YYT-C3001 Management of environmental data and information

Lecture 4: INSPIRE

Aalto University
School of Engineering

Jussi Nikander

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Contents of this lecture

The INSPIRE directive and the importance of standardization

The INSPIRE spatial data infrastructure

INSPIRE data specifications

Learning goals for this lecture

Understand what is INSPIRE

Be able to read and comprehend the INSPIRE data specifications

The INSPIRE Directive

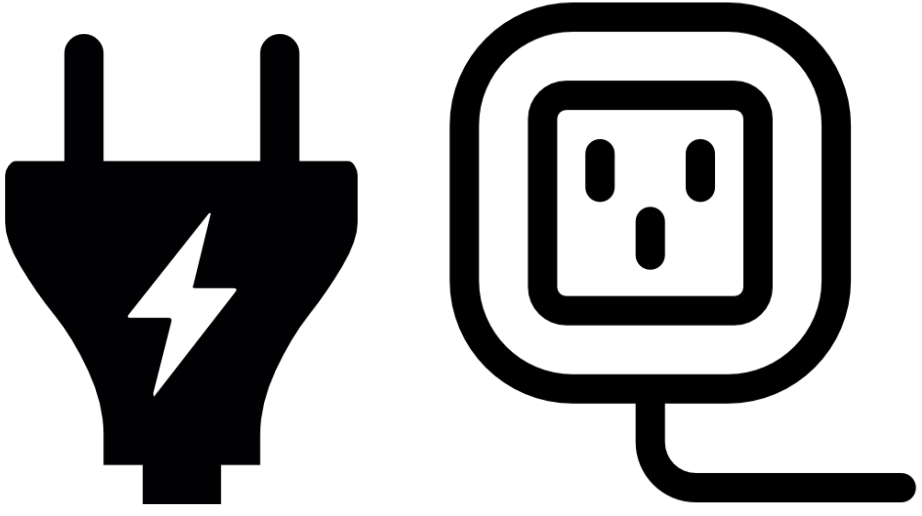
Introduction: what is INSPIRE

- **INSPIRE is an EU directive**
- **It is also a framework for establishing a Spatial Data Infrastructure for EU**
- **The goal is to provide EU-wide spatial data as a commodity**
  - Similar to electricity, water, etc.
- **Should be completely implemented in 2021**

Why INSPIRE and what for?

- **Sharing spatial data among 27 nation-states who all have their own institutions is not simple**
- **Standards and common technical guidelines are needed in order to enable interoperability**

- **Without common standards data will be incompatible**



Goals of INSPIRE

- **Data stored only once**
  - typically at country-level
- **Data from different sources can be combined seamlessly**
- **Geographic information can be used to promote good governance**
- **Geographic information is easy to find**

- **Mind you, it is not always easy to accomplish, and requires standardization**

The need for sharing geospatial data

The environment does not respect political borders and many analyses require us to consider what happens at the neighbor's side. Also, each organization typically generates limited number of spatial data sets.

Thus being able to access geospatial data created by others is very often necessary for spatial analysis

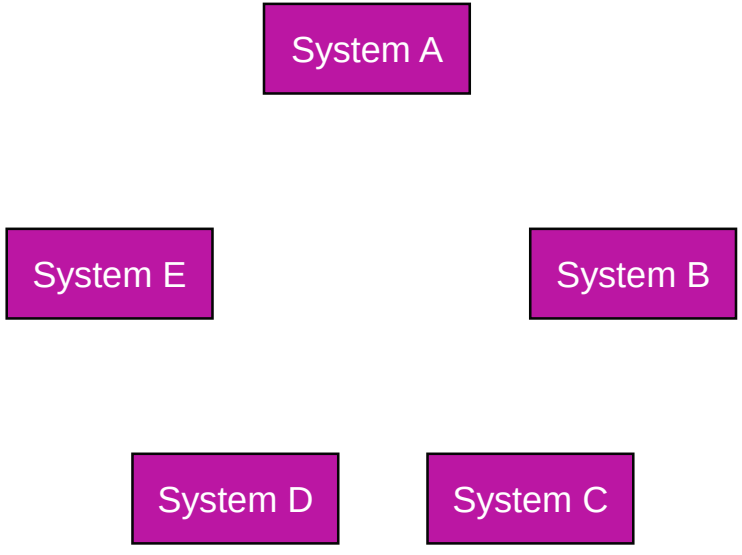
Data required for (or available for) an analysis is often heterogeneous

Thus, we often have a need to access data from several providers, and can also provide data for others

Sharing geospatial data

In general, we can model data sharing using several systems (actors, organizations, etc.) that wish to share data with each other

