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FOSTERING MULTI-SCIENTIFIC USAGE IN THE IBERIAN PRODUCTION INFRASTRUCTURE

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Abstract. In this article we present the strategies foreseen to foster the usage of the Iberian production infrastructure by regional scientific communities. The main focus is on describing the user support mechanisms implemented through a cooperative effort from the Portuguese and Spanish user support teams, and on the services and tools offered to the regional user communities for their use and customization, to foster VO production user activity within the Iberian region.

Keywords: User support, virtual organizations, user requirements

1 INTRODUCTION

The evolution of the European Grid Infrastructure (EGI) [1] and of National Grid Initiatives (NGI) should be driven by users. Their overall degree of satisfaction is a key aspect for a sustainable growth of any Distributed Computing Infrastructure (DCI), and NGIs have to be ready for the challenge of implementing a user support model able to properly answer to user demands. The distributed nature of an e-science infrastructure adds one more layer of complexity to a multi-science universe of geographically distributed users, belonging to a wide spectrum of Virtual Organizations (VOs), and with a large range of applications. To summarize, users expect certain levels of service, independently from where they are and from where the problem is experienced. NGI user support teams must be up to the challenge.

Another way to look to user support activities is from a VO management perspective. VOs should be empowered with the proper tools to promote their user activities and guarantee a reliable infrastructure from their users point of view. The availability of such tools and services changes the way scientific research takes place and fosters user satisfaction. Moreover, the deployment of standard tools and services enables the establishment of Virtual Research Communities (VRCs), representing disperse groups of researchers, using the same e-Infrastructure (services) to produce scientific results at a much lower cost.

This paper presents how the Iberian region is facing those challenges through its regional model to support Portuguese and Spanish users. The user enrolment process, the user management activities and the implemented strategies to integrate regional user support operations within global project mechanisms are explained in detail, including how requests and issues exposed by regional users are forwarded to central operations and technological providers, and how regional requirements for enhancements are followed up by project boards. Finally, the paper concludes with a survey of evaluated services and tools provided and disposed to the regional user communities to foster their activities within the region.

2 USER ENROLMENT AND MANAGEMENT

A wide spectrum of user activities are taking place in Ibergrid. International VOs make a strong use of regional resources from Resource Infrastructure Providers (RIPs) participating in European and world-wide projects like WLCG [2], ITER [3] or AUGER [4]. The enrolment of regional users in such international communities is outside of the Iberian NGIs scope since those VOs establish their own procedures and workflows. On the other hand, national and regional user activities are increasing with the establishment of formal e-science networks enabled by NGIs, and connecting universities and research institutions. To cover those emerging necessities, the Portuguese and Spanish NGIs offer support to a set of VOs dedicated to scientific disciplines with a traditional relation with e-Science domains:

- VO `phys.vo.ibergrid.eu`: physics and space sciences
- VO `chem.vo.ibergrid.eu`: chemistry and materials science
- VO `life.vo.ibergrid.eu`: life sciences
- VO `ict.vo.ibergrid.eu`: information and communication technologies
- VO `earth.vo.ibergrid.eu`: earth sciences
- VO `eng.vo.ibergrid.eu`: engineering
- VO `social.vo.ibergrid.eu`: social sciences

In addition, 3 more VOs exist: `ops.vo.ibergrid.eu`, aimed for regional operations; `iber.vo.ibergrid.eu`, for general and transient activities; and `tut.vo.ibergrid.eu`, for tutorial sessions. Each regional VO was created with two different groups representing the two participating countries, and the user communities are aggregated as VO subgroups according to their applications (see Figure 1).

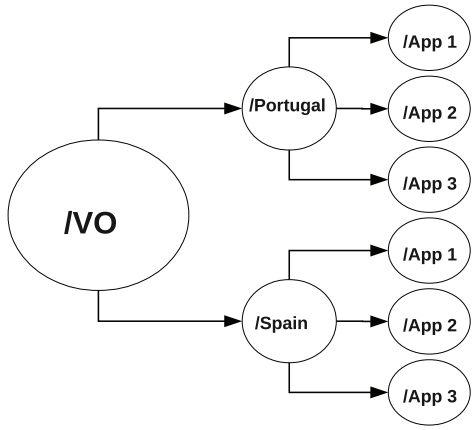

Fig. 1. Regional VO group hierarchy

The main advantage with this method is that it will limit the VO growth and minimize the effort involved in configuring VOs. At the same time, this mechanism is general enough to encapsulate the user activity under a national scope, or alternatively, to establish an Iberian context for international collaborations between the two countries. However, the establishment of VO subgroups per application, although more flexible, presents an additional challenge. In the current schema, the VO administrator does not know who has permissions to be registered in a given VO group. To overcome this obstacle, the user communities must assume the responsibility for authorizing or denying registrations under the VO application subgroup. The user management process for Ibergrid regional VOs is therefore shown in Figure 2, and can be briefly summarized in the following steps:

1. A user submits a VO registration request.
2. After evaluation, the VO admin rejects or accepts the request and the user is notified of the decision. In case of acceptance, the VO privileges are set for the user, and the request is forwarded to the application group manager.
3. After evaluation, the group manager rejects or accepts the request. In case of acceptance, the user is notified and the VO group privileges are set for the user. In case of rejection, the user and the VO admin are notified of the decision, and the VO admin should re-evaluate the context of the VO registration. An automatic rejection from the VO is not executed to allow a failover mechanism regarding incorrect group assignments.

