WLCG-specific special features in GGUS

T Antoni[1], D Bosio[2], M Dimou[2]

[1]Karlsruhe Institute of Technology
Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany
[2]European Organization for Nuclear Research CERN
CH-1211, Genève 23, Switzerland

E-mail: antoni@kit.edu

Abstract. The user and operations support of the EGEE series of projects can be captioned "regional support with central coordination". Its central building block is the GGUS portal which acts as an entry point for users and support staff. It is also as an integration platform for the distributed support effort. As WLCG relies heavily on the EGEE infrastructure it is important that the support infrastructure covers the WLCG use cases of the grid. During the last year several special features have been implemented in the GGUS portal to meet the requirements of the LHC experiments needing to contact the WLCG grid infrastructure, especially their Tier 1 and Tier 2 centres. This paper summarises these special features, with particular focus on the alarm and team tickets and the direct ticket routing, in the context of the overall user and operations support infrastructure. Additionally we will present the management processes for the user support activity, detailing the options which the LHC VOs have to participate in this process. An outlook will be given on how the user support activity will evolve towards the EGI/NGI model without disrupting the production quality service provided by EGEE for WLCG.

1. 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 [1], EGEE attempts to meet these expectations.

Enabling Grids for E-sciencE (EGEE) is Europe's leading grid computing project, providing a computing support infrastructure for over 10,000 researchers world-wide, from fields as diverse as High Energy Physics, Earth and Life sciences [2].

The Worldwide LHC Computing Grid (WLCG, [3]) community is the largest user community of the EGEE project and also one that has the strongest requirements towards the infrastructure concerning the quality of the services delivered. This resulted in several WLCG specific workflows in the area of user support, which were implemented in the past twelve months. We will describe these features in detail.

During 2009 EGEE is focusing on the transition to a sustainable operational model, while maintaining reliable services for its users. The resources currently coordinated by EGEE will be managed through the European Grid Initiative (EGI) as of 2010 [4]. In EGI the grid infrastructure in each country will be run by National Grid Initiatives (NGIs). The adoption of this model will enable the next leap forward in research infrastructures to support collaborative scientific discoveries. EGI

will ensure abundant, high-quality computing support for the European and global research community for many years to come.

This transition to a new operations model necessitates an adaptation of the user support processes as well. We will describe the adaptations we foresee for the coming months and how we plan to handle those.

2. GGUS management

The support model in EGEE can be captioned "regional support with central coordination". This model is sustained by a help desk system consisting of a central platform, which is developed and maintained at the Steinbuch Centre for Computing of the Karlsruhe Institute of Technology [1], integrated with several satellite systems that have a regional or thematic focus. A clearly defined support process, involving all the parties needed for a project-wide support service, is of the utmost importance for such a distributed effort. The bodies and the tool involved in the user support management process are described in this section.

2.1. USAG

Organised and chaired by the Operations Coordination Centre (OCC), the User Support Advisory Group (USAG) in EGEE III is composed of the VO managers (or their representatives) and representatives from the other activities using GGUS. Its role is to advise GGUS on development directions both for the tools and the processes. [6]

The USAG mandate is to:

- Examine requirements from all relevant parties, VOs, Regional Operations Centres (ROCs) and resource centres, identify common points and differences and see how they influence the grid support processes and tools.
- Consolidate all requirements taking into consideration the needs and operational procedures of ROCs and resource centres.
- Advise on the consequent evolution of GGUS, which is the core system of the grid support effort.
- Report on the development, testing and deployment plan for new GGUS features compared to the recommended evolution.
- Make known to the appropriate forums - VOs, ROCs, sites and all other Support Units (SUs) - the suggested GGUS system evolution and the procedures that need to be updated accordingly.
- Define the expectations from all SUs via Operational Level Agreements (OLAs), get acceptance by the SUs and leave OLA enforcement to the management partners involved.

USAG meetings take place monthly, usually on the last Thursday of the month. Participation from all ROCs is important via representatives authorised to comment on their ROC's agreement and commitment to USAG decisions and recommendations. Other participants are the GGUS developers, the OCC via the USAG chairperson, NA4, VOs and resource centres (in agreement with their ROC). The meeting themes are agreed by the USAG members, published on the agenda, analysed and carried forward, when necessary, documented and available from our records index [7]. Most of the themes concern the technical development of GGUS leading to new functionality and requiring understanding, agreement, testing and awareness by all partners involved.

All the development activities and functionalities described in sections 4 and 5 of this paper have been thoroughly discussed and approved by USAG, before they have been implemented and rolled out.