The goal is to find a way for systems to share data efficiently

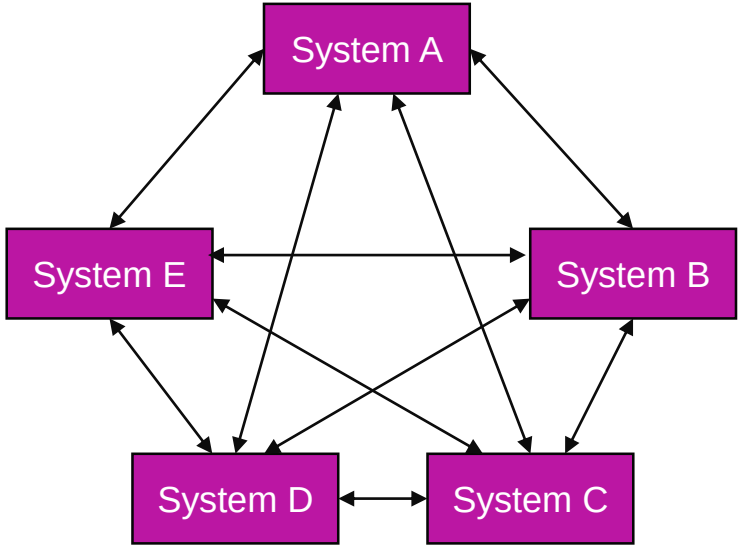


Sharing geospatial data

In general, we can model data sharing using several systems (actors, organizations, etc.) that wish to share data with each other

The goal is to find a way for systems to share data efficiently

A simple solution is for every pair of actors to agree how they would like to share data



As the number of systems increases, so does the complexity of the system

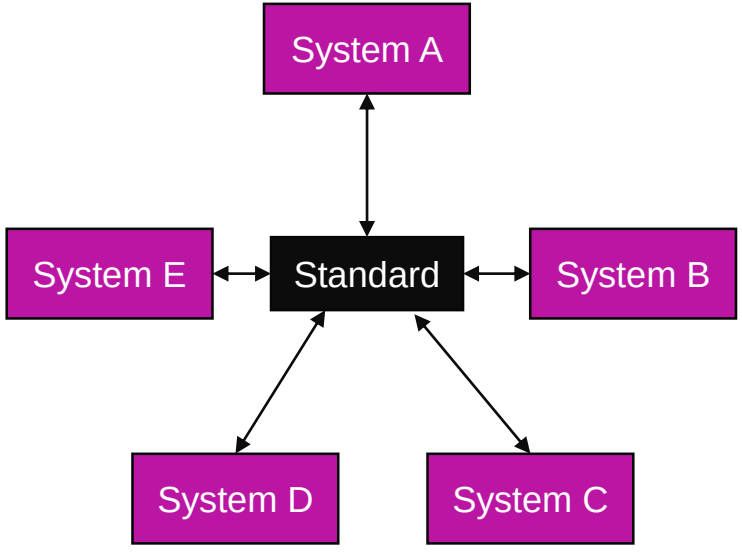
Number of agreements required is $\frac{n(n-1)}{2} \approx n^2$

Sharing geospatial data

In general, we can model data sharing using several systems (actors, organizations, etc.) that wish to share data with each other

The goal is to find a way for systems to share data efficiently

The actors can also agree on a common structure for the data sharing (a data model standard)



Complexity of the system stays (nearly) constant: each new actor just conforms to existing standard

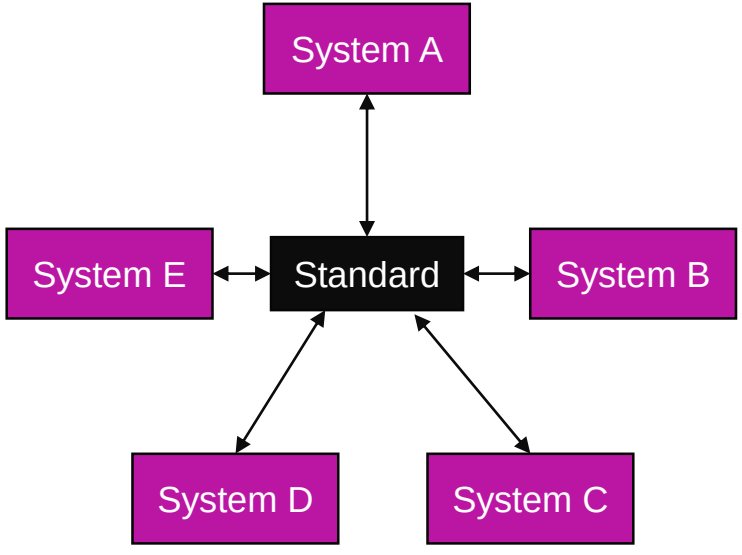
Sharing geospatial data: standards

Using a standard approach to data sharing enhances interoperability and simplifies operations

There are many ways to define what is “a standard”

“A standard is a documented agreement between providers and consumers, established by consensus, that provides rules, guidelines, or characteristics ensuring materials, products, and services are fit for purpose.”

