



Interoperability between INSPIRE, GMES, and GEOSS: What has been learned?



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Boundary conditions [GIGAS]

Characteristics	GMES	INSPIRE	GEOSS
Policy owner	European Commission (DG ENTR), assisted by GMES Steering Board	European Commission (DG ENV), assisted by INSPIRE CT	GEO Member States, European Commission, assisted by the GEO Executive Committee
Paymaster	EC, ESA	EU Member States FP7 (INFSO, RTD) CIP (INFSO)	GEO Member States, Participating orgs, FP7, GMES, INSPIRE
Distance to decision maker	Long	Short	Medium
Stakeholder potential to influence initiative	Through activities organized by <u>projects</u> and fora, GMES Advisory Council, (Future Partners Board)	Direct participation	Participation in GEO Tasks Indirectly, via Participating Organisations (e.g. OGC, IEEE, DE)

Introduction

- There exists a **liaison group** among GMES, INSPIRE and GEOSS for interoperability [promoted by GIGAS]
- Fostered the use of and maintained a **technology watch and comparative analysis**
- Sustained a **communication platform, interoperability workshops** (CEN TC287, OGC), and the **GEO SIF European Team**
- Exploit and nurture the **knowledge base, the network, and sustain shaping activities** (CEN TC287, OGC)
- Coordination of **EU programmes and projects**
- Establish a **permanent testing infrastructure**



Introduction

- **EC/FP7** projects dealing with interoperability requirements from INSPIRE, GMES, and GEOSS
 - FP7 **GIGAS**
 - FP7 **EuroGEOSS**
 - FP7 **GEO-WOW**
- **GEOSS IP3** and **AIP** (phases 2, 3, and 4)
 - Including pilots stemming from GMES and INSPIRE activities
- **GEO ADC** and **SIF** workshops and meetings
 - SIF white paper on interoperability gaps and EuroSIF discussions
- **CEN TC 287** Workshops
 - TR 15449 – SDI reference model
- **OGC Domain Working Groups and interoperability workshops**
 - e.g. MeteoOcean, Hydrology, Coverage, etc.
 - OGC best practice –e.g. GIGAS gap analysis deliverable

