Infrastructures (SDI)

Term ‘SDI’ in use since 1991 (McLaughlin)[1]

Definition used for US NSDI: **“the technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data”**[2].

[1] McLaughlin, J. D. (1991) “Towards national spatial data infrastructure”, Proc. Canadian Conference on Geographic Information Systems, Ottawa, pp 1-5.

[2] http://www.whitehouse.gov/omb/circulars/a016/print/a016_rev.html#background

"Non-authoritative" data sources

SDI's tend to represent the top-down "authoritative" governmental view of the world - but increasingly data comes from a much wider range of sources such as "crowd-sourcing" [includes volunteered data, data collected by citizens perhaps under guidance of specialists and even data mined from web sources including social media sites].

Contribution from "crowd-sourcing"

Crowd Sourcing		Authoritative Government Data
'Non-systematic and incomplete coverage	vs	Systematic + comprehensive coverage
Near *'real-time'* data collection + continuing data input allowing trend analysis	vs	*'Historic'* and *'snap-shot'* map data
Free *'un-calibrated'* data but often at hi-res and up-to-the-minute	vs	Quality assured *'expensive' data.*
'Unstructured' and mass consumer driven metadata and mash-ups.	vs	*'Structured'* and defined metadata but often in rigid ontologies.
Unconstrained capture + distribution from *'ubiquitous'* mobile devices with hi-res cameras and positioning capabilities	vs	*'Controlled'* licensing, access policies and digital rights.
Simple' consumer driven web services for data collection + processing.	vs	'*Complex* 'institutional survey + GIS applications

Jackson, M. J., Rahemtulla, H. + Morley, J. (2010). "The Synergistic Use of Authenticated + Crowd-Sourced Data for Emergency Response", Proc, 2nd Int Workshop on Validation of Geo-Information Products for Crisis Management (VALgEO), 11-13/10/10, Ispra, Italy, pp 91-99.
http://globesec.jrc.ec.europa.eu/workshops/valgeo-2010/proceedings

The GRASP Project Objectives (i)

- Develop a pilot interoperable platform compliant with GEOSS for geospatial risk assessment in agriculture in relation to species and pests.

- Undertake open source/standards based research on a framework for cross-disciplinary geospatial workflows integrating data from many sources (e.g. satellite imagery, mapping, crowd-sourced information), exploiting genetic trait diversity in animal and crop breeding to support food security analysis at different scales.

The GRASP Project Objectives (ii)

- Support integrated workflow modeling and geocomputation to enable uncertainty assessments of models supporting food security planning scenarios linked to crop selection and climate change.

- Work with UK + Malaysian partners within the “WikiCrop/CropBase” framework to support the Crops for the Future Research Centre initiative particularly on under-utilised crops.

- Engage with wheat and bambara nut pathology, entomology and breeding communities developing models relevant to the GRASP generic model for agricultural trait diversity in relation to the changing environment, pests, pathogen pressures and climate.

Key themes

- Spatial data conflation – data integration and semantic alignment
- Spatial data management
- Service harmonisation and interoperability
- Spatial modelling
- Error propagation and uncertainty modelling

- Carried out within a loosely-coupled and distributed web services environment

The Group on Earth Observations

The Group on Earth Observations (GEO) is coordinating efforts to build a Global Earth Observation System of Systems (GEOSS.

GEO was launched at the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialized countries <because> “international collaboration is essential for exploiting the growing potential of earth observations to support decision making in an increasingly complex and environmentally stressed world”.

The Group on Earth Observations

GEO is a voluntary partnership of governments and international organizations. March 2012, GEO's Members included 88 Governments plus the EC + 64 intergovernmental, international, and regional organizations with a mandate in Earth observation or related issues.

GEOSS has a 10-Year Implementation Plan for the period 2005 to 2015. The Plan defines a vision statement for GEOSS, its purpose and scope, expected benefits, and the nine "Societal Benefit Areas" of disasters, health, energy, climate, water, weather, ecosystems, agriculture and biodiversity.

Global Earth Observation System of Systems

GEOSS is a global system for environmental data discovery + access and provides decision-support tools allowing decision makers to access a wide range of information at their desk.

It links together observing systems + supports the development of new systems where gaps exist. It promotes standards so that data from different instruments can be combined into coherent data sets.

The '**GEOPortal**' offers a single Internet access point for data, imagery and analytical software packages relevant to all parts of the globe.

