



UNSDI Technical Governance Framework

**UNGIWG
Eighth Plenary Meeting
“UNSDI in the Year of Planet Earth”**

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Overview

- Some thoughts on the nature of the problem
 - what do we mean by technical governance
- UNSDI technical governance framework
 - approach
 - context and requirements
 - the framework
 - applying the framework – administrative boundaries



What is governance?

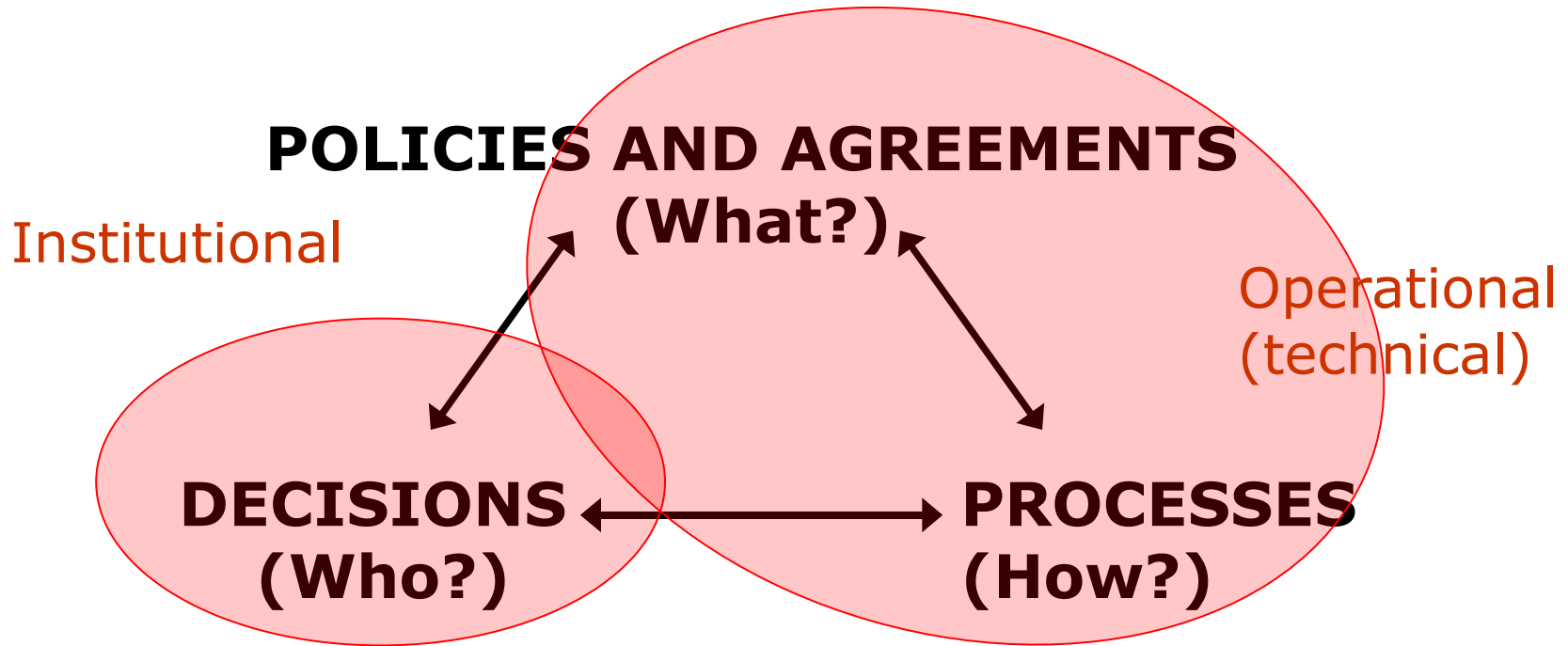
"process of making decisions that define expectations, grant power, or verify performance. It consists either of a separate process or of a specific part of management or leadership processes"[wikipedia]

Why do we need governance?

- to develop and manage consistent, cohesive policies, processes and decision-rights for a given area of responsibility
- to ensure on behalf of stakeholders that organizations produce good results



An interaction of



What decisions must be made for effective management?

Who will make those decision?

How will decisions will be agreed, implemented, documented & managed?



Governance and management

- distinct but interrelated processes
- may include management tasks i.e. of people, shared resources, processes
- governance provides a framework (institutions, policies and processes) within which management of the SDI implementation takes place



Governance is not Government

- Government
 - set up to administer governance processes and systems for a country or sub-national jurisdiction
 - top-down approach “**drives**” communities
- Governance
 - “**steers**” communities
 - inclusive, “bottom-up”, representative of stakeholders



What's the role of governance in an SDI?



Why is an SDI necessary?

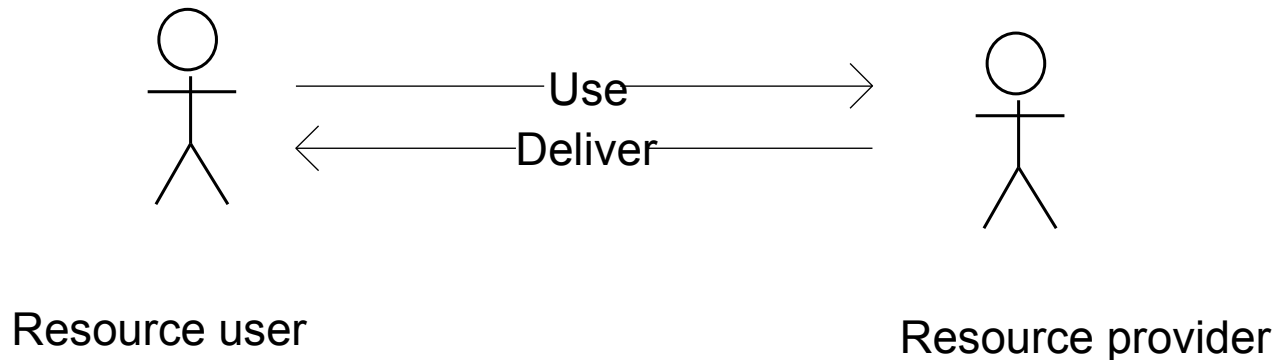
to enable discovery and use of
resources

- geospatial data (increasingly via services)
- also the agreements that enable interoperability
 - and allow resources to be found and understood



Current situation – 2 organizations

- to share resources providers & users negotiate bilateral arrangements



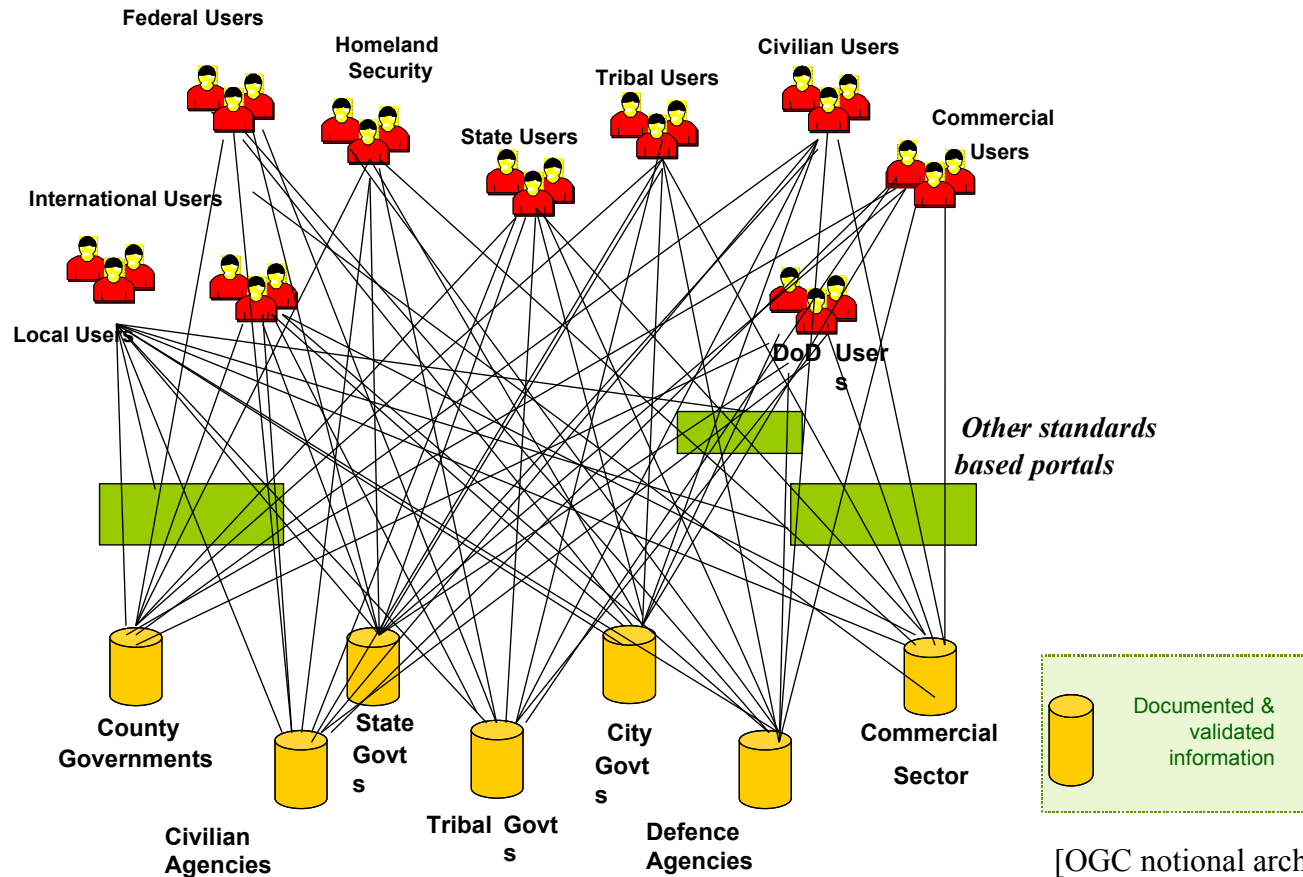
- This is:
 - *ad hoc*
 - costly (in time, effort, capacity) to negotiate,
 - cannot be found and re-used by others



