

InGeoCloudS

INspired GEOdata CLOUD Services

Pilot2 Presentation

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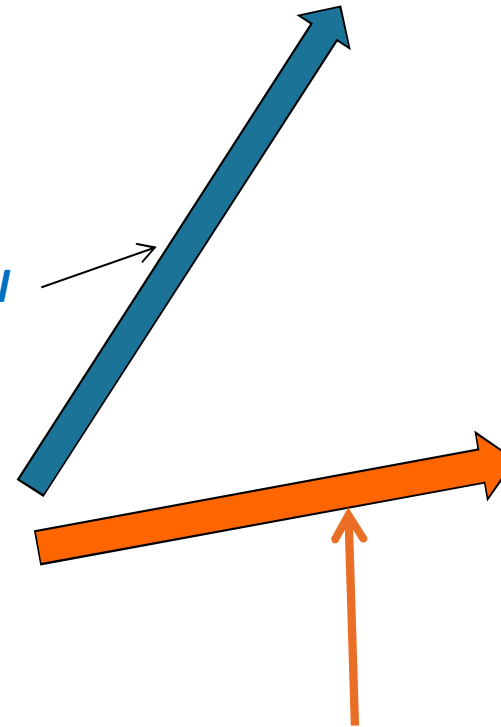


Why InGeoCloudS?

It is about Geo- (Spatial) Data

*We cannot act here
The tsunami of data is real
and the quality raises too*

Data Quantity and Quality
Visibility, Accessibility and Sharing



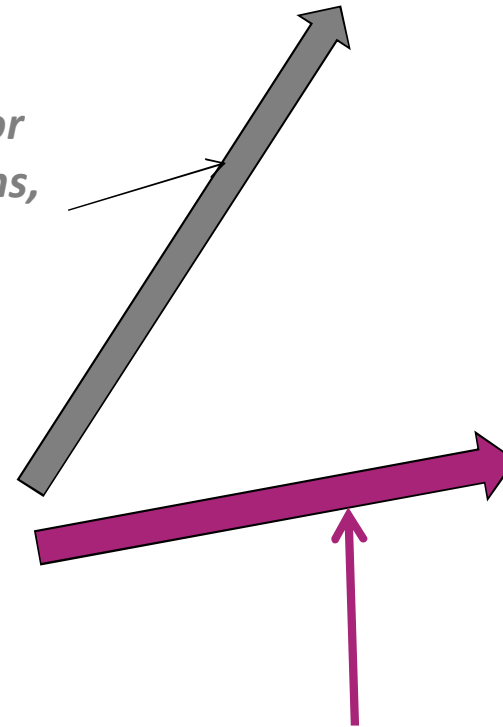
*We act on here for improving
necessary services*

Why InGeoCloudS?

It is **also** about Geo- (Spatial) Data processing and applications

More and more needs for computations, simulations, peak responses to emergencies....

Geospatial sciences & applications
Resources available



We act on here for accelerated procurement, for resources availability and pooling



Why InGeoCloudS

Characteristics of Geo-Applications



- **Data intensity** scenarios: storage but not only: modeling, discoverability and accessibility
- **Computing-intensity** scenarios: geo-processing on demand, procurement and release of resources
- **Access-intensity** scenarios: World-wide and/or concurrent access to information in case of particular events



InGeoCloudS
Inspired GEOdata CLOUD Services

Why InGeoCloudS?

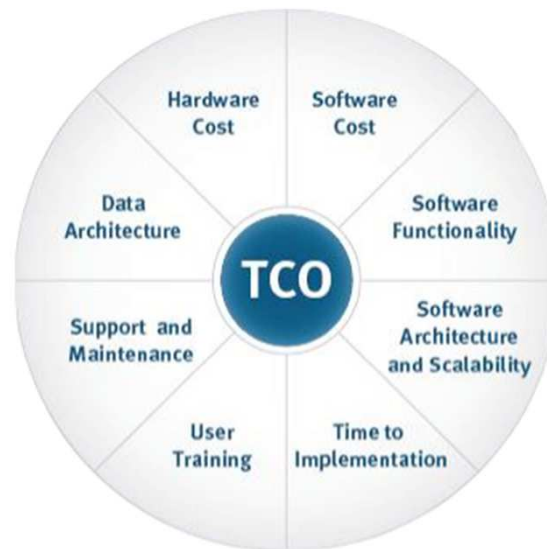


Data must be provided to their consumers:

- Efficiently
- Ubiquitously
- In various forms
- At no (or cheap) price
- Following standards and recommendations
- « packed » into relevant services

**Data Publication
Requirements**

But...



Why InGeoCloudS?

Promises of the Cloud

- ▶ TCO Simplification and Reduction
 - ▶ Power supply, physical space, hardware, cables, network devices
 - ▶ Flexible (Elastic) Provisioning of resources
 - ▶ Rapidity versus classical ordering processes
 - ▶ Technical staff reduction
- ▶ Easy procurement (on-demand, self-service)
- ▶ Security, Availability, Quality of Service, Performance
 - ▶ Very performant (virtual) hardware available
 - ▶ Broad network access
 - ▶ Up-to-date software, OS
- ▶ Possible Scale-economy through pooling and share partners (consolidating different types of resources such as Database servers, application servers...)
- ▶ Facilitation for uptaking standards

**See next session on
Cloud Computing**

Why InGeoCloudS?

About INSPIRE



In order to ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and transboundary context... ,

... the Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas: Metadata, Data Specifications, Network Services, Data and Service Sharing and Monitoring and Reporting.

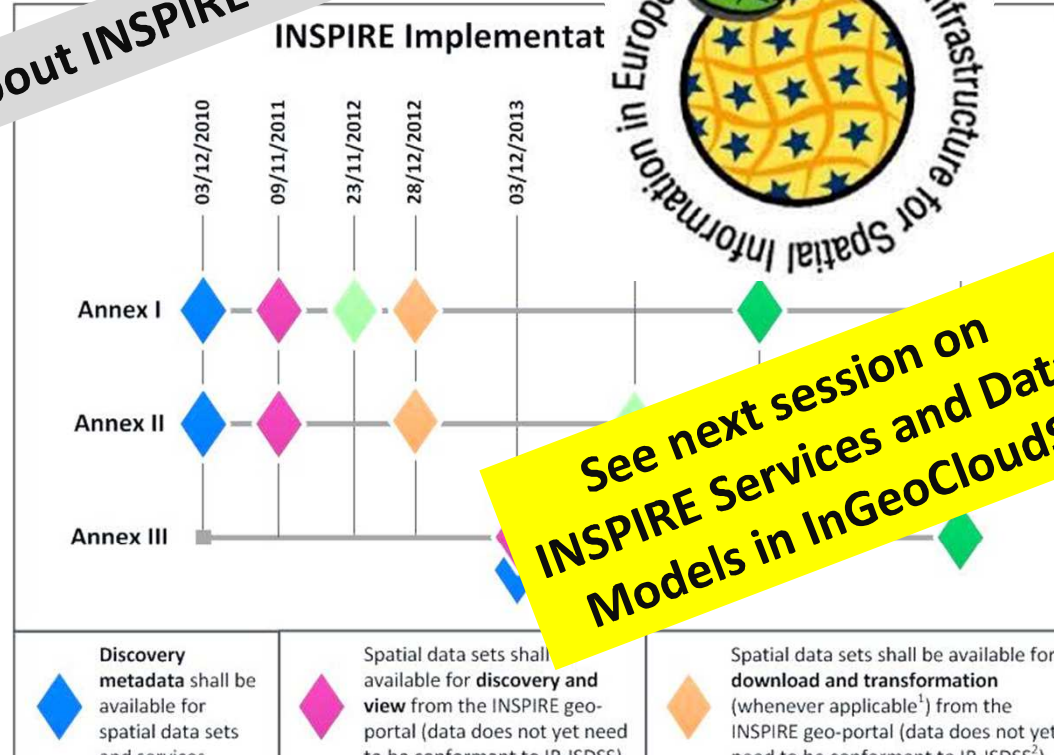


InGeoCloudS
Inspired GEOdata CLOUD Services

Why InGeoCloudS?



