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Research objects and ROHub - A journey from theory to practical infrastructure

Jose Manuel Gomez Perez (1) and Raul Palma (2)

(1) Expert System, Madrid, Spain (jmgomez@expertsystem.com), (2) Poznan Supercomputer and Networking Center, Poznan, Poland (rpalma@man.poznan.pl)

A research object is a semantically enriched information unit encapsulating all the materials and methods relevant to a scientific investigation, the associated annotations and the context where such resources were produced and came into play. Research objects can be seen as artefacts of both a technical and social nature, with the goal to enhance the sharing, preservation and communication of data-intensive science, facilitating validation, citation and reuse by the community. On the one hand, they deal with technical challenges such as preservation, reproducibility, interoperability and platform portability and are rich with metadata that make them uniquely identifiable, processable, and exchangeable by machines. On the other hand, research objects attempt to address some of the social aspects crucially involved in the scientific enterprise, facilitating that due credit is given to the authors of scientific contributions in their various forms, enabling discussions around the investigation, and ultimately supporting collaboration.

Models, tools and integrated infrastructure are consequently critical to realize this vision. As the reference platform for research object management throughout the entire lifecycle, ROHub (www.rohub.org) addresses such needs in practical ways. Its purpose is to support the management and exploitation of scientific knowledge, resources and materials both by communities of scientists and by related stakeholders that require specialized knowledge at the forefront of scientific research. Built entirely around the research object model and inspired by sustainable software management principles, it is the only system that enables researchers to preserve their work and make it available to others in the form of research objects, as well as to discover and reuse other research objects in its digital library. ROHub annotates research objects automatically based on their content and, as a DataCite node, it can release them with a DOI. It provides a web interface and a set of open APIs for programmatic access to its functionalities, enabling the development of custom applications and integration with existing VREs. ROHub also encourages the creation of scientific social networks and enables discussion around research topics and specific contributions through comments and rating mechanisms.

ROHub is the product of uninterrupted work funded by the European Commission during the last years, initially under the Wf4Ever grant and currently in the context of the EVER-EST project, which has built a research object-centric virtual research environment for Earth Sciences using ROHub at its core. ROHub currently supports hundreds of transactions per hour and hosts several thousands of research objects and hundreds of scientists, both in Europe and the USA, across several experimental and observational disciplines. Amongst them, Earth Sciences are particularly well represented in ROHub, with user communities from fields such as sea monitoring, natural hazards, and geohazard supersites, and also new communities from fields like ecology and biodiversity observation, which are adopting ROHub as their platform for sharing, preserving and communicating scientific data, software and methods.