Name of Proposed Interest Group: **Virtual Research Environments IG**

***Introduction*** *(A brief articulation of what issues the IG will address, how this IG is aligned with the RDA mission, and how this IG would be a value-added contribution to the RDA community):*

The vision of the Research Data Alliance (RDA) is that “*researchers and innovators openly sharing data across technologies, disciplines, and countries to address the grand challenges of society*.” The Mission of RDA is that it “*builds the social and technical bridges that enable open sharing of data.”*

Increasingly researchers who are not co-located are seeking to work dynamically together at various scales from the local to global using the internet to share data, models, workflows, best practices, publications, management and administration of their research etc. The Virtual Research Environments Interest Group (VRE-IG) seeks to build the required technical bridges, skills and social communities that enable global sharing and processing of data across technologies, disciplines and countries through the creation of shared online virtual environments. As these individual VREs grow, inevitably they need to also connect with other major research infrastructures.

The goal of the VRE-IG is to identify the technical issues to and, where known, share solutions that enable online access to data and other research assets required to address issues that can range from local challenges (which are also potentially of direct relevance to researchers in other geographical areas or other research domains), to the research grand challenges currently being faced by society on global issues, e.g., societal impacts of climate change; sustainable cities; and environmentally sensitive utilisation of the scarce resources of our planet.

***User scenario(s) or use case(s) the IG wishes to address*** *(what triggered the desire for this IG in the first place):*

1. Domain specific VREs are being built in individual nationally and regionally funded research projects (e.g., geophysics, environment, hazards mitigation). Although the data sets being accessed are of national extent, can these tools be utilised for development of similar VREs, such as for geophysical inversions, species tracking, flood prediction and mitigation)?
2. A new group wishes to develop a shared virtual research environment - what are the best practices defined for how to technically build and sustain a VRE?
3. Building a VRE requires specialised skills - what are those skills and how can they best be shared?
4. As a VRE grows it will inevitably link with major infrastructure initiatives such as European Open Science Cloud (EOSC), the US Extreme Science and Engineering Discovery Environment (XSEDE) and the Australian National Research Data Cloud (NRDC) – but how to connect to these?
5. How can a community around online access to and processing of major data resources be built and maintained?
6. How to access and build gateways to major supercomputer or cloud resources to enable processing of data in data intensive scientific environments?

***Objectives*** *(A specific set of focus areas for discussion, including use cases that pointed to the need for the IG in the first place. Articulate how this group is different from other current activities inside or outside of RDA.):*

VREs are synonymous with Science Gateways (SGs) in the USA and Virtual Laboratories (VLs) in Australia, and are increasingly being used to support a more dynamic approach to collaborative working across the internet. The proposed VRE-IG will explore all aspects of existing and planned future VRE/SG/VLs with the aim of moving towards common policies and best practices, such as those now being promoted by the European EOSC, the US XSEDE and the Australian NRDC. There is currently no coordination of the development of the underlying architectures, as well as specifications for components and interfaces in any of these initiatives, nor is there any agreed best practice way to connect to the major research infrastructures, in particular data to compute resources. Likewise there is also no mechanism for sharing best practice, skills, tools and software that connect tools to data in online environments that could ultimately allow these individual VREs to interoperate on a global scale. The goal of the VRE IG is to encourage initiatives tasked with developing these technologies to create ‘building blocks’ of common data infrastructures and build specific ‘data bridges’ to enable online sharing and in situ processing of data. The US SGCI (begun in August 2016) is starting to work on these challenges for the US and will closely collaborate with this IG.

The VRE IG will aim to act as a longer-term organization responsible for tracking and contributing to the evolution of VRE/SG/VL technologies, particularly as they relate to data access. It will also seek to engage with those making use of these online technologies in an effort to identify the necessary technical aspects, social and community building practices, required skills, as well as governance issues and best practice required to support a more coordinated approach to the development of collaborative environments that enable data sharing and in situ online processing.

The proposed VRE-IG group is in effect, an ‘umbrella group’ that brings together:

1. Those initiatives that are actively developing VRE/SGs/VLs internationally;
2. Representatives of the common eInfrastructure (eIs) services e.g. EUDAT, EOSC, XSEDE, NRDC, etc.; and
3. Specific RDA groups (e.g., software citation, metadata IG, Versioning IG, etc.), which are developing outputs, that are themselves best practice inputs to research groups developing VREs.

The objectives of the VRE-IG are to

1. Review the state of the art and compare/contrast existing VREs, VLs and SGs;
2. Ensure associated relevant technologies are highlighted to IG participants so that they are aware of them and understand their potential to enhance their own VRE efforts, particularly those that enhance online access to data and enable in situ processing;
3. Compare architectures used for a VREs that facilitate connecting people to the required resources online (data, tools and compute) (it may be feasible to develop a reference architecture as a dedicated Working Group);
4. Propose specifications for standard components (software and interfaces) for a VRE/SG/VLs;
5. Propose best practices for VRE/SG/VLs development and implementation, in particular definition of best practice for building communities around and sustaining VREs;
6. Contributing to the SGCI’s scientific software collaborative to build a central information hub for researchers and developers seeking to connect data, tools and compute infrastructures online; and
7. Suggest policies to stakeholders VREs in close collaborations with existing foundation projects and initiatives e.g. VRE4EIC, SGCI, XSEDE, OSG, NRDC, etc..