About INSPIRE



See next session on
INSPIRE Services and Data
Models in InGeoCloudS

Example:
December, 3rd 2013
MetaData Discovery for spatial datasets and services relative to Annex III Thematics



Why InGeoCloudS?

Objectives in a nutshell



Design and build a cloud infrastructure for public agencies in the spatial-environmental field

Provide an innovate (flexible,...) infrastructure for data services

**See next session on
Return on Experience for
the various Use Cases**

“Move” our services to a cloud-based infrastructure.

Integrate geo-data by exploiting a Linked Data “model”

ID-Card of the Project

Partnership

5 Geological Surveys bringing in 6 initial Use Cases (datasets and applications)

- Ground Water Management
- Geo-Hazards
- GeoData Publication and Mapping



3 ICT organizations bringing key-expertise

- Cloud Computing
- Semantic Web and Linked Data
- GIS
- Software architecture and integration...

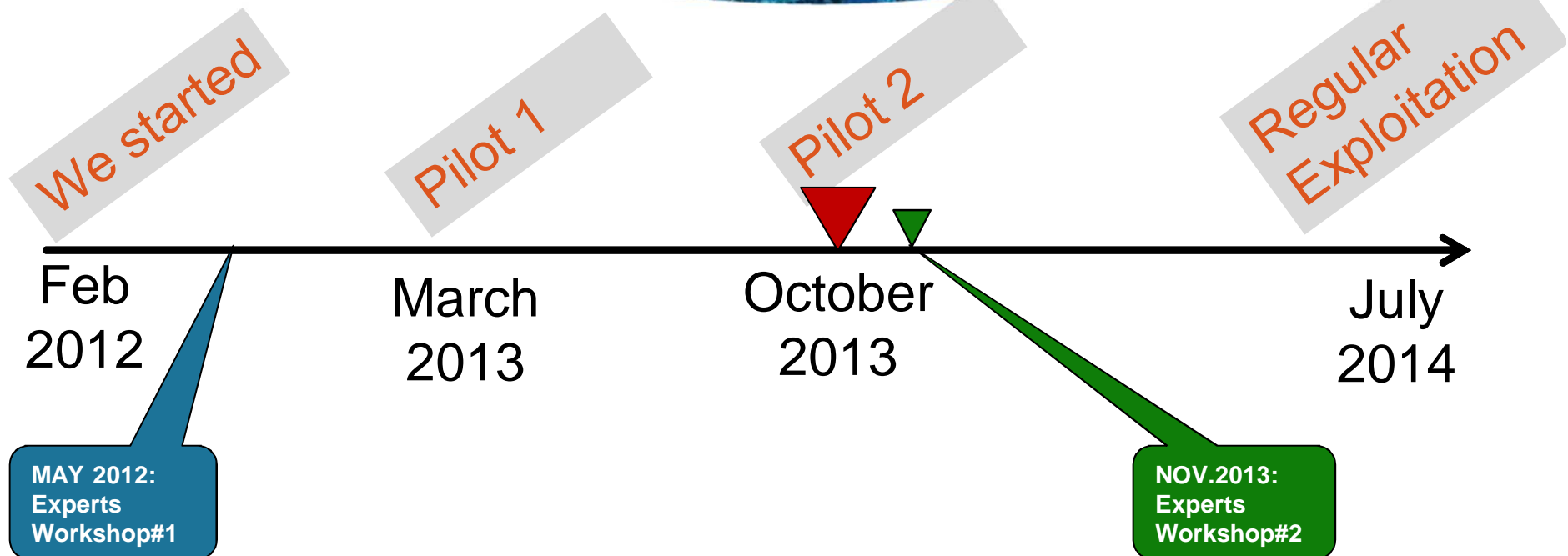




InGeoCloudS
Inspired GEOdata CLOUD Services

ID-Card of the Project

Key Dates



ID-Card of the Project

Achievements

- Fundamental **scalable/elastic services for data management:**
Database Server, File Server, Linked Data Store
- **Data publication** modules
- **An API:** Web Services upon a REST-based architecture
- **Data providers' data and applications in the cloud**
- **Portal and Management Tools**

