# Integrating Datasets and Services in the Solid Earth Domain: the EPOS case.

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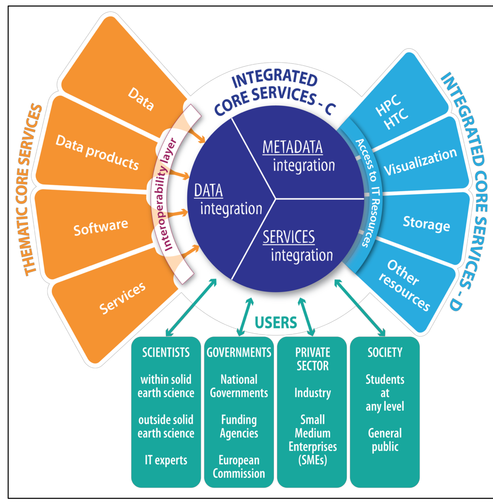
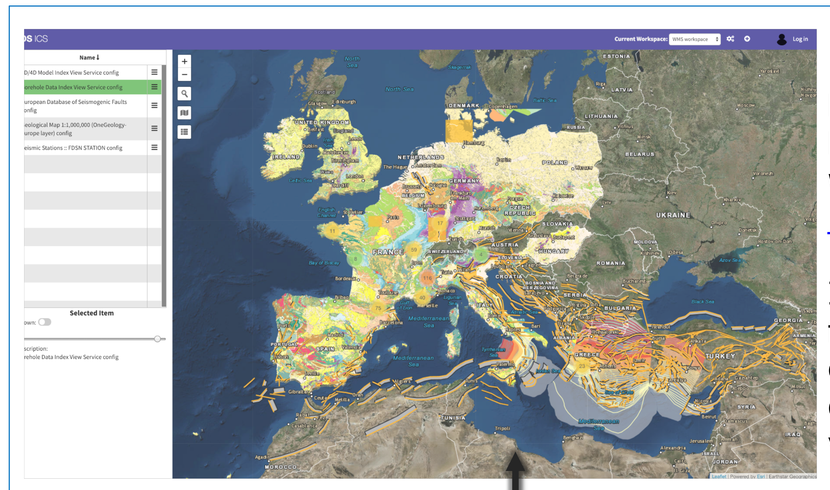



## EPOS-ERIC Research Infrastructure

EPOS enables users to access and integrate data, datasets, software and services (DDSS) provided by Research Infrastructures in Europe in a **FAIR** way, and is composed by:
**Thematic Core Services (TCS),** international nodes integrating DDSS of same scientific domain provided by National Research Infrastructures; **Central Hub (ICS-C),** main system orchestrating resources and managing the metadata catalogue; **Distributed Services (ICS-D) [7],** i.e. distributed resources from e-Infrastructure providers (HPC, HTC, visualisation, processing etc.); **Users Access** tailored to user type, now demonstrated with a web **Graphical User Interface (GUI).**