For multiple organizations....

Need to negotiate each bilateral resource provider-user relationship

Current situation simplified





...leads to lack of interoperability

Lack of common agreements about policy, format, structure, contents, & description of data means resources are not **interoperable**

Lots of good effort on the ground, but each SDI is re-inventing many of the details



Levels of interoperability

- **Policy/organizational-level**
 - agreements enabling agencies to interoperate
 - e.g. data access policy - am I allowed to use the river data set from agency Y?
- **Technical-level**
 - **syntax** - data files and their transmission
 - Does my software understand the format?
 - Does the data use a standard projection
 - Is the data transferred using the FTP?
 - **structure** - contents of data files (data models)
 - Can I integrate rivers data obtained from agency Y with my rivers data?
 - **semantics** - Vocabularies, definitions and meanings of features described by the data
 - What does agency Y mean by a semi-permanent stream?
 - What does updated 'recently' mean?

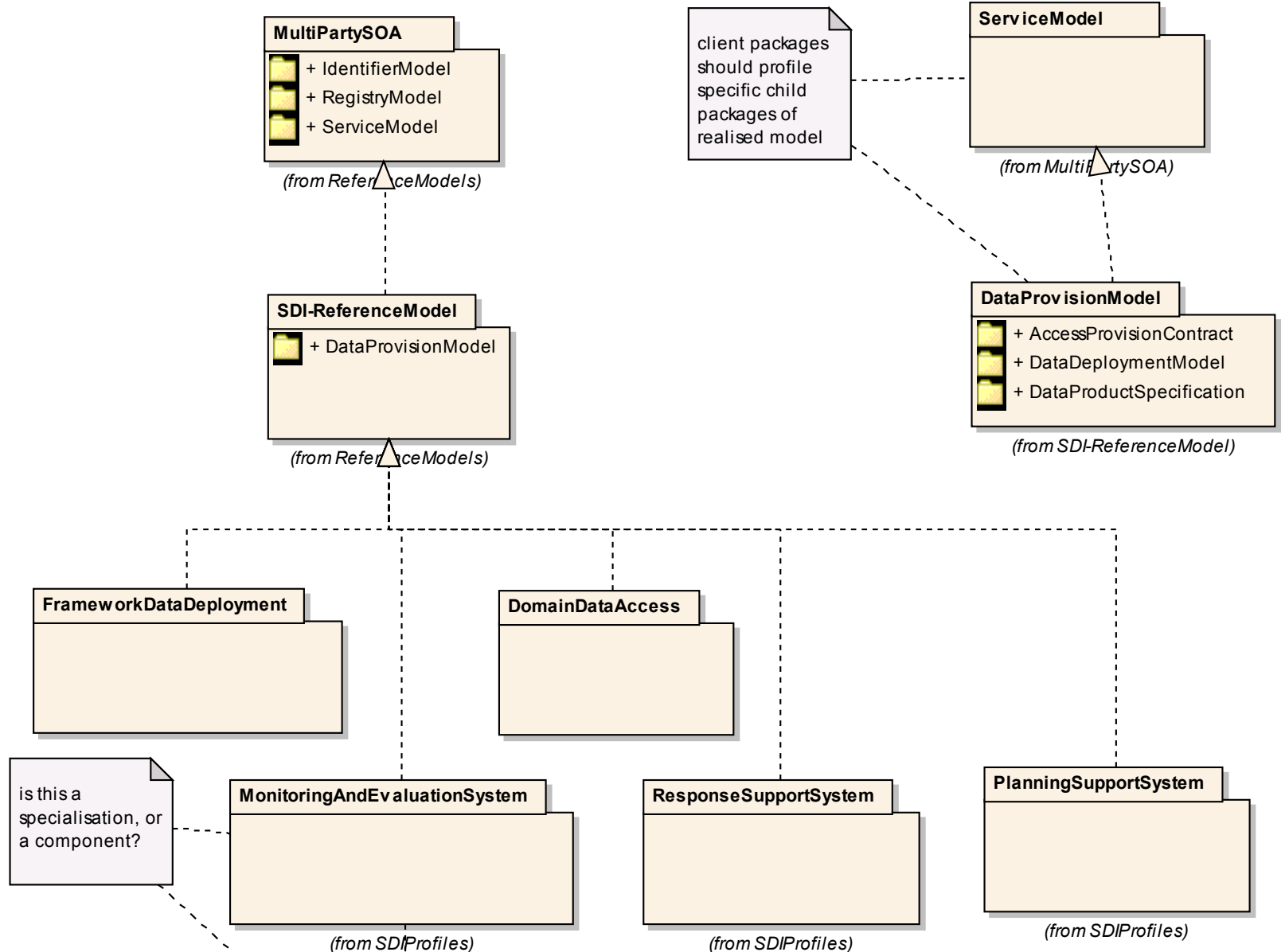


Levels of interoperability

- various levels of interoperability required for different components of an SDI
- to integrate and use data, structures and semantics must be consistent & well understood



pkg Overview





So how do we improve access to
resources and achieve
interoperability?

Publish resources for re-use



What do we mean by resources?

Two main types:

1. Interoperability **agreements** about how the SDI behaves:

- Policy agreements (e.g. data sharing, funding, service agreements of partner)
- Technical agreements – technology and information standards e.g. data models, vocabularies, metadata, service specifications