In addition to new technical development, the USAG meeting is also the forum for a continuous assessment of GGUS according to EGEE milestone document MSA1.6 [8]. The weekly escalation reports and the periodic metrics reports, both available from the GGUS homepage [1], are used for this continuous evaluation of the quality of user support. The identification of weak areas leads to commonly accepted technical or procedural changes. This explains the importance of regular

participation both from customers (VOs) and service providers. Discovering needs and requirements in USAG meetings helps to build mutual trust.

2.2. Shopping list

All GGUS improvement requests are recorded in a dedicated savannah tracker [9]. Their grouping depends on the expected month of completion and release, which in turn, is a factor of the tickets' urgency and the development effort required. Using savannah to record requests and their progress proved to be valuable as it constitutes a reference for information collection and reporting.

The GGUS developers and deployers evaluate the effort required, clarify technical details and organise information and dissemination of the new functionality during a dedicated weekly meeting. All features made available with a given release are published in the release notes linked from the GGUS homepage [1]. All historical information on previous releases is also available from the same web location. Clarifications and priorities are discussed at the USAG and WLCG meetings as required.

2.3. Release cycle

The monthly releases of the GGUS portal take place, in most cases, on the last Wednesday of the month. When the technical changes planned within a given release affect the interaction with local ticketing systems, the release is classified 'Major' and cross-country testing takes place for a number of weeks prior to the release.

All release dates and contact references are widely publicised to all GGUS support staff and users, using the EGEE broadcast tool. News on the GGUS homepage and a permanent link to release notes and savannah references are available for consultation at any time [10]. Information dissemination is done via regular reporting to the daily WLCG meeting, the weekly EGEE-OSG-WLCG operations meeting, the monthly USAG and the GDB every few months.

3. GGUS Standard workflow

The central GGUS system acts both as a single entry point for the users and as an interconnecting body for the various regional support systems (Figure 1). Changes or updates happening to a ticket in any of the help desk systems connected to GGUS are automatically propagated to the GGUS system. Hence a user can follow the current status of their ticket in the GGUS system alone.

The central GGUS system is connected with several regional systems belonging and operated by the ROCs, the VOs, other Grid infrastructures and Middleware providers. Each of these regional systems maintains its full independence from the central system [11].

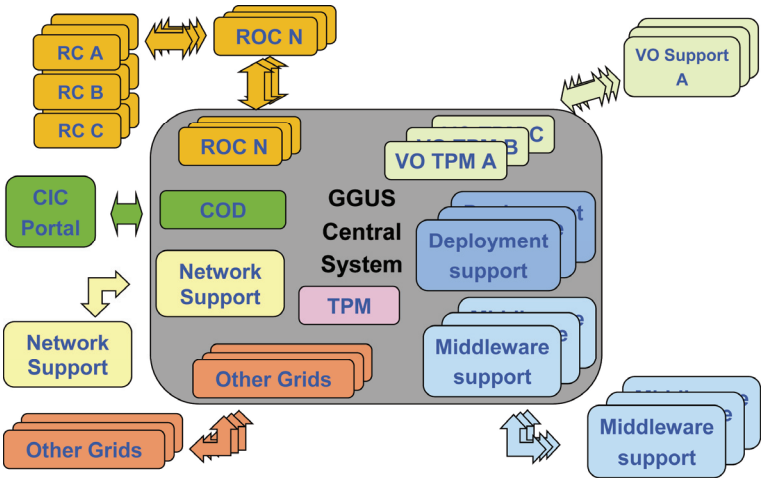

Figure 1. GGUS, central system and satellites

Until the beginning of EGEE III the ticket workflow has been implemented using a three level support structure. Each ticket, submitted either via e-mail or via the web interface, would be initially assigned to the Ticket Process Manager (TPM), which constituted the first line support. It could then be assigned to one of the Service Support Units, which constitute the second level support, or, in exceptional cases, directly to the Expert Support Units, which constitute the third level line of support (see also Figure 2).

