

D15.4 Report on Use Cases, Requirements, Metadata and Interoperability of WP 15.

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1. Summary

a. Context

EPOS WP15 is the thematic core service (TCS) for geological data and modelling within the EPOS-IP project. Its purpose is to bring to EPOS reference geological datasets (including observation data and 3D/4D Models).

It gathers together European geological surveys building on the European Geological Data Infrastructure and two NRIs, the University of Uppsala bringing its expertise in scientific drilling projects and GFZ Potsdam renowned for its 3D/4D models activity.

The TCS works around one core vision: sharing data usually produced by partners using international geosciences interoperability standards and rules (ISO, OGC, W3C, INSPIRE, IUGS/CGI).

It is organised as follows:

- Task 15.5 targets delivery of Geosurveys' Data,
- task 15.6 the delivery of Scientific Drilling Data,
- and task 15.7 Scientific Subsurface Data (ex : 3D/4D Models).
- on top of those three tasks, tasks 15.3 and 15.4 provide the umbrella to identify relevant standards to be implemented, enhanced and/or developed. This to ensure interoperable data discovery, view and download and successful delivery to the ICS-C

Several information elements have been identified of relevance for EPOS and some reside under more than one community (ex : Borehole data will come from tasks 15.5, 15.6 and 15.7) which reinforces the need for interoperability not only between the TCS and the outside world but also within the TCS as it will ease data collection.

In order to ease data discovery and connection to the ICS-C it has been decided to set up a unique IT access point to WP15. This access point is not to harvest all data description stored at data providers' level but only descriptive information regarding identified information elements. Each 'Index' (as they are called in the rest of this document) will be accessible to the ICS.

Core DDSSs the TCS considers are thus

- Geological Maps, Geological feature Index
- Borehole Index and associated borehole data flows
- 3D/4D Model Index
- Geohazards ground deformation
- MineralResource Index

Each identified DDSS goes through the same rationale:

- UseCase definition,
- Data Structure definition,
- Metadata services identification: ISO 19115/ 139 + CSW,

- View service setup : WMS,
- Download (data access) service setup: initially considered WFS, could also be other for big datasets retrieval
 - o Simple (as in OGC 10-100r3, SimpleFeature)
 - o Complex (as in ComplexFeature)

To get a common understanding about how different levels of metadata support different discovery situations and how different use scenarios impose different requirements on the underlying service architecture, a number of very concrete use cases were analysed developed – going from very simple (level 1) to more advanced (level 3 and 4) use cases. The present document summarises the outcome of this exercise and provides:

- A general introduction to the four identified levels of use cases
- More detailed use cases for boreholes and other data types identified for implementation.

b. Terms and Definitions

- Dataset: Datasets are considered a collection of a specific type of data instances, for example a national set of boreholes stored in a database, available in a GIS file or a webservice flow
- Metadata: In this document the term is used with the following meaning: INSPIRE Metadata Regulation¹ and its corrigendum².

Metadata is available at dataset level (ex: metadata description of the French borehole dataset) and not at data instance level (ex: description of one sensor deployed within one borehole of the above mentioned dataset and generating a groundwater level timeseries).

In INSPIRE, datasets are described using the ISO 19115 metadata standard and OGC services that are set up on top of such datasets are described using ISO 19119. Because an entire data collection is described by a single metadata record, the discovery results will be very generic.

2. Priority List of DDSS (Data, Data Product, Service, Software)

WP15 has declared the following priority DDSS elements for implementation by month 24.

DDSS Number	DDSS Name
WP15-DDSS-01a	Borehole Data Index
WP15-DDSS-01i	Borehole Data Index Discovery Service
WP15-DDSS-01j	Borehole Data Index View Service

¹ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1205&from=EN>

² [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1205R\(02\)&from=EN](http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1205R(02)&from=EN)

WP15-DDSS-02a	Geological Map 1:1,000,000 (OneGeology-Europe layer) service
WP15-DDSS-02b	GeologicFeature Index
WP15-DDSS-02e	GeologicFeature Index Discovery Service
WP15-DDSS-04c	Geohazards Ground deformations
WP15-DDSS-06a	3D/4D Model Index Discovery Service
WP15-DDSS-06b	3D/4D Model Index
WP15-DDSS-06c	3D/4D Model Index View Service
WP15-DDSS-7	WP15 Catalogue service
WP15-DDSS-08a	Borehole visualisation tool (logs)
WP15-DDSS-10	Georesources service

Those are detailed in deliverable 15.5.

3. TCS roadmap

TCS has defined an internal roadmap to ensure on time delivery of the identified DDSS elements. Indeed, before each DDSS is fully available a data specification exercise is necessary.

In order to ease the reading of this document, only core steps and dates are summarized in the following table.

