GLOBAL GRID USER SUPPORT: THE MODEL AND EXPERIENCE IN LHC COMPUTING GRID

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Abstract

The organization and management of the user support in a global e-science computing infrastructure, such as the Worldwide LHC Computing Grid, is one of the challenges of the Grid. Given the widely distributed nature of the organization, and the spread of expertise for installing, configuring, managing and troubleshooting the grid middleware services, we have adopted a central coordination model with distributed expertise and support.

The central infrastructure has been interfaced to the regional support units and a first line support team provides support for generic Grid problems.

The system plays a great role in daily Operations support and therefore it is interfaced to the grid Central Infrastructure Centre for grid monitoring and specific virtual organization information.

In this paper we describe the model and general infrastructure of the Global Grid User Support and provide insight to it's many interfaces.

INTRODUCTION

Providing adequate user support in a grid environment is a very challenging task due to the distributed nature of the grid. The variety of users and the variety of Virtual Organizations (VO) with a wide range of applications in use add further to the challenge. Wherever a user is located and whatever the problem experienced, a user expects certain levels of service. With the Global Grid User Support (GGUS) infrastructure, the Worldwide LHC Computing Grid (WLCG) project attempts to meet these expectations. The GGUS system is a distributed infrastructure with central coordination. The system has been interfaced to regional support units so to allow requests to flow in all directions. A first line support team provides support for generic grid problems while specialized units answer to middleware, deployment, network, other grid infrastructures and virtual organization specific problems. Whenever the expertise is missing at a regional centre, the problem can be forwarded to the central system for solving or forwarding to an appropriate specialist. Useful user services are also available. Tutorial for users and supporters are organized regularly by the GGUS support training service.

In what follows we give a short history of GGUS and an overview of its current status. The organization, role and tasks of the supporters are explained in some details. We then explain how GGUS meets the user needs. The interface to other support entities, such as the Regional Operation Centres (ROC) and the other Grid Infrastructures is described as well.

GGUS is also the basic system used for daily Grid Operations and monitoring. Some details about this activity is also explained. We conclude giving some results and a summary of future work.

DEVELOPMENT HISTORY AND CURRENT STATUS OF GGUS

In 2003 the WLCG Grid Deployment Board developed its concept for end-user support based around a central entry point for all user problems.

A prototype for this support model was developed at Forschungszentrum Karlsruhe and the first user support group was subsequently established in October 2003.

With the start of the EGEE project it became necessary to adapt to a tailored operations structure. Instead of the hierarchical approach of LCG, a federative model was chosen for EGEE. In place of one global operation centre there are several regional operation centres, each of the centres providing support for their local users with the help of their own helpdesk.

The model of the existing EGEE Global Grid User Support is as follows. The support model in EGEE can be captioned "regional support with central coordination". Users can submit a support request to the central GGUS service, or to their Regional Operations' Centre (ROC) or to their Virtual Organisation (VO) helpdesks.

Within GGUS there is an internal support structure for all requests. The ROCs, VOs and the other project wide groups such as middleware groups, network groups, service groups and other Grids (OSG, NorduGrid, etc.) are connected via a central integration platform provided by GGUS (Figure 1).

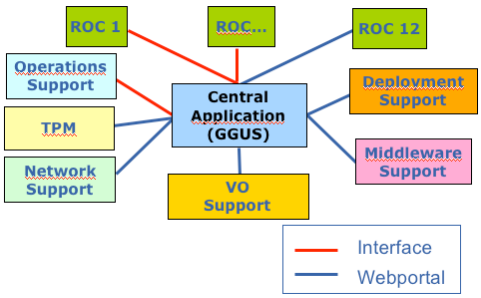

Figure 1: EGEE support model

The GGUS central helpdesk also acts as a portal for users who do not know where to send their requests. All requests can be entered directly into the GGUS system via a web form or e-mail.

GGUS-SYSTEM

The GGUS system consists of the following components:

- Web-Application based on a LAMP (Linux/ Apache/ MySQL/ PHP) environment, using SSL (secure socket layer)
- Remedy Action Request, a development environment for automating Service Management business processes
- Oracle 9i database

There are sections of the GGUS website which are freely accessible and others which require a digital certificate or a GGUS login account.

The Oracle Call-Interface (OCI) performs the communication between the web front-end and the ticket database. Remedy Action Request controls the entire workflow and the read/write communication with Oracle.

Remedy also provides Web Services, which allow for easy data exchange with many of the interfaced ROCs and support units.

GGUS SUPPORTERS

In the central GGUS system, first line user support experts from the ROCs and the VOs will do the initial problem analysis. These experts are called Ticket Processing Managers (TPM and VO TPM). These experts can either provide the solution to the problem reported or escalate it to more specialized support units such as network, middleware and grid service support. They may also refer it to specific ROCs or VO experts.

Behind the specialized VO TPM support units, people belonging to EGEE/NA4 groups such as the Experiment Integration Support group (EIS) help VO users with on-line support and the integration of the VO specific applications with the grid middleware. Such people can also recognize if a problem is application specific and forward the problem to more VO specific support units connected to GGUS.