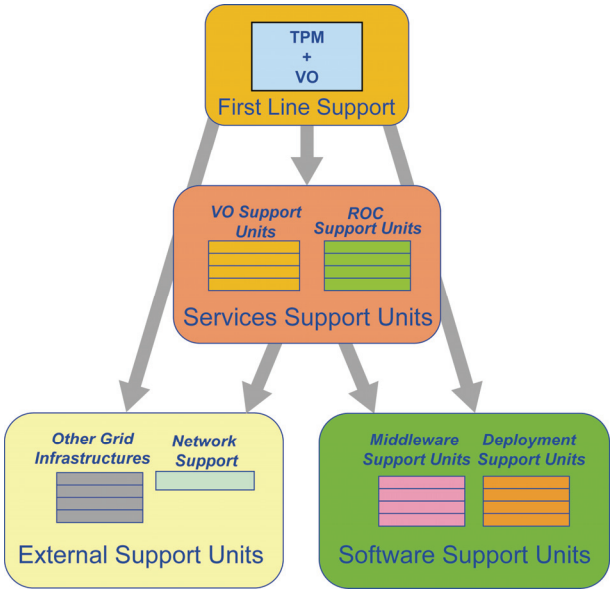

Figure 2. Schematic view of the GGUS standard workflow

3.1. TPM

The TPM unit is in fact staffed by several teams, rotating across the different ROCs, with two ROCs on duty on any given week. The TPM unit has several responsibilities: finding a solution to simple tickets, gathering as much information as possible from the user concerning the problem at hand before the ticket is assigned to another unit, and reassigning the ticket to another unit if a ticket is reassigned back to the TPM.

It also plays a fundamental role in the escalation procedure when a user deems that a ticket has not been adequately handled: in this case they are the second level of escalation. When a ticket is escalated to the TPMs the TPM unit is asked to follow the particular ticket in question more closely to ensure that the SU to which the ticket is assigned addresses the problem in a timely and adequate manner.

3.2. Services support

The Service SUs are the second line support of the GGUS system. They are typically operated by ROCs, VOs, or other grid infrastructures and provide support for questions concerning resource centres belonging to their region or middleware directly provided by the VOs.

3.3. Expert support

The Expert SUs are the third line support of the GGUS system. They are typically operated by ROCs or middleware providers and furnish support for questions concerning operations that cannot be answered by the service units or problems related to the middleware itself. If the problem concerning the middleware proves to be a bug, then a bug report is opened with the support system of the middleware in question.

4. WLCG specific workflows

The largest user group utilising of the EGEE grid infrastructure are the WLCG VOs, each corresponding to one LHC experiment. Due to the LHC reaching its start-up phase, the requirements for the quality of service and of support provided by EGEE for the WLCG VOs grew. To satisfy the needs of the LHC community in the area of user and operations support several new workflows and mechanisms had to be implemented. In this section we describe these workflows and their use cases.

4.1. Direct user ticket notification to resource centres

The basis of the workflows described in this section is the direct notification of user tickets to computing centres providing resources to the WLCG VOs. The standard ticket workflow (as described in section 3) foresees all tickets being triaged, assigned or possibly solved by the first line support (the TPM). As the LHC VOs do their own first line support and only grid experts from the VOs submit tickets through GGUS to the EGEE infrastructure it was considered to be envisageable to let these users assign tickets directly to the concerned resource centre, as they could be trusted to be able to properly judge the problems and submit tickets that could only be solved by the resource centre directly.

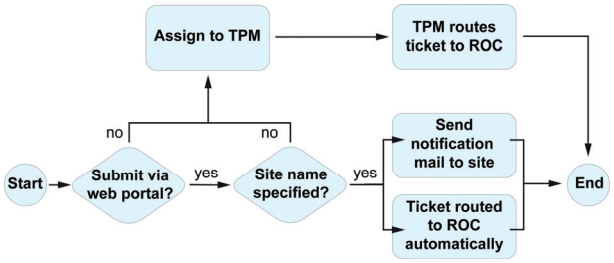

Figure 3. Direct ticket assignment workflow.

To be able to keep the standard management procedures in place and also to keep the independence of the various ROC ticketing systems it was important to still involve the ROCs in this process. Therefore the workflow for the direct assignment was implemented by assigning the ticket to the ROC the resource centre is affiliated to and simultaneously sending a notification email to the resource centre itself. The resource centre is aware of the ticket and can start working on the problem immediately. At the same time the ROC is informed about all the steps that are taken and retains the responsibility for the all the tickets in its region, as in the standard workflow. A schematic view of the workflow for the direct assignment can be seen in Figure 3. The contact information for the resource centres is retrieved automated from EGEE's GOCDB [12].

Following the success of the direct assignment mechanism within the WLCG community this feature has been opened to all users submitting tickets to GGUS and so far no misuse or major problems have been encountered.

4.2. Team tickets

In the standard ticket workflow within GGUS every ticket is owned by the user who submitted it. This means that only the submitter and members of the support staff are able to modify the ticket. This workflow does not cover the WLCG use case of experiment shifts that are carried out by a large group of members of the collaboration. The team ticket mechanism enables a hand-over of tickets between these experiment shifters. One shifter could, for example, shortly before the end of his shift, submit a ticket which during the next shift has to be updated. This mechanism was enabled by sharing the ownership of the ticket between all members of the VO participating in each of the shifts.

