

# VERCE



**Summary:** The earthquake and seismology research, an intrinsically Global undertaking, addresses both fundamental problems in understanding Earth's internal wave sources and structures, and augment applications to societal concerns about natural hazards, energy resources, environmental change, and national security. This community is central in the European Plate Observing System (EPOS), the ESFRI initiative in solid Earth Sciences. Global and regional seismology monitoring systems are continuously operated and transmitting a growing wealth of data from around the world. The multi-use nature of these data has put a great premium on open-access data infrastructures integrated globally, e.g. in Europe, USA and Japan.

The European Integrated Data Archives infrastructure provides strong horizontal data services. Enabling advanced analysis of these data by utilising a data-aware distributed computing environment is instrumental to exploit fully the cornucopia of data, and to guarantee optimal operation and design of the high-cost monitoring facilities. The strategy of VERCE, driven by the needs of data-intensive applications in data mining and modelling, aims to provide a comprehensive architecture and framework adapted to the scale and the diversity of these applications, and integrating the community Data infrastructure with Grid, Cloud and HPC infrastructures.

## Objectives:

- Provide to the Virtual Earthquake and seismology Research Community in Europe, a data-intensive e-Science environment - based on a service-oriented architecture - integrating a number of specialized services, tools, data-flow and work-flow engines, to support the data-intensive applications of this community and beyond to the EPOS community.
- Provide a framework wrapping the seismology data-infrastructure resources and services with a set of distributed data-aware Grid, Cloud and HPC resources provided by the European e-infrastructures and the community.
- Productise a core of pilot data-intensive applications and use cases of the Virtual Earthquake and seismology Community of research in Europe that exemplify the power of the platform architecture and its capabilities.
- Deliver a scientific gateway providing a unified access, management and monitoring of the platform services and tools, domain specific interfaces supporting the coevolution of research practices and their supporting software.
- Deliver an 'intellectual ramp' providing safe and supported means for researchers and users of the community at large to advance to more sophisticated data use through tailored interfaces and facilitators integrated within the scientific gateway.
- Deliver a 'research-methods ramp' through a toolkit of training programs for data intensive research - composed as a set of training session material, demonstrators, and best practice guides - based on tailored use-case scenarios and productised data-intensive applications of the community.
- Provide a collaborative environment between the earthquake and seismology research community and the computer scientists, system architects and data-aware engineers, fostering the emergence of 'research technologists' with sustained mastery for data-handling methods and a thorough understanding of the research goals.

**Project Acronym:**  
VERCE

**Contract n:** RI-283543

**Project type:** CP&CSA

**Start date:** 01/10/2011

**Duration:** 48 months

**Total budget:**  
5,955,220.00 €

**Funding from the EC:**  
4,650,000.00 €

**Total funded effort in person-month:**  
569

**Web site:**  
[www.verce.eu](http://www.verce.eu)

**Contact person:**  
Jean-Pierre Vilotte  
email: [info@verce.eu](mailto:info@verce.eu)  
tel.: +33 (0)1 83 95 75 83  
fax.: +33 (0)1 83 95 77 17

**Project participants:**

CNRS-INSU	FR
UEDIN	UK
KNMI-ORFEUS	NL
EMSC	FR
INGV	IT
LMU	DE
ULIV	UK
BADW-LRZ	DE
SCAI	DE
CINECA	IT

**Keywords:**  
data intensive e-science environment, service-oriented architecture, Grid and HPC computing, data infrastructure, earthquake, seismology

**Collaboration with other EC funded projects:**  
EPOS  
EUDAT  
ENVRI  
NERA  
SHARE  
GEM  
WHISPER  
QUEST  
EGI-InSPIRE  
GISELA  
PRACE

*continued overleaf*

**Action Plan:** VERCE will integrate a service-oriented architecture with efficient communication and data stream layers between the Data and the Grid/Cloud infrastructures. VERCE will also orchestrate HTC data analysis and HPC data modelling applications through workflow and data sharing mechanisms. VERCE will strengthen the European earthquake and seismology research competitiveness, and enhance the data exploitation and the modelling capabilities of this community. In turn, it will contribute to the European and National e-infrastructures.

A high level of coordination and monitoring is needed to insure the timely delivery of the different components. Emphasis has been put on providing sufficient management structures and resources at the different levels of the project. The VERCE project is therefore structured into a set of networking, services and research activities according to the following organisation:

#### *Network Activities*

The networking activities will run for the duration of the project. The NA activities are horizontal orchestration activities that emphasize a user-centricity evident throughout the project. These activities will lead seeding changes in the collaborations across seismologists, computer scientists and the data-aware engineers within the VERCE consortium.

Work Packages: Management (NA1), Pilot applications and use cases (NA2), Training and user documentation (NA3), Dissemination and public outreach (NA4).

#### *Service Activities*

The service activities will exploit to the full the facilities of the evolving ecosystem of e-Infrastructures, including three existing European infrastructure core services: EGI and NGIs, PRACE, the European Integrated Data Archives infrastructure EIDA.

Work Packages: Management and operation of the research platform (SA1), Integration and evaluation of the platform services (SA2), Scientific gateway, user interfaces and knowledge and method sharing (SA3).

#### *Joint Research Activities*

The JRA activities draw on the pilot data-intensive applications, and their scientific use case scenarios, provided by NA2. JRA1 will analyse and enable the data intensive applications, while JRA2 will design and provide a data-intensive service oriented architecture, and a set of tools and services to be integrated onto the platform by the SA activities.

Work Packages: Harnessing data-intensive applications (JRA1), VERCE architecture and tools for data analysis and data modelling applications (JRA2).

**User communities:** VERCE is designed to provide a direct benefit to the entire earthquake and seismology community, as well as to the broader, solid earth sciences communities as a whole, as structured by ESFRI EPOS-PP. In addition, VERCE shall also organise and ensure a large, coordinated public outreach program to disseminate information and educational material about the benefits and advances made by the project activities.

**International aspect:** The centrality of the earthquake and seismology community in the solid Earth Sciences engages multiple European and International agencies in supporting the discipline through a number of large scale projects in Europe, e.g. NERA, SHARE, GEM, WHISPER, QUEST, and outside Europe, e.g. Earthscope, USArray and GEON in the US; the Earth Simulator, the Hi-net and K-net monitoring systems in Japan, international consortia, e.g. the Comprehensive (Nuclear) Test Ban Treaty Organisation (CTBTO), and the Global Earth Observations System of Systems (GEOSS). The community is today the central core of the European Plate Observing System (EPOS), the large-scale ESFRI research infrastructure in solid Earth Sciences.