Pilot2 Description

A Cloud Infrastructure as a Service



Pilot2 Description

Workspaces and data storage

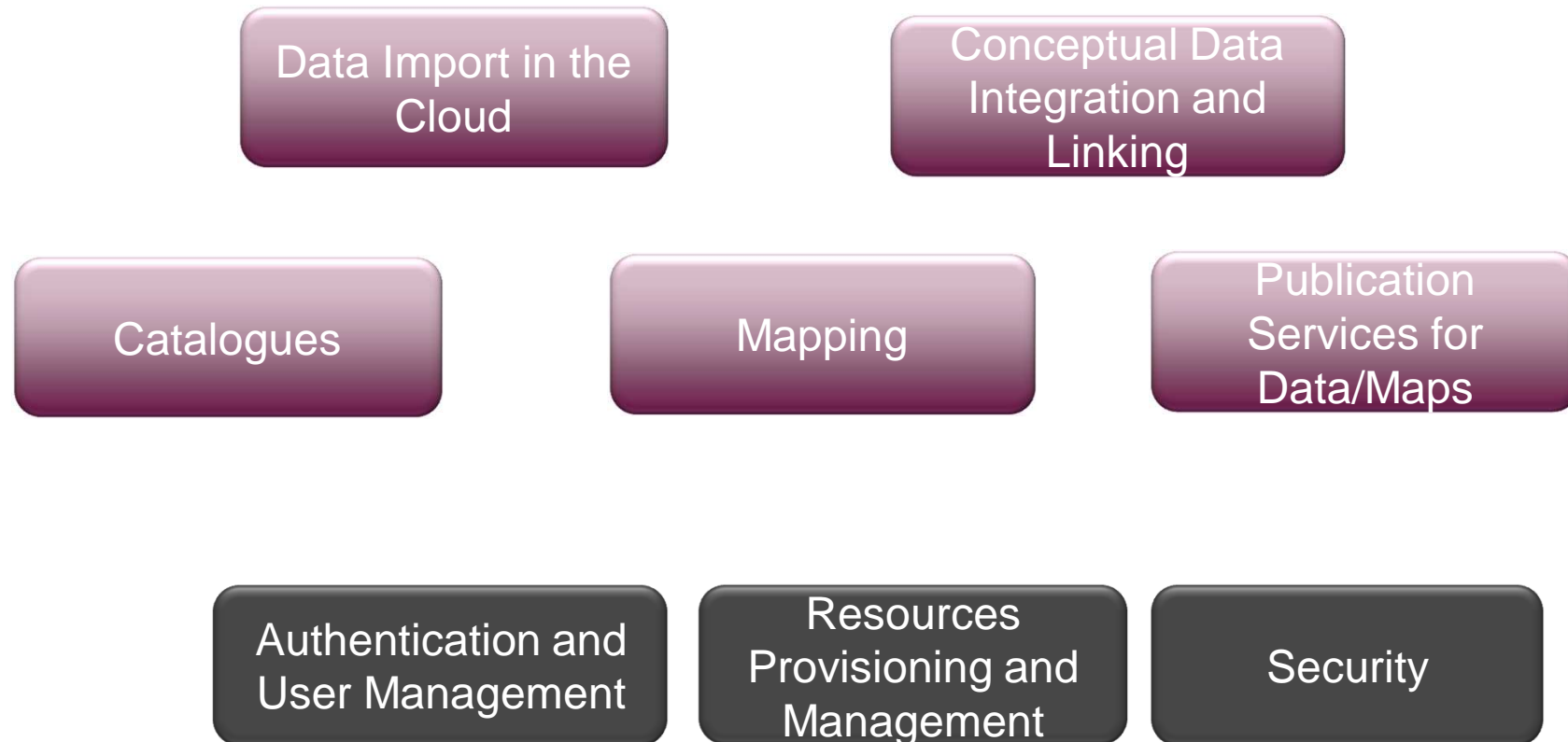
Elastic
File Server

Elastic
DBMS

LOD Triplestore

Pilot2 Description

Key Services



Pilot2 Description

APIs

REST Resources

This API supports a [Representational State Transfer \(REST\)](#) model for accessing a set of resources through a fixed set of operations. The following resources are accessible through the RESTful model:

- [File service](#)
- [Harvest service](#)

The REST resources expose a data model that is supported by a set of client-side libraries that are made available on the [files and libraries](#) page.

There is also a [WADL document](#) describing the REST API.

Data Model

All endpoints act on a common set of data. The data can be represented with difference media (i.e. "MIME") types, depending on the endpoint that consumes and/or produces the data. The data can be described by [XML Schema](#), which definitively describes the XML representation of the data, but is also useful for describing the other formats of the data, such as [JSON](#).

This document will describe the data using terms based on [XML Schema](#). Data can be grouped by namespace, with a schema document describing the elements and types of the namespace. Generally speaking, types define the structure of the data and elements are instances of a type. For example, elements are usually produced by (or consumed by) a REST endpoint, and the structure of each element is described by its type.

Namespace "master"

Namespace URI: <http://api.ingeoclouds.eu/master>
XSD: [master.xsd](#)

Data Elements

- [basicUser](#)
- [provider](#)

Data Types

- [basicUser](#)
- [provider](#)

Namespace "dataimport"

Namespace URI: <http://api.ingeoclouds.eu/dataimport>
XSD: [dataimport.xsd](#)

Data Elements

- [endpointStatus](#)
- [mediaMetadata](#)
- [pathMetadata](#)
- [state](#)
- [taskStatus](#)

Data Types

- [endpointStatus](#)
- [mediaMetadata](#)
- [pathMetadata](#)

Management
LinkedData
Data-Import
Elastic DB
Elastic FS
Elastic Map Server
Elastic Compute

Pilot2 Description

A Portal



Bienvenue sur le portail InGeoCloudS !

Projets

- Smart Queries**
Let the user build queries using OpenSearch and display the results
- GeoHazard**
Geohazard Management in Slovenia
- Shakemaps**
Shakemaps service
- GeoPublication**
UC GeoPublication for cataproviders
- geology/France**
geology in France
- Groundwater**
Pesticides in groundwater in Denmark

Groundwater
Pesticides in GroundWater This application is about finding areas where there are high concentrations of pesticides in the groundwater. The user is able to search for specific pesticides and restrict the output to pesticides found at a certain depth interval and/or from certain geology (lithology or lithostratigraphy).

Shakemaps
ShakeMaps This application is about viewing and downloading shaking intensity distribution maps for important earthquakes. The application produces automatically a new shakemap dataset a few minutes after the earthquake. Data is available to the user for viewing over a mapping interface and for downloading and re-using through the use of WMS and WFS services.

GeoHazards
Landslides Susceptibility Maps This application provides automatically produced susceptibility maps of triggering landslides due to higher precipitation levels. The endangered zones will be predicted using the combination of the landslide susceptibility model, the precipitation forecast and the landslide triggering threshold values. Data is available to the user for viewing over a mapping interface and for downloading and re-using through the use of WMS and WFS services.

GeoPublication
An integrated Platform/Infrastructure for data dissemination The Inspire Compliant Data publication is a data-provider service that allows to publish your own geo-data and to create maps. It allows you to simplify the re-use of data, without worrying about all technical, legal and Information Technology (IT) issues.