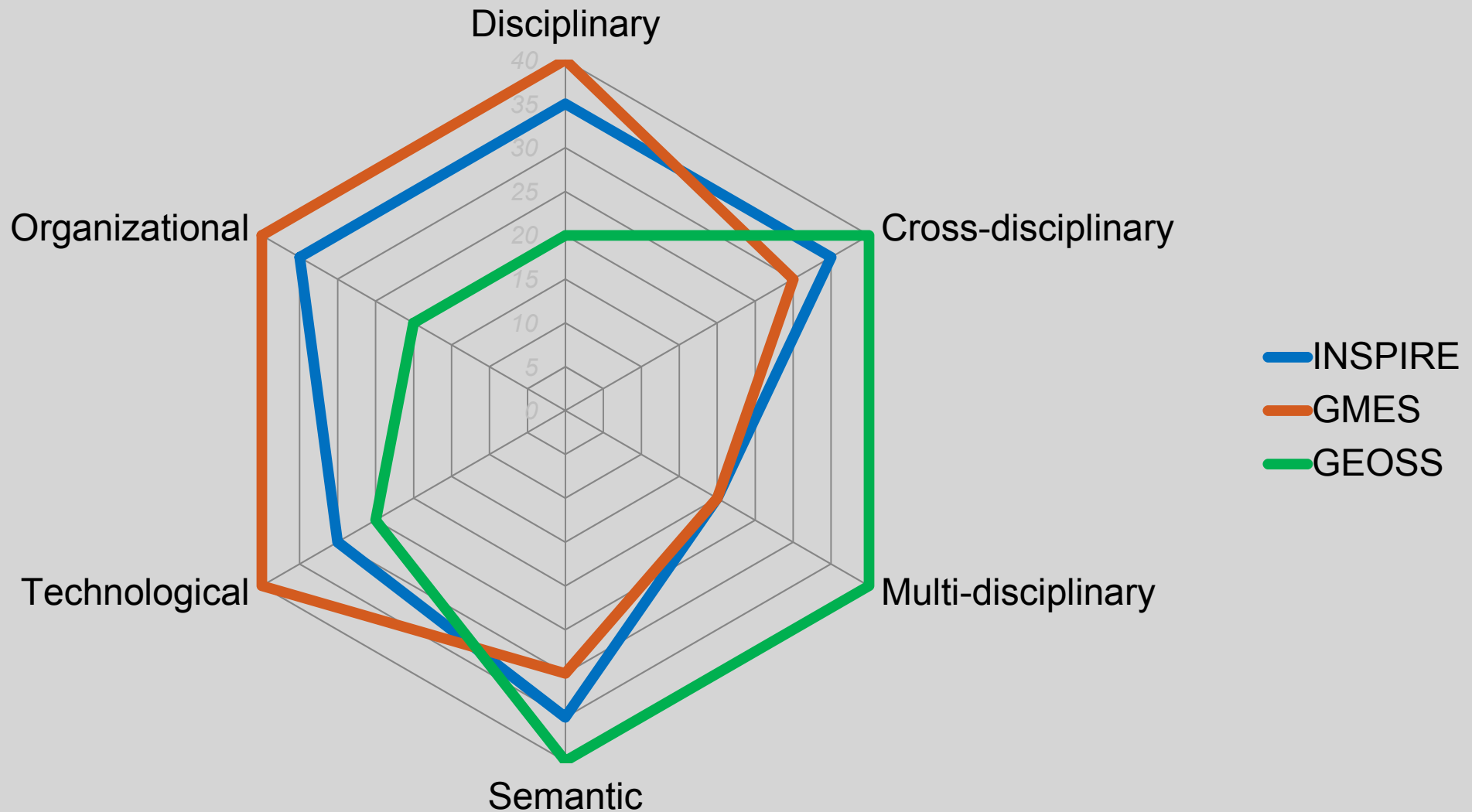


Interoperability Types

- Inter-disciplinary
- Cross-disciplinary
- Multi-disciplinary
- Technological
- Semantic
- Organizational
- Local
- Regional
- Global
-
- ...