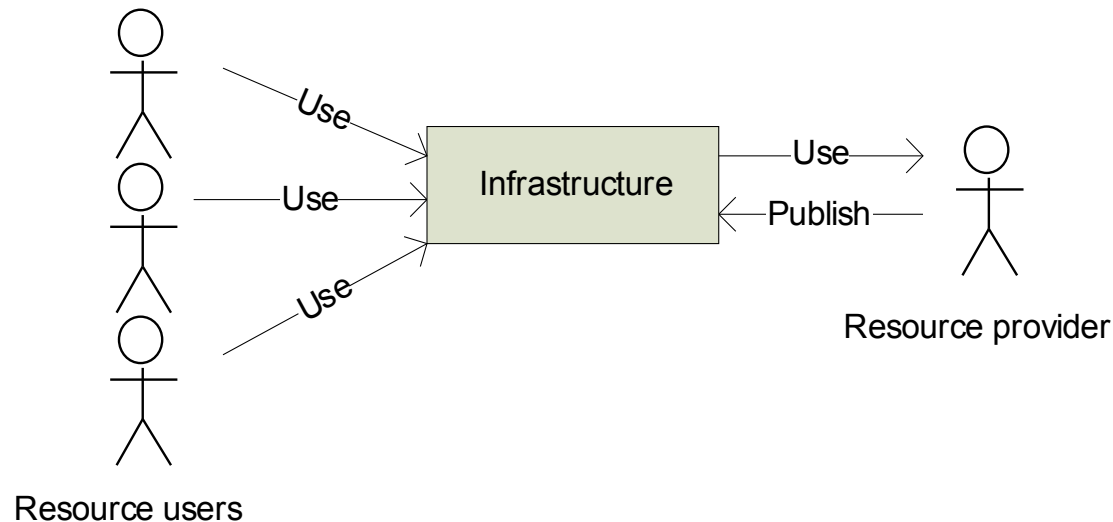
2. Data accessed via web services

- designed according to technical agreements

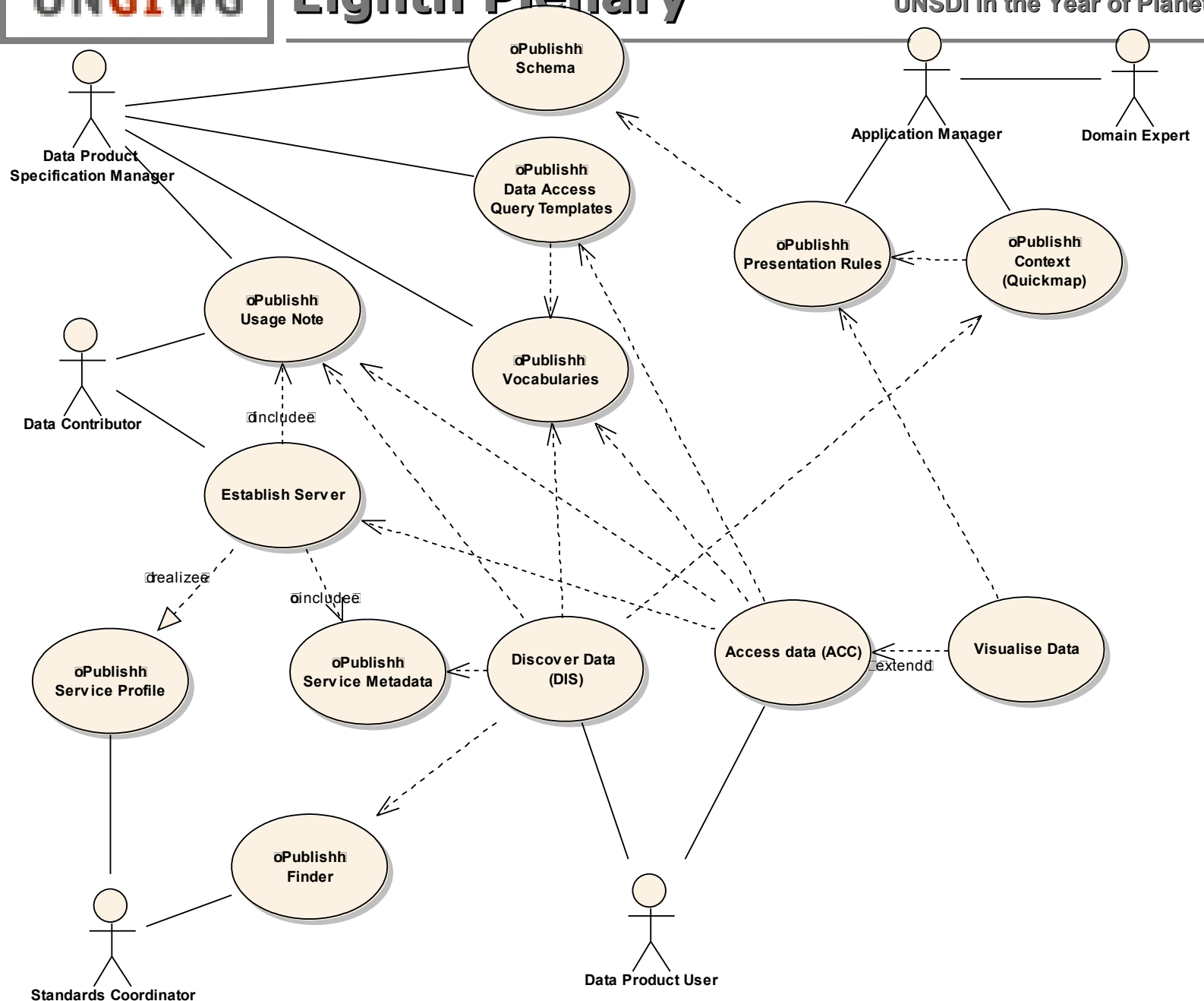


Within a single SDI

- Create shared infrastructure to improve access to **resources**

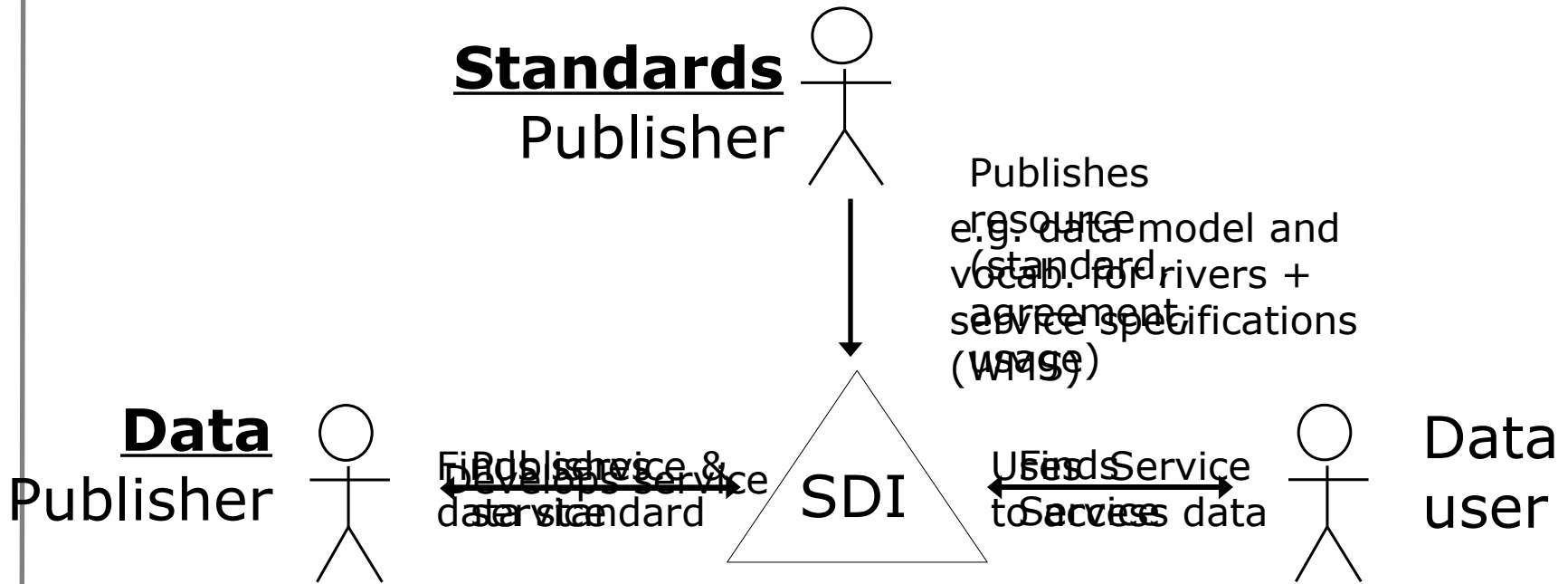


- Providers
 - publish resources using the infrastructure
 - based on agreed standards
- Users
 - discover and re-use resources





