



ever-est

Training Strategy and Plan

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Definitions and Acronyms

Acronym	Description
AHM	All Hands Meeting
CNR-ISMAR	Consiglio Nazionale delle Ricerche – Istituto di Scienze Marine
COTS	Commercial Off the Shelf
DOA	Description of Action
ES	Earth Science
EO	Earth Observation
ESA	European Space Agency
EVER-EST	European Virtual Environment for Research - Earth Science Themes
GUI	Graphical User Interface
RDA	Research Data Alliance
RDF	Resource Description Framework
RDFS	RDF Schema
RO	Research Objects
RODL	Research Objects Digital Library
SATCEN	European Union Satellite Center
SMART	Specific, Measurable, Achievable, Relevant, Time-bound
VRC	Virtual Research Community
VRE	Virtual Research Environment
W3C	World Wide Web Consortium
WP3	Work Package 3 - VRE Use Cases
WP5	Work Package 5 - VRE Infrastructure, Service Design & Development
WP6	Work Package 6 - VRE Deployment, maintenance and operations

Applicable Documents

Document ID	Document Title
EVER-EST DEL WP3-D3.1	Virtual Research Environment use case detailed definition
EVER-EST DEL WP4-D4.1	Workflows and Research Objects in Earth Science
EVER-EST DEL WP5-D5.1	VRE architecture and interfaces definition

Reference Documents

EVER-EST DEL WP2-D1.1	Project Management Plan
EVER-EST DEL WP2-D2.1	Dissemination strategy and plan



1 Introduction

The purpose of this document is to provide a comprehensive description of the Training Strategy and Plan that addresses the internal needs of the EVER-EST consortium along with those of external communities, that potentially have an interest in adopting the Virtual Research Environment (VRE) platform. The plan will describe the logic behind the strategy, the stakeholders, the issues that activities have been addressing, the solutions which have been identified, and the different training phases which are foreseen during the project lifetime.

The EVER-EST VRE will provide the Earth Science domain with a series of highly innovative concepts and functionalities for collaborative work. All training activities must therefore take into account the difficulties that the target communities might have in understanding and adopting its logic, platform and services. As a result, the training activities have emerged as a necessity and have been carried out within the consortium, targeting the four Virtual Research Communities (VRC) involved in EVER-EST, since the very beginning of the project.

Training is an iterative process that contributes to an improved understanding of the key sustainability points of the VRE by the consortium partners. It also leads to the identification of those training topics that potentially increase interest in the EVER-EST project by the wider community beyond the project partners which is fundamental to one the main goals of the project: the enlargement of the user base for the EVER-EST VRE through targeting of external Earth Science communities.

This requires a continuous effort to understand what are the generic dynamics, inter-dependencies, approaches and interests of the Earth Science community. In this perspective the training activity is also a key aspect of the Dissemination Strategy: it is fundamental for building and consolidating both the user community and the VRE sustainability model which will be addressed later in the project.



Figure 1 Discussion between the technical team and the VRCs (Venice All Hand Meeting, April 2016)



1.1 Document structure

The document is organized as follows:

- **Chapter 1** introduces the document and explains its evolution throughout the project lifetime.
- **Chapter 2** provides information concerning the overall training approach. It identifies what are the issues, the solutions, and planned activities. The last part of the chapter provides a quick overview of the main training topics.
- **Chapter 3** provides a detailed description – topics and roadmap - of the internal training activities.
- **Chapter 4** provides information concerning the external training approach, schedule and stakeholders throughout the project lifetime.
- **Chapter 5** maps the training activities against the SMART Objectives and Key Performance Indicators (KPI's) defined for the project.

1.2 Document evolution

Task 2.3 which focuses on training starts at M10 and ends at M26, however as already indicated, training activities have emerged as a need within the EVER-EST consortium since the very beginning of the project. Training sessions have been carried out across the various project work packages and tasks with the aim of bringing the project partners to a common and shared level of knowledge about the VRE (both scientific and technical) that was essential in order to effectively carry out any further development work.

Although these training activities have been performed in other work packages, it is possible to bring together their logic, approach and feedback and use the lessons learned to prepare the next steps of the training along with the associated materials.

At M25 the report on the training activities will be issued as deliverable *D2.5 Report on Training Activities*; which will contain input from this deliverable covering the first year of the project in addition to reports on all training activities and events that will be carried out during the next 16 months of the project according to the current plan.



2 Training Strategy

The EVER-EST project has been designed and is currently implemented to satisfy the following three main objectives:

1. Create a Virtual Research Environment for Earth Science disciplines providing a platform and a generic set of services that will allow scientists to cooperate by effectively sharing their work and findings.
2. Validate the infrastructure by demonstrating the benefit of the VRE for the four Virtual Research Communities (VRCs) that are participating to the initiative. Each of those communities is bringing a unique case for validation, in terms of data used, processes, team structure, activities, etc.
3. Apply the concept of Research Objects and demonstrate its advantages for the Earth Science domain. This concept has been already validated in other disciplines, including Astrophysics, but is now developed and adapted for Earth Science for the first time.

By analysing the three main objectives of the EVER-EST project it is possible to identify a set of issues that need to be addressed by defining appropriate training activities.

One of the main issues relates to the high degree of innovation, as this could result in the slow or partial adoption of the VRE by the scientific communities due to the possible impact it could have on their working practices, procedures, standards and technologies. In addition, EVER-EST introduces the concept of Research Objects within Earth Science for the first time, which will allow creation and sharing of scientific collaborative workflows among researchers; potentially completely changing the way research activities are implemented and conducted within a team or across teams.

These ideas need to be properly communicated and promoted by identifying and highlighting the immediate advantages and benefits they can bring to the researcher's daily work. This makes the training a crucial element for encouraging the wider adoption of the VRE and also demands that the trainers clearly define and understand the Earth Science audience before even starting any training material preparation.