DDSS Number	DDSS Name	Availability
WP15-DDSS-01a	Borehole Data Index	M15
WP15-DDSS-01i	Borehole Data Index Discovery Service	M15
WP15-DDSS-01j	Borehole Data Index View Service	M15
WP15-DDSS-02a	Geological Map 1:1,000,000 (OneGeology-Europe layer) service	M18
WP15-DDSS-02b	GeologicFeature Index	M18
WP15-DDSS-02e	GeologicFeature Index Discovery Service	M18
WP15-DDSS-04c	Geohazards Ground deformations	M24
WP15-DDSS-06a	3D/4D Model Index Discovery Service	M24
WP15-DDSS-06b	3D/4D Model Index	M24
WP15-DDSS-06c	3D/4D Model Index View Service	M24
WP15-DDSS-7	WP15 Catalogue service	M18
WP15-DDSS-08a	Borehole visualisation tool (logs)	M24
WP15-DDSS-10	Georesources service	M24

In addition to the above mentioned DDSS elements, tentative target periods are already identified for DDSS elements providing additional data related to Boreholes. They are introduced below for information.

DDSS Number	DDSS Name	Availability
WP15-DDSS-01b	Boreholes detailed data	After M24
WP15-DDSS-01c	Boreholes Geophysical logs	After M24
WP15-DDSS-01d	Boreholes geological Description	After M24
WP15-DDSS-01e	Boreholes Groundwater level	After M24
WP15-DDSS-01h	Boreholes Geotechnical Information	After M24

4. Data Management Plan (DMP)

It has been agreed within WP15 that, for each DDSS element, the Data Management Plan will be defined scoping the TCS central node level.

Indeed, WP15 is not producing any new data instance. Work is targeted on agreeing on common semantics and then sharing datasets according to this semantic.

For each DDSS element considered within WP15, data providers already have data management plan of some sort at their own level.

It is not up to TCS central node to dictate how each data provider should manage their own instances especially when it comes down to data curation and management.

However, elements are being set up to ensure streamlined exchange of information between the central node and the data providers:

- WP15 is working on the best solution for data providers to notify the central node about changes in their Index instances level so that it can be updated accordingly.
Indeed when it comes down to datasets containing million entries (ex: borehole index with shallow boreholes), only harvesting the changes instead of harvesting the whole dataset is crucial
- Contact entry points are being identified so that when a consumer of WP15 flows needs to provide feedback this can be transmitted to the relevant actor.

5. Use cases

a. Introduction to WP15 use cases

A fundamental facility to be achieved by EPOS as such will be the ability for researchers to find data across domains and the primary effort has therefore been concentrated around discovery use cases. Typically, use cases describe a system from a user perspective and dictate requirements for the system.

But in reality, use cases also need to be adjusted according to technological possibilities, data availability, feasibility in the given project framework and the level of ambition. In order to obtain the most clear and realistic picture, a holistic approach has been chosen in the current document taking into account the implications of the use cases on the architectural choices. In general three or four levels of discovery use cases have been defined.

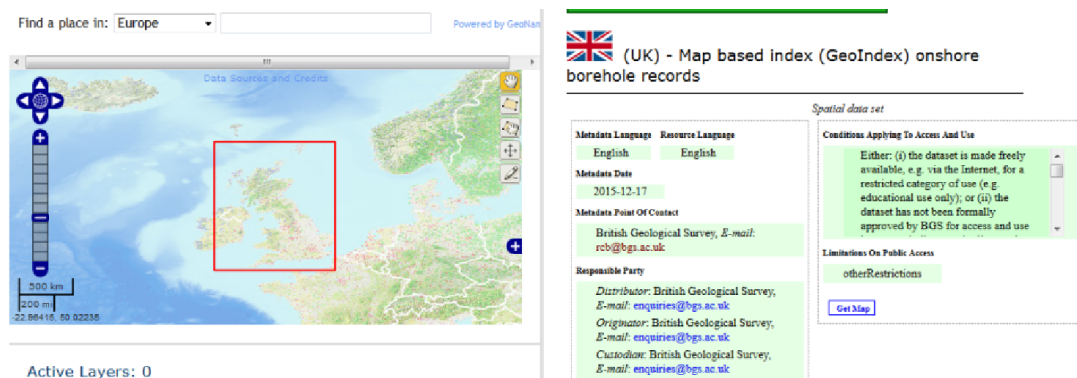
This gradual approach is exemplified below on the basis of Borehole related use cases.

For consistency sake each use case is identified by a 2 letters identifier and an integer allowing identifying the use case level concerned (ranging from 1 to 4).

Use case level 1: Dataset discovery

The example below illustrates use case level 1 through the discovery of borehole datasets from the UK in the INSPIRE geoportal (another example could be provided in a machine to machine exchange). The main actor searches for available borehole related datasets via a set of search criteria. Search criteria and the information accompanying the search results are limited to the generic type of metadata that is registered on a dataset level such as title, contact person, online resources (web services, web pages etc.), confidentiality, use restrictions, keywords etc. The same applies for any other types of data.

The result of the search is a set of potential datasets matching the user search criteria. Each of them is provided with a bounding box corresponding to the geographical extent of the boreholes in the database – not the boreholes themselves.