Publishing & re-use of agreements and data





So within a

spatial data infrastructure

discovery of,
access to and
dependable
Use of

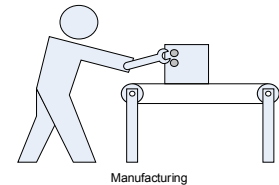
geospatial data

is enabled
by

an umbrella of

policies, technologies,
common standards,
practices, protocols &
specifications

SDI help organizations & technologies interact

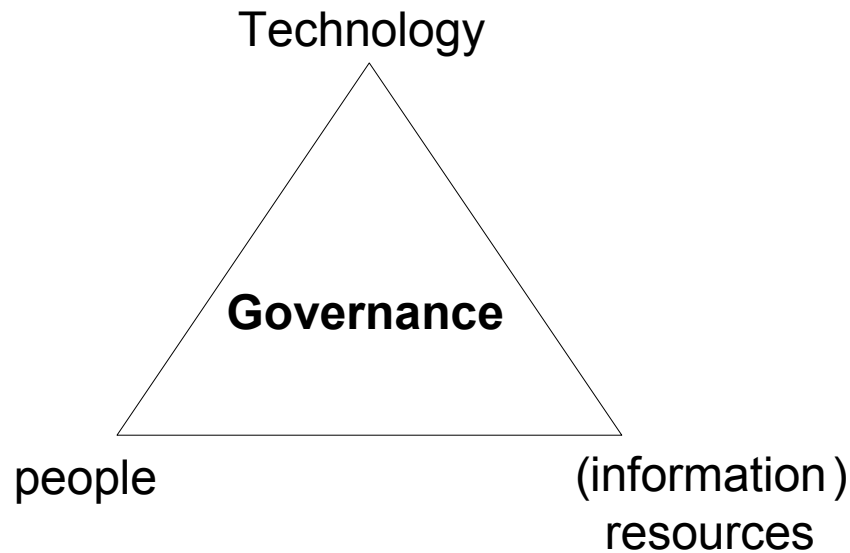


*To enable
more efficient use, management
and production of geo-spatial data*



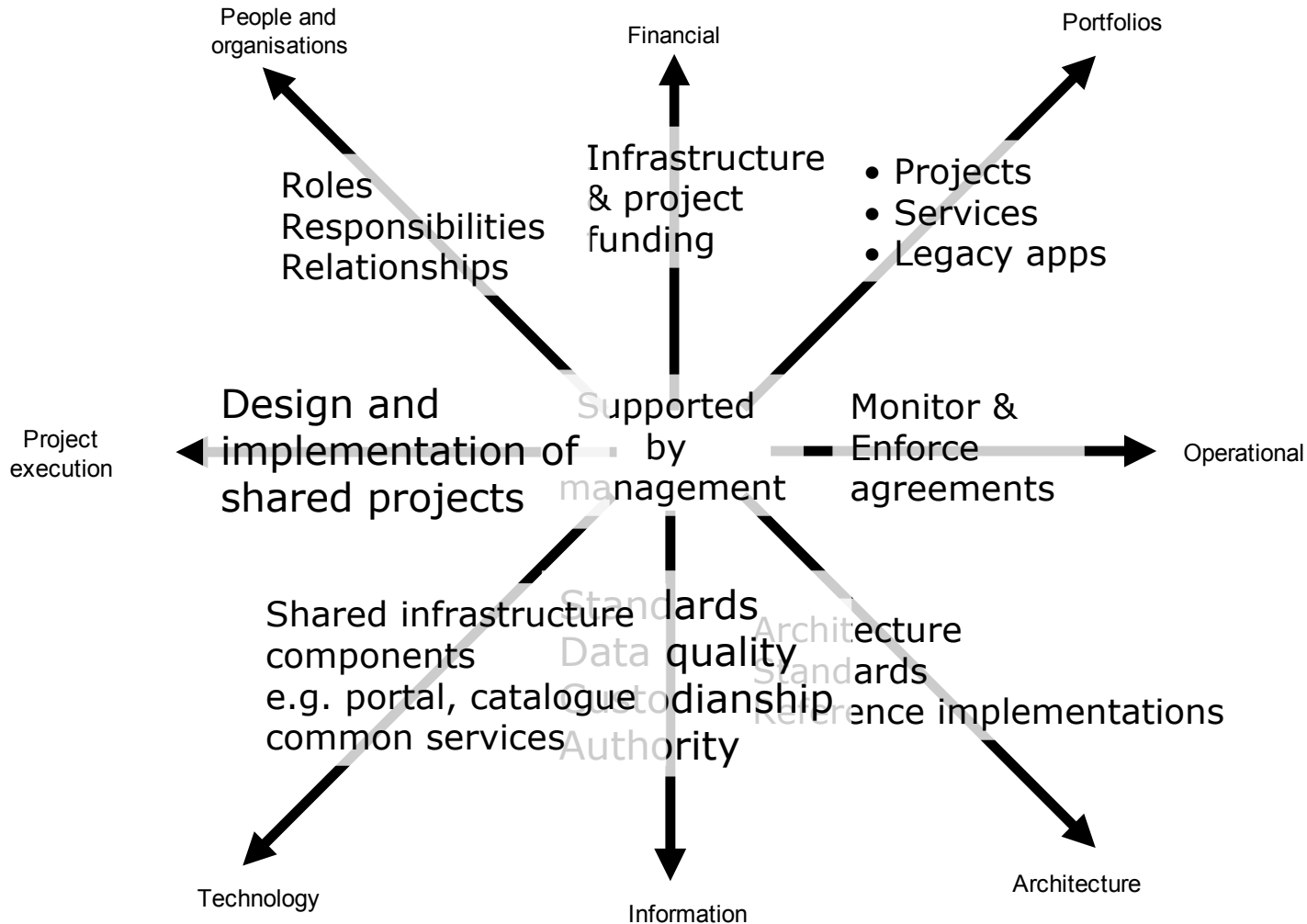
...and the role of governance is to...

glue together the technology, organizations and information that comprise an SDI





Governance scope





UNSDI technical governance framework

- approach
- context
- requirements
- the framework
- the role of registries
- a worked example – administrative boundaries



The approach (in a nutshell)

- Accept UNSDI is going to evolve as different challenges are taken on with
 - improved tools
 - better organisational governance
 - external capabilities
- Provide a means for best practice on the ground to be adopted for re-use
- Provide a means for re-use of resources across multiple activities

- Need a set of mechanisms to achieve this



The approach

- examine UNSDI context
 - pay attention to what works
 - what doesn't
 - and identified needs
- *analyze* interoperability requirements implied by scope of UNSDI
- break problem into manageable pieces
- know who needs to do what:
 - formalise Use Cases (identify "Actors")



Governance dimensions

Framework governance

- SDI governance in relation to enclosing governance realities
- development of an initial governance capability (e.g. mandate)

Technical governance – what and how?

- what re-usable components of a UNSDI need to be governed
- e.g. data, vocabularies, services, data and service metadata standards

Institutional governance – who?

- roles and responsibilities of organizations and people in the use and maintenance of infrastructure



UNSDI institutional context

- multi-domain
- multi-jurisdictional
- diverse participation capabilities
- differing context and requirements for UN SDIs
e.g. peace-keeping, humanitarian, development, environment
- handling change - institutional and technology contexts



UNSDI data context

- data silos and concentrations
- different requirements and responsibilities according to whether stakeholders are delivering or acquiring data
- operating at full spectrum of scale and spatial extents: village – global
- lack of clarity regarding custodian, authoritative sources



UNSDI technology context

- heterogeneous systems landscape
- many evolving standards – which ones should be used
- globally, many uncoordinated data modeling initiatives
- UNSDI Compendium recognizes the important potential role of FOSS in enabling the UNSDI
- UNSDI implemented using SOA approach



Constraints

- diverse (institutional, political and business) cultures
- differing business needs and capacities
- limited resources for geospatial data management
- limited up-front investment available for SDI development



Governance requirements - general

governance framework should be:

- scalable
- based on resource availability
- commensurate with the volume of resources (data, services and agreements) under governance
- flexible and adaptive to meet changing organizational, technology and business realities
- means of creating common threads between short and long term requirements.



Governance requirements - agreements

- goal of UNSDI is to reduce organizational challenges to creating, growing and achieving interoperability between SDIs
- key is governance of artifacts that describe, or are implementation of interoperability agreements (expectations) between stakeholders within an SDI and between SDIs
- service profiles are example of critical type of agreement



Web service profiles

- improved access to data achieved by publishing services
- OGC Web Service Specifications - family of standards to implement this function
- web service specs are necessarily broad
- Differing implementation choices for aspects of services can reduce information interoperability
- in broader IT sector, general standards (e.g. W3C Web Services protocols), not sufficient to achieve interoperability by themselves.
- community need to agree on common **profiles** to ensure that compatible set of options chosen