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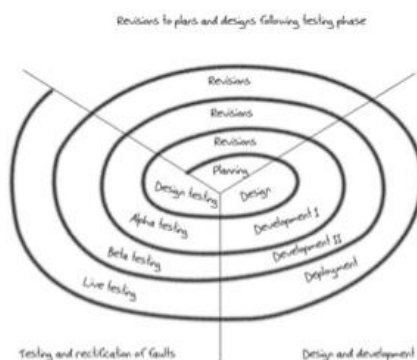


Figure 2 Excerpt from internal training sessions - Changing researcher's habits: step by step

This means that, in the first instance, many of the training topics can be inherited from the analysis of what is currently missing and most desired by the potential target community, and by the understanding of how the EVER-EST platform could fill the gap. This analysis has been carried out starting with the four Virtual Research Communities participating in the project that represent the Earth Science domain. By implementing a consistent



set of training activities for the VRCs, trainers are able to identify the best approach both for training and promoting the innovative EVER-EST solutions to the scientific community. For example, the internal training provides an understanding of the terminology that is needed to explain how to integrate the EVER-EST innovations into an Earth Science working environment. Most importantly, it provides regular feedback on the success of the internal communication and allows constant monitoring of the level of comprehension that the target communities have acquired with regards to the potential benefits of the EVER-EST VRE.

The second crucial pillar of the training strategy is leveraging a continuous internal training methodology to test, focus and progressively consolidate ideas and training material that will be used for training external communities. Meanwhile the third pillar is based on the identification and analysis of the commonalities among Virtual Research Communities with the goal of understanding common working practices and approaches. Although one Virtual Research Community might work with bathymetry data, while another is focusing on Earth Observation or one team could be working in the same office while another brings together different researchers from different institutions, it must be always be possible to identify the analogies and understand how these could be addressed using the EVER-EST technologies. Understanding the generic workflows in Earth Science research is a fundamental step to facilitate the creation of training material and methodologies for external communities.

Another key guideline is to avoid training the external Earth Science community until the platform is fully implemented and available online. The project schedule foresees the release of the first version of the platform by the end of the first quarter of 2017 and then a second, final, release by the end of 2017. It could be counter-productive to gather together external communities to explain the platform before at least several of the planned services have been implemented and tested by the EVER-EST VRC partners. Earth Science communities are constantly invited to try new technologies, but often as beta testers, providing feedback on solutions, which may not be ready for use. If the audience is trained on a platform which is not able to provide the expected services there is a significant risk that this will jeopardise their interest and future involvement. This approach therefore creates a logical milestone for the training strategy: create and refine training material and modules with the help of the four EVER-EST VRC partners and then start to set up training sessions for external communities once the platform has reached a good level of stability. This is planned for M18 for a subset of use cases within the framework of the EVER-EST VRE development.

2.1 Stakeholder training

The four EVER-EST Virtual Research Communities constitute the test audience for the training activities. By working in close cooperation with the EVER-EST researchers, the development/engineering team can progressively refine the training message and content. Internal training has started since the very beginning of the project to facilitate dialogue and a shared vision about the VRE functionalities across the consortium. To date, two main training events have been carried out within the framework of WP4 that specifically focus on Research Object creation and management.

In addition, a two-month long exercise started during the All Hand Meeting in April 2016 that aims to refine user requirements defined in deliverable D3.1 (WP3) and to improve the comprehension and adoption of workflow-based procedures within the VRC research community. As a result, a set of additional documents called “VRC User Actions”, which was not originally foreseen within the Description of Action (DoA), have been produced and integrated into deliverable D3.1 which outline how a VRC could deploy the workflows at their own premises.

Training events and related documents have facilitated not only a common understanding of the infrastructure in terms of the functionalities that it might provide, but also the terminology that can be used to describe its features. These are examples of how the consortium intends to engage the VRCs during the project as an internal



training audience, to consolidate and refine the messages that will be delivered to the external Earth Science community.

During the first year of the project the internal training has covered the main platform characteristics: Research Objects, workflows, generic services, etc. During the second year additional training modules will be developed which focus on specific VRE functionalities, such as the Sandbox for Cloud Processing or the VRE security mechanisms. These modules will be progressively made available to the internal audience during dedicated events (face to face or on-line workshops) and, based on their feedback, refined and consolidated for future use with the external communities.

The adoption of the VRE by the four VRCs and the involvement of external communities plays a major role in ensuring the sustainability of the platform. To achieve this goal, training both peripheral (i.e. working closely with the project VRCs) and external Earth Science communities, which are not actually part of the consortium, is a fundamental step. As already described, this will require a rich training curriculum that should encompass a wide range of teaching platform characteristics, services, commonalities, opportunities and detailed “how-to’s”.

The consortium has opted to schedule the external training activities for the last year of the project when the platform will be released. Training material will be made available directly on the platform to guide external users through simple and generic steps for using the EVER-EST VRE, which should address their needs and requirements. The training logic will be organized to follow the paths suggested by the commonalities in workflows that have been identified from the VRCs participating in the project.

Dedicated face-to-face training events for external audiences will be carried out in association with other dissemination activities where possible using the approach is described in D2.1, and exploiting opportunities provided by other initiatives such as, for example, the Research Data Alliance (RDA), to organize training sessions at specific events.



3 **EVER-EST Project Activities**

As previously described, training activities will be of interest to two different categories of stakeholders:

- **Internal training** - Represented by the EVER-EST VRC's. Internal training covers the full project lifetime with a particular effort made during the first two years. The activity includes the identification of all lessons learned and new training material derived from other WP activities, plus the refinement of all training presentations and activities carried out with the VRC's.
- **External training** - During this phase, which will be carried out systematically starting from the delivery of a stable version of the platform (planned for M18 for at least some components), the EVER-EST consortium will involve the external scientific community by organizing VRE training sessions. The training material will be the consolidated versions of those used for internal training. Training modules will cover different aspects of the VRE from the detailed technical aspects to the functionalities it provides to a researcher depending on the audience.