OGC/ISO Technical committee 211 (2015): A guide to the role of standards in geospatial information management



Importance of standards

“… standards make everyday life work. They may establish size or shape or capacity of a product, process or system. They can specify performance of products or personnel. They also can define terms so that there is no misunderstanding among those using the standard.”

“In 1904, much of the City of Baltimore in the United States was destroyed by a massive fire. Firefighters from hundreds of kilometers away were sent to assist Baltimore firefighters during the height of the blaze. They could do little to help because the fire hoses used by different responders were not standardized. The resultant inability to connect hoses to fire hydrants turned hundreds of firefighters into spectators.“

OGC/ISO Technical committee 211 (2015): A guide to the role of standards in geospatial information management

INSPIRE Standards and guidelines

- **Implementing rules are binding standards INSPIRE implementations need to follow**
  - Metadata, data specification and services
- **Technical guidelines describe how INSPIRE might be implemented**

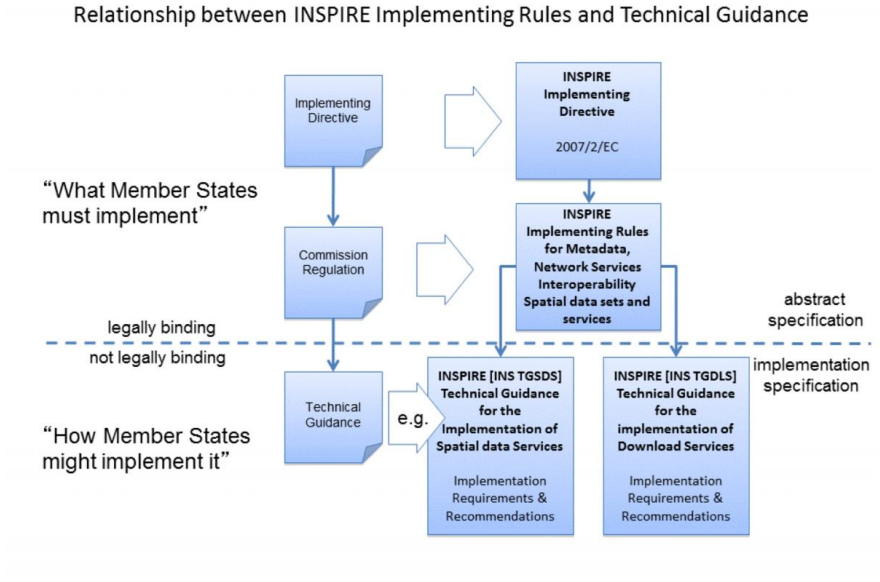


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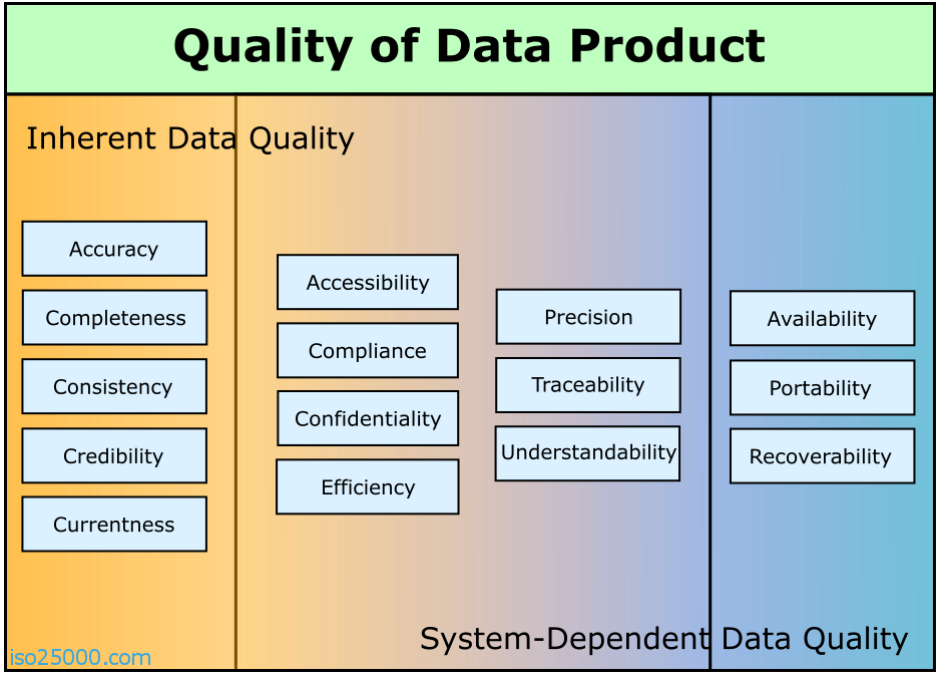
Image source: https://inspire.ec.europa.eu/inspire-technical-guidance/57753