Find a place in: Europe

Powered by Geotitles

(UK) - Map based index (GeoIndex) onshore borehole records

Metadata Language: English

Resource Language: English

Metadata Date: 2015-12-17

Metadata Point Of Contact: British Geological Survey, E-mail: rcb@bgs.ac.uk

Responsible Party: Distributor: British Geological Survey, E-mail: enquiries@bgs.ac.uk; Originator: British Geological Survey, E-mail: enquiries@bgs.ac.uk; Custodian: British Geological Survey, E-mail: enquiries@bgs.ac.uk

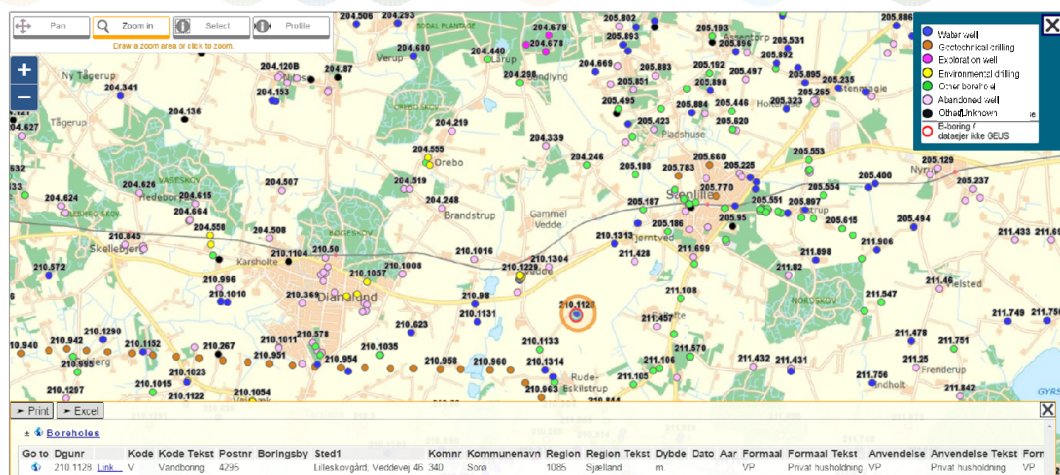
Conditions Applying To Access And Use: Either: (i) the dataset is made freely available, e.g. via the Internet, for a restricted category of use (e.g. educational use only); or (ii) the dataset has not been formally approved by BGS for access and use

Limitations On Public Access: otherRestrictions

Get Map

Use case level 2: Simple feature view

Use cases level 2 are designed for providing the user with information about the location of the individual data records in a dataset. This means for example that the location of all boreholes in a borehole dataset can be visually discovered. The typical scenario will be that the main actor searches for e.g. boreholes in a geographic area with a map showing their symbolised location... The user can then click an individual borehole on the map and get some simple summary information about that particular borehole.



Use case level 3: Advanced feature discovery

This level of use case will allow the main actor to perform a search using criteria specific for each data type and retrieve summary information about the resulting features. An example could be that a main actor searches for boreholes in a specific geographic area (e.g. within a bounding box) being deeper than a certain value, that have been drilled for a specific purpose and that have e.g. geophysical log data associated. The result of such investigation would be a map showing only those boreholes that fulfil the criteria and by clicking each of the boreholes, summary information is displayed – also containing a link to or information about how to get access to actual data such as geophysical logs, geochemistry, sample descriptions, drill cores etc.

Water well
Geotechnical drilling
Exploration well
Environmental drilling
Other borehole
Abandoned well
Other/Unknown

Use case level 4: Advanced complex feature data access

This level of use case allows the main actor, once domain features are identified to access in an interoperable manner to more detailed information flows regarding those features. Those information flows will be structured using shared semantic/data model. This will, in turn allow those flows to be:

- displayed to domain specialist using common tools
- and/or ingested into more complex data processing solutions

