

# Statement of Interest in Future Project

Science and Technologies Facilities Council

## The Virtual Observatory Technology Centre (VOTC:UK)

The Virtual Observatory (VO) provides an evolving internationally standardised means for accessing and extracting science from vast and heterogeneous datasets. To minimise the overhead and cost of providing VO-compliance while maximising on the UK role in the international VO, here we propose to provide a core VO support team for UK astronomy facilities, missions and data centres. Working with these projects, this team will provide and maintain a common framework for VO data access with targeted developments for each facility.

Background. After a number of years of development and engineering, the global VO is now entering a phase of deployment and daily operations, with major projects (eg ESO surveys, GAIA, SKA, the LSST) committed to utilising VO technologies as they develop their data access strategies. The benefits of a common data and applications framework are seen across Europe, the USA, and Asia. In the UK, the AstroGrid project has been at the forefront of the global movement in defining data interoperability standards through the International Virtual Observatory Alliance (IVOA), providing the technical infrastructure for the Euro-VO and releasing an integrated data access and analysis environment for the UK astronomy community. The release of AstroGrid's user software suite in April 2008 came too late to significantly affect the STFC programmatic review, but has since then been heavily used (two thousand downloads, thousands of queries processed every day).

The VO is an intrinsically global enterprise. The data resources themselves are of course highly international. Standards are set by the IVOA at which AstroGrid has been strongly represented. Within Europe, a variety of partners co-operate via Euro-VO, established by an MOU signed by PPARC in 2005. This includes the idea of a distributed "VO Technology Centre (VOTC)" for which the UK has been the agreed leader. The Astronet roadmap recommends continued investment in the VO at roughly current levels, and round the world VO projects are growing. To remain truly world class, UK facilities will have to fit in to the VO framework, and will need to comply with standards. This is just as true for solar system missions and facilities where the structure of the data presents additional challenges, and interactions are additionally maintained with the US Virtual Solar Observatory. Upcoming missions in all areas of astronomy and solar system science have very large data sets which present a challenge to UK community access.

Next Steps. AstroGrid will complete its agreed programme by June 2009, with all software available and documented for other projects to use. Now that the basic broad-brush technology has been created, the next phase in the evolution of the VO should be targeted developments for each facility/mission/data centre, and their own user communities. At the same time, discussions with the potential collaborators for this proposal made it clear that there are substantial requirements in common to many facilities - both continued technology developments, such as a common Application Programming Interface (API), and running services that many facilities will use in the background, such as Registry, or storage services. The most cost effective way to achieve this is to provide expertise and effort in a core team that facilities can work with. Following the resources invested in AstroGrid, the UK is in a strong position to do exactly this.

Most UK facility/data center work in fact consists of commitments within a European framework, especially with ESO and ESA. The proposed core team would operate as the UK (lead) contribution to the VOTC, and would work closely with colleagues at CDS, ESO, and ESA, guaranteeing European cohesion.

How it will work The necessary work will be undertaken by a collaboration between the core team and existing funded facility staff. Governance and planning will be undertaken by a Collaboration Board with representation from all participating facilities, meeting twice a year in conjunction with a multi-day technical forum. Work planning will be in the context of a three year plan, but in each six month planning cycle specific mini-projects will be debated and agreed. The Collaboration Board will set the strategic priorities for VOTC:UK and its work with the mission partners. Its independence will be strengthened by selecting a Chair and Co-Chair representative of the UK missions, distinct from the PI of VOTC:UK. Within each cycle, VOTC:UK work will be managed by a smaller management team, led by the VOTC:UK PI and with selected representatives from the Collaboration Board and senior staff. At a minority effort level, the current AstroGrid team already has some experience in this new mode of working directly with external projects, through a series of "Science Calls". Perhaps the best example is the work with IPHAS to produce a tailored VO

interface to their database, work that would have cost IPHAS themselves several times as much effort to deliver by themselves. Similar work was undertaken with the Belfast PanSTARRS team.

Deliverables. The project will work with both a fixed set of three year deliverables, and additional in-cycle deliverables, agreed every six months. The three year deliverables are under discussion and will be finalised by the time of full proposal. There will be two types of deliverable : cross-cutting infrastructural deliverables, and targeted mission-specific deliverables. The cross-cutting deliverables are already fairly clear, and include

- implementing a common Registry
- designing and implementing an agreed user-authentication system
- providing a standard Application Programming Interface (API)
- establishing shared virtual storage (VOSpace)
- providing facilities and missions a toolkit for automating publication of data services
- building a framework for observation preparation tools.

Targeted mission-specific deliverables need more discussion, but those currently under consideration include

- building a SWIFT workflow/GUI, for automating rapid identification of GRBs in multi-wavelength catalogues
- for LT/LOFAR, investigating changes to the VOEvent protocol to take forward to IVOA
- integrating existing solar-system tools within the VO environment, which will for example require adding IDL bindings to the middleware that AstroGrid constructed.