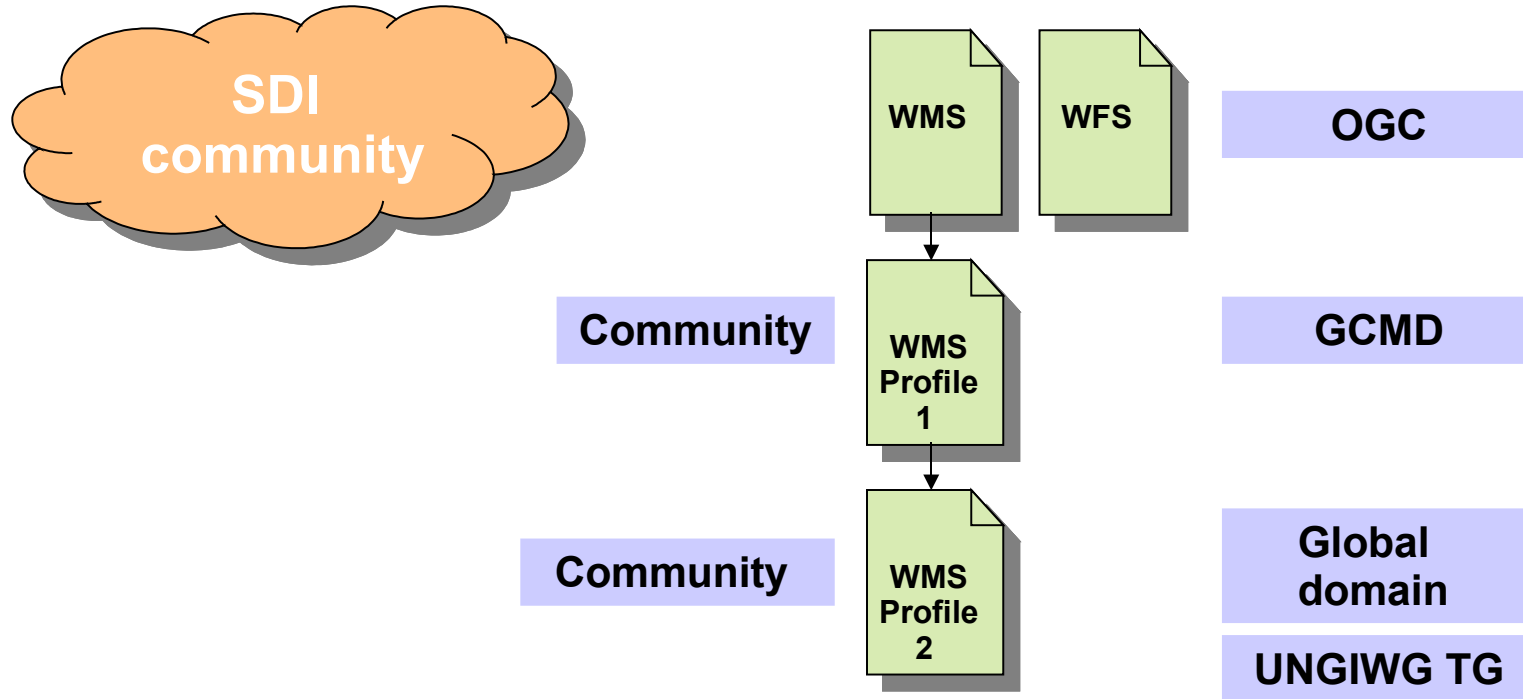


Web service profiles

- profiles contextualize generic services and enable
 - services to be designed and described in a consistent manner, that is relevant to the usage context
 - consistent discovery and interoperability of resultant services from end user perspective
- emerging pattern is that service profiles have inheritance patterns
- parts of the profile are inherited from other communities that have separate governance arrangements



Web service profiles



- community develops profile #2 – **Data series WMS profile** (for a collection of continually updated data sets):
- inherits all requirements of parent + additional specifications:
 - syntax of start/end date and update frequency of temporal extent
- Governed by community
 - rules for organization of archive and latest data product
- Governed by global domain peak body
 - symbology rules for time series data
- Governed by UNGIWG – cartographic WG



Handling profiles

- currently no standard way to describe profiles
- key requirements for profile handling include:
 - need to be discoverable by service developers
 - machine readability to enable exploitation of services
 - need to manage changing profiles
 - ability to determine conflict when multiple dependencies & separately governed parts of a profile

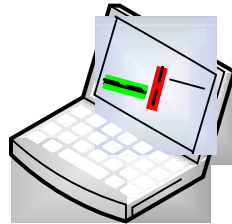


Governance requirements – data modeling

- high degree of semantic/structural interoperability
- therefore need:
 - data models and vocabularies
 - harmonized within & between jurisdiction



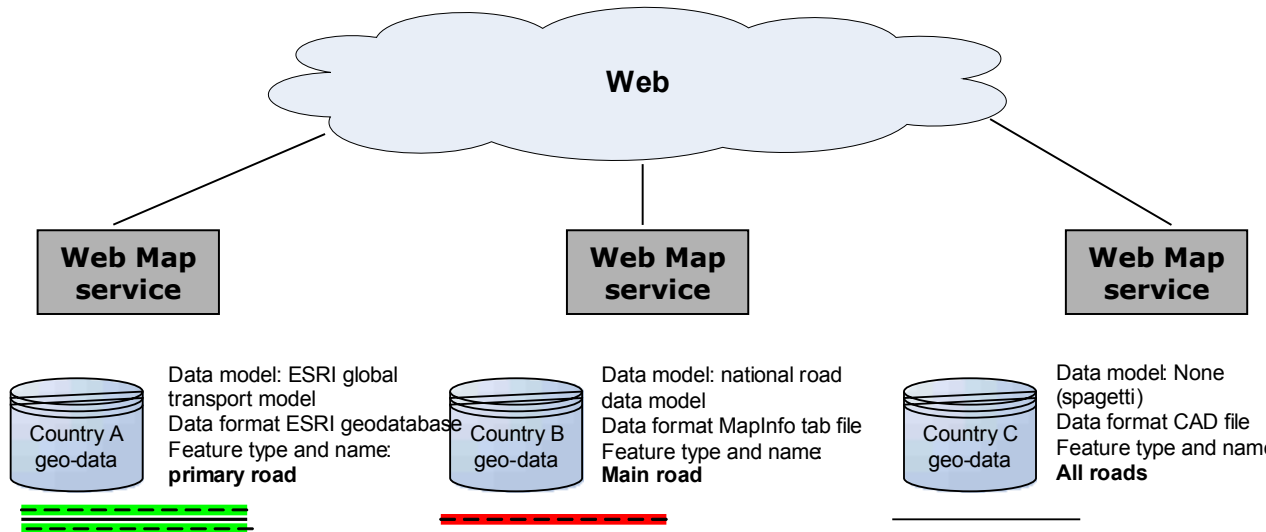
Syntactical interoperability



Can be accessed and viewed together by a user

BUT

Data retains its structural and semantic difference



Exposed via a web map service using a common syntax (XML and image)

Structurally, syntactically and semantically different data sets from 3 countries

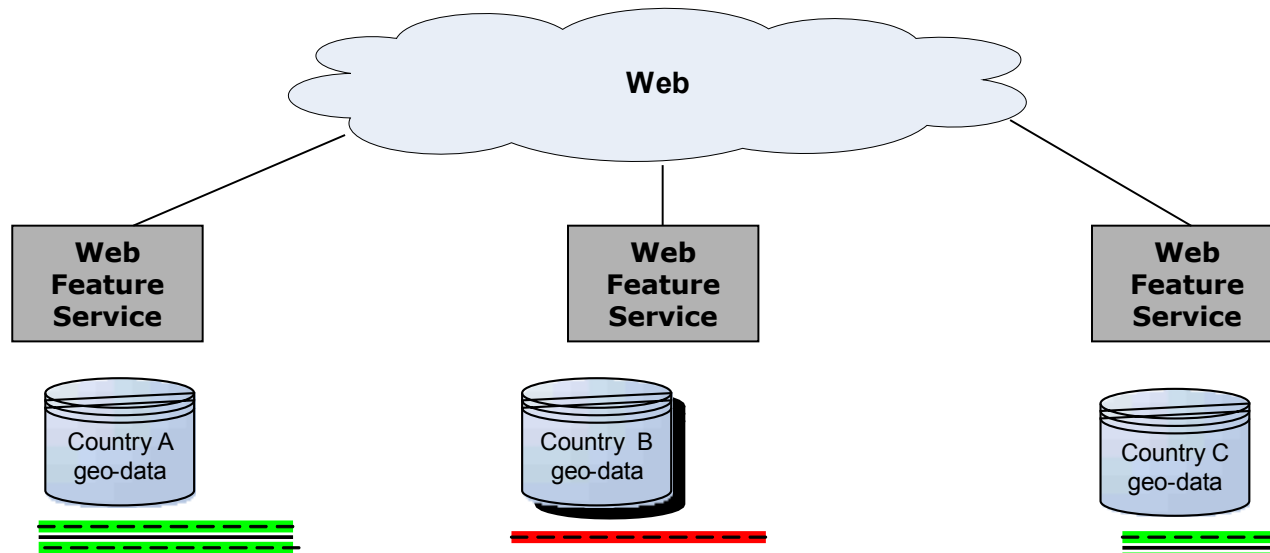


Semantic and structural interoperability



Users can access, integrate and use data consistently

e.g. query the length of all roads classed as primary across three countries



Data exposed via web feature service based on a common data model (and vocabulary) expressed in common syntax (GML)

Country C has adopted agreed international data model (already adopted by Country A) for storage of data

Country B uses own native storage model



Governance requirements – data modeling

- harmonization **does not** imply single common data model
- harmonization is ability to develop independent data models that share common elements
- e.g. if transport, logistics and humanitarian systems share common gazetteer of place-names this will aid effective relief planning.
- related domains need common governance arrangement to share common concepts
- UNSDI can provide this mechanism.