For information, see **www.earthobservations.org/geoss.shtml**

NGI GRASP Research topics on qualityinclude:

- **Understanding the geographic dimension of the data + issues associated with spatially conflating or linking the authoritative and "crowd-sourced" data.**
- **Processing the crowd-sourced data using data validation, data cleaning techniques, and topological and other forms of structuring prior to conflation with authoritative data.**
- **Using the authoritative data as a template within which crowd-sourced data can be assessed.**
- **Dynamic model-based validation and iteration through directed collection using mobile devices.**

COBWEB – Citizen Observatory Web Project

- Aim: to develop a citizen's "observatory framework" to make it easier for people to collect environmental information suitable for use in policy formation and governance and using World Network of Biosphere Reserves as test cases.
- European Community funded - €6.5m over 4 yrs. Started 1/11/12
- Partners from UK, Germany, Greece, Netherlands and Ireland
- NGI has 77 person months funded (€637k)
- NGI research focus is on:
  - (i) Design, build + test prototype mobile phone data collection system
  - (ii) Design, build, test the back-end system for dynamic model-based data validation and quality assurance.

A way forward? Prototype development

(i) Agree on a manageable test use case with some key data sets [wheat and/or bambara nut use-cases]

(ii) Collect, collate and review the data, to assess what would be needed to make this data interoperable and fit for purpose .

(iii) Define data model and input data to a (spatial) database (Postgres)

(iv) Define and carry-out a project to clean the data, add missing essential meta-data, and harmonise ontologies and geospatial reference models if needed. [Catalogue data]

(v) Design portal for the discovery, access and dissemination of data, services and results. [Later stage?] Use of WMS for Map mash-ups(?)

(vi) Identify open source software for the processing and modelling of the data.

(vii) Write any necessary additional client-level software for modelling of data and output of results. [error modelling / modelling of uncertainty]

(viii) Use (adapt) open source software for the output /mapping of results.

(ix) Publish data and any developed services / register as GEOSS data /services.

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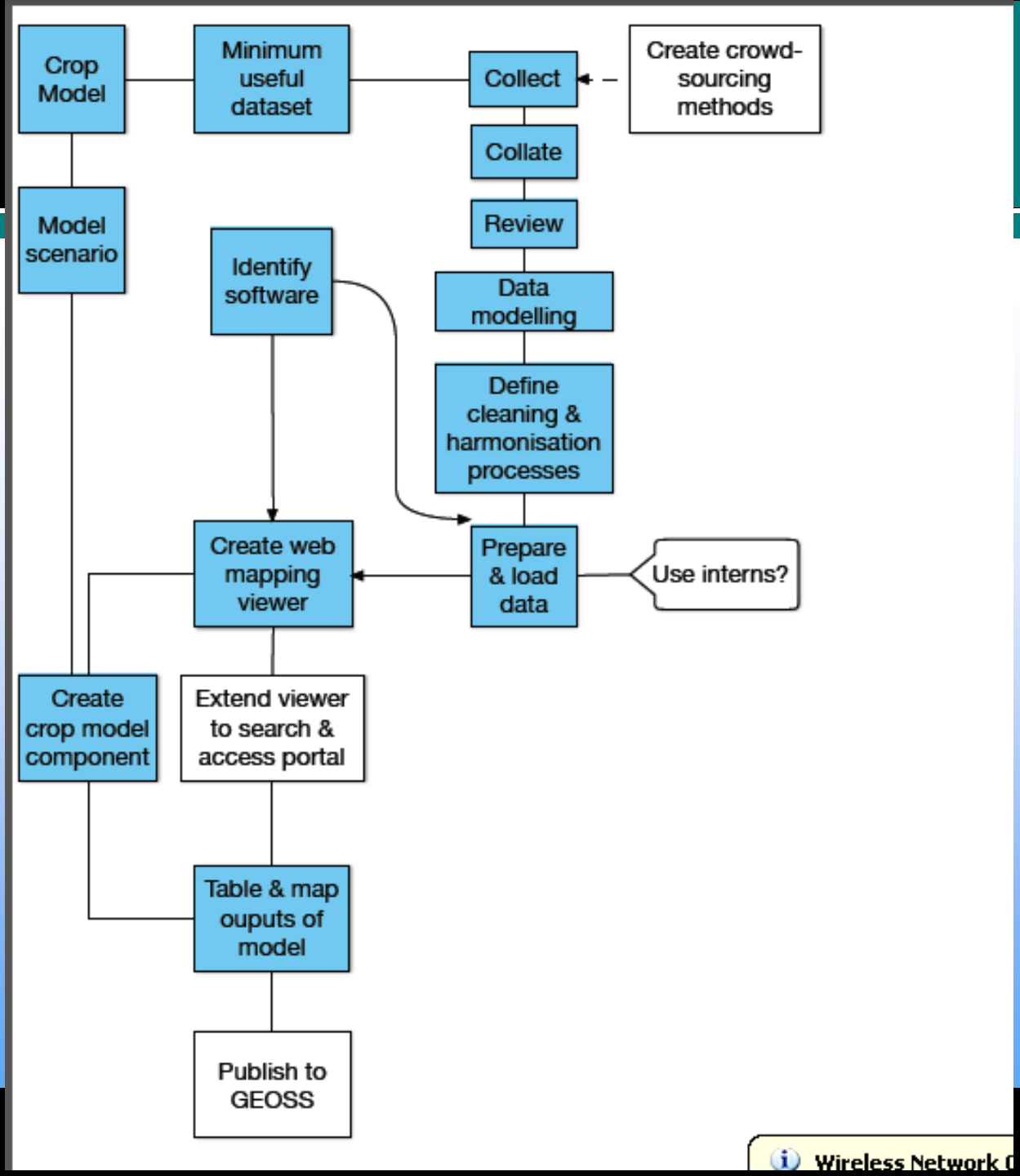

The University of Nottingham

Thank You

Questions?