Costs, Timescales, Risks. The project should begin in July 2009, in order to minimise loss of key staff and expertise, and to fit with the agreed Euro-VO plan. We propose that it be funded for three years, possibly with a mid-term review. The core team is envisaged as being approximately 8 FTEs, costing ~£600K/year. The staffing level is set to provide the minimum level of resource required to deliver on the three main topics of activity of VOTC:UK. Two FTEs will be required for participation within the IVOA standards activity, and strategic interaction with Euro-VO and IVOA partners. Two FTEs will be focused on maintaining and refreshing the core VO infrastructure product, which forms the baseline system for the UK project partners. Four FTEs will be available as a common pool of VO expertise to work with the UK mission partners in delivering targeted demands. In any 6 month cycle a spread of project activities will be supported ranging from short-term – for instance configuring access to database products for VISTA survey teams, to longer term initiatives, such as developing a virtual analysis environment for SKA. Eight FTEs is a minimum effort level to allow for a meaningful engagement with the IVOA standards process, support of the core VO infrastructure and minimum level of engagement with the higher ranked UK missions and facilities. A rigorous justification and breakdown of resource implications will be given in the full proposal.

The aim is in fact to *minimise* the total cost of keeping the UK at the forefront of data access and exploitation, and to mitigate the risks involved in each facility attempting separately to keep pace with international developments. There are ~30 facilities and projects, representing an investment of many tens of millions of pounds, backing VOTC:UK; if each of these ended up expending half an FTE to maintain competitiveness in this area, it would cost double what we are proposing, and the result would be unco-ordinated and so less effective.

#### Benefits to UK astronomy and solar system science

Benefit-1: facilities gain access to 'state of the art' technology for publishing data, applications, and creating value added services, ensuring compatibility and interoperability with Euro and Global data and applications

Benefit-2 : facilities avoid the expense of having to develop their own expertise independently

Benefit-3: the UK maintains a lead in the rapidly emerging field of distributed data and analysis systems through leadership in the Virtual Observatory, both in standards development through a key position in the International Virtual Observatory Alliance, and in wider European infrastructure deployment through leadership of the Euro-VO Technology Centre.

Benefit-4 : Knowledge Exchange with other scientific disciplines, and with commercial computing enterprises, is made more effective by channelling through a co-ordinated effort

## Appendix A : Alphabetical list of co-Investigators

D.Abrahams	LPO	ING
P.Alexander	Cambridge	SKA
P.Allan	RAL	CLUSTER, Lisa, planetary missions
A.Allen	Imperial	CLUSTER, solar system projects
A.Bridger	ATC	UKATC projects
L.Culhane	MSSL	SDO
S.Dalla	UCLAN	SDO
J.Drew	U.Herts	IPHAS, VPHAS
S.Eales	Cardiff	HERSCHEL-Atlas
J.Emerson	QMW	VISTA
R.Fender	Southampton	LOFAR:UK
C.Frenk	Durham	HPC-VIRGO
G.Fuller	Manchester	ALMA
S.Garrington	Manchester	e-MERLIN, SKA
G.Gilmore	Cambridge	GAIA
R. Harrison	RAL	SOHO, STEREO
L.Harra	MSSL	Hinode
M.Hendry	Glasgow	LISA
M.Irwin	Cambridge	CASU, ING archives
O.Lahav	UCL	Galaxy surveys
A.Lawrence	Edinburgh	UKIDSS, VOTC:UK PI
I.McCrea	RAL	EISCAT, UK SSCD
R.McMahon	Cambridge	VISTA Hemisphere Survey
R.Mann	Edinburgh	WFAU, WSA, VISTA, LSST
S.Matthews	MSSL	SURF
K.Noddle	Leicester	VOTC:UK Project Manager
S. Oliver	Sussex	HERSCHEL-Hermes
J.Osborne	Leicester	SWIFT
C.Perry	RAL	UKCDC, SPASE
S.Rawlings	Oxford	SKA
B.Sathyaprakash	Cardiff	LIGO
S.Schwartz	Imperial	CLUSTER
I.Soechting	Oxford	UK Gemini Support Group
I.Steele	Liverpool JM	Liverpool Telescope
A.Vick	ATC	UKATC Projects
N.Walton	Cambridge	GAIA, VOTC:UK Project Scientist
M.Watson	Leicester	XMM SSC, IXO
G.Wright	ATC	JWST
J.Yates	UCL	Miracle, HPC

### Notes

- (1) All the above will be the members of the collaboration board
- (2) Chair and co-chair of the collaboration board will be chosen on a rotating basis
- (3) Chair, co-chair, three other co-Is, PM, and PS will constitute management team
- (4) Only co-Is who are members of the management team will require FEC funding
- (5) In addition to these formal co-Is, each project has named a technical contact

**Appendix B : Supporting email from STFC e-Science Centre**

[neil.geddes@stfc.ac.uk](mailto:neil.geddes@stfc.ac.uk)

Subject: RE: VOTC:UK Sol

Date: 6 November 2008 10:18:28 PST

To: [al@roe.ac.uk](mailto:al@roe.ac.uk)

Andy

Thanks for forwarding the SOI. As we discussed over the phone I am a great believer in the benefits of sharing the infrastructural development and support costs wherever appropriate. I can see great potential for synergies with your ideas and work across other STFC programs and facilities.

Best wishes

Neil

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Note: From September 1st 2008, my new email address will be [Neil.Geddes@stfc.ac.uk](mailto:Neil.Geddes@stfc.ac.uk)  
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