The current chapter covers the internal training roadmap and topics, while next chapter (see 4) will provide details about external training activities and schedule.

3.1 **Internal training**

By the time this document is written and delivered, the consortium has already carried out an entire year of training activities within the scope of the various project WP's.

3.1.1 **The approach**

The internal training is divided into three main phases:

- **Internal Training Phase 1 - The basics (M1 – M12):** the goal is to start the practical dialogue on the future usage of the platform between software developers and Earth Science researchers. The training focuses on explaining to the community how to familiarize themselves with the most innovative technologies that the project will deliver.
- **Internal Training Phase 2: Hands on the EVER-EST services (M12 – M18):** the training program continues with interactive activities using the first software modules which will be delivered by the technical team through ad hoc meetings and via the training environment. The VRC's will be trained on how to use these modules and connect to them through workflows. The results of these repeated iterations of the internal training will be in the form of Microsoft® PowerPoint presentations and on-line exercises that will be used for external training, and also demonstration workflows that will be made publicly available on the EVER-EST VRE Gateway.
- **Internal Training Phase 3 - Platform usage and feedback (M22 – M36):** the platform will be available and fully functional. Each VRC will be requested to provide continuous feedback to the developing team in terms of training module refinement or new solutions that could be adopted for use during the external training activities. At the same time the VRC's will elaborate and consolidate domain specific training material in order for them to become trainers for their own communities.

3.1.2 **Internal training phase 1 activities**

The first phase of the training, starting at M1 and finishing at M12, focuses on those topics which constitute the basis for the VRE adoption within and Earth Science working environment.

- **Research Objects** - This the first time this concept has been applied to the Earth Science domain. Research Objects are the key paradigm to allow the implementation of sharable scientific workflows in a Virtual



Research Community. In this context, a mutual understanding between Research Objects developers and the Virtual Research Community is key. In terms of contents, the Research Object development team needs to understand how the VRCs work and to identify how to evolve the Research Objects paradigms and related technologies to accommodate them. At the same time, the VRC members need to fully understand what Research Objects can do for them and how they can be used as part of their regular working practices.

- **Workflows** – As already described, the innovative working practices enabled by the EVER-EST project fosters the possibility to create collaborative workflows in the Earth Science domain through the adoption of workflow-centric Research Objects. This opens up a variety of new possibilities to researchers, all of which have to be understood and analysed, and, in some cases discovered, as many of these new opportunities are potentially still unknown.
- This exercise deals with a series of themes including, as an example, the impact of moving consolidated processing routines to configurable workflows or how the change could be perceived by the VRC's and how they can be trained on a daily basis to adopt the underlying technology. These are just some of the topics that have been discussed and analysed throughout the entire first phase of the training within the EVER-EST consortium, by leveraging a "learning by doing" approach.
- **EVER-EST Services** - To complement the RO-based workflows there are five categories of VRE services that are described in detail in deliverable D5.1 which will be developed within the project and provided to the research communities. Some of them will be generic e-collaboration services for sharing information, e.g. chat, messaging systems, etc. while others will be specific technical and domain related Earth Science data processing services that can be integrated into workflows. During the first phase of the training the VRCs are provided with a general overview of those services to improve their comprehension. At the same time this allowed the trainers to understand the priorities of the VRCs for those services within their own working environment.

During phase 1 of the internal training the four EVER-EST VRCs have been constantly engaged to critically review their approach to cooperative research and to identify, in a creative way, new working best practices based on the adoption of Research Objects and workflows. The goal was to understand how the new paradigms brought by EVER-EST could improve their current working environments.

During the first year the following main training activities were performed:

- Immediately after the project Kick-Off Meeting, a Hackathon event dedicated entirely to Research Objects, workflows and RO-related technologies was held within the scope of work package 4. The event was organised at the CNR premises in Bologna during late January 2016 and the various teams took advantage of the event to further expand the discussion between technical partners and VRC's with regard to EVER-EST services and capabilities.
- Following the completion of deliverables D3.1, D4.1 and D5.1, the four VRCs were encouraged to start implementing collaborative working practices based on the adoption of Research Objects, in order to take full advantage of the EVER-EST services and functionalities. This activity originally emerged from the need to discuss the user requirements of the VRCs collected in the context of WP3 from a strictly technical perspective. This discussion was initiated during the All Hand Meeting in Venice (April 2016), but it then continued for the next two months through dedicated virtual meetings and interviews.
- The VRC's were requested to divide their working practices into smaller steps that could then be optimized by the adoption of workflow-centric research objects or, by the EVER-EST services in general. The result of this activity is summarized within the VRC User Actions technical notes. These documents are included in the updated release of D3.1, as refinements of the use case scenarios defined in the first release of the deliverable and which will be further improved during



the project. Within the context of the training, the activities related to the finalisation of the User Actions is allowing in-depth dialogue between the VRC's and the technical team in order to assess each individual step of their research process to allow progressive adoption of workflow-based working practices.

- An additional activity of relevance for the training strategy is the analysis of commonalities in the working approaches and dynamics of the VRCs. Although different VRCs might work with different data types or team setups, analogies and generic commonalities are found in the way they carry out their research activities (e.g. search for data, process, exchange information, etc.). This allows the creation of so-called generic Earth Science workflows, which will be sufficiently generalised to be of interest to a wider audience. The results of this activity therefore provide crucially important input material for building the training paths and scenarios that are relevant for the external audience.
- As the VRC's awareness of both the Research Object concept and the functionalities of EVER-EST platform in general had radically improved over the first eight months of the project, a second RO Hackathon was organized at the beginning of July 2016, to "close the loop" on Research Objects. As for the first training event, this second one was also held in Bologna and focused on complex workflow creation and Research Object management as part of the VRC partners' specific activities.

