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Virtual Research Environments as-a-Service

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Virtual Research Environments (VREs) are innovative, web-based, community-oriented, comprehensive, flexible, and secure working environments conceived to serve the needs of science [3]. They are expected to act like “facilitators” and “enablers” of research activities conducted according to cutting-edge science patterns. They play the role of “facilitators” by providing seamless access to the evolving wealth of resources (datasets, services, computing) - usually spread across many providers including e-Infrastructures - needed to conduct a research activity. They play the role of “enablers” by providing scientists with state of the art facilities for supporting scientific practices, e.g. sharing and publishing comprehensive research activities giving access to the real research products while scientists are working with them [1], automatically generating provenance, capturing accounting, managing quota, and supporting new forms of transparent peer-reviews and collaborations by social networking. The development of such environments should be effective and sustainable to actually embrace and support research community efforts.

Ad-hoc and from-scratch approaches are not suitable for the development and provision of such working environments because the overall costs (implementation, operation and maintenance) are neither affordable nor sustainable by every scientific community.

In this presentation it is discussed the experience made by a series of initiatives and projects (e.g. D4Science and iMarine) enabling the creation and provisioning of Virtual Research Environments by the as-a-Service paradigm [2]. In particular, it is presented the gCube technology by focusing on the mechanisms enabling the automatic creation and operation of VREs by relying on an extended resource space (comprising datasets, functionalities, services) built by aggregating constituents from existing Infrastructures and Information Systems. This mechanism envisages a definition phase and a deployment phase.

The definition phase is based on a wizard enabling a user to specify the characteristics of the VRE he/she is willing to enact in terms of datasets to be offered and services to be made available by selecting them from a catalogue. In addition to that, the VRE designer can specify requests for services customisations (e.g. enable/disable features) as well as establish the policies that govern the VRE (e.g. whether it is public or by invitation). The overall goal of the definition phase is to be as easy and as short as possible by abstracting on technical details.

The deployment phase is completely automatic and results in the delivery of a web-based environment ready to be used. During this phase the VRE specification, after the approval by a Manager, is analysed and transformed in a deployment plan consisting of creating the software system and the secure application context needed to operate the VRE. This software system is created by instructing service instances to support the new VRE, by deploying new service instances dedicated to it, by allocating computing power, by deploying services giving access to the datasets. All of this is done according to resources usage policies and by maximising the overall exploitation of the resources forming the resource space.

Links, references, publications, etc.

[1] M. Assante, L. Candela, D. Castelli, P. Manghi, and P. Pagano. Science 2.0 repositories: Time for a change in scholarly communication. D-Lib Magazine, 21(1/2), 2015.

[2] L. Candela, D. Castelli, A. Manzi, and P. Pagano. Realising Virtual Research Environments by Hybrid Data Infrastructures: the D4Science Experience. In International Symposium on Grids and Clouds (ISGC) 2014 23-28 March 2014, Academia Sinica, Taipei, Taiwan, PoS(ISGC2014)022, Proceedings of Science, 2014.

[3] L. Candela, D. Castelli, and P. Pagano. Virtual research environments: an overview and a research agenda. Data Science Journal, 12:GRDI75-GRDI81, 2013.

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