Data reusability and harmonization

- The goal is to make data from all EU countries comparable
- This would allow the reuse of the data in many applications
- One goal is to provide data and services with sufficient quality and reliability that private actors dare to build services based on them



Source: https://iso25000.com/index.php/en/iso-25000-standards/iso-25012

The INSPIRE SDI

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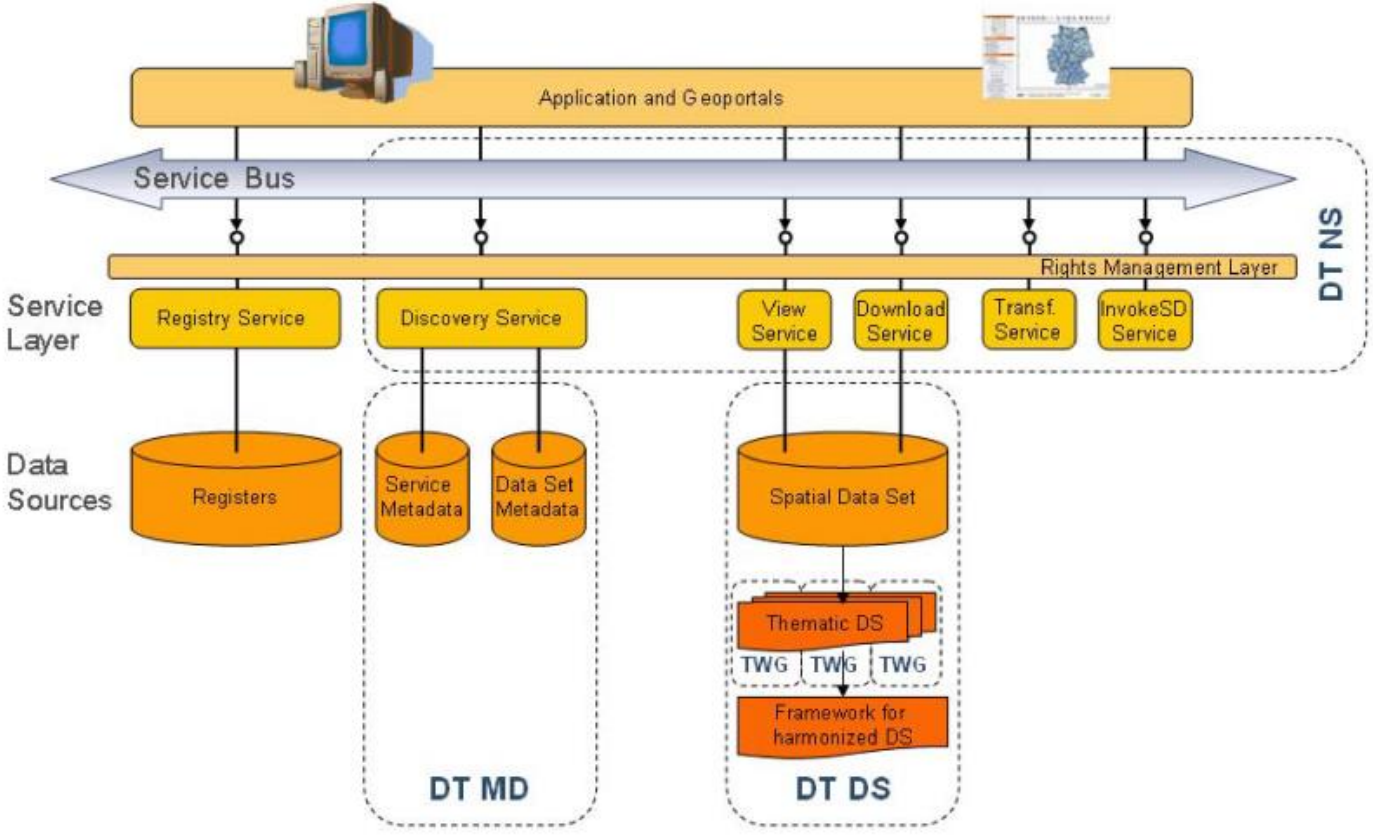
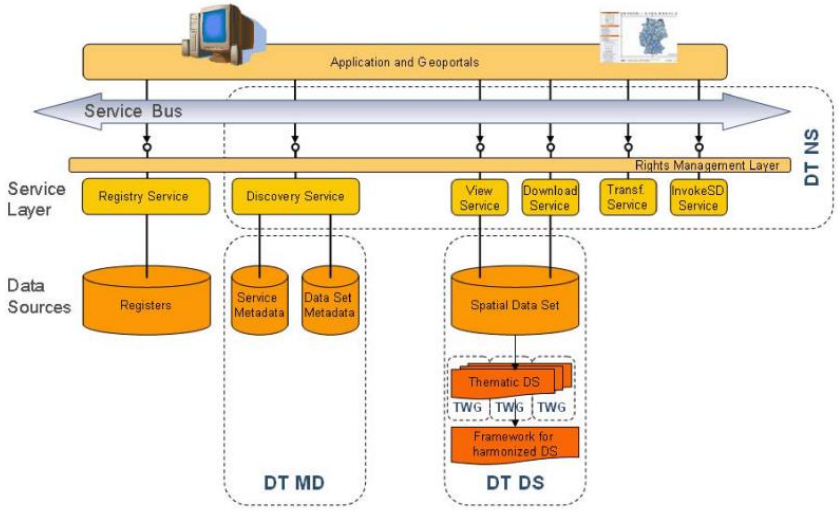
The INSPIRE SDI



A?