Feedback

Conditions d'utilisation | Politique de confidentialité | Contact | Aide

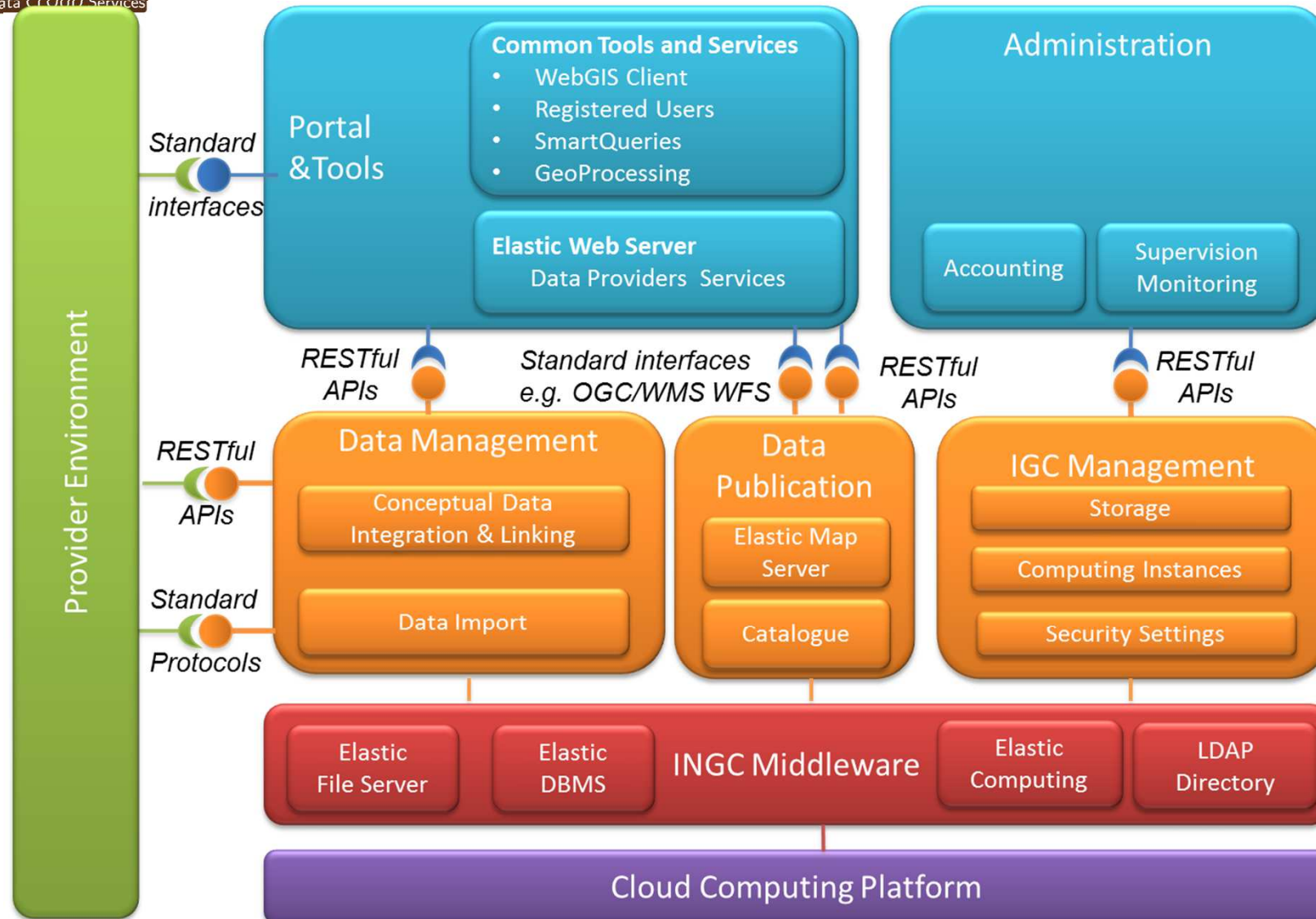


InGeoCloudS
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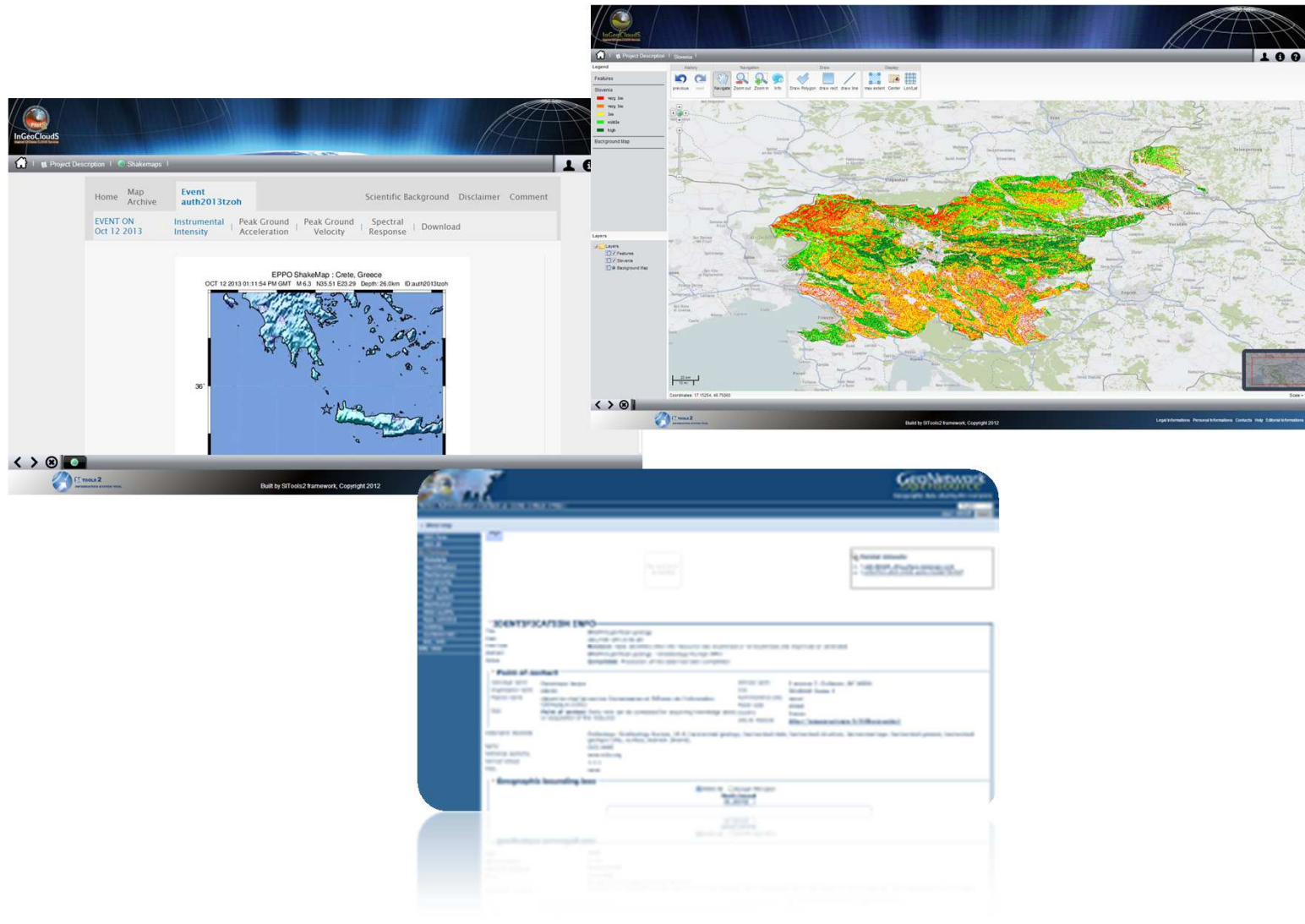
Pilot2 Description

The Whole Picture



Pilot2 Description

Integrated Geo Applications





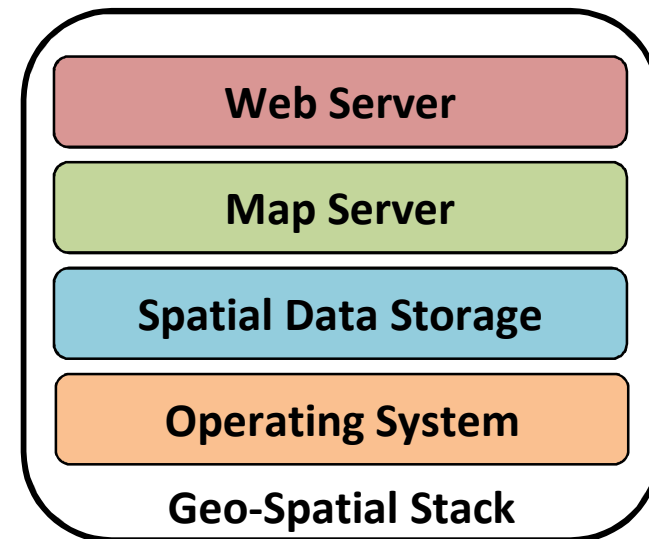
InGeoCloudS
Inspired GEOdata CLOUD Services

Achievements

Some lessons Learnt.....so far.



- Identify a common **software stack**
 - Homogeneous infrastructure
 - Scale economies
 - Cloud compliance
- Define **data volumes** requirements
 - Capacity planning
- **Scalability** challenges and requirements
 - High-throughput services
 - Reliability
 - Guarantee **QoS** for INSPIRE/OGC services



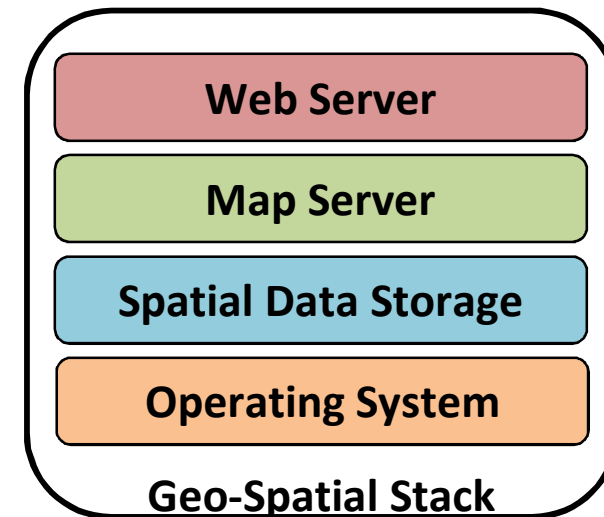
It is not simply about **porting** existing applications to the cloud, but rather to **integrate** them in a **scalable geo-spatial framework**

Achievements

Technical Components

The Basics

Apache and Tomcat,
MapServer,
PostgreSQL/PostGIS, GlusterFS
Linux OS,



What else?