TPM and VO TPMs also have the duty of following-up tickets, making sure that users receive an adequate answer, coordinating the effort of understanding the real nature of the problem and involving more than one second level support unit if needed. The following figure depicts the ticket flow.

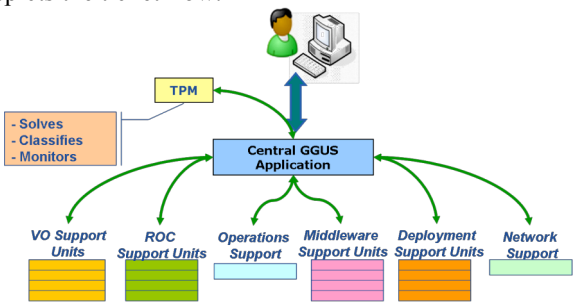

Figure 2: Support workflow

The community of supporters is distributed. Their effort is coordinated centrally by GGUS and locally by the local ROC support infrastructures.

The ROC provides support to classify the problems and to resolve them if possible. Each ROC has named user support contacts who manage the support inside the ROC and who coordinate with the other ROCs' support contacts. The classification at this level distinguishes between operational problems, configuration problems, violations of service agreements, problems that originate from the Resource Centres (RC), and problems that originate from global services or from internal problems in the software. Problems that are positively linked to an RC are then transferred to the responsibility of the ROC with which the RC is associated.

MEETING USER NEEDS

As explained above, GGUS provides a single entry point for reporting problems and dealing with the grid. In collaboration with the EGEE Experiment Integration and Support (EIS) team, the EGEE User Information Group, NA3 training team, and the entire EGEE infrastructure, GGUS offers a portal where users can find up-to-date documentation, and powerful search engines to find answers to resolved problems and examples. Among the services offered we have:

- The specialized GGUS Search Engine
- The GGUS knowledge database and Wiki pages compiled for frequent or undocumented problems/features.
- Hot lines for users and supporters and a VRVS chat room to make the entire support infrastructure available on-line to users.
- Special tools and grid middleware distributions are also made available for GGUS users under request.
- GGUS is interfaced with other grids' support infrastructures such as in the case of OSG and NorduGrid.
- GGUS is used for daily operations to monitor the grid and keep it healthy. Therefore, specific user problems can be directly communicated to the Grid Operation Centres and broadcasted to the entire grid community.

- GGUS is used also to follow and track down problems during stress testing activities such as the HEP experiments production data challenges and the service challenges.

GGUS Search: GGUS Search is a web application that helps users find information relevant to EGEE Grid middleware. Many people find information by directly using search engines such as Google which usually provides good results. However, users are often looking for very specific information that is hard to convey in a search string. As a result, search requests usually return many irrelevant links that can drown out the desired information.

For EGEE, technical information is concentrated in only a few sites. So users only need to search through these sites and can safely ignore other sites that may mislead them. GGUS Search helps provide this capability through a CGI application that accepts a search string and generates Google searches only to the sites that are rich with EGEE middleware specific information. Each search runs in a separate thread and performs a request to Google's web service.

GOK Wiki: The GOCWiki is a knowledgebase that holds information relevant to Grid operations and users. The Wiki system was chosen over dedicated FAQ system for its flexibility and ability to allow the growing Grid community to contribute. Currently the user related sections in the GOCWiki are:

- User Guide
- User howtos
- User FAQ
- Common errors encountered by users
- User Tools
- Documentation on tools for the user community

There is already a good amount of content that can be found within these sections, but more can be added by encouraging the user to refer, and contribute, to the Wiki pages. A new version of MoinMoin may be helpful since it provides a WYSIWYG interface to make editing trivial for potential contributors.

GGUS AND OPERATIONS SUPPORT

Another important role played by the GGUS system is its use for daily operations support. Following weekly rotations, operations support teams (called "CIC on duty") have to monitor grid resources using available monitoring tools and track problems using a ticketing system (see [1]). To share effort on the set up of this new functionality, the front-end and back-end have been decoupled: with the core mechanism hosted by GGUS, and the user interface hosted at IN2P3 Computing Centre in Lyon, France. Implementation started early February 2005, and the system was put in production mid-March.

The back-end consists of a dedicated database in the GGUS Remedy system called CIC_Helpdesk: the central Helpdesk could not directly be used because of specific format of operations tickets (special fields for implied site and for impacted node, and different escalation steps). When assigned to a given Responsible Unit, the CIC_Helpdesk ticket is duplicated in the central Helpdesk where it is treated as all other tickets. Any change on one of the two tickets triggers the same modification on the other to ensure synchronization (see Figure 3).