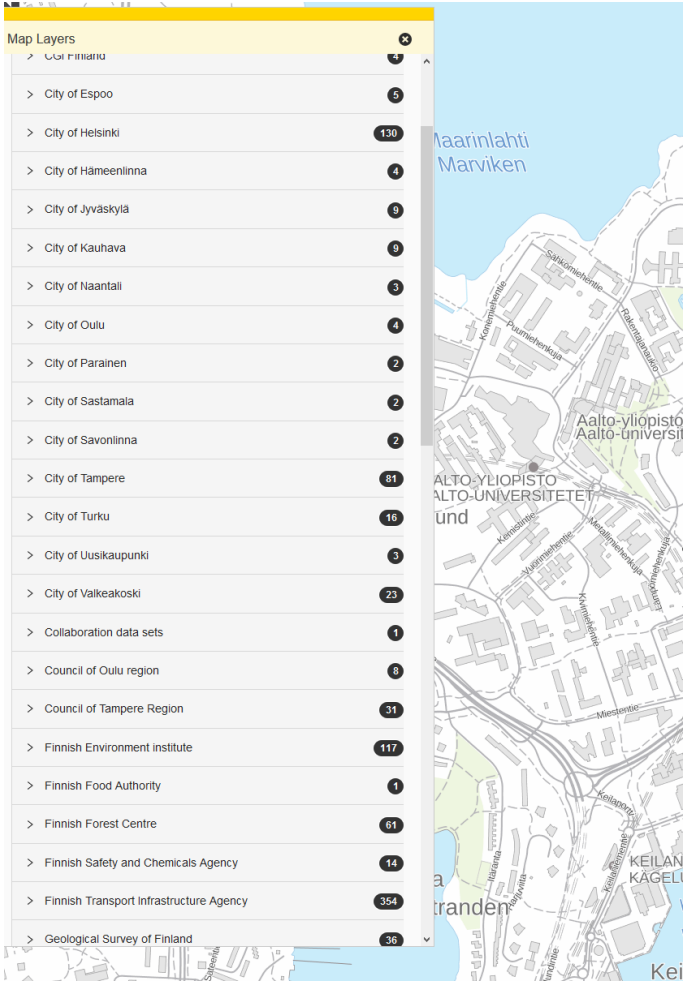
The INSPIRE SDI

- The registry service is used to provide metadata
- The discovery service is used to find data
- View and download services are used to access data
- Transfer and invoke services can be used to build other services