The Interoperability Space

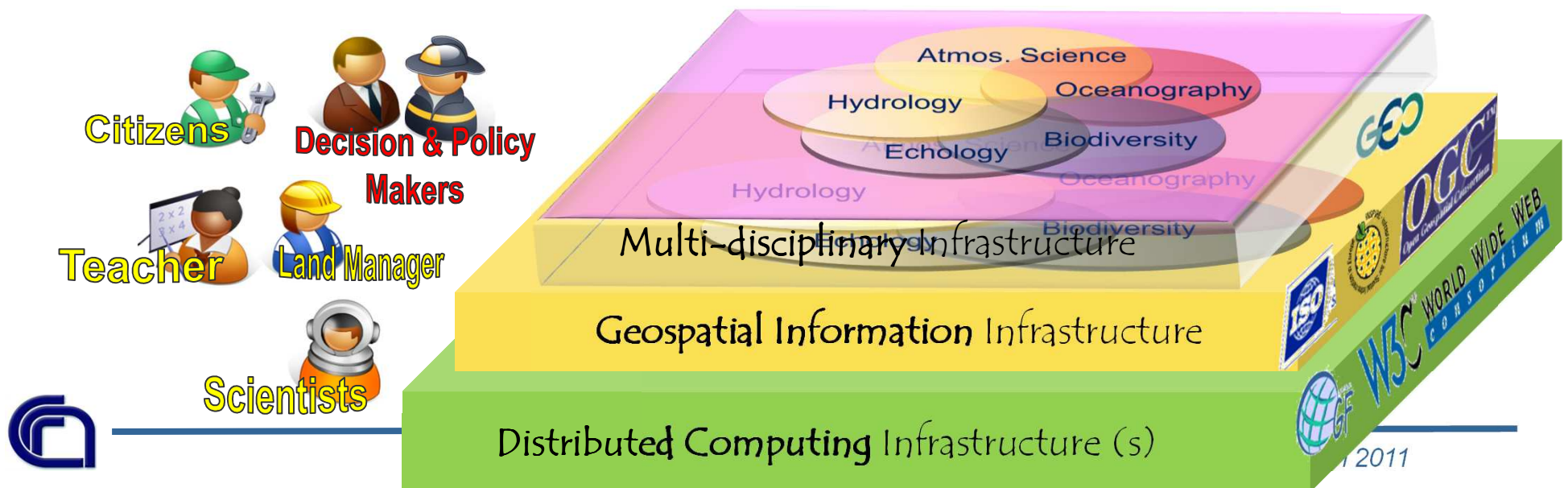


Present Interoperability Levels

1. **Distributed Data** interoperability (**DISCIPLINARY** infrastructures on the WEB)
 - Build on Distributed Capacity provision functionalities
2. **Geospatial Data** interoperability (**CROSS-DISCIPLINARY** infrastructures applying INSPIRE and using GMES services)
 - Geospatial resources core functionalities
3. **Earth Observation** interoperability (**MULTI-DISCIPLINARY** infrastructures applying GEOSS approach)
 - CoP/SBA resources core functionalities



Domain
Semantics



Interoperability Gaps

- Interoperability gaps and challenges recognized –*GEO ADC workshops, SIF analysis, etc.*
 - Support **semantic interoperability**
 - Inter-disciplinary, cross-disciplinary, multi-disciplinary
 - Data Model composability
 - Support Interoperability **standards heterogeneity**
