

## **Discussions for Next Steps**

### **1. Singapore-UK test bed**

The intention here would be to better understand what kind of infrastructure would be necessary to run Grid applications between UK and Singapore. It would be useful to first identify who would be involved in creating the test bed. It would be useful to identify perhaps 2 or 3 eScience Centres in the UK (we would be happy to be one of these, the others could be White Rose and York) -- and similarly those in Singapore.

Participants from the National Grid Office and the Institute of High Performance Computing in Singapore could be good initial partners. Discussions should center on what kind of software should be available within the collaborating institutions. An initial software stack could include:

- i. Web Services container (Apache/Axis + Tomcat) + some support for Globus -- GT4 could be used for supporting job submission between the two sites.
- ii. User authentication capability based on GSI or X.509 certificates. This would mean interaction with existing certificate authorities in the UK (at Daresbury -- or run out of one of the eScience Centres) and the National Grid Office in Singapore.
- iii. Data access via SRB.
- iv. Monitoring software -- such as Ganglia installed at each of the participating site. Ganglia metrics should also be accessible outside the participating site.
- v. Application composition/deployment via a workflow engine: Triana or Taverna could be the basis for this. Other options include ActiveBPEL.

The event at the All-Hands meeting could provide a useful basis for discussing what software has been selected for this, and the particular decisions involved.

### **2. Application Exemplars**

Once the test bed in (1) has been established, the next step would be to identify one or two application exemplars to deploy over the test bed.

At the meeting in Singapore -- data analysis and mining seemed to be a common example across all the talks. This could be a good starting point for application deployment. Here, involvement of industry from UK and Singapore would be really useful. Participants in Engineering and BioSciences expressed an interest in this area -- and could provide a useful initial set of scenarios. Interaction with specialist data stores -- such as Cybula at York and Cardiff -- would also provide a useful example of deployment.

A secondary scenario -- which could also make use of data mining techniques -- would be healthcare provision.

An AccessGrid session would be really useful to identify two kinds of application scenarios -- and who would be involved in which scenario. It would be useful to better understand what other existing work is in progress between UK and Singapore -- and perhaps use this as a basis to develop "application clusters" that focus on particular themes. For instance, there is also existing work between NTU and Birmingham Universities in the area of discrete event systems modelling.

The event at the All-Hands meeting could provide a useful basis for discussing what application scenarios have been selected for this, and the particular decisions involved. The importance of these application scenarios for Singapore industry should also be highlighted -- along with particular experience of these within the UK.

3. UK experience in building and deploying the National Grid Service should inform some of the decisions in building the test bed and deploying the applications. Cardiff, WhiteRose are already involved in the National Grid Service (<http://www.ngs.ac.uk/>) and in the future, other participants from this activity could be involved. It may be useful, in the longer term, to consider how the National Grid Service could be extended to Singapore based on experience gained in the test bed from activity (1) described above.

One of the key additional aspects would be support for Service Level Agreements between contributing institutions -- which would highlight exactly what resources are being made available by contributing institutions.

4. All of the work outlined in (1) and (3) should make use of standards that are arising out of GGF and W3C activity. It is important that standard software infrastructure -- such as use of Web Services -- is followed. This would ensure that the collaboration resulting from UK-Singapore interaction can also be rolled out to other South East Asian countries, such as Thailand. This will also encourage interaction with industry.