This implied a deviation from the flat hierarchy in the access rights management of GGUS which previously only distinguished between user and support staff. Special roles had to be implemented for the several different shift teams of the LHC experiments. Currently the user credentials and their roles

are stored in the GGUS user database. When accessing the GGUS web portal the user authenticates with his certificate enabling the matching of his credentials with the user database.

When submitting a "team ticket" the shifter can decide which workflow he wants the ticket to take: the standard workflow with ticket triage by the TPM or the direct routing to the ROC and notification to the resource centre.

4.3. Alarm tickets

In the WLCG computing model the Tier-1 centres have special roles and requirements to fulfill. For example they have to provide 24x7 support for specific services defined in the Memorandum of Understanding (MoU, [13]). To enable the LHC VOs to make the Tier-1 centres aware of problems outside of office hours an alarm ticket mechanism was introduced in GGUS.

Using the same mechanism as for the shift teams the authorised alarmers are stored in the GGUS user database. The number of alarmers for each experiment is restricted to four or five people trusted by the VO managers. This serves as a guarantee that this alarm feature is only used after a thorough evaluation of the problem. GGUS will then sign the alarm ticket with a GGUS certificate to prove the authenticity of the alarm tickets.

Alarm tickets can only be opened against Tier-1 centres and will use the direct assignment mechanism to make sure that there is no delay in delivering alarm ticket information to the centre. The Tier-1 centres have to ensure that the information about the ticket is propagated to the experts. During office hours the local standard procedures can be used whereas outside of office hours a mechanism has to be introduced to inform the on-call engineers about the issue.

For instance, at GridKa, the German Tier-1 centre [14], this is done via a web services interface between the ticket system and the local monitoring system based on Nagios [15]. The workflow for the alarm ticket mechanism at GridKa is shown in Figure 4.

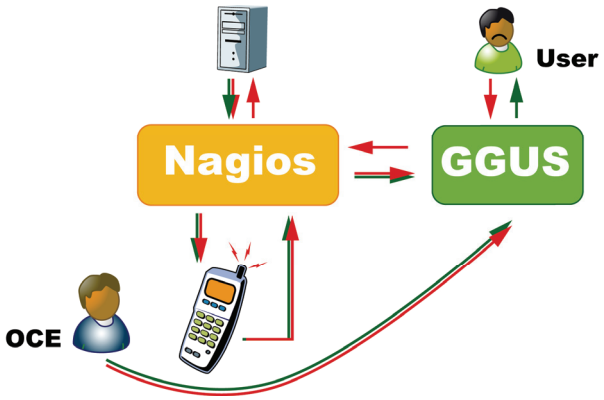

Figure 4. Simplified view of the alarm ticket mechanism (GridKa example).

5. Into the EGI era

In approximately an year from now the series of EGEE projects will come to an end. The last year of the EGEE-III project is focused on preparing for a transition to the follow-up infrastructure called EGI, which will rely heavily on the existing and emerging NGIs. This transition, of course, must not compromise the quality of the production service offered by EGEE.

As this infrastructure will have some major inherent differences from the current EGEE grid it is necessary to re-evaluate the organization of operations and user support and to identify areas that have to be dealt with differently from the processes defined today.

A major difference is that the resources that will be provided for the central coordinating part of the infrastructure will be significantly smaller than those currently in EGEE. In the area of user support, where the effort is and has to be quite distributed, this affects mainly the first level support which is currently handled centrally by staff from the ROCs on a rotational basis. In the following paragraphs

we describe how the first line support could be handled in the EGI context and what other measures will be taken to reduce the overall user support workload.

5.1. The future of first line support

In the EGI era, given the number of NGIs involved, GGUS is considering changing the TPM model. One of the options that is considered is that instead of one TPM team responsible for all GGUS tickets in a given week, we should move to a workflow where, for a problem submitted to GGUS by a user from a certain country, the ticket will be routed to the first level support team within the relevant NGI.

Another option is that a central TPM team will triage all tickets. This could be full time team doing first line support exclusively or could be organized similarly to the current TPM by sharing the work between some of the NGIs.

The different models will be examined in the framework of the USAG meetings and a proposal will be made and discussed with the relevant parties. The transition to the new model should be done gradually during the second year of EGEE-III and be completed well before the end of the project.