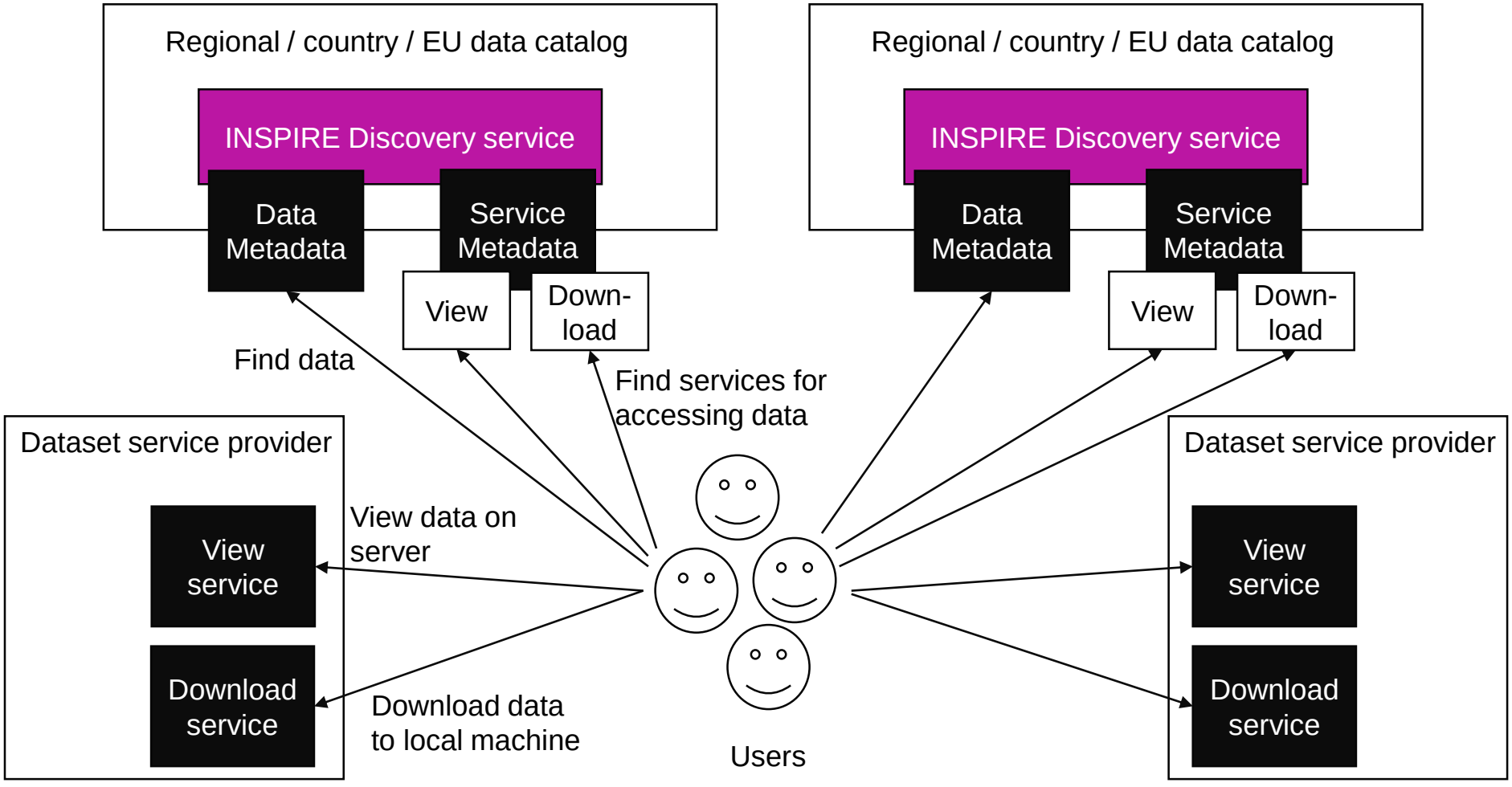


The INSPIRE SDI is distributed

- The INSPIRE SDI is not a single service maintained by one actor (the EU)
- It consists of many cooperating services
- Download and view services for each dataset can be provided separately
- Paikkatietoikkuna uses INSPIRE view service implementations to fetch the data used in the service



The INSPIRE SDI is distributed



Lecture exercise

I will divide you into breakout rooms in Zoom

In the breakout room groups, try find out what standards are behind the INSPIRE services

Each room has one service they need to concentrate on

Detailed instructions as well as a place where to put your results can be found in https://jamboard.google.com/d/1MvusgxQ3XaDNfyFVBDRKxyyHjZiyVEKeCXnKtLmEBmU/edit?usp=sharing

Let's use 20 minutes for this (take a break, if you're ready before)

Technical standards behind INSPIRE

- **INSPIRE data access is primarily using OGC standards and their extensions**
- **Discovery: OGC Catalogue service (CSW)**
- **View: OGC Map service (WMS)**
- **Download: WCS, WFS, etc. depending on the implementation**

