Sustainable support for WLCG through the EGI distributed infrastructure

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Abstract. Grid computing is now in a transition phase from development in research projects to routine usage in a sustainable infrastructure. This is mirrored in Europe by the transition from the series of EGEE projects to the European Grid Initiative (EGI). EGI aims at establishing a self-sustained grid infrastructure across Europe. The main building blocks of EGI are the national grid initiatives in the participating countries and a central coordinating institution (EGI.eu). The middleware used is provided by consortia outside of EGI. Also the user communities are organized separately from EGI. The transition to a self-sustained grid infrastructure is aided by the EGI-InSPIRE project, aiming at reducing the project-funding needed to run EGI over the course of its four year duration. Providing user support in this framework poses new technical and organisational challenges as it has to cross the boundaries of various projects and infrastructures. The EGI user support infrastructure is built around the Global Grid User Support system (GGUS) that was also the basis of user support in EGEE. Utmost care was taken that during the transition from EGEE to EGI support services which are already used in production were not perturbed. A year into the EGI-InSPIRE project, in this paper we would like to present the current status of the user support infrastructure provided by EGI for WLCG, new features that were needed to match the new infrastructure, issues and challenges that occurred during the transition and give an outlook on future plans and developments.

1. Introduction
Establishing EGI.eu to create and maintain a pan-European Grid Infrastructure with the National Grid Initiatives as building blocks, Europe has taken a major step towards providing a long-term sustainable production quality grid infrastructure for multi-disciplinary use by international, national and regional user communities. With the aid of the EGI-InSPIRE project EGI.eu coordinates between user communities, resource providers and technology providers within Europe and with partners from outside Europe [1].

As all these stakeholders are structured in their own organizations or projects, it is necessary to enable formalized communication between them. Here EGI plays the integrating role.

In the area of user support the integration platform is the Global Grid User Support (GGUS) [2] hosted and maintained at Karlsruhe Institute of Technology [3]. GGUS is used as the central helpdesk for EGI, as well as for linking other project’s support infrastructures in the overall EGI set-up.

In the following we will describe in detail how GGUS is used to implement workflow within and between the different areas of user support depicted in Figure 1.
2. Technology Support

One area in which the transition for EGEE [4] to EGI triggered major changes is the support for middleware and other technology. Whereas in EGEE technology development was part of the project’s work plan, the situation is different in EGI, which is a purely infrastructural project. This means that the development of technology takes place outside of the project.

The middleware consortia had to find other ways of organizing themselves. The gLite, UNICORE, ARC and dCache consortia formed EMI, the European Middleware Initiative [5]. For Globus IGE, the Initiative for Globus in Europe [6], was created.

For the user support infrastructure this meant, that workflows spanning various project needed to be defined and implemented. These workflows have to ensure that when tickets cross the boundaries of projects, they have been thoroughly checked for appropriateness.

Within EGI the DMSU (Deployed Middleware Support Unit) has been created, whose task it is to filter all technology related tickets and route them to the appropriate support units for further processing. It has been defined that only the DMSU is allowed to assign tickets to support units belonging to the technology providers (currently EMI and IGE).

Technically this was realized through separate technology helpdesk to which tickets are moved once assigned to the DMSU. The access to this technology helpdesk is restricted to members of the DMSU and support units from the technology providers. Figure 2 shows a schematic view of the DMSU workflow. In the near future a workflow to handle announcements and feedback for software releases will be included in the technology helpdesk as well.
3. Operations Support

In the area of operations support the major change in the transition from EGEE to EGI was moving away from the concept of ROCs (Regional Operations Centres) and establishing the NGIs (National Grid Initiatives) as the building blocks of the EGI grid.

The operations support consists of two major parts, the central EGI-wide support, e.g. central monitoring, accounting and first line support, and the regional support in the NGIs, which is responsible for all the resource providers belonging to the respective NGI.

For the operations support the main challenge is the increased number of NGIs and therefore of interfaces needed between the NGI helpdesk systems and GGUS. Depending on the size and the maturity of the NGIs, there are several possible options how the NGI support can be interfacing the central EGI support infrastructure. The simplest one, which can be sufficient for small NGIs, is to just have an NGI support unit in GGUS. This means that communication with the resource providers within the NGI or other national support units takes place offline and is not tracked in a ticket system. The other option is to set-up an NGI ticket system that is interfaced with the GGUS system, thus enabling a routing of tickets from EGI to the NGI and vice versa. To ease this process the GGUS team has developed the xGUS helpdesk template (see 5.1) as an alternative to the NGI needing to set up a full-fledged stand-alone ticket system and maintaining it. The schematic workflow for operations-related issues is shown in Figure 3.

4. User Community and Application Support

Similar to the operations support, the user community and application support is made up of central services for all and specific services for single communities. Among the central services are technical services, e.g. an application database for registering grid-ready applications, and consultancy services, that help new communities in using the infrastructure. Some of these central services can make use of the GGUS portal for tasks that benefit from tracking issues through tickets. Additionally a lot of the work on tasks like application porting and community support is done in the NGIs, which are connected to EGI through their helpdesk systems that are interfaced with GGUS for operations issues. Therefore it makes sense, also in the light of establishing a sustainable infrastructure, to use the same tool for user community and application support as well (see Figure 4).

**Figure 3.** Schematic view of the workflow for operations related problems

**Figure 4.** Schematic view of the workflow for user community or application related problems
The xGUS helpdesk template (see 5.1), even though originally developed for the use by NGIs, might also be of interest for user communities looking for a beneficial way of formalizing their internal support procedures and linking them EGI.

5. Tools
In addition to central integration platform the GGUS team has developed two other tools that are designed to ease the use of the EGI infrastructure and therefore work towards sustainability of the infrastructure. In the following two sections these tools, xGUS and Gatlet are described.