Geonetwork

Portal + Search + Data Access Facilities (**Sitools2**)
Triplestore and SPARQL endpoint (**Virtuoso**)
OpenAM + OpenLDAP and Resources Usage monitoring (**AAA**)
Generalized **REST** Architecture
Secured API



InGeoCloudS
Inspired GEOdata CLOUD Services

M Europe

INTERNATIONAL EUROPE Grèce Crise de l'euro Russie Ukraine Serbie Espagne

Un séisme d'une magnitude de 6,2 frappe l'île de la Crète

Le Monde.fr avec AFP | 12.10.2013 à 12h30

Abonnez-vous à partir de 1€

Réagir ★ Classer

Recommander Envoyer



Un séisme d'une magnitude d'au moins 6,2 a frappé samedi l'île de la Crète, au sud de la Grèce, faisant des dégâts matériels selon les premières informations. Le séisme a frappé en mer à environ 60 kilomètres au large de la ville de Hania, dans l'ouest de l'île, selon l'observatoire grec des séismes sis à Athènes.

"Le séisme a eu lieu dans une région connue pour son activité sismique. Il a été ressenti fortement en Crète et dans le reste de la Grèce", a dit le géologue Eftymios Lekkas à la radio Skai. Selon cette radio, des maisons et des boutiques ont été endommagées.

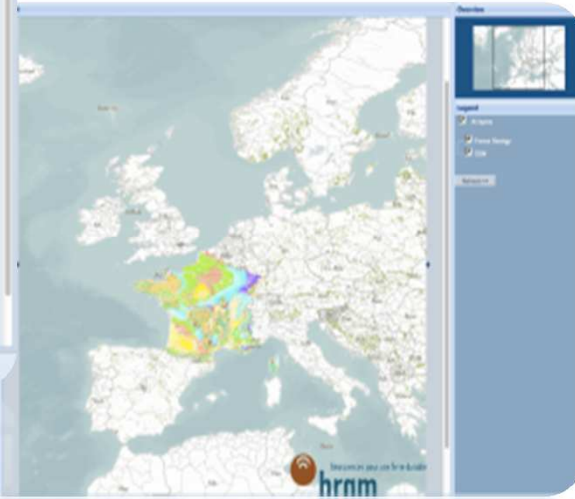
Vendredi, un tremblement de terre d'une magnitude de 4,4, décrit comme

Pilot2 Description

Map Design and Publication Service

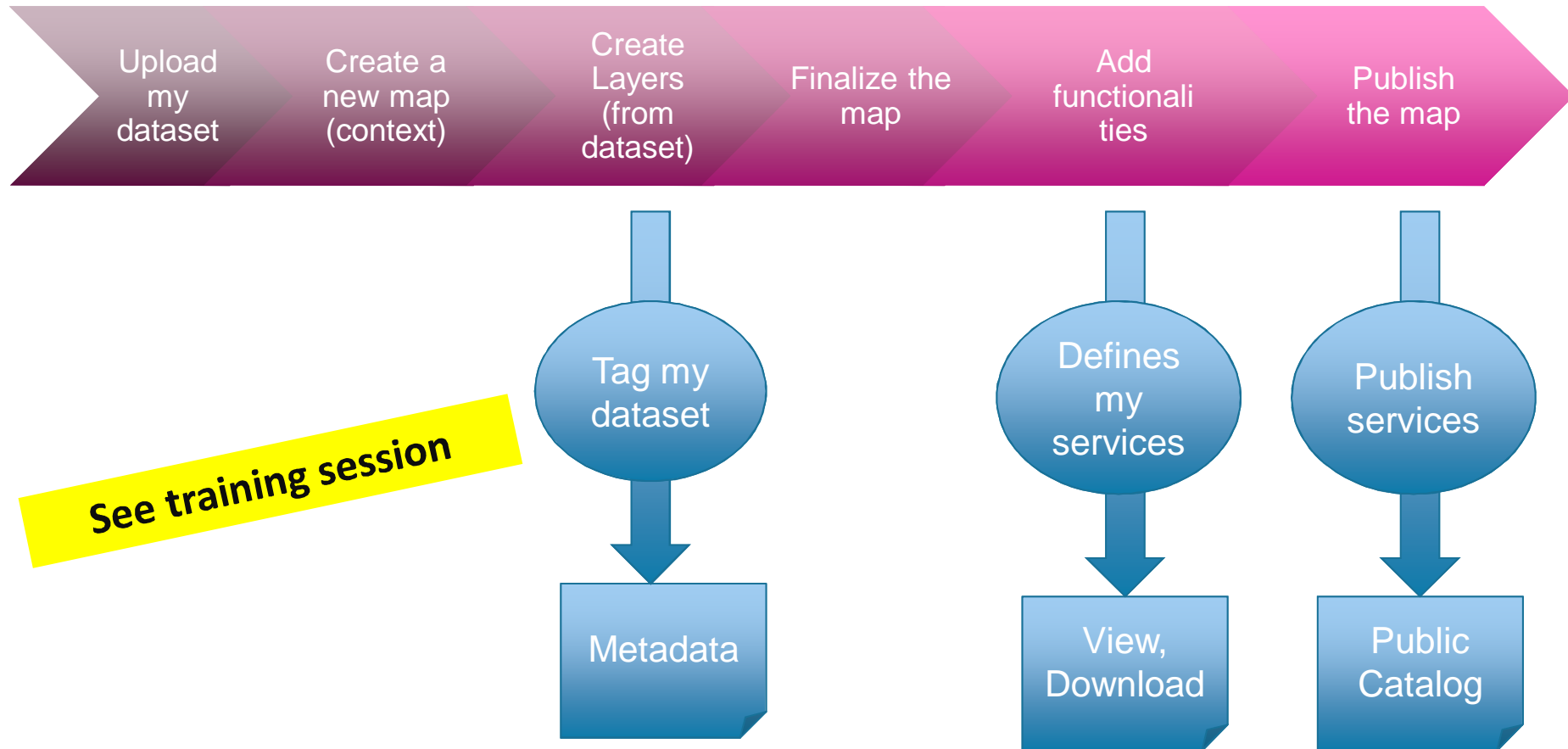


Non	Frame	Color of the object	Outline color	Base pattern	Thickness	Legend	Display	Print
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isobars	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isom	<input type="checkbox"/>		13	0	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Pilot2 Description