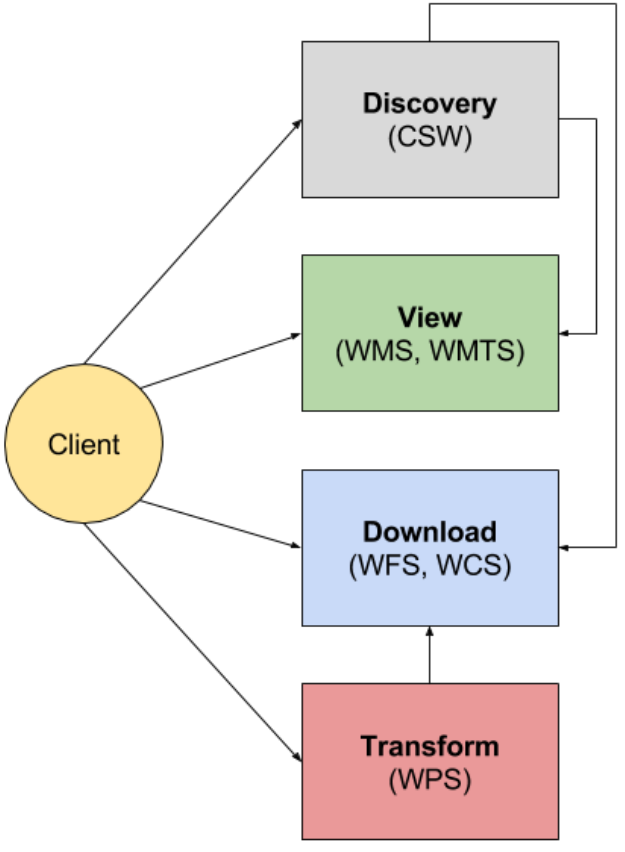


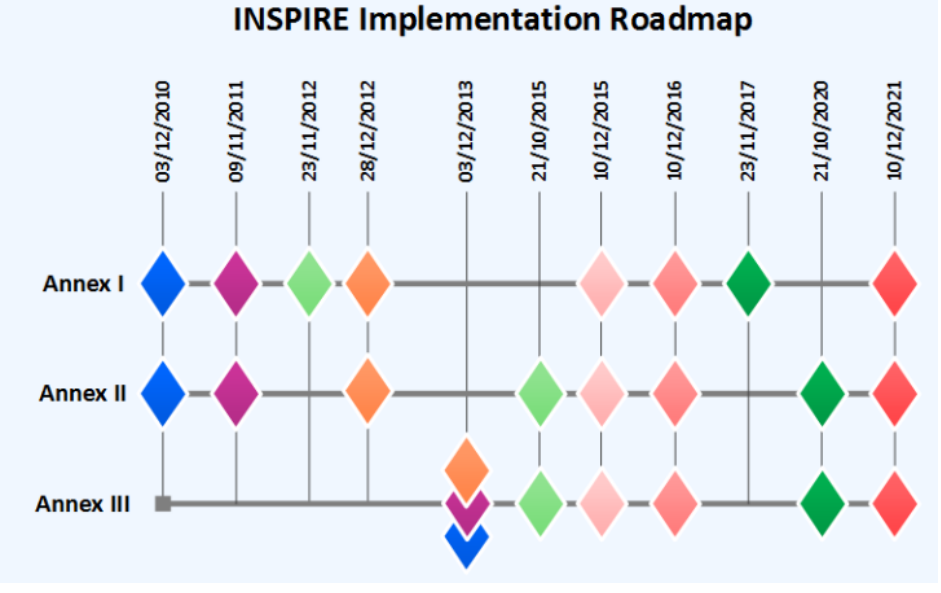
Image source: https://docs.geoserver.geo-solutions.it/edu/en/ogc_protocol_intro/index.html