3.1.2.1 VRC user requirements commonalities

The analysis of the User Actions documents provided by the four VRC's has allowed common workflows and working paths to be identified across the different communities. These commonalities are of great value in terms of training as they allow "generic training modules" to be built for the external communities. These modules will show how the EVER-EST services and functionalities can practically help researchers in their daily activities by addressing a number of generic, and therefore widely understood and accepted, working exemplars.

To date, three generic modes of working have been identified and are being further consolidated, and will represent a core element of the external training.

- 1) Systematic observation over a given time frame (daily, weekly, monthly, etc.), using specific information (datasets) and conditions.
- 2) Setting up a research workflow for scientific publication purposes and progressively share it with the team (start research, save it, publish it or share some of its parts with interested people, get feedback, provide knowledge, etc.)
- 3) Setting up a collaborative work flow with the team to work on a specific project or activity (e.g. measurements, delivery of results to third parties, weekly reports bringing together different inputs and processes performed by different people, etc.).

3.1.2.2 Phase 1 training material

Table 1 lists the core training materials that have been identified during phase 1, and which will be used by the external Earth Science communities. The documents are currently stored on the internal project repository and will be made available for download to support training events. They will also be publicly available both on the project website and the EVER-EST gateway.



Topic	Format	Status	Description
Research Objects	Microsoft® PowerPoint presentation	Available	<p>General presentation on the Research Objects. Topics included:</p> <p>For the VRCs</p> <ul style="list-style-type: none"> • What can Research Objects do for me? • How can I use them? • Learning by doing <p>For data providers and technical specialists</p> <ul style="list-style-type: none"> • How can we put it all together
Scientific Workflows	General Microsoft® PowerPoint presentation	Available	Exemplars of Scientific workflows implemented by the four VRCs.
RO-HUB user manual	PDF	Available	The infrastructure: description. Ro management on RO-HUB: creation, saving, preservation.
User Actions template	Microsoft® Word file	Available	The template can be used prior to a targeted training event to ask an Earth Science (ES) community to fill in their working practices and procedures. The training can then be based on this document to show how the EVER-EST infrastructure can improve the effectiveness or solve some of the issues, gaps and bottlenecks the community is experiencing.
Generic Earth Science workflows	Microsoft® PowerPoint presentation	Under completion	The list of generic workflows for use in a general training event (e.g. bringing together different ES communities) to quickly explain how the platform can be used to implement different set of actions. Depending on the audience, the presentation will be integrated with specific training modules.

Table 1 Phase I Training material



3.1.3 Internal training phase 2: hands on the EVER-EST services

The main focus of the first phase of the training has related to understanding workflow-based research principles, and the comprehension of Research Objects as workflow enablers and as a new way to implement shared research.

The second phase of the internal training will focus on the platform services and will provide an in-depth overview of how they can be integrated into workflows to create complex data processing chains in a research environment or be simply used as a stand-alone service by scientists. As previously described, some of the services are designed to facilitate team cooperation and communication and can be considered as a standard for collaborative environments. Another substantial group of EVER-EST services that are specific to the Earth Science domain include, among others, services for data research, access, processing and preservation.

Phase 2 of the internal training program will focus on the service capabilities, configuration and usage, with a particular emphasis on how they can be plugged into existing workflows and how they can be updated or modified over time. As for Phase 1, this is an iterative process in which the technical team will train the four VRC's on each specific module whilst getting constant feedback from them to fine-tune the training material. The result of this iterative training process will be in the form of Microsoft® PowerPoint presentations that will be used for external training, and also demonstration workflows that will be made available to the wider community on the EVER-EST gateway.

3.1.3.1 The EVER-EST services

The EVER-EST services are divided into five categories which are summarised as follows:

- **E-Collaboration services** – Services that allow real time collaboration between users. They include chat, messaging systems, alerts, and the creation of on-line groups for notification. In some cases, they might include systems for video-conferencing and screen sharing. These technologies, which are quite common in VREs, will be integrated on the platform as Commercial Off-The-Shelf (or COTS) solutions depending on the progressive needs emerging from the VRC's. These services do not require complex training procedures and can be disseminated via standard presentations and/or 'how-to' and user manuals.
- **E-Research services** – Services supporting scientific research processes. These are the domain related core services specific for Earth Science. A consistent part of these services has been inherited from previous EU funded projects and will be adapted and integrated into the new VRE environment. This is the service category containing the most outstanding functionalities for data processing, based on the sandbox technology, data research, access and preservation. Specific training modules will be provided for each of those services, as summarised in the next paragraph (see 3.1.3.2). In addition, the services for RO and workflow management, which have been already addressed during phase 1, will be covered in much greater detail.
- **E-Learning services** – Services providing access to learning material. E-Learning will be based on Jupyter Notebook technology that has been integrated into the EVER-EST platform. While a training session on how-to use Jupyter Notebook is foreseen during phase 2, the tool will be used as a hands-on training mechanism to teach internal, and during phase 3 external, audiences on how to use specific tools.
- **Common Services** – Base services to build upon the core infrastructure. These services include user management, access and security. Most of these services are opaque to the final user and do not require a training session. The audience interested in these services can find more detailed information by consulting the project technical deliverables such as *D5.1 VRE Architecture and Interfaces Definition* and *D5.2 Technical Note on common services*.



3.1.3.2 Phase 2 training modules

This section describes the specific modules that will be delivered to the VRC's during this phase of the training. These presentations and training modules will be updated to reflect the feedback coming from the VRCs regarding their overall comprehension and their applicability to their individual user scenarios.

