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Challenges in building Virtual Research Environments

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Virtual Research Environments (VRE) are trending. As data and processing become bigger, more distributed and more collaborative, more and more research communities call for a VRE to execute data-drived science on the cloud.

The advantages are obvious: Processing is no longer bound by the user's laptop's computing power and memory. Large datasets do not have to be downloaded to local disk before they can be processed. This is an advantage especially for researchers from institutions or locations where access to good hardware, large network bandwidth or performant computing facilities are difficult to obtain.

To be attractive and useful to users, VREs need to provide efficient access to interesting datasets. In conjunction with Open Data, accessed efficiently through a VRE, they can be an catalyst for Open Science. If designed with this intention, processing results can easily be shared and openly published in their turn. Similarly, the processing workflows can often be made available to and reproducible by others. This encourages the FAIRness of not only the data, but the processing services.

Developing such a VRE holds some challenges, mainly because of the multitude of actors and tools. Within this lighting talk, examples from the geosciences will be used to highlight specific challenges and solutions.

On a desktop, every researcher puts together their own collection of resources, tools and applications. A VRE generally tries to replace that desktop environment by an online environment. As such it is usually aimed at a larger group of different users and thus has to cater to varied needs.

The tools that researchers use for their work exist already and need to be incorporated into the VRE. They may be quite diverse, of diverse programming languages, frameworks, etc. As re-implementing the tools is of course not an option, a way must be found that allows to efficiently integrate diverse existing applications into a common VRE and to keep the VRE extensible for future services to be included.

Another challenge is the development mode. Often, VREs are not commercial software products developed by commercial software companies, but they are developed in research communities or in consortia between research institutions and research infrastructure providers. This leads to distributed, heterogeneous development teams, with additional efforts for manage and have effective communications.

Closely related to this is the funding scheme. Not being commercial products, the development and the operation of a VRE need to be funded through other mechanisms. Typical ones are those of H2020, national or even cross-institutional fundings. Such programs usually fund development efforts, but often operations and hardware acquisition are not sufficiently funded.

Type of abstract

Lightning Talk

Summary

Developing a VRE holds some challenges, mainly because of the multitude of tools and actors involved. These challenges are technical ones (such as integrating a variety of processing tools), management ones (heterogeneous development teams) or political ones (common funding schemes). Within this lighting talk, examples from the geosciences will be used to highlight specific challenges and solutions.

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