## EPOS User Interface - Data Access

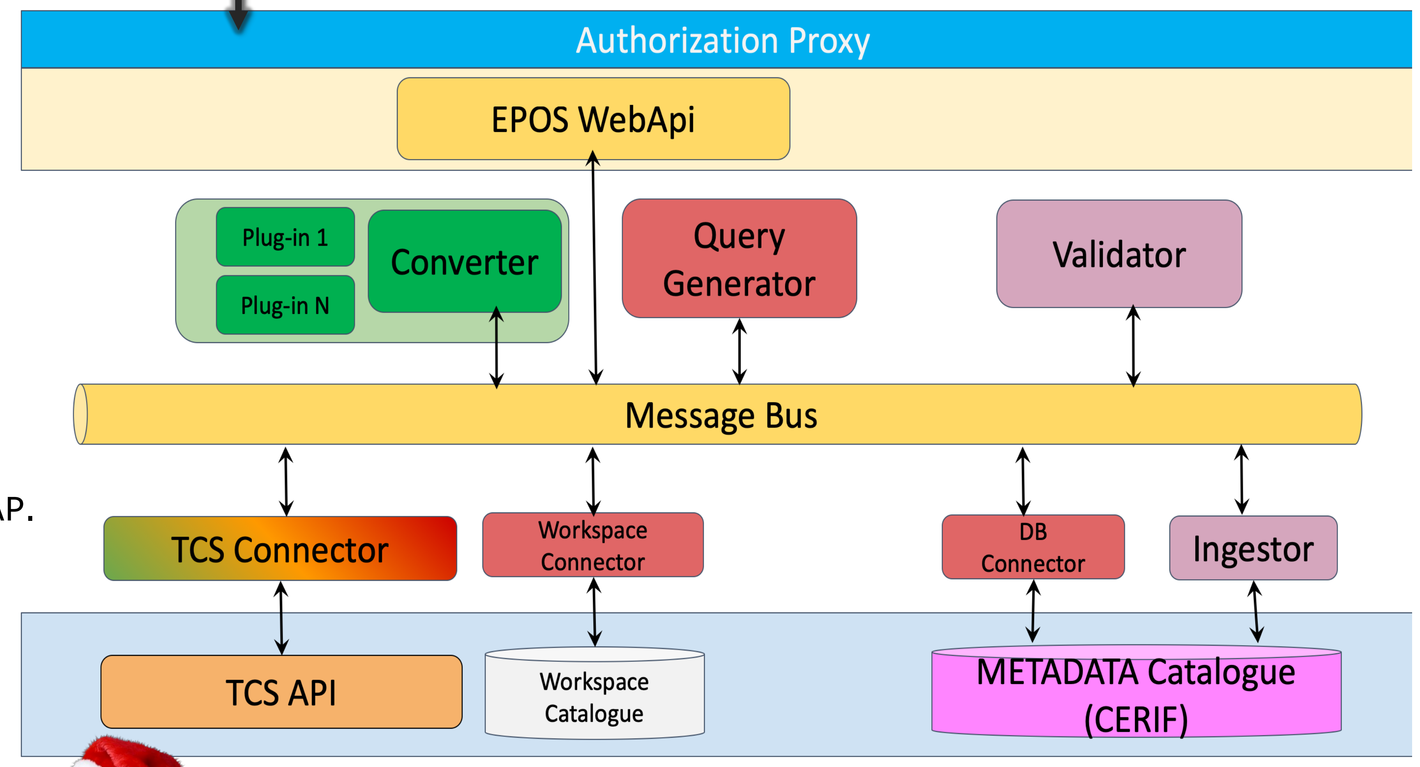
Data, data products and services integrated within EPOS system can be accessed by means of a GUI. A web demonstration is available at https://epos-ics-c-beta.brgm.fr/epos/epos-gui/master/

It includes search, filtering, download, pre-visualisation functionalities (map view) and a user workspace where configured datasets and services can be visualised or downloaded and in the future pushed to processing or visualisation facilities (ICS-D)

## Integrated Core Services Central Hub | ICS- C | Microservices Approach

ICS-C adopted an architectural approach based on microservices that ensures scalability, flexibility and system interoperability. Such architecture includes components and technolgies that *enable FAIR principles to become reality.*

- **EPOS WebAPI:** it represents the entry point to access the EPOS system and provides RESTful services.
- **Message Queue/Bus:** provides an asynchronous communication protocol, enables the different components to communicate by sending and receiving messages.
- **Workspace:** this module manages results found by users and stored in their personal workspace.
- **Query Generator:** vreates SQL query from request Web API.
- **Converter:** converts an input format to a different output format, e.g. converts from CERIF model to EPOS-DCAT-AP.
- **Ingestor and Validator:** these components are used to ingest metadata into the catalogue and validate it.
- **TCS Connector:** Represents the interface to access TCS API.
- **Metadata Catalogue:** based on the CERIF [8] standard, it stores information about Data, Users, Resources, Processing models.



