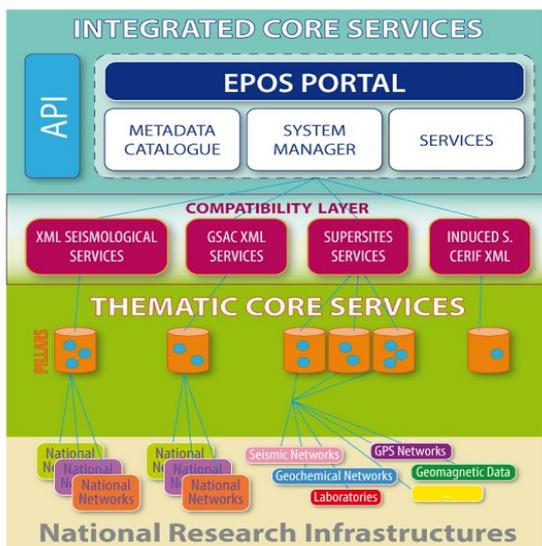# Functional Architecture

As a result of EPOS, the integration of the existing national and trans-national Research Infrastructures will increase access and use of the multidisciplinary data on solid Earth recorded and produced by them. The establishment of EPOS will foster worldwide interoperability in Earth sciences and will provide services to a broad community of users.

In order to face such ambitious challenges, a complex functional architecture has been designed to enable users to discover and select the data, download or visualize them, and perform processing over distributed resources in Europe. A particular attention is taken into metadata handling and intelligent management of distributed resources.

The EPOS functional architecture is composed of three connected technical and organizational elements: *NRIs, TCS,*

ICS. The **National Research Infrastructures (NRIs)** represent the underpinning EPOS data providers that will guarantee access to quality-checked data and products. The EPOS architecture ensures that new RIs as they become operational can be integrated in future. The existing solid Earth science NRIs which support the EPOS integration plan are listed in the RIDE database. RIs contributing to EPOS will continue to be owned and managed at a national level. These have a significant economic value both in terms of construction and yearly operational costs, which are typically covered by national investments that must continue during EPOS implementation, construction and operation.

The **Thematic Core Services** (**TCS**) are the community-specific integration (e.g., seismology, volcanology, geodesy, experimental laboratories, etc). They represent transnational governance frameworks where data and services are provided to answer scientific questions and where each community discusses their specific implementation, best practices and sustainability strategies as well as legal and ethical issues. The TCS were designed taking into account the requirements of the different EPOS communities. The fact that ten TCS contributed to EPOS demonstrates the multidisciplinary breadth of the integration plan and the potential impact of the community building aspect of EPOS. TCS will be interoperable with ICS thanks to appropriate ICT solutions (the compatibility layer).

The **Integrated Core Services** (**ICS**) represent the novel e-infrastructure that will allow access to multidisciplinary data, products (including synthetic data from simulations, processing and visualization tools), and services to different stakeholders, including but not limited to the scientific community (i.e., users). The key element of the ICS in EPOS will be a central hub (**ICS-C**) where users can discover and access data and data products available in the

TCS and NRIs as well as access a set of service for integrating and analysing multidisciplinary data. The technical interface between TCS and ICS is the **compatibility layer**, which guarantees communication and interoperability. The ICS-C single-sited (replicated for resilience) e-infrastructure will include the EPOS portal and its key functions: the Application Programming Interface (API), the metadata catalogue, the system manager and the services that will allow the data discovery, the interactions with users as well as the access, download and integration of data. The ICS-C will also provide access to distributed resources which form the distributed ICS (**ICS-d**) and include access to supercomputing facilities as well as to visualization, processing and modelling tools that need not be centralised. ICS-d may be (a) additional computing/storage/detector array facilities outside the scope of EPOS; (b) nodes providing general software services used across all TCS such as input/validation, data management, analytics, simulation, mining, visualisation; (c) replicates/mirrors of ICS-C in distributed locations for resilience and performance.