5.1. xGUS – a helpdesk template
The xGUS helpdesk template has been developed for NGIs and user communities who want to build their own user support infrastructure [7]. It contains all basic helpdesk functionalities including user administration and certificate access. xGUS is hosted and maintained centrally at KIT. Portal administrators from the client NGI or user community can customize the portal via the web interface to their specific needs.

The xGUS portal is a template framework for a helpdesk system. It is based on the BMC Remedy Action Request system with an Oracle database for the tickets and a MySQL database for news and user administration.

The portal brings a lot of features which are suitable to provide effective user support. Users can submit a ticket via a form and classify their problem. The ticket gets assigned to the appropriate support unit by the First Level Support. The responsible support unit gets informed via email about open tickets. Users or support staff can also use an email interface to add comments to the ticket.

Support staff can create relations between different tickets, e.g. master/slave or parent/child. With the news module, which is included in the portal, maintenances, downtimes or events can be announced easily via the portal. An RSS feed for news can be subscribed by portal users to stay up to date.

Registered users can view tickets of their personal interest on their dashboard.

Subscription to a ticket triggers email notifications about ticket updates for interested users who are not the submitter.

Tickets which cannot be solved within the helpdesk instance can be duplicated to GGUS. All changes which are made in the GGUS system are also synchronized to the original ticket.

Running on the same system, adjustments concerning the relationship and the interface between GGUS and xGUS can be made quickly and efficiently. Clients are not obliged to care about technical details of their helpdesk system. All server-related issues are handled at KIT, as well as the operation and maintenance of the helpdesk portal itself.

Portal administrators can customize the portal via a web interface. They can set links on the portal which are helpful for users like documentations or other relevant web pages, define the list of selectable problem types, VOs and sites and add or modify support units.

The xGUS framework provides NGIs or user communities with their own, independent helpdesk system with many helpful features. They can benefit of the experience gained over several years in the GGUS team instead of starting from scratch with a new helpdesk system. Their User Support can be integrated into the existing and well-established structure with GGUS at the center. All problems described in the tickets are stored in databases as well as the steps that have been done to obtain a solution. Each helpdesk system becomes a problem database which can help to solve similar or related problems.

5.2. Gatlet – a grid portal framework
The aim of the Gatlet project [8] is to implement an interface for portlets accessing grid resources through the Grid Application Toolkit (GAT). The advantage in using GAT is that it provides access to all three major Grid middlewares (Globus Toolkit, Unicore and gLite) through one common Application Programming Interface (API). Gatlet is implemented and tested within the GridSphere portal framework.
Portals built on top of the Gatlet framework address grid resource providers, grid users, portal providers and application developers (see also Figure 5). Users, especially grid newcomers, can use their well know web browsers to obtain access to grid resources. They need no deep knowledge of specific middleware clients, of grid security mechanism or of operating systems. Another important fact is that they do not need to install any software on their computers. Resource providers get software to provide easy access to their grid infrastructure over the internet. The process of importing data from a resources database to the Gatlet database can be automated easily. The portal administrators can assign installed software, hardware and VOs information to grid resources. This information is used by a Meta-Submitter that automatically chooses a matching resource. This eases the job submission for non-grid experts. With the Gatlet Service API it’s easy to develop portlets with access to grid resources. A developer of custom portlets programs against this API, which will integrate his portlets seamless into the portal. This gives a solid foundation on which to base a web interface to higher level applications installed on clusters.

![Figure 5. Schematic view of the structure of Gatlet in the context of GridSphere and GAT](image)

6. WLCG-specific Workflows
During the series of EGEE projects various workflows have been developed in close collaboration and specifically for the support needs of the WLCG community. Among these are the Alarm and Team Ticket mechanisms, which are described in detail in [9]. Other features like the direct routing of tickets to resource centres, bypassing the first line support, have started out as WLCG specific but have been since then adopted for general use in GGUS.

During the transition from EGEE to EGI utmost care was taken that all the WLCG-specific features remained functional and were not affected by the changes to the operations model (ROCs to NGIs). To guarantee this, the regular meetings between the GGUS developers and WLCG continued during the transition period and are currently being integrated in the EGI communication and management procedures.

All the WLCG-specific workflow are functioning properly also with the EGI context and are regularly tested after the monthly releases of GGUS.

7. Extension to other European and extra-European DCIs
As many of the user communities are utilizing more than one distributed computing infrastructure (DCI) and software from several technology providers, a logical next step in building a sustainable European distributed computing landscape is to try to streamline the workflows between the various key players and thus providing the user communities with a consisted way of communication issues and request to all their infrastructure and technology partners.
GGUS has shown to be an excellent tool to integrate existing support infrastructures and to act as a central platform for bridging infrastructures and projects, therefore trying to expand its use to cover various DCIs and technology providers seems to be the right choice. Figure 6 shows a schematic view of GGUS as integration platform between DCIs.

There is also interest from international projects to make use of GGUS to be linked to the EGI support infrastructure [10].

![Figure 6. Schematic view of a possible extension of the integrating role of GGUS](image)

**Summary**

The WLCG-specific workflows in GGUS have been successfully migrated into the EGI framework without disruptions if the production service. Communication channels for WLCG and EGI are currently being merged.

GGUS has proven to be a tool that can be beneficially used to integrate existing support infrastructure and to support complex support workflows across multiple domains of projects and infrastructures.

Making use of GGUS to further harmonise the communication between user communities, distributed computing infrastructures and technology providers in Europe will help the process of moving from project-based funding to providing long-term sustainable infrastructures.

Discussions with international infrastructures outside of Europe on how to use GGUS to streamline their user support and to integrate it with the European DCIs have started.

**References**

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