The example below shows a borehole log structured description and a GUI build on top of it

```

<?xml version="1.0" encoding="UTF-8"?>
<BoreholeLog>
  <Header>
    <Title>Borehole Log - Example</Title>
    <Location>Example Location</Location>
    <Depth>0.00</Depth>
    <Altitude>223.27</Altitude>
  </Header>
  <Description>
    <Formation>Sol (terre végétale)</Formation>
    <Lithologie>Terre végétale</Lithologie>
    <Stratigraphie>Holocène</Stratigraphie>
  </Description>
  <Data>
    <Depth>0.60</Depth>
    <Formation>Formations limoneuses et loessiques en place</Formation>
    <Lithologie>Limon argileux</Lithologie>
    <Stratigraphie>Riss à Holocène</Stratigraphie>
    <Altitude>221.77</Altitude>
    <Depth>2.10</Depth>
    <Formation></Formation>
    <Lithologie>Galets, graviers et sable argileux jaune</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude>220.57</Altitude>
    <Depth>3.30</Depth>
    <Formation></Formation>
    <Lithologie>Galets, graviers et sable argileux gris</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude>219.07</Altitude>
    <Depth>4.80</Depth>
    <Formation></Formation>
    <Lithologie>Gros galets, graviers et sable grossier jaune noir, très argileux</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude>215.67</Altitude>
    <Depth>8.20</Depth>
    <Formation>Formations fluvo-glaciaires et dépôts résiduels associés</Formation>
    <Lithologie>Galets, graviers et sable grossier jaune, légèrement argileux</Lithologie>
    <Stratigraphie>Riss</Stratigraphie>
    <Altitude>209.77</Altitude>
    <Depth>14.10</Depth>
    <Formation></Formation>
    <Lithologie>Graviers et sable avec quelques petits galets, formation légèrement argileuse</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude>204.87</Altitude>
    <Depth>19.00</Depth>
    <Formation>Marnes de Bresse et formations pilo-quaternaires bressanes</Formation>
    <Lithologie>Argile jaune très compacte</Lithologie>
    <Stratigraphie>Pliocène à Riss</Stratigraphie>
    <Altitude>202.87</Altitude>
    <Depth>19.30</Depth>
    <Formation>Marnes de Bresse et formations pilo-quaternaires bressanes</Formation>
    <Lithologie>Argile grise très compacte</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude>200.07</Altitude>
    <Depth>21.00</Depth>
    <Formation>Marnes de Bresse et formations pilo-quaternaires bressanes</Formation>
    <Lithologie>Argile marseuse bleue</Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude></Altitude>
    <Depth>23.00</Depth>
    <Formation>Marnes de Bresse et formations pilo-quaternaires bressanes</Formation>
    <Lithologie></Lithologie>
    <Stratigraphie></Stratigraphie>
    <Altitude></Altitude>
  </Data>
</BoreholeLog>

```

Profondeur	Formation	Lithologie	Lithologie	Stratigraphie	Altitude
0.60	Sol (terre végétale)		Terre végétale	Holocène	223.27
2.10	Formations limoneuses et loessiques en place		Limon argileux	Riss à Holocène	221.77
3.30			Galets, graviers et sable argileux jaune		220.57
4.80			Galets, graviers et sable argileux gris		219.07
8.20			Gros galets, graviers et sable grossier jaune noir, très argileux		215.67
14.10	Formations fluvo-glaciaires et dépôts résiduels associés		Galets, graviers et sable grossier jaune, légèrement argileux	Riss	209.77
19.00			Graviers et sable avec quelques petits galets, formation légèrement argileuse		204.87
19.30	Marnes de Bresse et formations pilo-quaternaires bressanes		Argile jaune très compacte	Pliocène à Riss	202.87
21.00	Marnes de Bresse et formations pilo-quaternaires bressanes		Argile grise très compacte		200.07
23.00	Marnes de Bresse et formations pilo-quaternaires bressanes		Argile marseuse bleue		

b. Borehole use cases

UC Bh.1: Borehole dataset discovery

Use Case Name/Topic: <i>Find borehole dataset concerning the Channel</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use Case Description Search and discover borehole datasets in a given area (ex: the southern part of the UK) so to find potential sources of information for a 3D modelling of groundwater reservoirs.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> High
Pre-conditions <ul style="list-style-type: none">
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map above the Channel between France and England User types in “borehole” in a search field User press “search” User assesses the list of results User expands one item in the result list and reads more about the specific borehole dataset User clicks a link to “web site” and is redirected to a portal where the corresponding borehole

dataset can be accessed, downloaded or purchased.
System workflow – system view <ul style="list-style-type: none"> In order execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = borehole”. The backend requests synonyms from a thesaurus and searches for borehole, well and drilling in EPOS metadata catalogue. A list of results is returned to the front end.
Post-conditions <ul style="list-style-type: none"> User should have gained access to one or more national portals or OGC web services containing borehole information in the relevant area.
Extension Points
<<Used>> Use Cases
Other Requirements <ul style="list-style-type: none"> All relevant datasets should be discoverable as “borehole datasets” no matter if they are named borehole, well or drilling datasets. Online resources need to be registered in the metadata records.

UC Bh.2: Simple feature view of the Borehole Index

Use case name/topic: <i>Find and map borehole dataset in a specific part of Denmark</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Map visualization of boreholes in Denmark.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority High
Pre-conditions <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in Denmark User types in “borehole” in a search field and presses “search” User assesses the list of results The Borehole Index being part of the results the user clicks a link to “view service” and is redirected to an EPOS viewer, where the corresponding map can be explored and queried The system displays the Borehole Index on the map with the corresponding symbology along with the possibility to query graphically each borehole.
Flow of events – user view
System workflow – system view <ul style="list-style-type: none"> In order execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = borehole”. The backend requests EPOS metadata catalogue and searches for ‘borehole’ and provides corresponding datasets including the Borehole Index. The GUI provides a cartographic interface with the ability to add the Borehole Index in it

<p>Each borehole entry in the Borehole Index that is represented on the map (with a dedicated symbology) can be queried.</p> <ul style="list-style-type: none"> The GUI (via the ICS-C) provides the relevant interface to query from the Borehole Index content/service for feature information based on their geolocation
Post-conditions <ul style="list-style-type: none"> User should have visualised Borehole Index entries in its area of interest
Extension Points
<<Used>> Use Cases
Other Requirements