 - Adopt international standards and Recognize community standards
 - Support **complex resources** –*not only data and services*
 - Environmental models, workflows, vocabularies, sensors, documents, etc.
 - Support **advanced functionalities**
 - Discovery, evaluation, access, use



Technical Interoperability gaps [GIGAS]

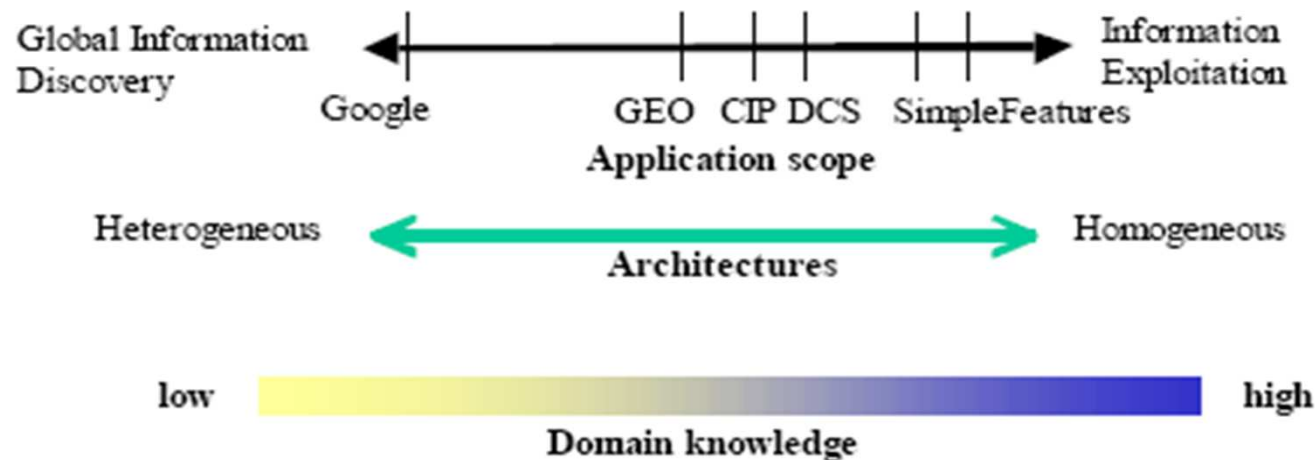
- OGC /ISO developed standards through a bottom-up consensus process, based on a relatively **weak architectural oversight**
- There is a tendency towards **proliferation of minor incompatibilities**
- Examples
 - **OWS common metadata** don't map to **ISO 19119 service metadata** structure or its content
 - Remote sensing and fluid-earth communities primarily use a **field oriented view** (Coverage). While, GI community mostly follows the '**GIS**' traditional **feature oriented view**
 - A third approach has emerged the **Sensor-enabled view**



