

## VREs (Virtual research Environments) and ENVRIplus



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**The concept of the virtual research environment (VRE) has been discussed for more than 10 years with a number of definitions having been put forward.**

Candela et al (2013) asserted that “Virtual Research Environments are innovative, web-based, community-oriented, comprehensive, flexible, and secure working environments conceived to serve the needs of modern science.” While JISC (formerly the Joint Information Systems Committee) in the UK had previously stated that “A VRE helps researchers from all disciplines to work collaboratively by managing the increasingly complex range of tasks involved in carrying out research”(JISC 2011). Both of these definitions can be considered aspirational, giving little practical information on constructing a VRE. How-

ever, JISC in their explanation of a VRE continues by saying: “The term VRE is now best thought of as shorthand for the tools and technologies needed by researchers to do their research, interact with other researchers (who may come from different disciplines, institutions or even countries) and to make use of resources and technical infrastructures available both locally and nationally.”

From these definitions we can extract the key features of the VRE: it supports researchers in their work by providing access to resources and technical infrastructures and assisting interaction among researchers. Increasingly the resources are defined as users, data, software, computing and equipment/detectors. Interaction is increasingly supplementing conventional scholarly com-

munication through journals and conference proceedings with liquid publications, blogs, wikis and e-conferencing. This description approaches the aims and objectives of ENVRIplus, which may be succinctly defined as improving researcher access to datasets and services and researcher intercommunication within the environmental sciences. ENVRIplus concentrates on access to - and improvement of - measurement devices, access to datasets, provision of analytical IT services, physical access to Research Infrastructures (RI), dealing with ethics, security, transnational access, authorization, as well as education/training. It is a Research Infrastructure cluster project that aims to coordinate and amalgamate pre-existing RIs (e-RIs and physical RIs) although the project also has ambitions to develop



methodologies that are needed to be able to implement VREs. The same is true of the European Plate Observing System (EPOS) and several other large ESFRI (European Strategy Forum for Research Infrastructures) projects [Figure 1]. The e-RIs have interfaces to European e-Infrastructures which provide services to the e-RI (such as GEANT, OpenAIRE, European Open Science Cloud) and – it is proposed – they should have an interface above to a VRE that provides end-user homogeneous access over the heterogeneous e-RIs – both within ENVRIplus and beyond, ideally covering at least all those in the ESFRI roadmap.

A direct relationship between ENVRIplus and the recently started EC-funded Project VRE4EIC ([www.vre4eic.eu](http://www.vre4eic.eu)) will create the framework necessary for exploring the potential of the VRE to provide researcher services across multiple e-RIs. VRE4EIC aims to (a) create an ‘ideal VRE’ with a reference architecture and (b) create components to build an

architecturally compliant VRE on top of any e-RI (e-Research Infrastructure). The critical element of this solution is the interface between a VRE and the underlying e-RIs [Figure 2]. This figure illustrates the characteristics of an e-RI that need to be matched to those of a VRE to allow the VRE – as a tool of the end-user – to access multiple heterogeneous e-RIs in a homogeneous manner. This approach raises many challenging Information and Communication technology (ICT) challenges and in particular the need for a move towards standardisation VRE4EIC includes representation from W3C (World Wide Web Consortium), from euroCRIS (which supports CERIF (Common European Research Information Format: the EU Recommendation to Member States for Research Information) and RDA (Research Data Alliance).

In an effort to encourage alignment across the various VRE initiatives an interest group (VRE-IG) is being established under the auspices of the Re-

search Data Alliance (RDA). An initial BoF (Birds of a Feather) was held at the RDA Plenary conference 7 in Tokyo, March 2016. This brought together various people working on VREs, virtual laboratories, science gateways etc. and representatives of multiple e-RIs in many subject domains in an attempt to converge on a roadmap towards standards for VRE interfaces to the underlying e-RIs. <https://rd-alliance.org/groups/vre-ig.html>

## References

- (Candela et al 2013) L. Candela, D. Castelli, P. Pagano (2013) Virtual Research Environments: An Overview and a Research Agenda. Data Science Journal, Vol. 12, p. GRDI75-GRDI81 DOI: <http://dx.doi.org/10.2481/dsj.GRDI-013>
- (JISC 2011) <http://webarhive.nationalarchives.gov.uk/20140702233839/http://www.jisc.ac.uk/whatwedo/programmes/vre.aspx>

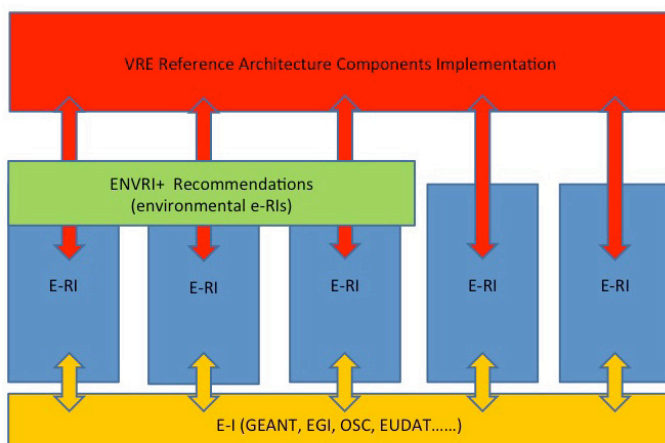


Figure 1: VRE, RI and e-I Relationships

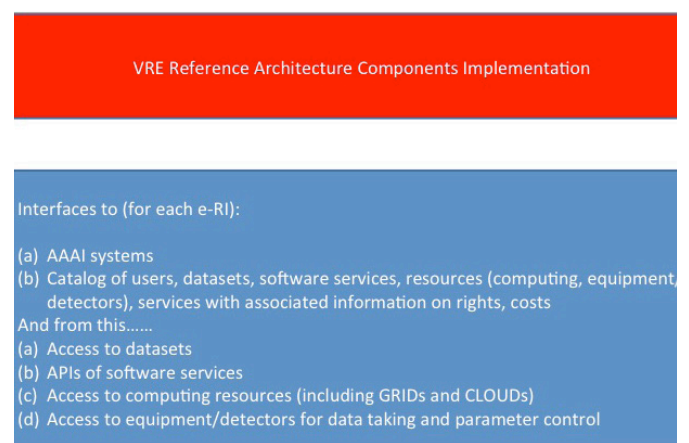


Figure 2: VRE INTERFACE to e-RIs