UC Bh.3: Advanced borehole feature discovery

Use case name/topic: <i>Find borehole in a specific area with specific search criteria</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Search for boreholes in Denmark being more than 700 metres deep, drilled with the purpose of oil and gas exploration and having geophysical log data available
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority High
Pre-conditions <ul style="list-style-type: none"> Borehole Index features should have semantic harmonisation and common data model
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in Denmark User types in “borehole” in a search field and presses “search” User assesses the list of results The Borehole Index being part of the results the users selects it and has the possibility to pass via the GUI dedicated search criteria values (depth, purpose, geophysical log available in that example) The system proposes the Borehole Index entries that matches those search criteria (either on a map or on a list) User expands one item in the result list and reads more about the specific Borehole Index entry (possibility zooms on it on a map). He gets the possibility to interact graphically in the GUI with that borehole description, download the Borehole Index entry of interest in various formats and access the geophysical log available in an interoperable manner.
System workflow – system view <ul style="list-style-type: none"> In order execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = borehole”. The backend requests EPOS metadata catalogue and searches for ‘borehole’ and provides corresponding datasets including the Borehole Index. A list of results is returned to the front end. The GUI (via the ICS-C) provides the relevant interface to query attributes from the Borehole Index

content/service
Post-conditions
<ul style="list-style-type: none"> User should have gained access to one or more Borehole Index entries and their associated OGC web services containing borehole information
Extension Points
<<Used>> Use Cases
Other Requirements

UC Bh.4: Advanced complex feature borehole data access

Use case name/topic:
Access to fully structured Borehole data flows available at NRI
Use case domain:
<ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description
<p>This Use Case is an extension of the previous one (Bh.3)</p> <p>Once a borehole (or set of boreholes) is identified in the BoreholeIndex, access to fully-fledged complex feature information flows available at data providers' level. These flow provide maximum amount of information on a dedicated sub-topic in a harmonized way (geophysical logs, geological description, ground water level, rock geochemistry, pore gas chemistry, geotechnical information, ...)</p>
Actors involved in the use case
<ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority
TBD
Pre-conditions
<ul style="list-style-type: none"> Borehole associated data flows should have semantic harmonisation and common data model(s)
Flow of events – user view
<ol style="list-style-type: none"> Identification of relevant Borehole Index entry(ies) From the entry(ies) possibility to access to more data flows organised by 'domains' Each data flow retrieved is available in a commonly agreed semantic/data model for further reuse either in EPOS GUI or user's client application. For example borehole logs from various data providers could be visualised in a shared borehole log visualisation tool.
System workflow – system view
<ul style="list-style-type: none"> BoreholeIndex is structured so that information items allowing access to further information are clearly identified and typed to allow dereferencing of pointers to those additional information resources
Post-conditions
<ul style="list-style-type: none"> User should have gained access in an interoperable manner to structured information regarding the Borehole (s) of interest. Supplemental information flows retrieved being available according to an agreed semantic/model they are further processable by the user.
Extension Points
<<Used>> Use Cases
Other Requirements

c. Geohazard use cases

UC Gh.1: Existing dataset discovery

Use Case Name/Topic: <i>Searching for existing geohazard maps and inventory datasets in a specific area (i.e. Northern Italy)</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology, engineering</i>
Use Case Description Searching for geohazards affecting a certain area (e.g. Lake Garda area) and, in particular, if geohazard maps or dataset inventories of specific natural hazards exist with the purpose of <ul style="list-style-type: none"> exploring existing basic geothematic information, And/or do a research on a specific geohazard, in order to evaluate possible correlation with other geohazards or geological data.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> High
Pre-conditions <ul style="list-style-type: none">
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map bounding the area to be investigated (Lake Garda) User types in a search field a keyword also exploring the pre-defined keywords (i.e. geohazard, landslide, active faults, ground motion, etc.) related to different hazard types. User presses “search” User assesses the list of results also exploiting the potential semantic engine based on a thematic thesaurus framework. User expands one item in the results list and reads more about the specific maps and dataset inventory User clicks a link to “web site” and is redirected to a portal, where the corresponding maps and dataset can be explored.
System workflow – system view <ul style="list-style-type: none"> In order to execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = geohazard”. The backend requests synonyms (step 6) from a thesaurus and invokes a multiple search for geohazard, landslide, active faults, ground motion, engineering geology, sinkholes or seismicity towards the EPOS metadata catalogue. A list of results is returned to the front end.
Post-conditions <ul style="list-style-type: none"> The user should have gained access to one or more national portals or OGC web services containing geohazard or geothematic information in the relevant area, to explore in the detail the resources.

Extension Points
<<Used>> Use Cases
Other Requirements <ul style="list-style-type: none"> All relevant datasets should be discoverable as “geohazard datasets”; no matter if they are named Landslide, Rock falls, Active faults or Engineering geology, etc. Online resources need to be registered in the metadata records.