Flexibility needs [OGC]

- The GI community is a **very broad-based community**
 - works in many **different operational environments**
 - Uses both
 - **Tightly coupled systems** dedicated to well defined functions
 - **Loosely based services** that know nothing about the client
- Multi and Cross-disciplinarity requires to support many different/topic specification profiles

[source OGC CSW specification]



Important Lessons/Challenges

- Adopt the SoS approach (GEOSS) applying SOA (INSPIRE)
 - Implement a “**system of systems**”
 - Build on existing and future information systems
 - Supplementing but not supplanting systems mandates and governance arrangements
- Lower the **user entry-level barrier** (extend the SOA approach)
 - Advance **interoperability**
 - Mediate and Interconnect international standard and disciplinary-standard capacities
 - Develop semantic Interoperability in addition to technical interoperability
 - Address environmental models and processing chainings
 - Integrate Web 2.0 resources
- Improve **sustainability**
 - Augment flexibility and scalability



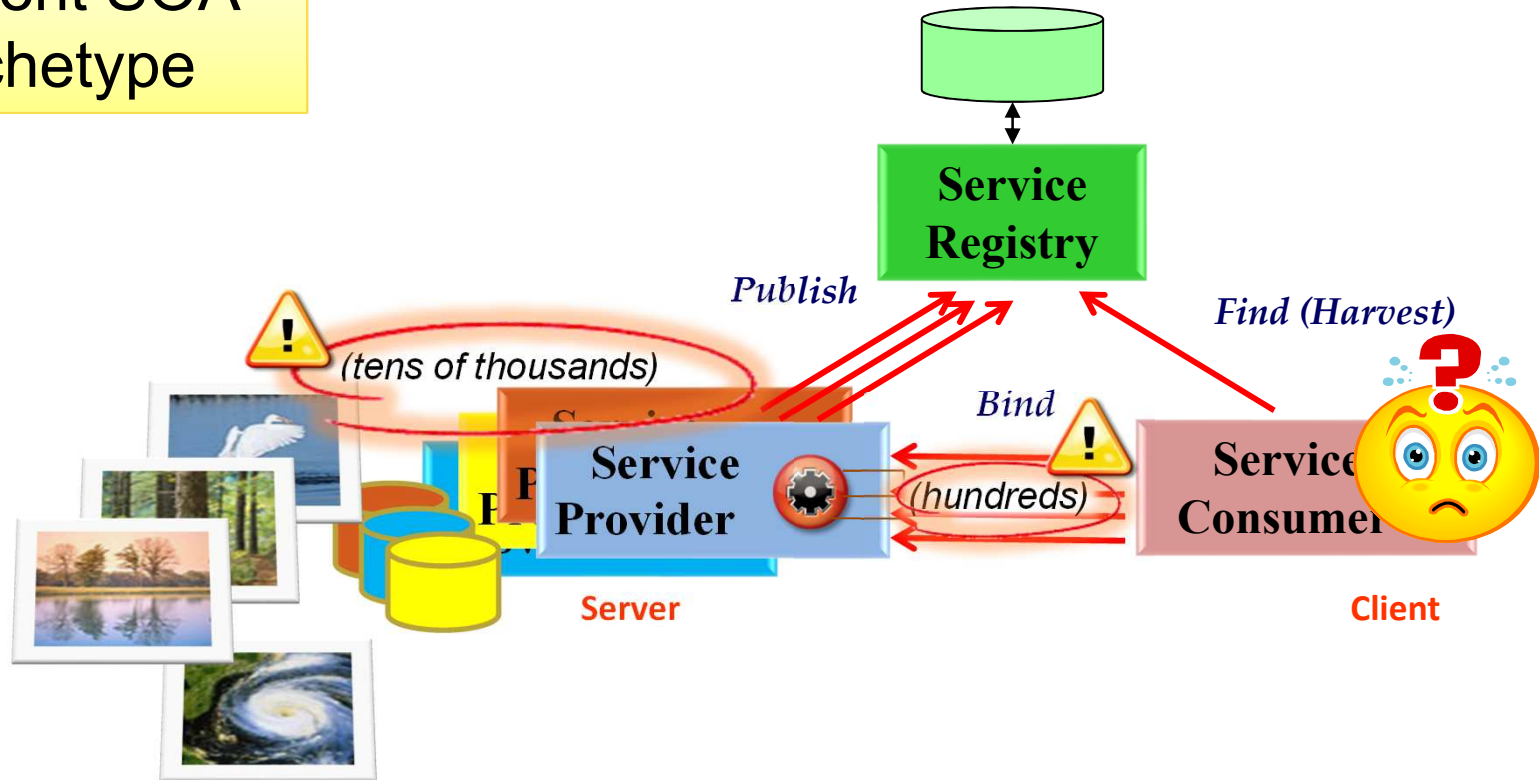
Extend the Service-oriented approach

- Good for enterprise (controlled and limited) environments
- Not appropriate for complex (broad and heterogeneous) infrastructures/communities
- Main shortcomings:
 - **Scalability** and **Flexibility** (interfaces heterogeneity)
 - **Semantic interoperability** is missing (only technical interop. is supported)
 - User **friendliness** (thought for machines)
 - High **entry level barrier** (thought for IT experts)