From the map to the INSPIRE service



Pilot2 Description

GSOM and Data Integration Module

Creation of a Conceptual Model to integrate and cover all the thematic fields

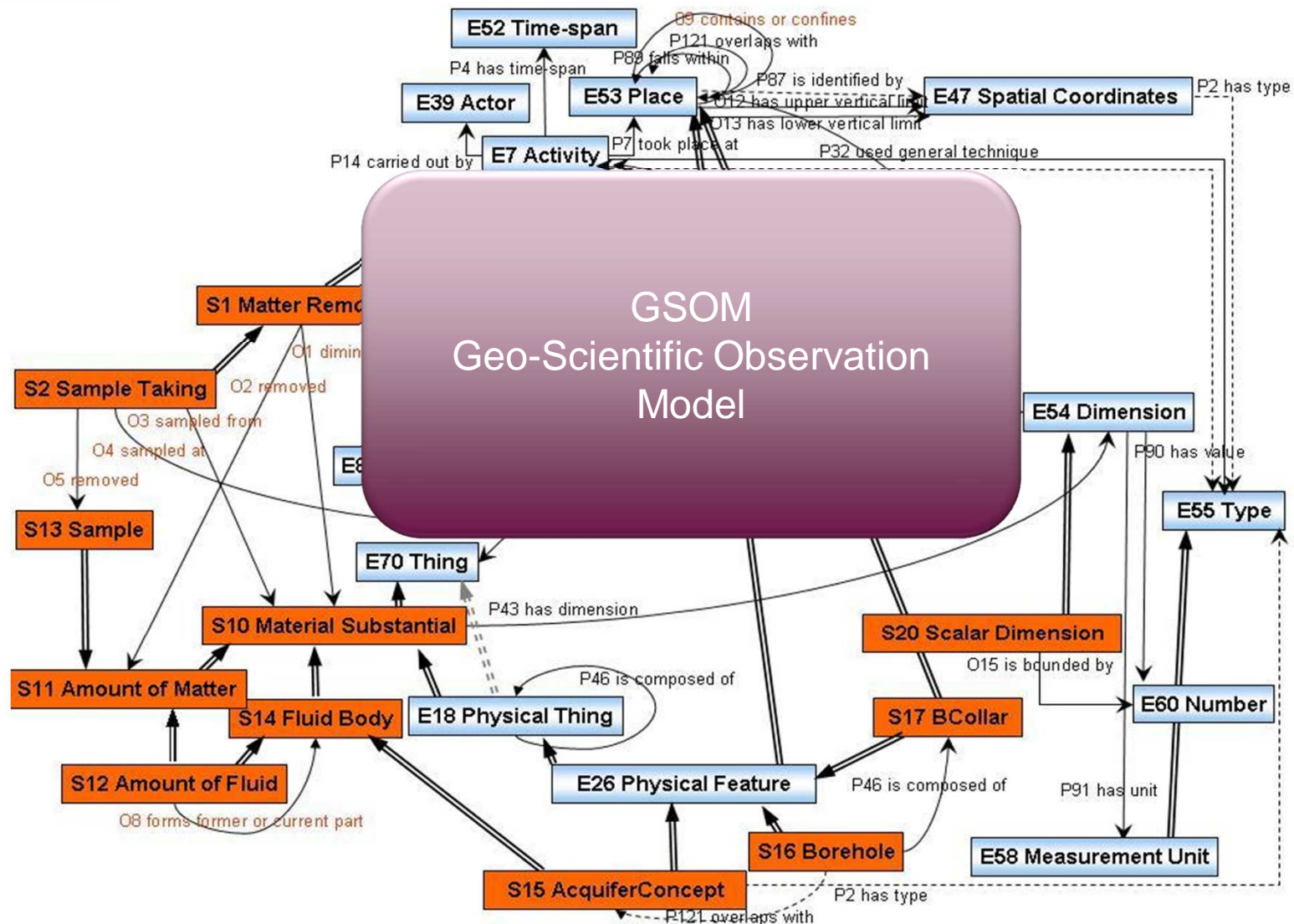
Map the source relational data into RDF data compliant to the Conceptual Model

Rely on a scalable RDF Triple Store (Virtuoso) to enforce the mappings and enable the storage and query of the RDF data



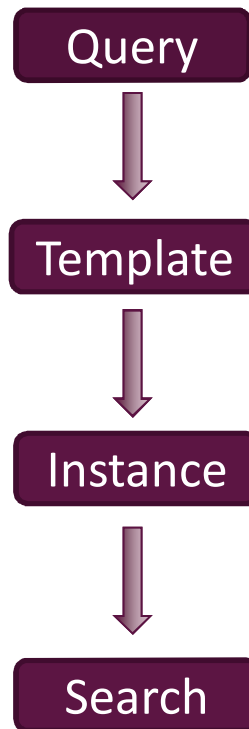
Pilot2 Description

Conceptual Integration



Pilot2 Description

SmartQueries: a Tool for Querying Linked Data Store



OpenSearch Description
Generated

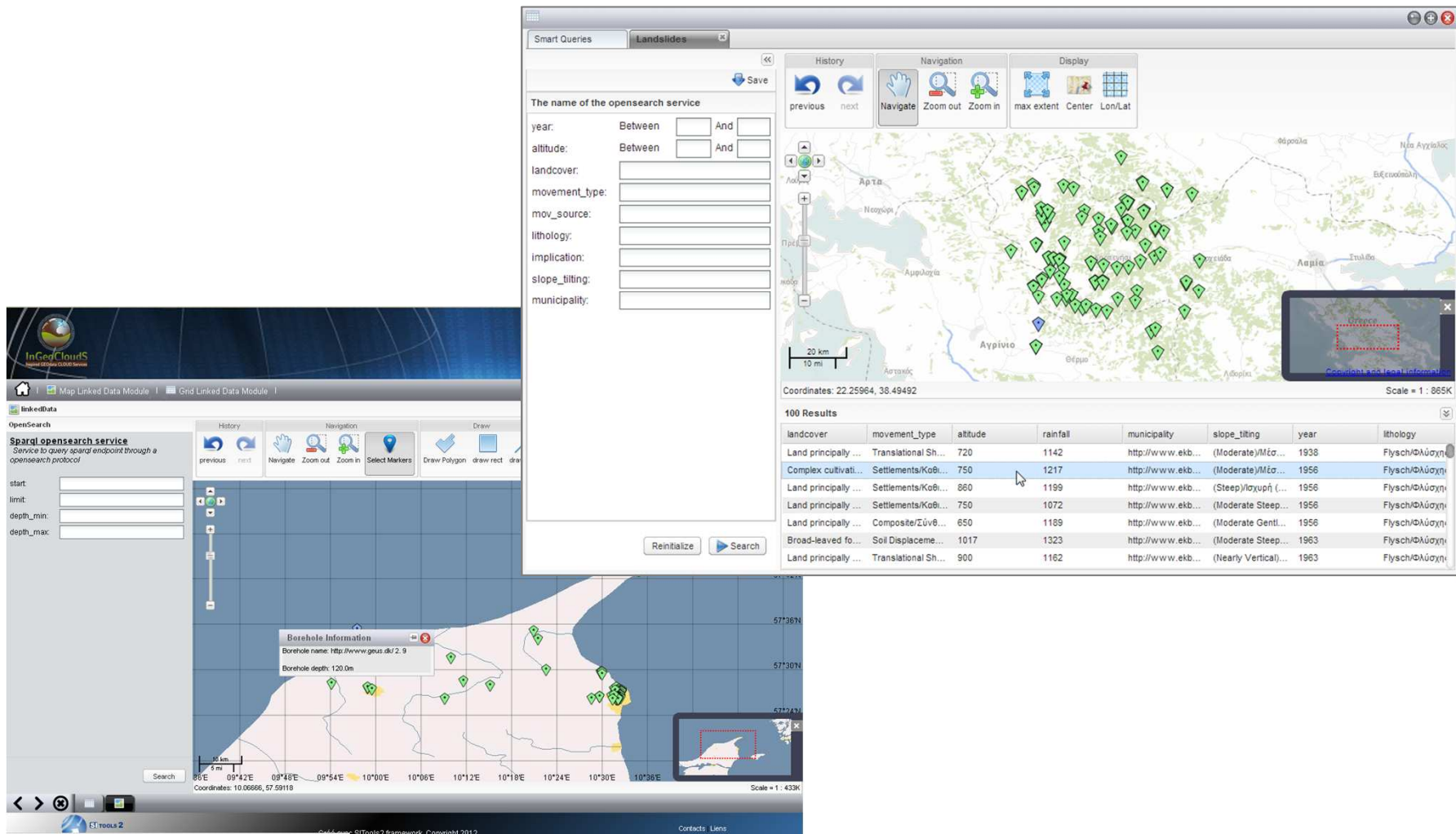
```

select ?location ?movement_type ?slope_tilting ?lithology ?rainfall
?year ?municipality ?altitude ?landcover from <http://ekbaa.data>
where {
  ?landslide a sci:S32_Landslide;
    crm:P1_is_identified_by ?id;
    crm:P2_has_type ?mov_t;
    sci:O25_generated_feature ?feat;
    crm:P4_has_time-span ?year;
    crm:P7_took_place_at ?place;
    sci:O17_has_dimension ?d.

  filter(isNumeric(?year)).
  filter(regex(?id, "Object_Id")).
  ?mov_t crm:P3_has_note ?movement_type.
  ?d crm:P2_has_type ?sl_til.
  ?sl_til crm:P3_has_note ?slope_tilting.
  filter(regex(?slope_tilting, "<SLOPE_TILT>")).
  ?curv sci:O26_is_section_of ?feat;
    sci:O17_has_dimension ?lith.
  ?lith crm:P3_has_note ?lithology.
  ?event sci:O21_triggers ?landslide;
    sci:O17_has_dimension ?d1;
    crm:P2_has_type ?m_src.
  ?d1 crm:P90_has_value ?rainfall.
  ?place crm:P87_is_identified_by ?alt;
    geo:hasGeometry ?point;
    crm:P89_falls_within ?sett;
    crm:P3_has_note ?landcover.
  ?point geo:asWKT ?location.
  filter(REGEX(?alt, "Alt")).
  ?alt sci:O20_has_value ?altitude.
  ?sett crm:P1_is_identified_by ?municipality.
  filter(regex(?municipality, "Municipality/Name/")).
  filter(regex(?landcover, "<LABEL3>")).
  ?impl crm:P3_has_note ?implication.
  ?m_src crm:P3_has_note ?mov_source.
  #####
  filter(?year > {year_min_val} && ?year < {year_max_val}).
  filter(?altitude > {altitude_min_val} && ?altitude <
  {altitude_max_val}).
  filter(regex(?landcover, {landcover_val})).
  filter(regex(?movement_type, {movement_type_val})).
  filter(regex(?mov_source, {mov_source_val})).
  filter(regex(?lithology, {lith_val})).
  filter(regex(?implication, {impl_val})).
  filter(regex(?slope_tilting, {slope_tilt_value})).
  filter(regex(?municipality, {municipality_value})).
}
  