UC Gh.2: Simple view of a geohazard information layer

Use case name/topic: <i>Finding, viewing and examining a specific hazard map at different scale in a specific area (e.g. a portion of territory of France).</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology, engineering</i>
Use case description Find, view and consult the active faults map available in a portion of the French territory; with the purpose of exploring the specific sought information (geohazard layer) directly in the EPOS portal, by searching on the map view services.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> High
Pre-conditions <ul style="list-style-type: none">
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in the specific area to be investigated (portion of French territory) User types in a search field a keyword also exploring the pre-defined keywords (i.e. geohazard, landslide, active faults, ground motion, etc.) related to the different hazard types. User expands one item in the result list and reads more about the specific hazard map or dataset inventory. <p>User clicks a link to “view service” and is redirected to an EPOS viewer, where the corresponding map can be explored and queried, or to the web service capabilities to have direct access to the resources.</p>
System workflow – system view <ul style="list-style-type: none"> In order to execute step 4, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = active faults”. The backend requests synonyms (step 5) from a thesaurus and issues a search for active faults and also seismic faults, tectonic structures, seismicity, etc. towards the EPOS metadata catalogue. A list of results is returned to the front end as view services composition The GUI provides a cartographic interface with the ability to add the view service in it and query it
Post-conditions <ul style="list-style-type: none"> User should have been able to visualise the geohazard information in a cartographic interface in its area of interest and been offered the possibility to access to OGC web services containing geothematic information in the relevant area.

Extension Points
<<Used>> Use Cases
Other Requirements

UC Gh.3: Multiple querying of geohazard information layers

Use case name/topic: <i>Finding, viewing, overlapping and examining two or more specific geohazard maps, at different scale, in a defined area (e.g. cross-border area between Italy and Slovenia).</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology, engineering</i>
Use case description Crossing two or more geohazard information layers, in order to find any matches. For example overlap landslide data with InSAR ground motion data in a specific cross-border zone, as between Italy and Slovenia. The intersection of more information layers allows to perform a comparative geohazard analysis
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> medium
Pre-conditions <ul style="list-style-type: none"> All the hazard inventories and maps must be “queryable” The data should have semantic harmonisation and common data model
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in the specific area to be investigated (cross-border area between Italy and Slovenia) User types in a search field a specific keyword in order to explore the existing geo-hazard maps and inventories. User expands one item in the result list and reads more about the specific hazard map or dataset inventory. The user selects two or more hazard layers in order to load them in a viewer/client. The user is able to compare data and perform a comparative analysis, using specific geo-spatial functionalities.
System workflow – system view <ul style="list-style-type: none"> In order to execute step 4, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = landslide&InSAR”. The backend requests synonyms (step 5) and issues a search for landslide and also InSAR data towards the EPOS metadata catalogue to collect related view service. The list of web services will be charged in a client system in order to perform comparative analysis.
Post-conditions User should have gained access to OGC web services containing geothematic information in the relevant area with a common semantic (data model)
Extension Points
<<Used>> Use Cases
Other Requirements

d. Geological multi-scale map use cases

UC Gm.1: dataset discovery

Use Case Name/Topic: <i>Find geological maps datasets at different scale in France</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use Case Description Find the geological map available as bedrock or surface information, or some specific geothematic maps (i.e. geophysics gravimetry) datasets in the central part of France to have potential basic information to build a geological model or to explore geologic information rather a specific research domain.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> High
Pre-conditions <ul style="list-style-type: none">
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in central France User types in a search field a keyword also exploring the pre-defined keywords (i.e. map, bedrock, surface, quaternary deposits, geophysics, etc.) User press “search” User assesses the list of results also exploiting the potential semantic engine based on a thematic thesaurus framework. User expands one item in the result list and reads more about the specific maps dataset User clicks a link to “web site” and is redirected to a portal, where the corresponding map dataset can be explored or downloaded.
System workflow – system view <ul style="list-style-type: none"> In order execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = bedrock”. The backend requests synonyms (step 6) from a thesaurus and issues a search for bedrock, geologic map, geologic structure or lithology towards the EPOS metadata catalogue. A list of results is returned to the front end.
Post-conditions <ul style="list-style-type: none"> User should have gained access to one or more national portals or OGC web services containing geological information in the relevant area.
Extension Points
<<Used>> Use Cases
Other Requirements <ul style="list-style-type: none"> All relevant datasets should be discoverable as “geological map datasets” no matter if they are named bedrock, geologic map, geologic structure or lithology, etc. Online resources need to be registered in the metadata records.