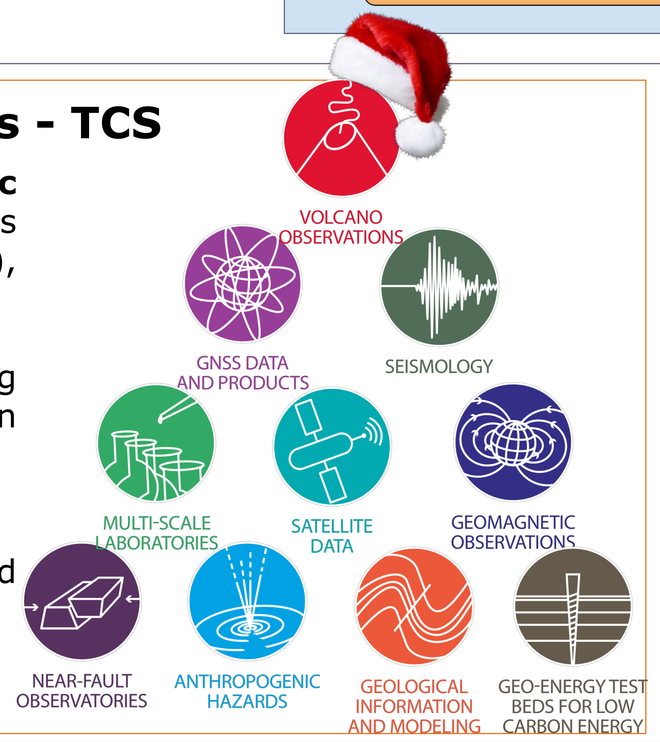

## Resources Harmonization - Thematic Core Services - TCS

Each community provides access to its resources through European-wide services called **Thematic Core Services (TCS).** For each of them a governance framework and a data provision platform is established, as in the case of EIDA/ORFEUS[1] (*Seismology*), ESA GEP[2] platform (*Satellite data*), INTERMAGNET[3] (*geomagnetic observations*) European Geological Surveys[4] nodes and others[5].

TCS are characterized by enormous **heterogeneity of data types and formats**, way of accessing data and metadata, scientific methods. In order to integrate their resources in one single portal, an **harmonization process** has been carried out along three dimensions:

1. *Governance*, in order to organise communities and avoid overlappings
2. *Data and Metadata formats*, in order to decrease heterogeneity if not necessary
3. *Resources representation in a common agreed metadata standard*: EPOS-DCAT-AP [6] was selected to describe TCS assets and ingest them into the EPOS metadata catalogue (CERIF[7] based).

All TCSs provide web services / APIs which enable ICS-C to access data and metadata.




## Rich Metadata Catalouge

ICS-C include a canonical metadata catalog: it is a rich superset representation of the various subset metadata standards used by the TCS allowing representation of the TCS assets in a consistent form and in a machine-readable and machine actionable way.

*A twofold approach was used for metadata:*

1. at metadata management level, the CERIF model was used for storing all information within the system;

2. at metadata transfer level, an extension of DCATAP was created (EPOSDCATAP [6]) to facilitate TCS metadata collection from TCS services to CERIF catalogue [8].

[1] https://www.orfeus-eu.org/
[2] https://geohazards-tep.eo.esa.int/
[3] http://www.intermagnet.org/index-eng.php
[4] http://www.eurogeosurveys.org/, http://www.onegeology-europe.org/, http://www.bgs.ac.uk/
[5] Full list here: https://www.epos-ip.org/thematic-core-service-index
[6] https://github.com/epos-eu/EPOS-DCAT-AP, - *IN31B-33 EPOS-DCAT-AP: a DCAT Application Profile for solid-Earth sciences, Wednesday, 12 December 2018 08:43 - 08:46*
[7] IN31A-05 Integrated Computing in solid Earth sciences: the case of EPOS Integrated Core Services Distributed Infrastructures, Wednesday, 12 December 2018 09:00 - 09:15
[8] CERIF: Common European Research Information Format. Now maintained by http://www.eurocris.org/

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This project has received funding from the European Union's Horizon 2020 research and innovation programm under grant agreement N° 676564 - Disclaimer: the content of this poster reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.