It will be the responsibility at first of the ROCs and later of the NGIs to dictate the response time requirements on their first level support teams for local tickets. It must be clear also to the teams at the ROCs/NGIs that the response time expected for global tickets coming in through GGUS will remain the same as before for the remaining part of EGEE-III and in EGI this will be defined at a central level and be part of the agreement an NGI accepts when joining EGI.

The involvement of a central coordinating unit is in any case necessary and will exist for:

- Tickets submitted from non NGI identifiable domains,
- Wrongly assigned tickets,
- Escalated tickets,
- GGUS tickets possibly due to middleware bugs, needing debugging.

Resources for GGUS are foreseen in the EGI blueprint that has been endorsed by a large number of NGIs already.

5.2. VOMS integration

Currently the roles of users (e.g. Alarmer or LHC experiment shifter) are maintained manually in a database by the GGUS development team. This of course puts a high workload on this team which would be better spent on development tasks. Therefore it is planned to implement these roles in the VO Management Service (VOMS) and have the VOs manage them themselves, which would also give the VOs more flexibility to change team membership. GGUS would, based on the roles defined in VOMS, enable its users to submit team and alarm tickets (Figure 5).

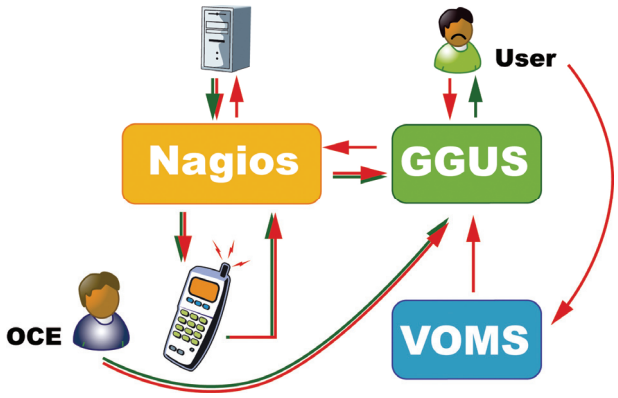

Figure 5. Simplified view of the Alarm ticket mechanism, including the VOMS integration.

5.3. Ticket timeline tool

To make working on tickets more effective for resource centres a ticket timeline tool is currently being developed. It gives site administrators a quick graphical overview of tickets within their responsibility. It has the form of a calendar with a selectable time frame and shows all tickets for a certain resource centre with the status values colour-coded (Figure 6). Moving the mouse over the bar will give a summary of the ticket information and clicking on the bar will lead to the ticket modification page. The display can be restricted to open or closed tickets.

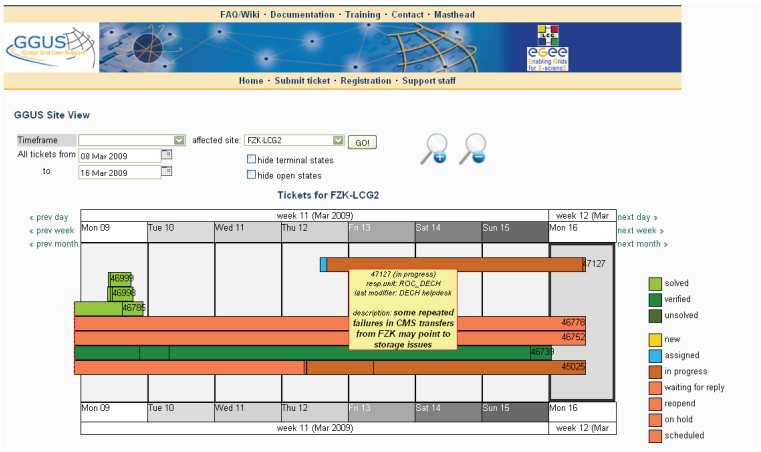

Figure 6. Screenshot of the prototype of the ticket timeline tool.

This feature will help site administrators in keeping track of tickets they are responsible for and will therefore improve the quality of the support provided by the resource centres.

6. Summary

The GGUS system is under constant development to adapt to the needs and requirements of its users, be they ticket submitters or members of the Support Units. An advisory group that meets regularly and a monthly release schedule ensure that these requirements are met in a timely fashion. Some of the features introduced to satisfy the needs of the LHC VOs proved to be so useful that they have been extended also to the other VOs, for instance the direct routing and notifications to the sites. The start up of the LHC and the transition towards EGI will undoubtedly represent a challenge in terms of having to adapt the system to the needs of the new European and National Grid Initiatives while keeping the quality of service to a production standard to satisfy the needs of the WLCG VOs. The flexibility and distributed nature of the GGUS design has so far proven invaluable and provides a strong foundation on which to address the inevitable further challenges which EGI and WLCG will bring.

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