UC Gm.2: Simple maps view

Use case name/topic: <i>Find and view geological map at multiple scale in a specific part of Denmark</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Find, view and consult the geological map information available in a part of the Denmark to have potential basic information to build a geological model or to explore geologic information rather a specific research domain.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> High
Pre-conditions
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in the specific part of Denmark User types in a search field a keyword also exploring the pre-defined keywords (i.e. map, bedrock, surface, quaternary deposits, geophysics, etc) User press “search” User assesses the list of results also exploiting the potential semantic engine based on a thematic thesaurus framework. User expands one item in the result list and reads more about the specific maps dataset User clicks a link to “view service” and is redirected to a viewer, where the corresponding map dataset can be explored and queried graphically.
System workflow – system view <ul style="list-style-type: none"> In order execute step 5, the EPOS front end sends a request to the EPOS ICS-C backend with a search request containing the bounding box and the search criteria “datatype = bedrock”. The backend requests synonyms (step 6) from a thesaurus and issues a search for bedrock, geologic map, geologic structure or lithology towards the EPOS metadata catalogue. A list of results is returned to the front end as view services composition
Post-conditions <ul style="list-style-type: none"> User should have gained access to OGC web services containing geological information in the relevant area.
Extension Points
<<Used>> Use Cases
Other Requirements

UC Gm.3: Advanced geological feature discovery

Use case name/topic: <i>Find geological features in a specific cross-border part between Italy and France, to search a specific lithology.</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Find geological features appearing on geological maps at a given scale (ex: at 1:500,000 scale) in a specific cross-border part between Italy and France, to search for a specific lithology or metamorphic facies; the purpose will be to analyse specific seismic response or a specific composition in a certain area, where geotectonic studies could be performed.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority <ul style="list-style-type: none"> medium
Pre-conditions <ul style="list-style-type: none"> The geological map features should have semantic harmonisation and common data model
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in central France User types in a search field a keyword also exploring the pre-defined keywords (i.e. map, bedrock, surface, quaternary deposits, geophysics, etc.) User press “search” User assesses the list of results also exploiting the potential semantic engine based on a thematic thesaurus framework. The Geologic Feature Index being part of the results the users selects it and has the possibility to pass via the GUI dedicated search criteria values (lithology,...) The system proposes the Geologic Feature Index entries that matches those search criteria (either on a map or on a list) User expands one item in the result list and reads more about the specific Geologic Feature Index entry (possibility zooms on it on a map). He gets the possibility to interact graphically in the GUI with that borehole description, download the Geologic Feature Index entry of interest in various formats and access the webservice providing it.
System workflow – system view
Post-conditions
Extension Points
<<Used>> Use Cases
Other Requirements

e. 3D/4D Model use cases

UC Mo.1: 3D/4D Model dataset discovery

Use case name/topic: <i>Find 3D/4D Models datasets available in a given area</i>
Use case domain: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: geology
Use case description: Explore and discover available 3D models datasets in a given area: “As a scientist I want to use the EPOS Portal so that I can easily discover and browse available 3D models datasets.”
Actors involved in the use case: <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority: (must have, should have, nice to have) <ul style="list-style-type: none"> High
Pre-conditions: <ul style="list-style-type: none"> 3D/4D Models should be described using a common semantic. This description should be exchanged using agreed technologies
Flow of events: – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map above a given area User types in “3D model” in a search field User press “search” User assesses the list of results User expands one item in the result list and reads more about the specific 3D/4D Models dataset. User clicks a link to “web site” and is redirected to a portal where the corresponding 3D/4D models dataset can be accessed can be downloaded or purchased.
System workflow: tbd
Post-conditions: tbd
Extension Points: tbd
« Used » Use Cases: tbd
Other Requirements: tbd
(to be filled in by WP7) After the interview: tbd

UC Mo.2: Simple Feature View of the Model Index

Use case name/topic: <i>Find and map 3D/4D models dataset in a given area.</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Visualization of available 3D/4D Models in a given area.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority High
Pre-conditions <ul style="list-style-type: none"> 3D/4D Models should be described using a common semantic. This description should be exchanged using agreed technologies
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in Denmark User types in “3D model” in a search field and presses “search” User assesses the list of results The 3D/4D Model Index being part of the results the user clicks a link to “view service” and is redirected to an EPOS viewer, where the corresponding map can be explored and queried graphically.
System workflow – system view <ul style="list-style-type: none">
Post-conditions <ul style="list-style-type: none"> User should have visualised locatable 3D/4D Model Index entries in its area of interest
Extension Points
<<Used>> Use Cases
Other Requirements

UC Mo.3: Advanced 3D/4D Model feature discovery

Use case name/topic: Find a 3D/4D Model corresponding to various search criterias
Use case domain: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description: Targeted filtering and search based on 3D/4D Model descriptive information allowing access to descriptive information on 3D/4D Models.
Actors involved in the use case: <ul style="list-style-type: none"> The scientist that uses EPOS GUI

<ul style="list-style-type: none"> Machine to machine exchange supporting the underlying services requests and data exchange
Priority: (must have, should have, nice to have) High
Pre-conditions: <ul style="list-style-type: none"> 3D/4D Models shall be described using a common semantic. This description shall be exchanged using agreed technologies
Flow of events: – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map in Germany User types in “3D Model” in a search field and presses “search” User assesses the list of results The Model Index being part of the results the users selects it and has the possibility to pass via the GUI dedicated search criteria values (purpose, type, ...) The system proposes the Model Index entries that matches those search criteria (either on a map or on a list) User expands one item in the result list and reads more about the specific Model Index entry (possibility zooms on it on a map, access to a graphical representation of that specific 3D model for preview) He gets the possibility to interact graphically in the GUI with that Model description, download the Model Index entry of interest in various formats and access to more information on the Model in an interoperable manner.
System workflow: tbd
Post-conditions: tbd
Extension Points: tbd
« Used » Use Cases: tbd
Other Requirements: tbd
(to be filled in by WP7) After the interview: tbd