***Participation*** *(Address which communities will be involved, what skills or knowledge should they have, and how will you engage these communities. Also address how this group proposes to coordinate its activity with relevant related groups.):*

The proposed VRE-IG is domain-agnostic and is relevant to the academic, government and industry sectors. It will bring together experts in data, tools and compute resources. The group already has 92 members, who truly reflect this diversity of interest.

The proposed VRE-IG will engage with the relevant IG/WGs including:

* Software Citation IG
* Metadata IG: definition of packages of metadata elements appropriate for the VRE/SG/VL
* Metadata catalogue WG which will potentially provide resources for documenting the metadata used in different VREs
* Preservation Tools, Techniques and Policies IG
* Research Data Provenance IG
* Reproducibility IG
* Federated Identity Management IG
* Data Fabric IG
* Domain groups for use cases, requirements and possible later validation
* Mapping the Landscape IG

In addition, the register of VRE’s and components of VREs being developed by the SCGI, will be entered into the RD-A Mapping the Landscape IG Inventory ( <https://sciencegateways.org/resources/catalog> and <https://catalog.sciencegateways.org/#/home>)

***Outcomes*** *(Discuss what the IG intends to accomplish. Include examples of WG topics or supporting IG-level outputs that might lead to WGs later on.):*

VRE/SG/VLs and associated technologies have matured in the last 10 years as evidenced by the evolution from more one-off, bespoke, single workflow systems developed by a specific set of researchers, to loosely coupled platforms shared by many groups of researchers. If the objectives outlined above for the VRE IG can be achieved it will lead to interoperating VRE/SG/VLs across multiple domains and where feasible, supported by integration of underlying national e-RIs. The alternative is divergent and heterogeneous systems that will have high maintenance costs and are incapable (or only capable with great effort) of interoperating: these more bespoke, more specialised systems have well known issues of long-term sustainability.

***Mechanism*** *(Describe how often your group will meet and how will you maintain momentum between Plenaries.):*

The Group will meet twice a year at each RD-A plenary. Specific VRE sessions will also be held at major domain conferences such as AGU, EGU.

Between RDA plenaries the momentum will be sustained via the webpage (<https://rd-alliance.org/groups/vre-ig.html> ) and via teleconferences for specific discussion topics.

***Timeline*** *(Describe draft milestones and goals for the first 12 months):*

The VRE-IG has already met (and has been well attended) at previous plenaries as follows:

1. **7th RD-A Plenary BoF Tokyo: Kick-Off Meeting to establish IG
*Link:*** <https://rd-alliance.org/bof-kick-meeting-establish-ig-vre-virtual-research-environment.html>

***Focus***: BoF to determine we should proceed to an RD-A Interest Group

1. **8th RD-A Plenary IG Denver: VREs/Virtual Laboratories/Science Gateways - opportunities for developing a more coordinated approach to support interoperability across different systems.
*Link:*** <https://rd-alliance.org/ig-virtual-research-environment-rda-8th-plenary-meeting>

***Focus*:** Discuss Case Statement and present on a variety of VREs

1. **9th RD-A Plenary IG Barcelona: Virtual Research Environments - coordinating sustainable online research environments across multiple infrastructures
*Link:*** <https://www.rd-alliance.org/ig-virtual-research-environment-vre-ig-rda-9th-plenary-meeting>

***Focus*:** Intercontinental comparison and contrast of VREs/SGs/VLs, particularly with respect to interoperability, community building and sustainability of components of a VRE.

1. **10th RD-A Plenary IG Montreal: Understanding VREs/SGs/VLs: planning for sustainable collaborative development
*Link:*** <https://www.rd-alliance.org/ig-virtual-research-environment-vre-ig-rda-10th-plenary-meeting>

***Focus:*** Intercontinental comparison and contrast of VREs/SGs/VLs, particularly with respect to understanding the differences/commonalities of VREs/SGs/VLs and on ensuring sustainability of community VRE platforms once they are built.

The format of meetings has been to choose 2 or 3 relevant topics and then present case studies on the topic from European VREs, Australian VLs and North American SGs..

For the Berlin Plenary the proposed title is ***Virtual Research Environments – how do I find them and what skills do I need to build and use them?*** The focus will be on intercontinental comparison and contrast on (1) preparing catalogs/inventories of VREs and (2) on approaches to developing skills needed to build and to use VREs.

At the end of each Plenary session the attendees are asked as to what are their burning issues for the next Plenary.

***Potential Group Members*** *(Include proposed chairs/initial leadership and all members who have expressed interest):*

There are currently 92 members of the VRE IG identified on RD-A portal (<https://www.rd-alliance.org/groups/vre-ig.html>). The proposed chairs are listed in bold below.