Governance requirements - architecture

- architecture is blueprint for UNSDI
- **contract** between implementers of systems and the UNSDI
- enables engineering and technology choices to be made
- UNSDI evolves over time - assess best way to deal with new challenges
- architecture developed and maintained through effective governance mechanisms to ensure a shared architectural view of the UNSDI.



Technical governance framework

- an approach to addressing technical governance challenges and enable UNSDI creation
- exercised through the implementation of a series of related projects that build different dimension of the UNSDI capability
- discrete projects enable stepwise creation & evolution of governance capabilities



Technical governance framework

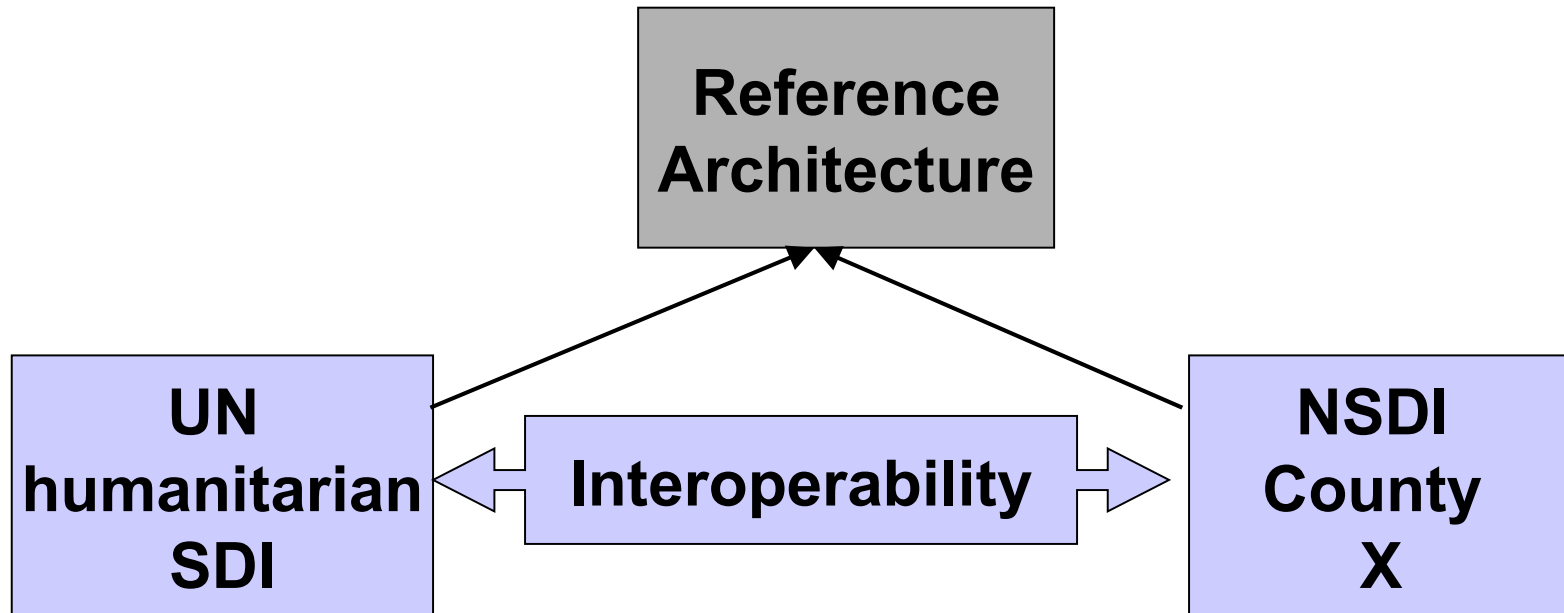
- conceptually, an SDI is the basic 'building block' of the UNSDI
- to enable resource sharing - need agreements defining interoperability 'contracts' both between and within SDIs
- Governance problem space divided into **inter-SDI (between)** and **intra-SDI (within)** governance



Inter-SDI governance

Between-SDIs

- High-level agreements
 - policy level - MOU for resource sharing
 - technical level - common architecture, OGC specs





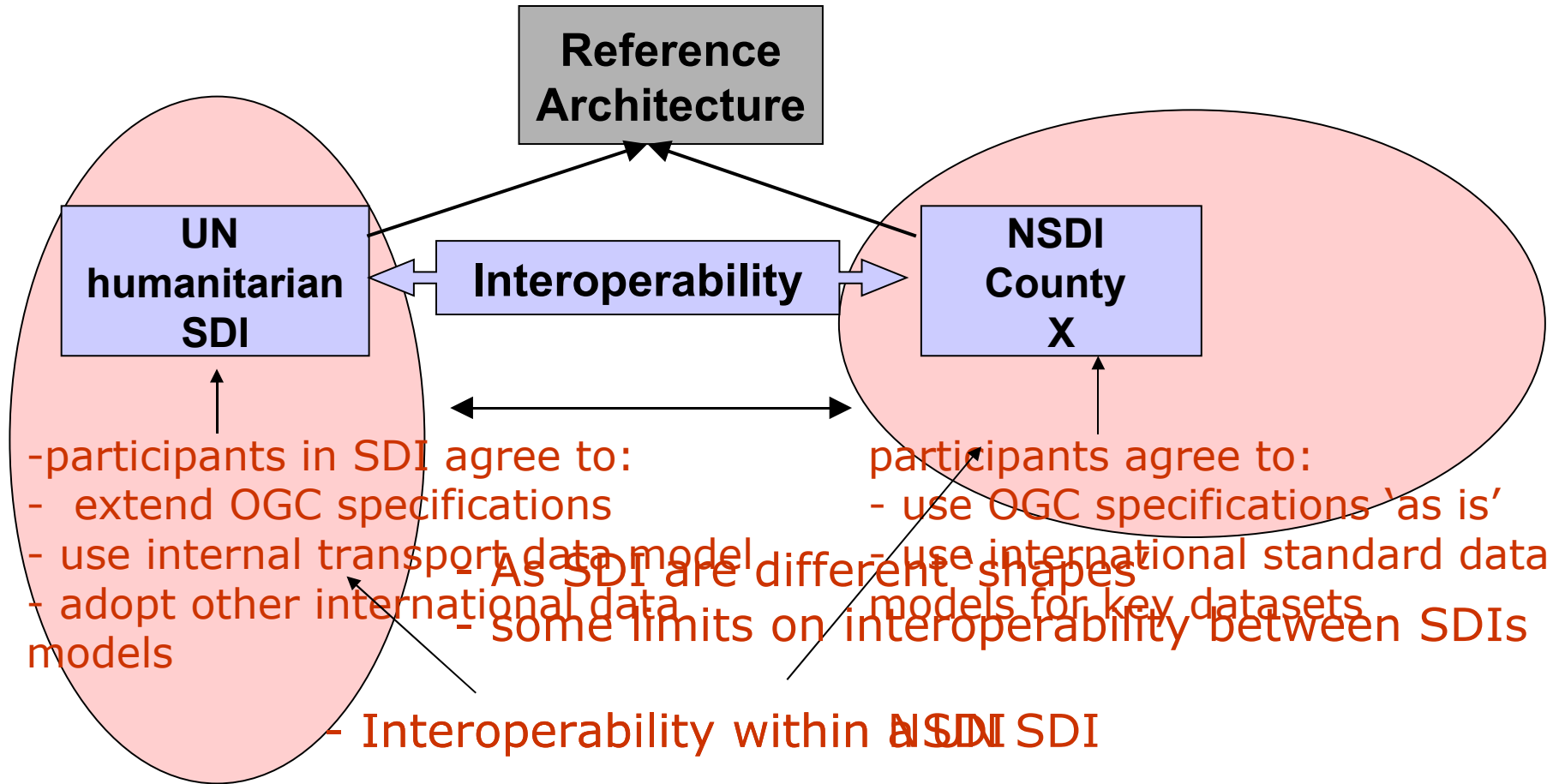
Intra-SDI governance

Within SDI

- need to publish interoperable services that deliver seamless data for users
- need governance of agreements (standards) & resources produced using them