Processing Services: The Sandbox

Cloud processing services provided via the Sandbox (Figure 3) can be directly integrated into existing workflows to enhance users processing capabilities. The cloud platform training module provided by Terradue will focus on the following topics:

1. Introduction to the cloud platform: what is the Terradue cloud platform, its mission, main services, portal and dashboard.
2. Building applications on the cloud platform: hello world example, what is the workflow involved, working with a developer cloud sandbox, the workflow descriptor, running an executable.
3. Delivering processes to users: testing the workflow, sharing processing jobs, starting the activities.
4. How to use the cloud platform provided by EVER-EST: inserting a job into an individual workflow management system.

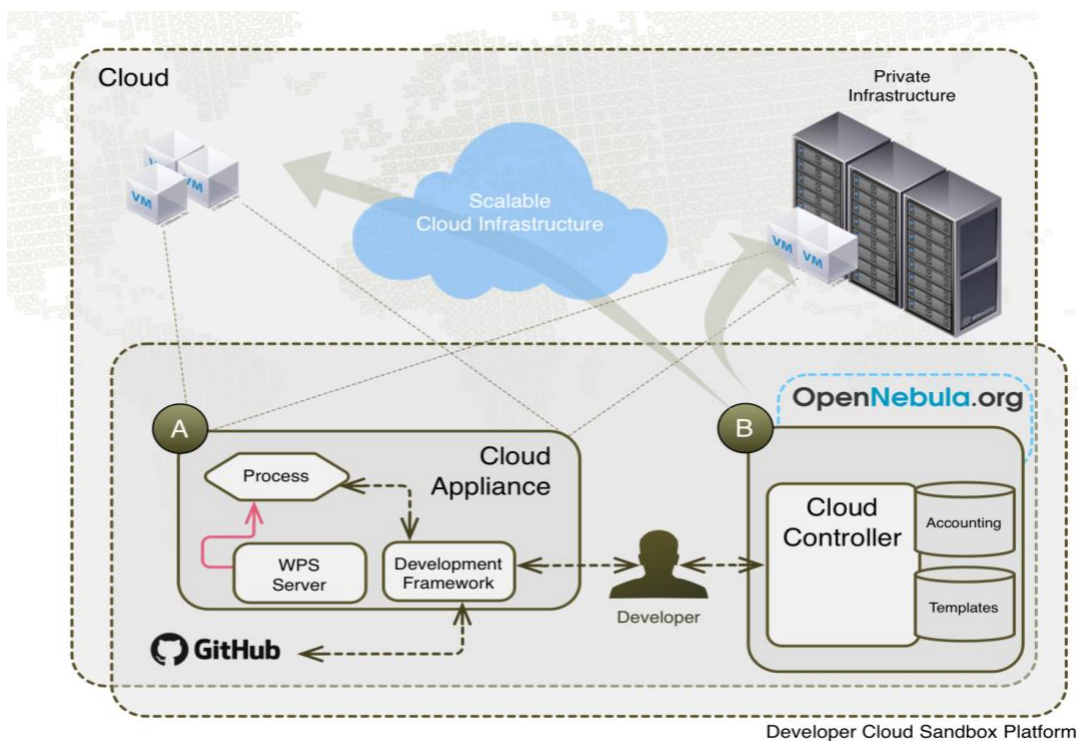


Figure 3 Extract from the Developer Cloud Sandbox training module

A specific set of on-line exercises will be available to the communities for hands-on training.

These exercises include¹:

- Hands-on Exercise 1: building a basic workflow

¹ see <http://docs.terradue.com/developer-sandbox/developer/index.html> for full details on each exercise



- Hands-on Exercise 2: make a robust workflow and debug it
- Hands-on Exercise 3: staging data
- Hands-on Exercise 4: using a toolbox
- Hands-on Exercise 5: using parameters
- Hands-on Exercise 6: a multi-node workflow
- Hands-on Exercise 7: debug a multi-node workflow
- Hands-on Exercise 8: browse published results
- Hands-on Exercise 9: using an OpenSearch catalogue
- Hands-on Exercise 10: prepare an OGC processing service

Common Services

These services are quite low-level and do not have a direct impact on the VRC's operational activities. The consortium will prepare descriptive slides about the Common Services technologies to provide enough technical detail for the interested parties, such as, security managers working within Earth Science organizations that intend to use the EVER-EST platform.

Specific "How-To's" for operational aspects will be prepared, focusing on the following topics:

1. The Identity Server: Description of the authentication mechanisms; Description of user management and How-To subscribe, authenticate, manage user accounts; description of security management.
2. The Enterprise Service Bus: description of communications adaptation; description of information transformation enhancement (role of the middleware in general).
3. Data Analytics: description of data logging in the light of KPI measurement.
4. Data Discovery and Access: description of discovery functionality within a VRE (what to discover and why); How-To discover and access EO data via OpenSearch; How-To discover RO, under the technical aspect, in conjunction with RO trainings.

Each high level topic (Identity Server, Enterprise Service Bus, Data Analytics, Data Discovery and Access) could imply a specific lesson lasting about half a day, including specific hands-on exercises.

EVER-EST User Interface

The EVER-EST project will deliver a VRE Gateway that will be accessible and visible by any user. Additional specific graphical user interfaces will be also deployed for each of the EVER-EST VRCs and made accessible only to registered users.

Specific training sessions will be organised for the internal audience on both the main gateway and VRC user interfaces which shall focus on usage and functionalities.

This training module will be available both in the form of a Microsoft® PowerPoint presentation and user manual. In addition, a training-mode setting can be activated on the VRE Gateway. By using this functionality, the user will be guided through a basic set of operations that can be performed in the EVER-EST VRE, while being assisted by a pop-up training window explaining the meaning of the action and the specific options (see Figure 4).

