Research object as mechanism for ensuring research experiment reproducibility within virtual research environment

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Abstrak

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A Research Object RO is defined as a semantically rich aggregation of resources that bundles together essential information relating to experiments and investigations. This information is not limited merely to the data used and the methods employed to produce and analyze such data, but it may also include the people involved in the investigation as well as other
important metadata that describe the characteristics, inter dependencies, context and dynamics of the aggregated resources. As such, a research object can encapsulate scientific knowledge and provide a mechanism for sharing and discovering assets of reusable research and scientific knowledge within and across relevant communities, and in a way that supports reliability and reproducibility of investigation results. While there are no pre defined constraints related to the type of resources a research object can contain, the following usually apply in the context of
scientific research data used and results produced, methods employed to produce and analyze data, scientific workflows implementing such methods, provenance and settings; people involved in the investigation, annotations about these resources, which are essential to the understanding and interpretation of the scientific outcomes captured by a research object. The example research object contains a workflow, input data and results, along with a paper that presents the results and links to the investigators responsible. Annotations on each of the resources and on the research object itself provide additional information and characterize, e.g. the provenance of the results. Therefore, exploitation of the RO model should be considered as a way to provide additional reliability and reproducibility of the research. The concept of the RO was introduced to the environment created in the EVER EST project in the form of Virtual Research Environment VRE. a group of Earth Scientists, who are observing, analyzing and modeling processes that take place on land and see, was examined
against their needs and expectations about the possible improvements in their scientific work. The results show that scientist expectations are focused on knowledge sharing and reuse, and new forms of scholarly communications beyond pdf articles as supporting tools of knowledge cross fertilization between their members. The Research Object concept seems a natural answer
for these needs. However, the model, in order to be sufficient and usable, must become a part of the working environment and needs to be integrated with the actual tools. Therefore, great efforts have been undertaken to create a generic, technical solution VRE, which implements the expected functionalities. In this article we present a concept of the VRE as a tool that takes advantage of the Research Object model in order to integrate and simplify the information exchange, as well as persist, share and discover assets of the reusable research. Moreover, we are presenting example
scenarios of the VRE usage in the four different Earth Science domains.