

EGU22-3261

<https://doi.org/10.5194/egusphere-egu22-3261>

EGU General Assembly 2022

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## Reimagining the AuScope Virtual Research Environment Through Human-Centred Design

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AuScope, founded in 2006, is the provider of research infrastructure to Australia's Earth and geospatial science community. Its unifying strategic goals include building the Downward Looking Telescope (DLT) (a metaphor for an integrated system of Earth and geospatial instruments, services, data and analytics to enable scientists to understand Earth's evolution through time) and exploring how Earth resources may support growing human demands. The AuScope Virtual Research Environment (AVRE) program is responsible for enabling the DLT through providing persistent access to required data and tools from a diverse range of Australian research organisations, government geological surveys and the international community.

In 2009 AuScope released a portal to provide online access to evolved data products to specific groups of users. Subsequently, this portal was combined with online tools to create the AVRE platform of specialised Virtual Laboratories that enabled the execution of explicit workflows. By 2021 it was recognised that AVRE should modernise and take advantage of new technologies that could empower researchers to access higher storage capacities and wider varieties of computational processing options. AVRE also needed to leverage notebooks, containerisation and mobile solutions and facilitate a greater emphasis on ML and AI techniques. Increased storage meant researchers could access less processed, rawer forms of data, which they could then prepare for their own specific requirements, whilst the growth in Open Source software meant easy access to tools that could meet or efficiently be adapted to their needs.

Recognising that AuScope researchers now required new mechanisms to help them find and reuse multiple resources from globally distributed sites and be able to integrate these with their own data types and tools, the AVRE informatics and technology experts began assessing the requirements for modernising the AVRE platform. The technologists reviewed other virtual research environments, research data portals, and e-commerce platforms for examples of well-designed interfaces and services that help users get the best use out of a platform.

We then undertook a series of interactive consultations across a broad range of AuScope researchers (geophysics, geochemistry, geospatial, geology, etc). We accepted there were multiple

requirements, from simple data processing on small volume data sets through to complex data modelling and assimilation at petascale, and openly acknowledged that there were numerous ways of processing: one size would not fit all.

In the consultations, we focussed on the context that AVRE was about enabling researchers to use a diversity of resources to realise the AuScope strategic goal of the DLT. We recognised that this would require an ability to meet the specialised requirements of a broad range of the current individual AuScope geoscience programs, but at the same time, there was a need to allow for future integration with global transdisciplinary challenges that explore how Earth resources may support growing human demands.

In this presentation, we will discuss the outcomes from our consultations with various AuScope Programs and will present initial plans for a co-designed, re-engineered AVRE platform to meet the expressed needs of a diverse range of DLT developers and users.