Current membership includes those directly engaged with the development of VRE/SG/VL technologies but also representatives of those responsible for governance structure of existing individual VRE/SG/VLs and their respective user communities.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | FIRST NAME | LAST NAME |  | TITLE |
| **1** |  **Lesley**  |  **Wyborn** |  |  |
| **2** |  **Keith** |  **Jeffery** |  |  **Prof** |
| **3** |  **Sandra**  |  **Gesing** |  |  |
| **4** |  **Helen**  |  **Glaves** |  |  |
| 5 | Afonso | Duarte |  |  |
| 6 | Alessandro | Saretta |  |  |
| 7 | Alex | Hardisty |  |  |
| 8 | Anton | Van de Putte |  |  |
| 9 | Antonio | Rosato |  |  |
| 10 | Aubert | Landry |  |  |
| 11 | Ben  | Evans |  |  |
| 12 | Bert | Jagers |  |  |
| 13 | Brian | Matthews |  |  |
| 14 | Bridget | Almas |  |  |
| 15 | Christian  | Page |  |  |
| 16 | Christopher | Brown |  |  |
| 17 | Clare | Austin |  |  |
| 18 | Claire | Trenham |  |  |
| 19 | Cosima | Wagner |  |  |
| 20 | Daniel | Mietchen |  |  |
| 21 | Daniele | Bailo |  |  |
| 22 | Daryl | Grenz |  |  |
| 23 | David  | Morse |  |  |
| 24 | Denise | Hills |  |  |
| 25 | Dimitrios | Koureas |  |  |
| 26 | Ebrahim | Jahanshiri |  |  |
| 27 | Eva  | Mendez |  |  |
| 28 | Franco | Zoppi |  |  |
| 29 | Hamish | Holewa |  |  |
| 30 | Hiela | Pienaar |  |  |
| 31 | Ingemar | Häggström |  |  |
| 32 | Johann | Van Wyk |  |  |
| 33 | Jonathan | Crabtree |  |  |
| 34 | Jose | Borbinha |  |  |
| 35 | Julian |  Barde |  |  |
| 36 | Katherine | Lawrence |  |  |
| 37 | Kheeran | Dharmawardena |  |  |
| 38 | Lene Krøl  | Andersen |  |  |
| 39 | Leonardo | Candela |  |  |
| 40 | Leslie | Hsu |  |  |
| 41 | Luca | Trani |  |  |
| 42 | Madeline | Huber |  |  |
| 43 | Maggie | Hellström |  |  |
| 44 | Malcolm | Wolski |  |  |
| 45 | Mario J | Silver |  |  |
| 46 | Mark | Leggott |  |  |
| 47 | Markus | Stocker |  |  |
| 48 | Marta | Busse-Wiche |  |  |
| 49 | Martie | van Deventer |  |  |
| 50 | Martin | Hammitzsch |  |  |
| 51 | Massimiliano  | Assante |  |  |
| 52 | Mathew | Fry |  |  |
| 53 | Merret | Buurman |  |  |
| 54 | Michael | Jones |  |  |
| 55 | Michael | Witt |  |  |
| 56 | Michael | Crusoe |  |  |
| 57 | Michael | Kahle |  |  |
| 58 | Michael | Maragakis |  |  |
| 59 | Michelle | Barker |  |  |
| 60 | Mingfang | Wu |  |  |
| 61 | Monique  | Crichlow |  |  |
| 62 | Nancy | Wilkins-Diehr |  |  |
| 63 | Natalie | Myers |  |  |
| 64 | Nayiri | Mullinix |  |  |
| 65 | Oded | Kariti |  |  |
| 66 | Paolo |  Tagliolato |  |  |
| 67 | Pawel | Ciecieląg |  |  |
| 68 | Pedro | Goncalves |  |  |
| 69 | Peter | Fox |  |  |
| 70 | Plato | Smith |  |  |
| 71 | Pyrou | Chung |  |  |
| 72 | Raphael | Levy |  |  |
| 73 | Raul | Palma |  |  |
| 74 | Rebecca | Koskela |  |  |
| 75 | Richard | Grunzke |  |  |
| 76 | Rob | Hooft |  |  |
| 77 | Roger  | Proctor |  |  |
| 78 | Roman | Gerlach |  |  |
| 79 | Rossana | Paciello |  |  |
| 80 | Sarah | Jones |  |  |
| 81 | Siddeswara | Guru |  |  |
| 82 | Silvana | Asteggiante |  |  |
| 83 | Simone | Mantovani |  |  |
| 84 | Stephanie | Cheviron |  |  |
| 85 | Timea | Biro |  |  |
| 86 | Trudi | Wright |  |  |
| 87 | Vincent | Smith |  |  |
| 88 | Weicheng | Huang |  |  |
| 89 | Yannis  | Marketakis |  |  |
| 90 | Yong |  Liu |  |  |
| 91 | Yulia  | Karimova |  |  |
| 92 | Zhengzhe | Wu |  |  |