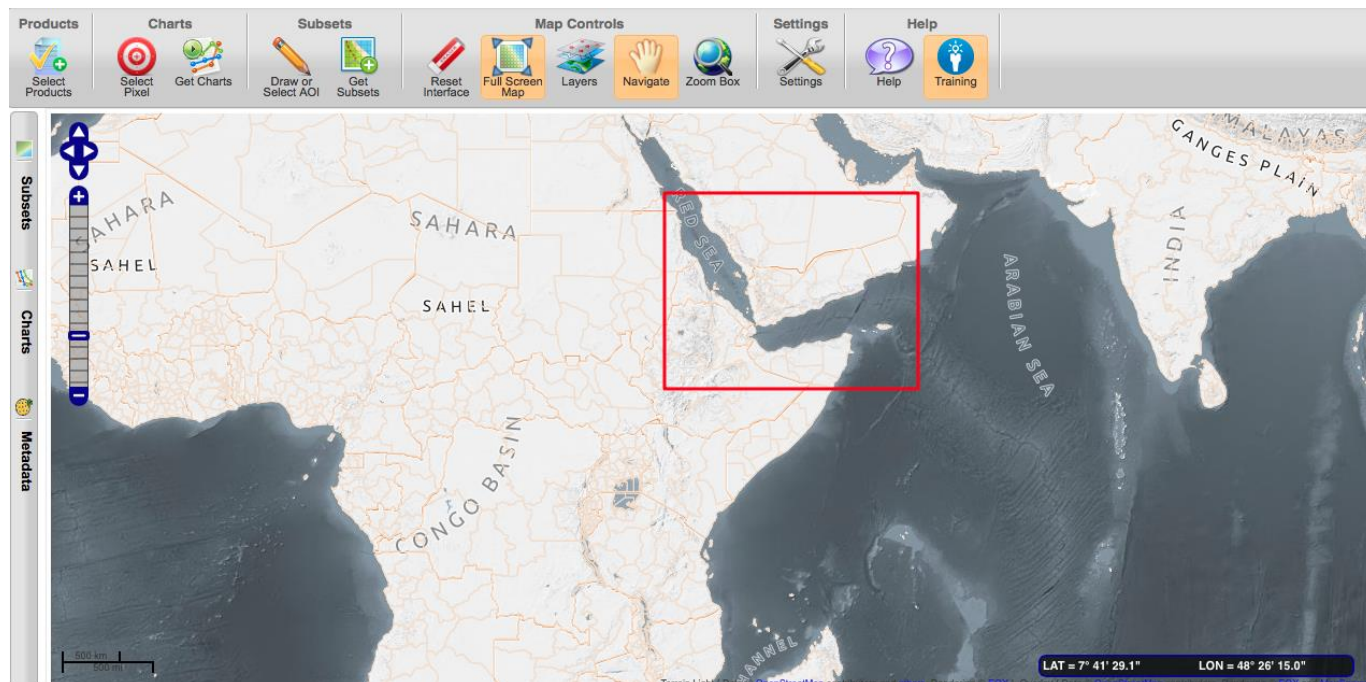


Figure 4 Example of the EVER-EST graphical user interface in training mode

The training materials relating to the functionalities of the EVER-EST graphical user interface (GUI) will cover the following topics:

1. Layout of the EVER-EST graphical user interface (GUI): homepage, top toolbox, main functionalities, toolbars, pop ups
2. GUI users: guests, registered users, grouping users, registration procedures, user settings
3. GUI Preferences panel and Control Panel
4. Getting started: the main components
5. The Virtual Globe map Panel
6. Data Analytics – This module will be carried out in conjunction with the Common Services Enterprise Service Bus training module
7. Data Searching
8. Data Accessing
9. Data Processing – in conjunction with Sandbox
10. Sharing and preserving your results
11. Building your workflow from the GUI using Taverna – in conjunction with RO training
12. Collaboration Spheres – in conjunction with RO training

Research Objects and Workflows

This module will continue the work carried out during the first phase of internal training (i.e. the two Hackathons). During phase 2, the focus of RO training will concentrate on the following topics:

- RO generation. In addition to the RO generated by the VRCs either on ROHUB or through the different VRC portals, the discussion will focus on how to deliver scientific Earth Science publications via Research Objects, starting, as a hands-on example from EVER-EST deliverables, both text (similar to the case of papers) and software
- Finalize a compelling scenario for the application of the Collaboration Spheres collaboration software within the VRE.



- Identify a simple yet compelling scenario for the application of checklists in support of Data Management Plans, produced by WP3.

The consortium is currently assessing the possibility of organising a workshop/user consultation with researchers from outside the consortium to develop their own ROs during year 3. The detailed plan for this activity has been discussed at the All Hand Meeting in Edinburgh during late September 2016 (M12) and is detailed in Table 3 External community training.

Research and Data Preservation

Specific training on the approach to data preservation is currently being consolidated. It is based on the outcomes of the SCDIP-ES project in terms of definition of Earth Science preservation phases within scientific research and the so-called Earth Science Preserved Data-Set Content (PDSC²).

3.1.3.3 Phase 2 training material

Table 2 lists those documents identified during Phase 2 as key resources for the future training of external Earth Science communities.

Topic	Format	Status (M12)	Description
Generic Earth Science workflows	Microsoft® PowerPoint presentation	Will be completed at M14	The document describes generic Earth Science workflows and how the VRE can address them.
EVER-EST Gateway User Manual	PDF	Will be completed by M18	The document describes the Gateway functionalities.
EVER-EST on-line training button	Software	Integrated into the VRE Gateway (M18)	Gateway VRE users On line help.
Sandbox	Microsoft® Word document and Exercises	Available	Training material regarding the Sandbox functionalities and usage.
Research Object and Publication	Microsoft® Word document	To be completed at M18	The document shows how the EVER-EST VRE can help researchers in their scientific publication routines.