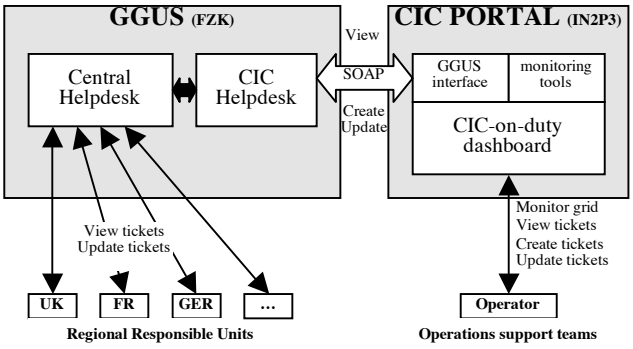

Figure 3: operations support model using GGUS

The interface appears as a dedicated section of the CIC portal [2], the "CIC-on-duty dashboard". Tickets are listed, created, modified and escalated from web pages, where this information is coupled with monitoring results, as described in [1]. This interface, mainly written in PHP, communicates with the back-end *via* SOAP-WSDL web services which allow performing all operations on tickets as illustrated on Figure 3. To improve performances and maintainability of the interface, CIC_Helpdesk web service will soon be accessed through the Lavoisier Service[3] instead of directly calling SOAP methods through PHP code.

The system is fully operational and in constant evolution to follow new needs.

The CIC-on-duty support team is a collaborative effort provided on a weekly rotational basis between currently six countries (France, Italy, Taiwan, Russia, UK, CERN). Each team provides 8x5 support with another team on standby to provide assistance. This effort will increase over the forthcoming months and the addition of the Taiwan team increases the length of cover 16x5 during their shift.

Tickets raised by the CIC-on-duty team are ultimately the responsibility of each Regional Operations Centre (ROC) who assist the site concerned and bring a speedy resolution.

The ROCs operate their own local helpdesk systems, many of which utilise a Web Services interface with GGUS as described later. The CIC-on-duty tickets via GGUS are sent to the ROCs. The ROCs also have access to the monitoring tools – Sites Functional Tests [4] and GSTAT [5] – which are integrated in the CIC-on-duty dashboard as described in [1].

ROC HELPDESK INTEGRATION WITH GGUS

Within EGEE, the ROC support infrastructures are connected via a central integration platform provided by the GGUS organization. Many ROCs already had helpdesk systems in place before the beginning of EGEE, for user and operational support in their own national grid projects. As national Grid users used these and resource centres managers, it was clear that the overall EGEE Support model should leverage the existing national support infrastructures, aiming to distribute much of the support effort, to be able to cope with the continuously increasing scale of the project. At the same time, the model should also allow the user to have a single point of contact for Grid related problems without getting lost among thousands of Grid related web pages.

The designed support model enables users to choose to submit support requests to either the central GGUS helpdesk or his local ROC helpdesk. The choice of this model required automatic interfaces between the each ROC helpdesk and the GGUS application.

The GGUS application provides secure web-services methods to create and update trouble tickets in the GGUS database. These methods are called via SOAP APIs which can be accessed in most programming languages. When this interface is supported in the local ROC helpdesks tickets can easily be escalated from the local ROC helpdesk to the GGUS server (and be assigned to another support unit) when the ticket cannot be solved locally.

In the other direction, trouble tickets originally submitted to GGUS can be assigned to any ROC helpdesk, which causes the ticket to be automatically entered into the local ROC database, through the use of an XML formatted email. These emails are fetched periodically from the mail server and then parsed by an importer tool running on the ROC helpdesk server. Currently a standard for a ROC helpdesk web-services interface is under development to replace these XML formatted emails.

The typical workflow from GGUS to ROCs and among ROCs is shown in Figure 4.

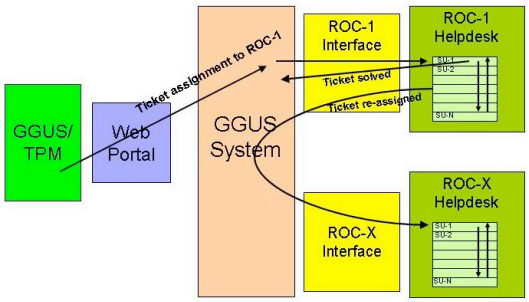

Figure 4: Basic GGUS-ROC ticket workflow

A first working prototype of the GGUS-ROC interface [6] was presented in November 2004 for use with the open source helpdesk system OneOrZero [7] by the Italian ROC support infrastructure in March 2005 [8]. Later many other ROCs also adopted this interface during 2005. Since then interfaces have been developed for other helpdesks, such as: XOOPS/xHelp, RT, OTRS, and FootPrints [9]. In 2006 it is hoped to interface with the OSG support infrastructure.

CONCLUSION

As of today the GGUS system has shown to be able to handle about 1400 requests per week. Given the distributed nature of the infrastructure, the system can scale up just adding more dedicated manpower to answer to the requests. During 2006, it is expected that there will be a large number of tickets passing through the system as the LHC VOs move from preparing for service to being in production. It is also expected that the number of Virtual Organisations will grow as the work of EGEE-II proceeds. There will also be an increase in the number of support units involved with GGUS, and an increase in the number of ROCs and RCs. For what concerns future work, the GGUS team is planning to improve the interfaces to the ROCs, the ticket handling interface and the quality of the user services already offered.

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