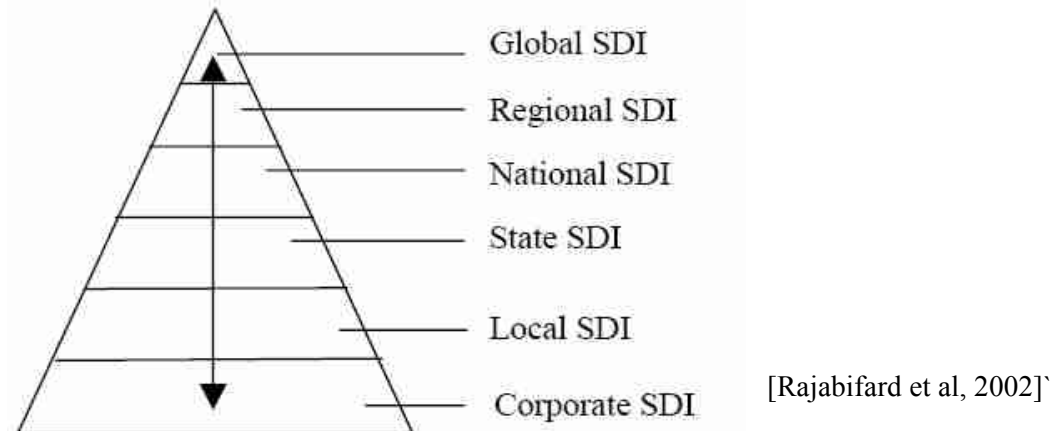
Intra-SDI governance





Inter and Intra-SDI governance

- in practice....SDIs are hierarchical e.g. NSDI comprises local and thematic SDI



- inter/intra-SDI distinction not always so clear
- e.g. governance of an NSDI (intra-NSDI) implies governance of the component SDIs (inter-SDI)



Governance actors and use cases

- governance will be built around identification of governance use cases and actors (a facet of the architecture)
- for each actor, identify registers (of agreements or their implementations) that need to be managed
- assign register management responsibility to agencies for each register
- approach based upon ISO 19135 “Procedures for registration of Geographic Item”



Governance actors and use cases – need for an architecture

- use cases and actors for governance based on analysis of governance requirements from SDI initiatives (e.g. INSPIRE, UNSDI, etc)
- analysis of common requirements and elaboration of architecture is separate project
- in short term - elaboration of registers and actors in their management provides useful input for elaboration of high-level governance actors and use cases



Role of registers in an SDI

- when artifact required to realize agreement between data provider and user need to establish **register** at a **registry** known to both parties
- to-date, data and service metadata catalogues are the most common example of registries
- many more registers required to meet interoperability requirements of UNSDI

key to understanding and building effective SDI governance.....

What registers required and who plays what roles in creation & maintenance of them

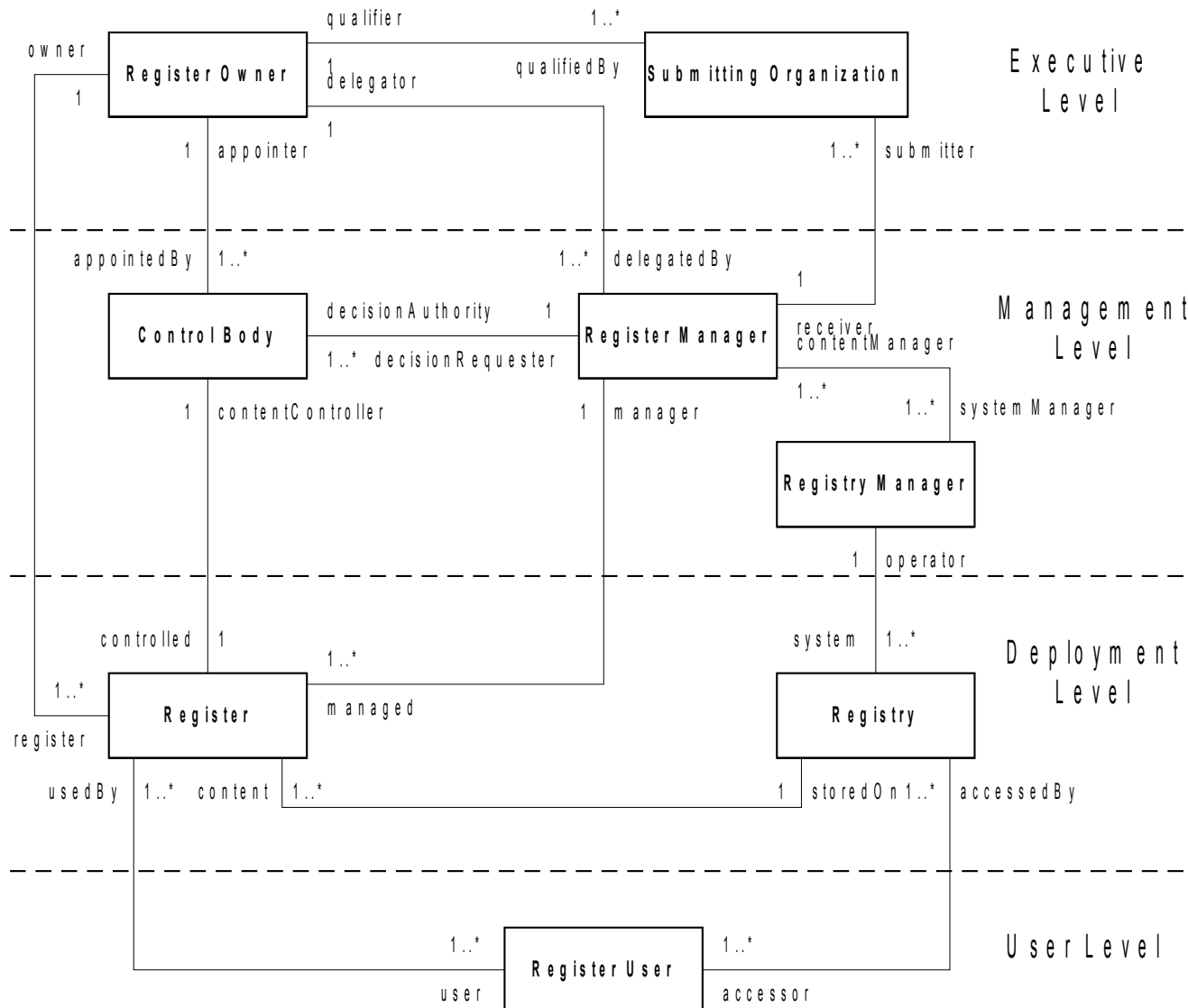


Conceptual registry model

- Registries are mechanisms by which:
 - artifacts related to agreements (service profile) or their implementation (service) can be published and discovered
 - data resources can be made available for re-use
- “meta-model” for registries (ISO/IEC 11179)
- governance of registries - ISO 19135
- “Procedures for registration of Geographic Items”
- articulates actors and roles in governance of registries