Table 2 Training material from phase 2

3.1.4 Internal training phase 3

Internal training activities intended as working sessions/meetings between the trainers (the technical team and/or research object experts) and trainees (the four VRC's) will be formally concluded after the end of Phase 2. All related training material, ready for external training, will then be made available on the EVER-EST gateway and the VRC portals.

² Full information and guidelines concerning this topic can be found at <https://earth.esa.int/web/gscb/ltdp>



The third phase of the internal training will be based on the feedback coming from the VRC as a result of using the platform, which will be made available in its first version at M18 and in its final deployment at M22. During the last year of the project VRC comments and feedback will be continuously collected as part of Task 6.4 *VRE End to End Evaluation* and Task 6.5 *VRE Operations and evolutive maintenance*. If necessary, this information will be also used within the training perspective, to consolidate and adapt the training materials and modules, which are available to external communities on the EVER-EST gateway. Ad hoc internal training meetings regarding specific aspects of the platform might take place during Phase3 if required by the Virtual Research Communities.

Between M18 and M24 internal training workshops will be carried out to prepare the four VRC members to themselves become EVER-EST trainers within their respective scientific domains, in order to maximise external training opportunities and dissemination events.



4 External Training Activities and Schedule

The external training constitutes a crucial element for the EVER-EST dissemination strategy and also for the overall infrastructure sustainability. As outlined in section 3.1.1, external training activities will only start after the delivery of the EVER-EST VRE in its first release (M18) and will be carried out extensively after the successful full deployment of the infrastructure in M24.

During this phase, the trainers (both EVER-EST technical teams and VRCs) will rely on resources and training material that have passed through several phases of internal training. All external training material and events will be developed and carried out with the implicit goal of enhancing the external Earth Science communities' interest in the EVER-EST VRE.

Particular attention will be paid to the visual appeal and accessibility of the training material. This will apply to all material collected to train the EVER-EST Virtual Research Communities that are listed in sections (see 3.1.2.2 and 3.1.3.3) and will be made available on line both on the project website and on the EVER-EST gateway. In addition, as explained in section 3.1.3.2, browsing the VRE portal in training mode will allow external users to easily identify the characteristics of the graphical user interface and modes of use.

EVER-EST partners will use all training modules, documentation and presentations during their face-to-face meetings to reach the widest audience. Training material, topics and themes will be sufficiently flexible to accommodate different target communities within the Earth Science domain. A list of potential target audiences for the training is identified in Table 3 External community training.

Training will also be available to online guest users directly from the EVER-EST gateway, which will provide hands-on working exemplars on the basis of the commonalities identified in 3.1.2.1. For each generic Earth Science workflow, a wizard will guide guest users through the main EVER-EST functionalities. In addition, a Jupyter Notebook component will allow the implementation of specific examples directly from the gateway (e.g. How-To process a given dataset).

4.1 External training activities

Table 3 provides an initial list of stakeholders identified by the EVER-EST partners that will participate in the external training activities. The target audience list and the content of the external training will be further refined during the course of the project, while progressing with the assessment and definition of benefits and value that the EVER-EST VRE can deliver to potential new communities in the EVER-EST sustainability model that shall be developed in the forthcoming months.

Name	Description	Engagement Message	Training Event
LTDP WG	International initiative bringing together space agencies from Europe and Canada for EO data preservation standardization.	EVER-EST implements LTDP WG approach for data and knowledge preservation	Ad hoc meeting organized by ESA
GSNL	The scientific communities belonging to five more Supersites, external to the project. Includes several tens of scientists doing research on volcanoes or earthquakes in USA, Ecuador, New Zealand,	EVER-EST empowers the community with a series of tools and services, which can improve collaboration and make the scientist's work more effective. EVER-EST is the supporting the GSNL goal of	Web-based and face-to-face training sessions organized by INGV.



	Turkey and Greece.	promoting a concrete Open Science approach to geo-hazard science over the Supersites and to ensure that scientific results are timely used for informed decision-making in Disaster Risk Reduction activities	
SatCen stakeholder's meetings	Periodical meetings at SatCen where Member States and other concerned entities involved in the Space and Security Domain are updated on SatCen activities.	EVER-EST is implementing a Land Monitoring use case, which is of interest for the Space and Security community.	Ad hoc dedicated sessions.
Environmental Science to Services Partnership (ESSP)	Partnership of 6 UK public sector bodies with collective purpose to develop ways to translate and apply world leading environmental science to support delivery and improve services.	EVER-EST provides common environment within which to collaborate and share scientific data, methods and outputs.	Meeting between NHP and ESSP
	The Italian Ministry of the Environment and for the Protection of Land and Sea (MATTM), as the Competent Authority for the Marine Strategy, with coordination functions for national activities; The Italian National Institute for Environmental Protection and Research (ISPRA) supports the Ministry of the Environment for scientific, technical and coordination activities.	EVER-EST implements tools and services for the assessment of GES in the Marine Strategy framework directive (MSFD) for the Sea Monitoring VRC. Training on how to use the platform and research objects	Ad Hoc meeting to be Organized by CNR-ISMAR
LifeWatch (E-Science European Infrastructure for Biodiversity and ecosystem Research)	The European e-Science infrastructure (including virtual lab) for biodiversity and ecosystem research meant to provide advanced capabilities for research on the complex biodiversity system.	EVER-EST is implementing a VRE dealing with biodiversity data and processing tools. Training on how to use the platform and research objects	Joined training event, next spring to be organized
MedPan (Network of	The MEDPad is a network for knowledge, information,	EVER-EST is implanting tools and services for ensuring that	Side Event during Next international



Marine protected areas in the Mediterranean Sea)	anticipation and synthesis to promote, through a partnership approach, the sustainability and operation of a network of Marine Protected Areas in the Mediterranean to help reduce the current rate of marine biodiversity loss.	Biodiversity is maintained in the framework of the Marine Strategy framework directive (MSFD), in the Sea Monitoring VRC. Training on how to use the platform and research objects	MedPan forum
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Table 3 External community training

4.2 External training schedule

Next those training events that have already been planned; the list will be expanded as further opportunities for delivering the EVR-EST VRE training are identified.