```

Pilot2 Description

Querying Linked Data Store



The screenshot displays the InGeoCloudS interface with a map of Greece showing landslide markers. A 'Smart Queries' window is open, showing a query for 'Landslides'. The query parameters are:

- The name of the openservice: []
- year: Between [] And []
- altitude: Between [] And []
- landcover: []
- movement_type: []
- mov_source: []
- lithology: []
- implication: []
- slope_tilting: []
- municipality: []

The '100 Results' table shows the following data:

landcover	movement_type	altitude	rainfall	municipality	slope_tilting	year	lithology
Land principl...	Translational Sh...	720	1142	http://www.ekb...	(Moderate)/Μέσ...	1938	Flysch/Φλύσχη
Complex cultivati...	Settlements/Koβ...	750	1217	http://www.ekb...	(Moderate)/Μέσ...	1956	Flysch/Φλύσχη
Land principl...	Settlements/Koβ...	860	1199	http://www.ekb...	(Steep)/Ισχυρή (...)	1956	Flysch/Φλύσχη
Land principl...	Settlements/Koβ...	750	1072	http://www.ekb...	(Moderate Steep...	1956	Flysch/Φλύσχη
Land principl...	Composite/Ζύνθ...	650	1189	http://www.ekb...	(Moderate Genti...	1956	Flysch/Φλύσχη
Broad-leaved fo...	Soil Displaceme...	1017	1323	http://www.ekb...	(Moderate Steep...	1963	Flysch/Φλύσχη
Land principl...	Translational Sh...	900	1162	http://www.ekb...	(Nearly Vertical)...	1963	Flysch/Φλύσχη

A 'Borehole Information' window is also visible, showing a borehole name and depth of 120.0m.