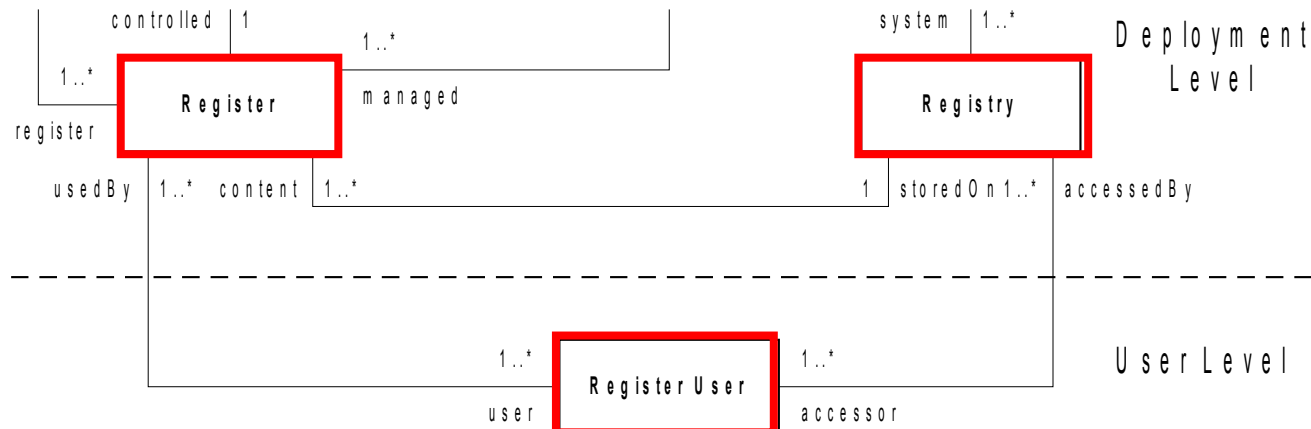
Conceptual registry model





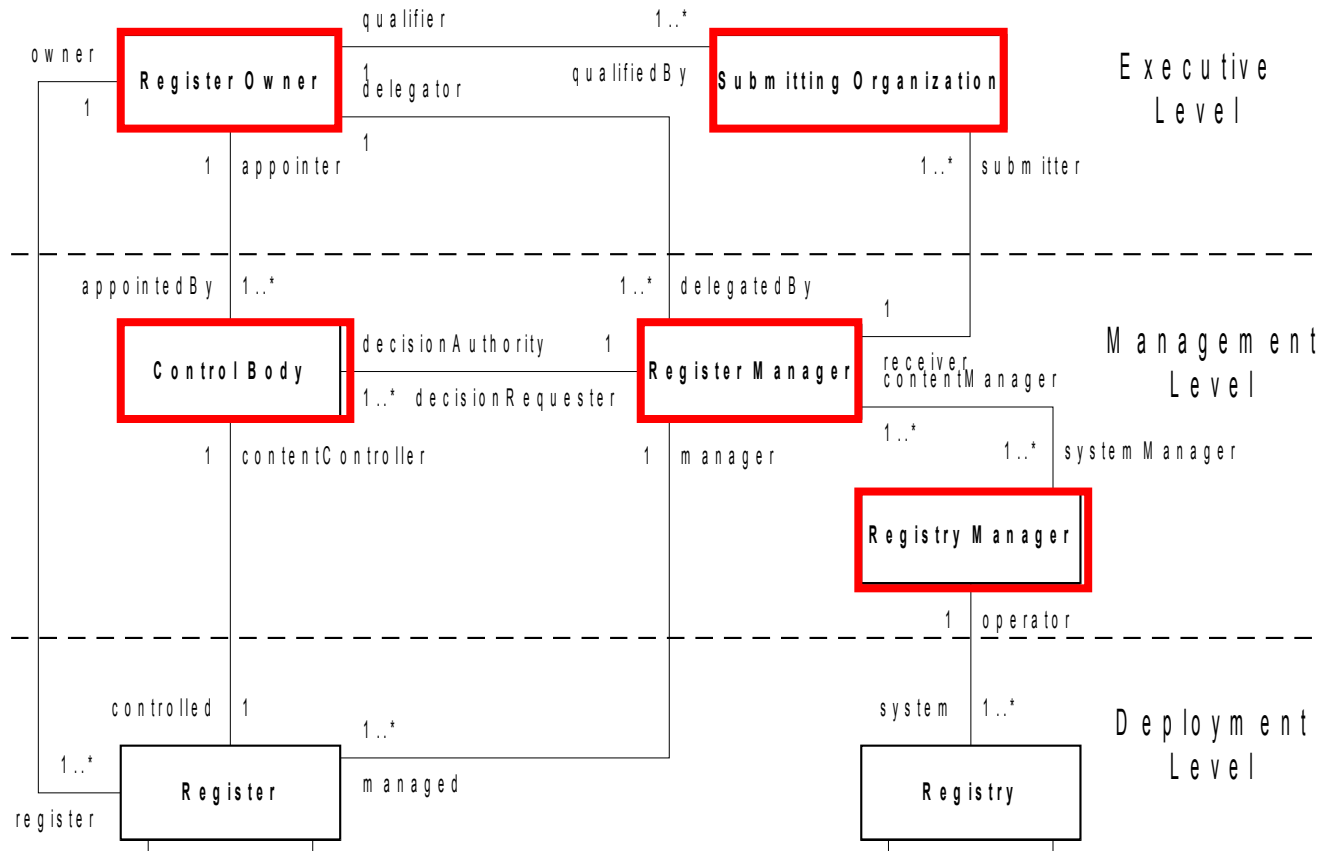
Register, register user & registry

Register user
accesses
A Register
Stored on a **Registry**





Governance roles



Registry manager

- day-to-day management of a registry.
- may engage a service provider to perform this service
- ensures integrity of registers
- provide means for electronic access to the registry for register managers, control bodies, and register users.



Applying the framework -1

- identify common, SDI governance **functions** and **actors** based on architecture (TBC)
- for each actor identify the lists of agreements (registers) they are **responsible for**:
 - e.g. data coordinator - register of data models, register of data sets, register of data modeling projects
- 'Responsibility' implies governance i.e. how to create, revise, adopt, use and manage agreements
- for each register, assign registry management roles to specific agencies



Applying the framework - 2

- identify projects to build SDI capability (work-plan)
- identify governance requirements of each (registers)
- assign registry governance roles to organizations



UNSDI work-plan

The work-plan focuses on five areas:

- **Architecture** -The creation and maintenance of a UNSDI architecture to support SDI creation
- **SDI development** - The creation of SDI instances that are nodes/systems within the UNSDI and the publishing of standardized data and services
- **Tools** - SDI 2.0, an SDI toolset with FOSS reference implementation
- **Data models** - development and harmonization and deployment of data models for priority geospatial data sets and the
- **Registry of SDI resources** - Implementation of registry for the management of SDI resources



Worked example - administrative boundaries

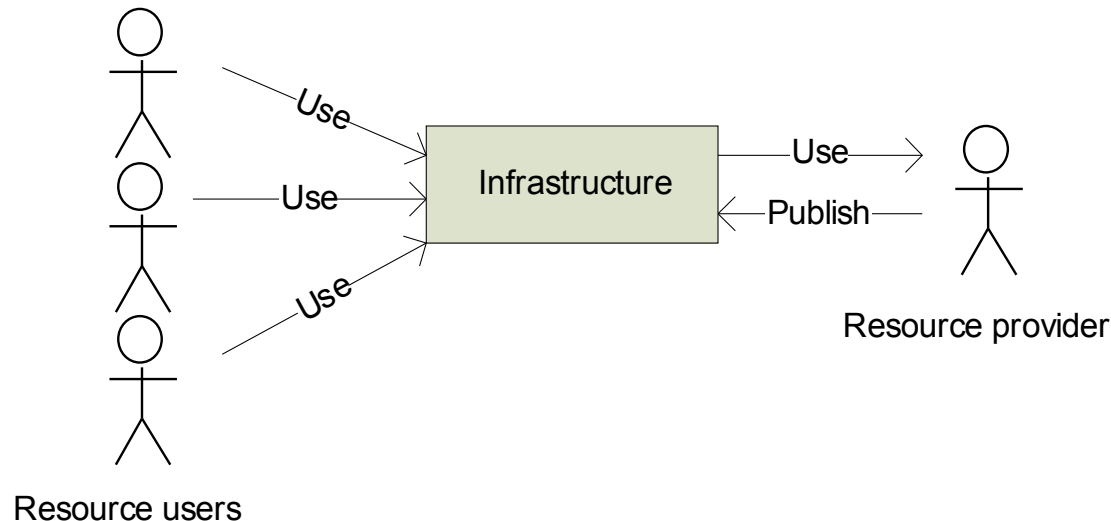
- following (straw-man) use cases and actors involved in governance of administrative boundaries data [slide required]
- for each of governance use case & actor a number of registers is required



Worked example - administrative boundaries

Scenario 1: GIS officer looking for administrative boundaries to add to map.

Scenario 2: Data manager wishes to develop an application that uses admin data





Worked example - administrative boundaries

- **access UNSDI (register of registers), to find:**
 - **register of data access services. Search register to find:**
 - **admin boundary data services – X services found**
 - **access service metadata to determine service of interest**
 - **obtain data product specification for data served by service from data product register**
 - **access feature catalogue and data model from relevant registers**
 - **downloads data/access the data online**



Worked example - administrative boundaries

Discovery of services

- Register of vocabularies
- Register of services
- Register of organizations
- Register of authoritative data sources



Worked example - administrative boundaries

Exploration of data

- Register of data products
- Register of feature types (feature catalogue)
- Register of data models
- Register of vocabularies



Worked example - administrative boundaries

Contributing to the data modeling effort

- Register of vocabularies
- Register of data models
 - Components to reuse
 - Place to publish results
 - Place to get metadata
- Register of SDI participants (and roles e.g register of register managers, register of submitting organizations)
 - How is it managed
 - How to fix or extend it
- Register of MOUs (who's using it)
- Register of UNSDI projects (where is it used)
- etc



Decision Point

- Is the UNSDI going to support re-use of resources and interoperability between SDIs

If so its going to need to develop and own the architecture to make it possible

And establish the mechanisms to publish resources?