Name	Venue and Date	Target Audience	Training Event Description
RDA	Barcelona, April 2017	VRE and Data Preservation experts. High level (non-technical)	In the framework of the RDA VRE group coordinated by EVER-EST members, the platform will be demonstrated
EGU	Vienna, 8-13 April 2018	Solid Earth geophysical scientific community	Half a day to one-day face-to-face training session.
AGU	New Orleans, USA, 11-15 December 2017	Solid Earth geophysical scientific community	Half a day to one-day face-to-face training session.

Table 4 Current training schedule



5 Smart Objectives and KPI's Compliance

The content of this deliverable is in line with all EVER-EST project objectives as it has a major impact on the adoption of the EVER-EST platform.

5.1 D2.4 Smart Objectives

Training activities can be seen as a key enabler for reaching the following Smart Objectives.

SM_OB#1.3	Deploy services to capture and store research activities workflows, processes and results
Measured by	VRCs capability to manage the full research activity workflow lifecycle.
Achievable	Using the innovative Research Objects paradigm adapted to Earth Science
Relevant	Research workflow lifecycle mgt. is key to create new knowledge re-using pre-existing research results and knowledge.
Timely	Research Object and RO-HUB finalized in M12; integrated in M22.

Table 5 Smart Objective 1.3

SM_OB#1.5	Ensure the long-term preservation of resources developed by existing VRC communities.
Measured by	Preservation registries for data-related knowledge deployed and populated.
Achievable	Leverage on SCIDIP-ES project results to adapt preservation services in the VRE
Relevant	Data related knowledge is key for data usability by heterogeneous user communities and for interoperability among them.
Timely	Preservation services integrated in their final version in M22.

Table 6 Smart Objective 1.5

SM_OB#1.6	Innovative and user friendly environment for real-time collaborative working.
Measured by	Web portal deployment and VRCs usage statistics generated through the web portal.
Achievable	Based on Multi-Sensor Evolution Analysis (MEA) technology
Relevant	Web portal for accessing VRE functionalities will facilitate communities' engagement.
Timely	EVER-EST web portal for cooperative working available and integrated in M22.

Table 7 Smart Objective 1.6

SM_OB#2.1 SM_OB#2.2 SM_OB#2.3 SM_OB#2.4	Validate and demonstrate the VRE functionalities within the Sea Monitoring VRC, Validate and demonstrate the VRE functionalities within the Natural Hazard VRC, Validate and demonstrate the VRE functionalities within the Land Monitoring VRC, Validate and demonstrate the VRE functionalities within the Supersites VRC
Measured by	Number of users (see specific SM_OB for details on each VRC)
Achievable	Via dissemination and training events
Relevant	These are all use case which bring examples of intra and inter-disciplinary work in



	terms of disciplines involved, data and software used (biology, chemistry, physics, earth observation).
Timely	Each VRC will receive proper training on the VRE functionalities during the first phase of the project. The VRC will be able to use the VRE services starting from M18 and eventually require for changes and adaptation.

Table 8 Smart Objectives 2.1 – 2.4

SM_OB#3.2	Development of means and technological support for research object preservation, including decay diagnosis and prevention both at the method and implementation levels.
Measured by	Implementation of core research object management services, including storage, retrieval, lifecycle management, quality assessment and preservation. Ratio of stable research objects vs. decayed ones over time.
Achievable	Availability of technological support for the management of research objects. This technology will be leveraged and customized to the case of Research Objects in ES.
Relevant	Providing the appropriate interfaces for managing, sharing and preserving experiments as research objects is crucial for the adoption of this concept by the community, and to foster the reuse of experimental results. Providing measures for assessing the quality of research objects will further support the publication of high-quality scientific results.
Timely	Technological support to be available at the end of the first year, ready for integration in the VRE. A second iteration will be released in M24.

Table 9 Smart Objective 3.2

5.2 D2.4 Key Performance Indicators

This work contributes directly to the fulfilment of the following Key Performance Indicators related to the SMART objectives mentioned above. Training activities are the basis for the correct use of the VRE platform by the VRCs. In this light they are a direct enabler for KPI's ranging from N°1 to N°4 about establishing a VRE for Earth Science as training will allow a growing number of datasets, research objects, user requirements, algorithms and workflows to be implemented on the platform. Sharing of experiences and feedbacks from the User Community (KPI N° 5) will be synchronously linked to training. On one side, training will facilitate the shared approach being taken by the community, on the other feedback are crucial to customize and adapt the training material and strategy. Training is also one of the pillars for the successful implementation of KPI N°6 Validate the VRE with four main Virtual Research Communities. As previously described (see 3.1.1), training the VRCs has emerged as an immediate necessity from the beginning of the project to enhance their comprehension of the platform and stimulate their interest in adopting its solutions. A consistent part of the training activities described in the document has been carried out in conjunction and coordination with WP3, which is responsible for both collecting the user requirements whilst also dealing with data providers services provision needs and constraints. Data providers, with particular emphasis on ESA, will leverage the results of the user communities' feedback to assess and improve their data services provisions and models.

KPI number	Objective / Result	Indicator
1-4	Establish a VRE for Earth Science	Number of user requirements successfully addressed Number of Earth Science Datasets managed by the system Number of algorithms managed by the system



		Number of workflows managed by the system
5	Establish a VRE for Earth Science	Facilitated sharing of experiences: number of positive feedbacks from the user community
6	Validate the VRE with four main Virtual Research Communities	Number of additional members of the VRC involved in the project
11	Impact on data providers	Number feedbacks regarding end-user experience

Table 10 KPI's addressed by D2.4