UC Mo.4: Advanced Model complex feature download

Use case name/topic: Access to full 3D/4D Model download made available by NRI
Use case domain: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description: This Use Case is an extension of the previous one (Mo.3). Once a Model is identified, download of this one uniquely identifiable 3D model in an interoperable manner
Actors involved in the use case:

<ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority: (must have, should have, nice to have) TBD
Pre-conditions: <ul style="list-style-type: none"> 3D/4D Model shall be structured in a shared semantic and common data model(s) and shall be exchanged using agreed technologies
Flow of events: – user view <ol style="list-style-type: none"> Identification of relevant Model Index entry(ies) From the entry(ies) possibility to download the Model itself. The Model being described in a commonly agreed semantic/data model it could be further reused (ex: user's client applications, EPOS GUI...).
System workflow: tbd <ul style="list-style-type: none"> ModelIndex is structured so that information items allowing access to further information is clearly identified and typed to allow dereferencing of pointer to additional information resource.
Post-conditions: tbd <ul style="list-style-type: none"> User should have gained access in an interoperable manner to structured information regarding the Model (s) of interest. The Model being available according to an agreed semantic/model it is further processable by the user.
Extension Points: tbd
« Used » Use Cases: tbd
Other Requirements: tbd
(to be filled in by WP7) After the interview: tbd

f. Mineral Resources use cases

UC Mr.1: Mineral Resources dataset discovery

Use case name/topic: <i>Find Mineral Resources datasets available in a given area</i>
Use case domain: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: geology
Use case description: Explore and discover available mineral resources datasets in a given area: “As a scientist I want to use the EPOS Portal so that I can easily discover and browse available mineral resources datasets.”
Actors involved in the use case: <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange

Priority: (must have, should have, nice to have) <ul style="list-style-type: none"> High
Pre-conditions: <ul style="list-style-type: none"> The content of the Minerals4EU metadata catalogue should be accessible through the TCS. Mineral resource datasets should be described using a common semantic by means of the Gemet keyword “Mineral resources” in the metadata entries.
Flow of events – user view <ol style="list-style-type: none"> User accesses the EPOS portal User goes to the search page User draws a rectangle on a map above a given area User types in “mineral resources” in a search field User press “search” User assesses the list of results User expands one item in the result list and reads more about the specific mineral resources dataset. User clicks a link to “web site” and is redirected to a portal where the corresponding mineral resources dataset can be accessed can be downloaded or purchased.
System workflow – system view <ul style="list-style-type: none"> The EPOS front end issues a request to the metatdata catalogue for metadata records where the keyword « Mineral resources » occur. A list of metadata records is returned to the front end.
Post-conditions:
Extension Points:
« Used » Use Cases:
Other Requirements:
(to be filled in by WP7) After the interview:

UC Mr.2: Simple Feature View of the Mineral Resources Index

Use case name/topic: <i>Find mineral resource with a given commodity in a given area.</i>
Use case domain: This use case is: <ul style="list-style-type: none"> Discipline-oriented, namely focusing on the discipline of: <i>geology</i>
Use case description Find occurrences of a specific commodity (e.g. Copper) in a given area.
Actors involved in the use case <ul style="list-style-type: none"> The scientist that uses EPOS GUI Machine to machine exchange supporting the underlying services requests and data exchange
Priority High
Pre-conditions <ul style="list-style-type: none"> Mineral resource information should be stored in a common data model.

Flow of events – user view <ol style="list-style-type: none"> 1. User accesses the EPOS portal 2. User goes to the search page 3. User chooses “Mineral Resources” theme 4. User draws a rectangle on a map in France 5. User chooses “Copper” from a dropdown list of commodities and presses “search” 6. User assesses the list of results 7. User inspects results on the map and on the list and clicks a given mineral occurrence. 8. User is presented with detail information about the selected mineral occurrence
System workflow – system view <ul style="list-style-type: none"> • The EPOS front end issues a request to a backend service that queries the mineral resources index with the given search parameters (bounding box and commodity). • The back end returns a list of results to the front end.
Post-conditions
Extension Points
<<Used>> Use Cases
Other Requirements

6. CONCLUSION

According to the roadmap expectations, WP15 feels that most (if not all) Index services will be up and running for the M24 deadline.

First version of DDSS ‘WP15-DDSS-08a’ Borehole visualisation tool (logs) might be expected by then but not final one. Indeed, in order to be properly functional, such tools requires the semantic exercise on borehole logs to be finished and implemented at data provider level.

Next work phase will then target:

- to ensure TCS central node infrastructure supports the exchange with ICS-C,
- to continue defining shared semantic for use cases level 4 (Bh.4 and Mo.4) and implement the corresponding data services.

Other DDSSs might also be added down the road (Analysis data, Hydrogeology, Drill Core, Active seismic data, Geochemistry ...).