Users/Clients overload

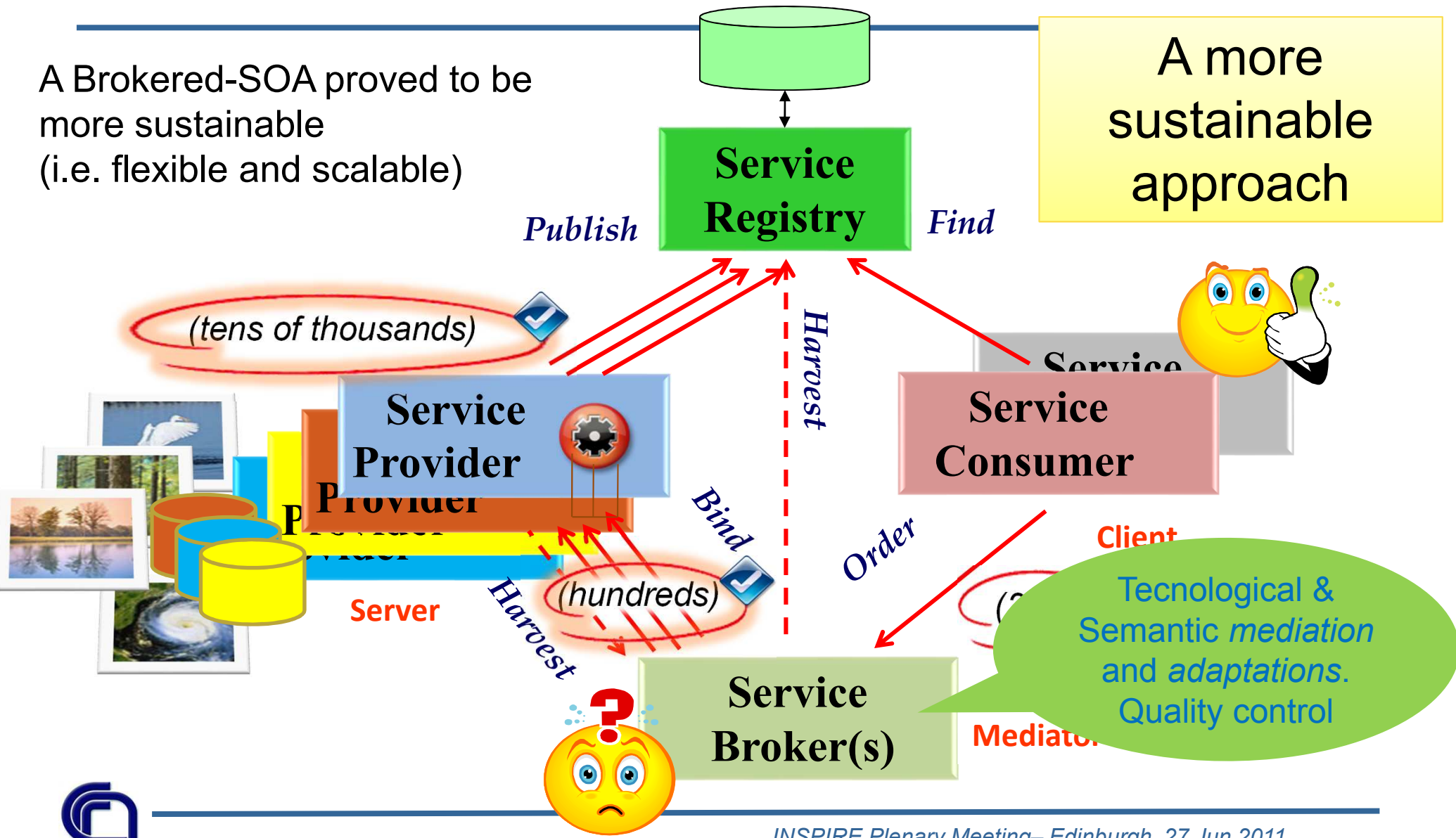
Present SOA Archetype



The Broker/Mediator component

A Brokered-SOA proved to be more sustainable (i.e. flexible and scalable)

A more sustainable approach



Requirements for Multidisciplinary Interoperability [EuroGEOSS, GEO-WOW]

- The EuroGEOSS recognized and discusses 15 main requirements for enabling multidisciplinary interoperability

Req.	Description
GR.1-3	Catalogues acts as brokers and support both distributed queries and harvesting
GR.4	Catalogue(s) supports queries on location , time , SBA , keyword
GR.5	Catalogue(s) supports discovery of data , services , and other resources
GR.6	Support of interoperability shared practices (special interoperability arrangements)
GR.7	Support for GeoRSS
GR.8	Catalogue(s) supports ontology-based queries
GR.9	Support (Availability) of Transactional Data Access Services
GR.10	Support (Availability) of OGC Web Processing Service
GR.11	Creation of a GEOSS Data-CORE
GR.12	Resource discovery by “ Data Access and Use Conditions ”
GR.13	Support semantic discovery (including GEOSS EO Observables Vocabulary)
GR.14	Develop and deploy services and technologies for facilitating effective and seamless multidisciplinary data access
GR.15	Support convergence on standards : in a first phase this also includes the development of necessary mediation components to bridge the existing and heterogeneous community standards



Thank you !

<http://www.eurogeoss.eu>

<http://www.thegigasforum.eu/sif/>

<http://www.cenorm.be/>

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BACK-UP SLIDES

Introduction

- **GEOSS** (Global Earth Observation System of Systems)
 - 10-Year Implementation Plan running from 2005 to 2015
 - Better decision making on 9 Societal Benefit Areas by making existing Earth Observations resources easily accessible
- **INSPIRE Directive**: establishing an Infrastructure for Spatial Information in the European Community
 - Legislative instrument for the purposes of Community environmental policies
 - Builds upon National SDIs operated and maintained by European Member States
- **GMES** (Global Monitoring for Environment and Security)
 - Joint initiative of the European Commission and European Space Agency
 - 3 components: Space Component, In-Situ Component, Service component on Marine, Atmosphere, Land, Emergency, Security at pre-operational stage