INSPIRE data specification

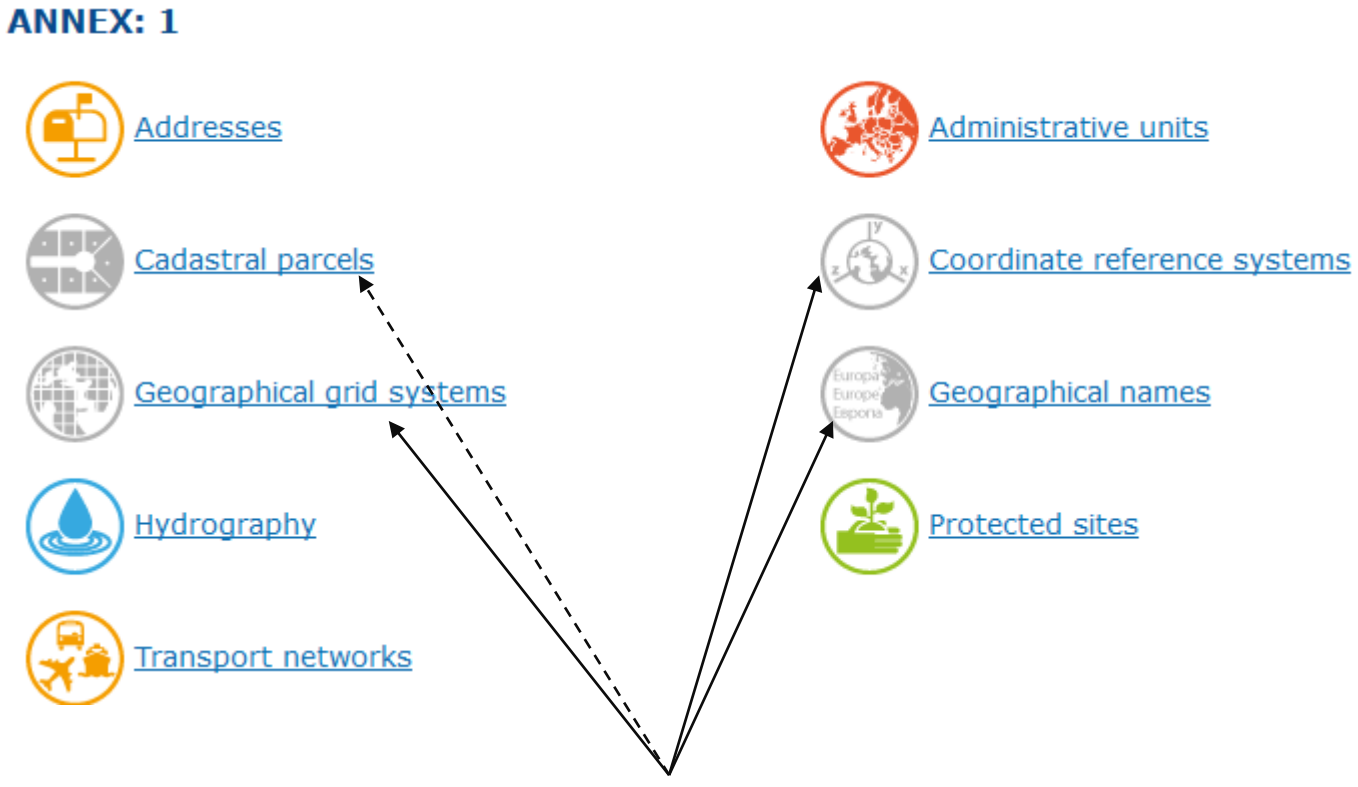
INSPIRE data definition

- **The scope of INSPIRE data covers 34 themes**
- **This data should be interoperable across EU**
  - Data can be harmonized by changing it to conform to same data model
  - A service can be used to transform the data into specific format upon use
- **Themes are divided into three annexes**

- **Each annex has different timeline for implementation**



Annex I


ANNEX: 1
Addresses
Cadastral parcels
Geographical grid systems
Hydrography
Transport networks
Administrative units
Coordinate reference systems
Geographical names
Protected sites
Can be used in the development of other INSPIRE themes

Annex II

- **Mostly basic and background information**
- **Required for a lot of applications**

ANNEX: 2

Elevation


Land cover

- **The Land cover theme is wider in scope than the pan-European CORINE land cover**


Geology


Orthoimagery

Annex III

- “Everything else”

ANNEX: 3


Agricultural and aquaculture facilities


Atmospheric conditions


Buildings


Environmental monitoring Facilities


Human health and safety


Meteorological geographical features


Natural risk zones


Population distribution and demography


Sea regions


Species distribution


Utility and governmental services


Area management / restriction / regulation zones & reporting units


Bio-geographical regions


Energy Resources


Habitats and biotopes


Land use


Mineral Resources


Oceanographic geographical features

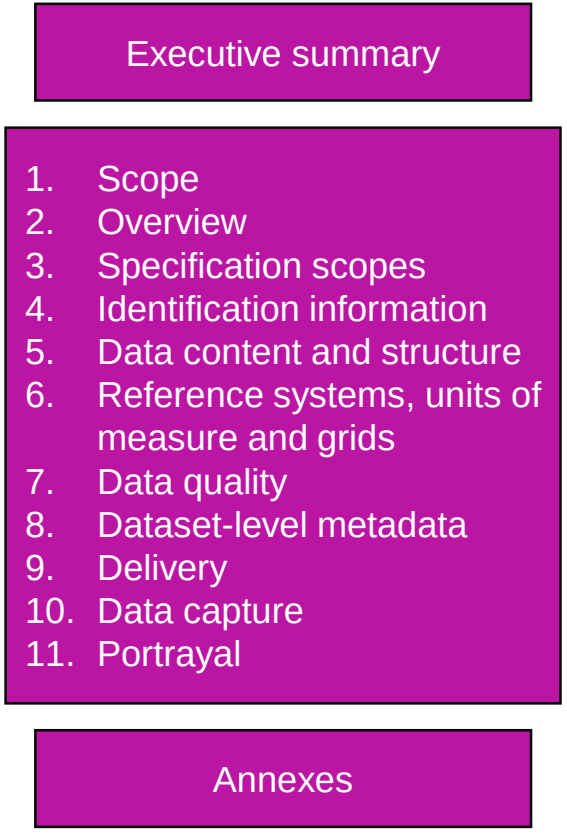

Production and industrial facilities


Soil


Statistical units

The specification and description

- **Each theme is described in a data specification document**
- **The documents have a standard format to make it easier to read them**
  - And to compare the data in different specifications



Lecture exercise: INSPIRE data themes

I will divide you into breakout rooms

Each room is given two INSPIRE data specification themes

Find out what data the theme covers (reading the first parts of the specification should be sufficient)

Consider what this kind of data is used for

Let’s use 15 minutes for this

https://jamboard.google.com/d/1Er03ufxglV1HcF8P_C-UvCbhKwzUXGABalmokr-am28/edit?usp=sharing

How good is the INSPIRE

- **The required part describes what needs to be done and how to implement it is non-binding**
  - This might sound like a good idea from legislative point of view, but may cause some interesting artefacts in the implementation
- **Overall, INSPIRE was written with little implementation experience**
  - Some technical requirements are odd
- **INSPIRE is much better than not having any such directive**
  - Legislative push was required to start data harmonization on European level
- **SDIs in general are difficult to get working**
  - This advance little by little
  - Public sector always has trouble with measuring success

For the next time…

Submit the second round of exercises

Continue writing the learning diary