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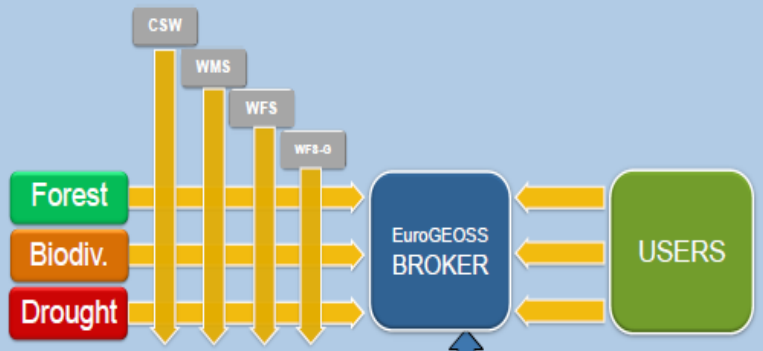
A EUROPEAN APPROACH TO GEOSS

The EuroGEOSS broker is the cornerstone



Brokering in Project	Catalog Service for the Web	Web Map Service	Web Feature Service
Forest	1	4	
Biodiversity	2	1	2
Drought	2	7	4

> 700 data sets

External Brokering	Services	Data Sets
GEOSS Clearinghouse	1	10000
NCEP model outputs	1	182
NASA Global Change MD	1	20980
Europe Sea Data Net	1	386
ESA Genesis - DEC		240 collections
CEOS CWIC	7	250 collections

> 30000 data sets

The EuroGEOSS Broker provides a unique capability to federate services provided by disciplines of Biodiversity, Forest Drought and more.

The EuroGEOSS Broker, is the cornerstone of the EuroGEOSS architecture. It is located between the user and the set of datasets and services providers.

The EuroGEOSS Broker is able to interface with existing web services, whatever the interoperability standards used. In technical terms, the Broker takes a request from a user as an entry, translates and dispatches it between the referenced services. Upon return of results from the services, it merges and displays the results to the user.

Capacity Building/Outreach

Figure 24 illustrates the distinction between client-side and server-side Application Services.

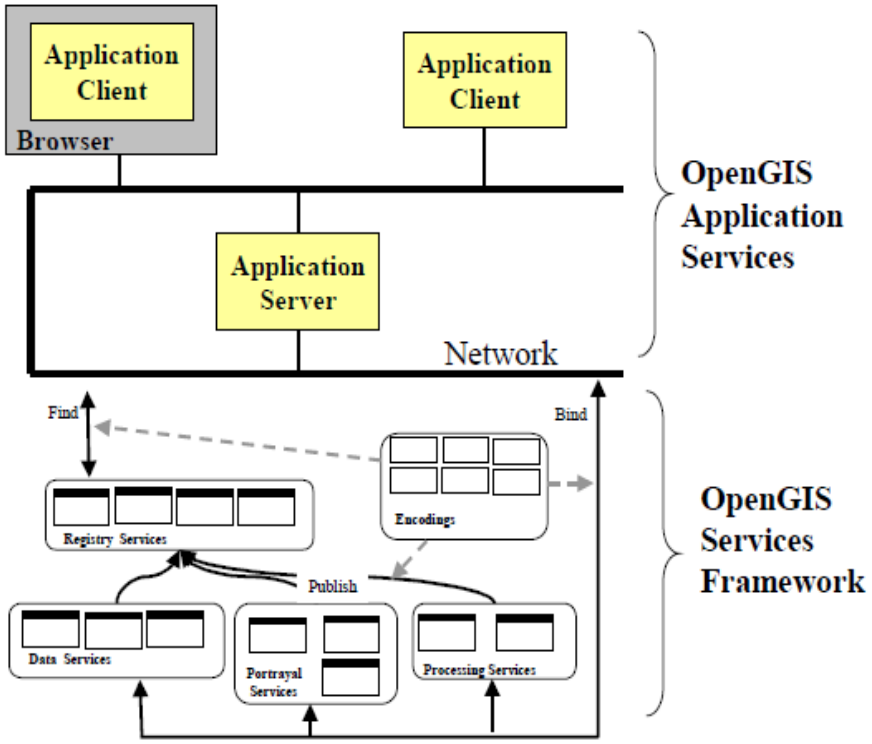


Figure 24 -Application Services and the OWS Services Framework

OGC Reference Model

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