Pilot2 Description

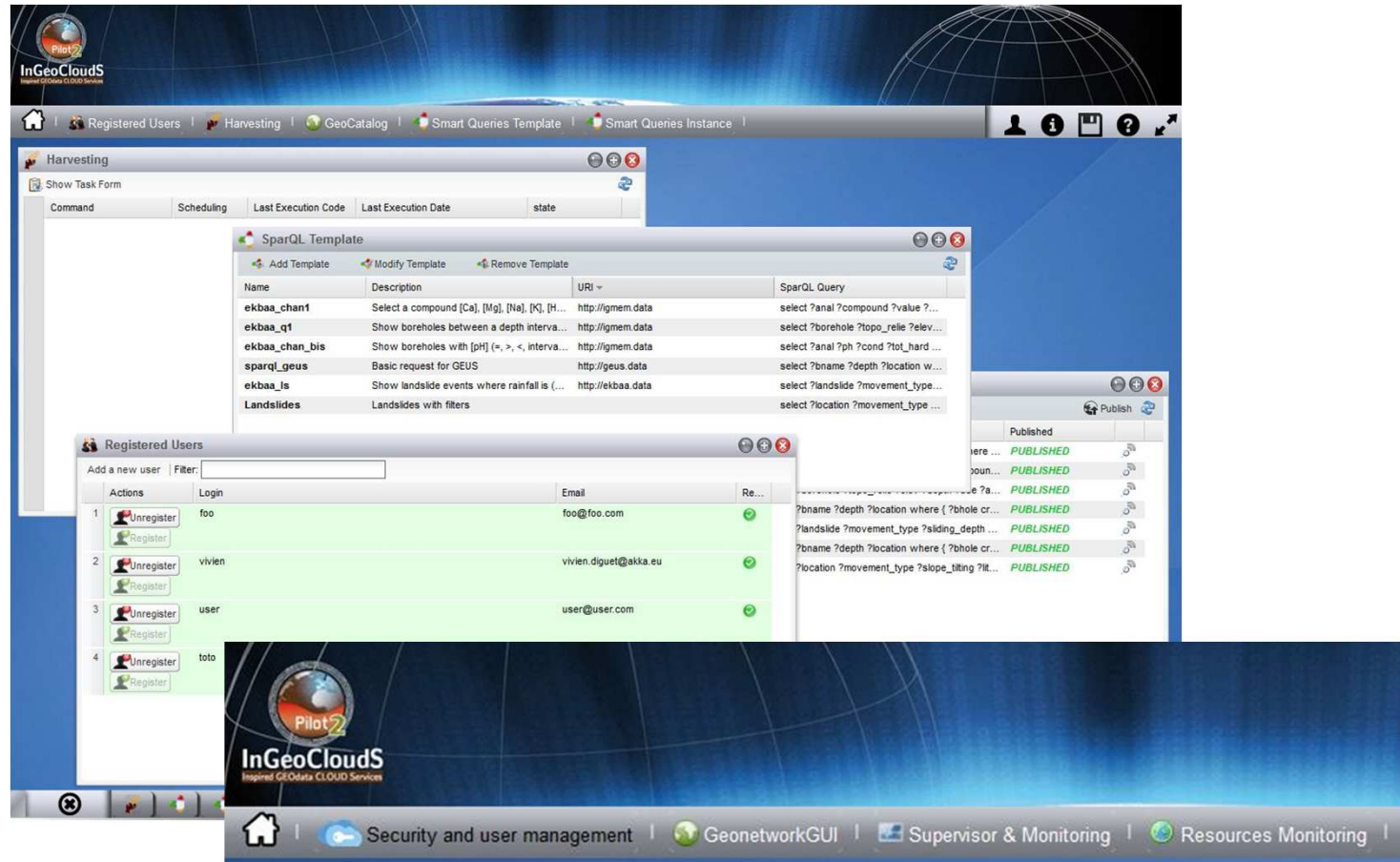
Toolkits



Data Provider Toolkit
Provide useful tools to manage applications



InGeoCloudS
Administration Toolkit
Useful applications to help administrators



The screenshot displays the InGeoCloudS Pilot2 web interface. The main navigation bar includes links for Registered Users, Harvesting, GeoCatalog, Smart Queries Template, and Smart Queries Instance. The 'Harvesting' section is active, showing a 'Show Task Form' window with columns for Command, Scheduling, Last Execution Code, Last Execution Date, and state. A 'SparQL Template' window is overlaid, listing various templates with their names, descriptions, URIs, and SparQL queries. A 'Registered Users' window is also visible, showing a list of users with columns for Actions, Login, Email, and Registration status. The bottom navigation bar includes links for Security and user management, GeonetworkGUI, Supervisor & Monitoring, and Resources Monitoring.

Name	Description	URI	SparQL Query
ekbaa_chan1	Select a compound [Ca], [Mg], [Na], [K], [H]...	http://igmem.data	select ?anal ?compound ?value ?...
ekbaa_q1	Show boreholes between a depth interva...	http://igmem.data	select ?borehole ?topo_relief ?elev...
ekbaa_chan_bis	Show boreholes with [pH] (<=, >, <, interva...	http://igmem.data	select ?anal ?ph ?cond ?tot_hard ...
sparq_geus	Basic request for GEUS	http://geus.data	select ?bname ?depth ?location w...
ekbaa_ls	Show landslide events where rainfall is (...)	http://ekbaa.data	select ?landslide ?movement_type...
Landslides	Landslides with filters		select ?location ?movement_type ...

Actions	Login	Email	Re...
1 Unregister Register	foo	foo@foo.com	✓
2 Unregister Register	vivien	vivien.diguet@akka.eu	✓
3 Unregister Register	user	user@user.com	✓
4 Unregister Register	toto		✓

Pilot2 Description

Toolkits - GeoProcessing

Geoprocessing implemented as a WPS service:
refers to ordinary **kriging** interpolation

WPS is provisioned in the ElasticWebServer component
and uses parameters:

- Given by the user
- Fetched from InGeoCloudS Triplestore using LD-API



InGeoCloudS
Inspired GEOdata CLOUD Services

Pilot2 Description

Measurement



A key needs in order to master one's Cloud-based system.
Two main levels in InGeoCloudS that help in better managing the cloud:

- ▶ Applications (analytics about usage)
- ▶ Resources (supervision of indicators, alerts and problems management)

The screenshot displays a comprehensive monitoring dashboard for InGeoCloudS. Key components include:

- Views Overview:** A line chart showing usage trends over time.
- Visitors in Real-time:** A table listing visitor activity with columns for Date, Visits, and Pages.
- Page Files:** A table listing various page files with columns for Page Name, Pages, Unique Pages, Source File, Avg. Time (of page), Hit Rate, and Hit Generation Time.
- Visits by Server Time:** A bar chart showing the distribution of visits across different server times.
- Current Network Status:** A box indicating the last update time (Thu Nov 21 00:27:44 UTC 2013) and providing links for history, notifications, and host status details.
- Host Status Totals:** A summary table showing counts for Up (12), Down (0), Unreachable (0), and Pending (0) hosts.
- Service Status Totals:** A summary table showing counts for Ok (6), Warning (0), Unknown (0), Critical (0), and Pending (0) services.
- Service Status Details For All Hosts:** A detailed table listing individual host and service status information.
- Inspired Geodata Cloud Services:** A section with a navigation menu for Tables (API, DB, MONITORING, PGPOOL), I_DB_MEM Table (a line chart showing memory usage for dbslave and dbmaster), and a Status Information table.
- Status Information Table:** A table listing various status messages, all of which are "Service does not respond properly (HTTP status code = 401)".

Pilot2 Description

Users

Data and Application Providers

A *Data Provider* is a user (representing for example an institution) willing to contribute with his own data or with a novel service.

The registration process for data providers is supervised by an InGeoCloudS administrator who must check and authorize the *Data Provider* account request.

Note that the platform creates a *Workspace* for each *Data Provider*. A *Workspace* notably provides the possibility to store (and access) his own data in a private database of the InGeoCloudS Elastic Database Server, and/or in a private folder of the InGeoCLOUDS Elastic File Server.

Pilot2 Description

Users

Visitors

Public / Visitors designate all users that browse the Portal without authentication/identification.

In Pilot2, public users are allowed to access most of InGeoCloudS applications, maps, views and data without restrictions.

Registered users

Registered Users are users of the platform that went through a registration process. Each *Data Provider* owns a group of users and is able to register and manage their user accounts. A same user (same login) can pertain to several *Data Providers* groups.

Registered Users can thus be recognized by InGeoCloudS, and they can thus potentially exploit some services that are not made available to the public user. Examples could be personalization of user experience and privileged access to certain services (e.g. data download).

Authorization Implementation

- **Public (anonymous user):**
 - user allowed to access the public part of the portal and of the data provider applications.
- **Registered user:**
 - user allowed to access a data provider application with specific behavior or additional features.
- **Data and Application provider:**
 - user allowed to access all the resources and services of the platform, except the administration services.
- **Administrator:**
 - user allowed to access all the administration services and resources.

Authorization Implementation

- Applications rely on a SSO token
- Applications check the user session and retrieve user profile
- Applications **build permissions from the user roles**
 - To customize the behaviour of the application (e.g. mail on event),
 - To control access (e.g. to some download services),
 - To filter results displayed on the application GUI.
- Each software component of the platform control access to its own resources
 - Sitools filter the accessible applications,
 - E.g.: APIs filter access to RESTful services, Geonetwork console dependent on the connected user, Global User Management console is only accessible for administrators.

Services per User Profile

Public...

Use Cases Geo-Applications

Catalogue consultation

SmartQueries (Opensearch on LOD)

API: some LinkedData methods

Data Provider

API: almost all

SITools Back-Office

Catalogue Management

Data Providers Toolkit

- Registered Users Management
- Harvesting Tasks Management
- SmartQueries Authoring and Publication
- Others...

Pilot Admin

API: all

Administration Toolkit

- Users Management
- Monitoring / Supervision / Accounting
- Catalogue admin

Pilot2 and Cloud Services Types

▶ IaaS Elements

- ▶ Servers
- ▶ Network
- ▶ Basic storage
- ▶ Administration APIs

▶ DaaS Elements

- ▶ GSOM
- ▶ LOD APIs
- ▶ Data storage, import, sync
- ▶ Meta-data description,

▶ PaaS Elements

- ▶ Authentication
- ▶ Roles
- ▶ Workspaces,
- ▶ Portal
- ▶ RESTful APIs
- ▶ Basic Mapping Framework

▶ SaaS Elements

- ▶ Geo applications,
- ▶ Geo Publication,
- ▶ Catalogues Management,
- ▶ Opensearch Queries
- ▶ Geo-Processing