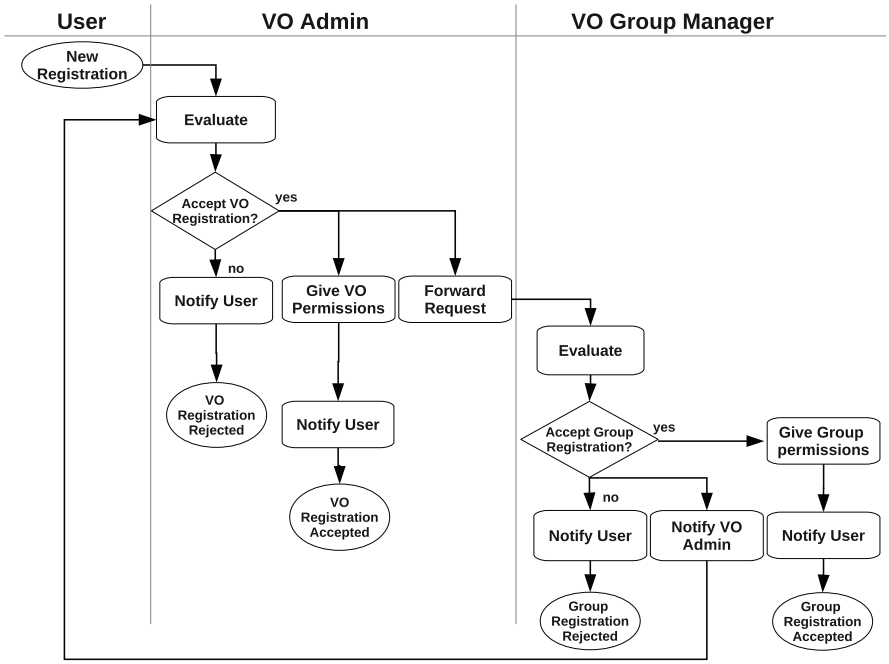

Fig. 2. Regional user VO management process

The initial step for user enrolment in Ibergrid VO is to provide sufficient information about activities, applications and resource consumption. To properly guide the user (or the user community representative), NGIs propose a light-weighted application form [5] (available online) to present the scientific problem under study, the application and software dependencies in use, operative details (hardware where the application is normally executed, parallel and latency requirements, operation system, ...) and execution details (storage needs, frequency of runs, requirements on privacy and confidentiality, ...). Through this process, the NGI user support

teams will have a notion of how much resources will this community need, which software and hardware necessities are foreseen, and will redirect the request to the proper VO support and find the experts to integrate the user community activities in the Iberian production infrastructure.

3 REGIONAL USER SUPPORT MODEL

User communities are the main driver for the development of standards. Previous experiences showed that a direct communication channel between users, technological providers and infrastructure operators is a complex link to maintain. The lack of a common taxonomy prevents reaching a fast understanding between the involved parties, delaying the resolution of bugs and technology enhancements. It is in this interface area that NGI user support teams play an important role, receiving, processing, validating and translating user requirements to the proper regional and global bodies. A clear procedure should be in place to optimize all user community requests and to deal with issues exposed by communities.

Figure 3 presents the established model for the Iberian community. It copes with two typical use case scenarios: the submission of issues (e.g. clarification of procedures, middleware support, bugs...) and the submission of requests (support on application porting, resource biding, etc.). The workflow for the two use cases is presented hereafter.

3.1 Submission of Issues

A user, while porting an application and interacting with the infrastructure, may face several issues, and may not know the cause of the problem in advance: either s/he is making an incorrect use of the client middleware tools, or some of the infrastructure services may be unavailable, or s/he could be facing a software bug. To distinguish between the different possibilities for the problem, the following steps are foreseen:

1. The user can report the issue, either by email or via local helpdesk, to the NGI user support shifters. More experienced users may submit the issue directly to the project/global helpdesk if they have clearly identified that the problem solution is outside the regional scope.
2. NGI user support shifters analyze the problem interacting with the user and with NGI user support experts if necessary. The regional support capabilities are well identified [6] so that the expertise to find a solution to a specific problem is easily found. The NGI user support teams will be able to track the source of the problem and redirect it if it is out of their scope. Technological providers, global operations and other NGI staff are reachable via the global project helpdesk.
3. Important operational problems can be brought up for discussion by the NGI user support team on shift, in the weekly Ibergrid operations meeting, where all the regional operation bodies are represented.

3.2 Submission of Requests

As examples of requests, a user may need assistance to port his/her application in the Iberian grid infrastructure. Alternatively, a user community may need more resources to run their applications or store their data. The established workflow to address this kind of request is detailed hereafter:

1. Requests can be issued via email or via local helpdesk. NGI user support experts analyze the request, and involve the user community representatives through the validation process, if further clarifications are needed.
2. If the fulfilment of a user request depends on a third party, the request can be forwarded as an issue, either to regional operations (via email or local helpdesk) or to technological providers or other project bodies (via GGUS).
3. If found relevant, NGI user support experts may add the user request for discussion during the weekly Ibergrid operations meeting

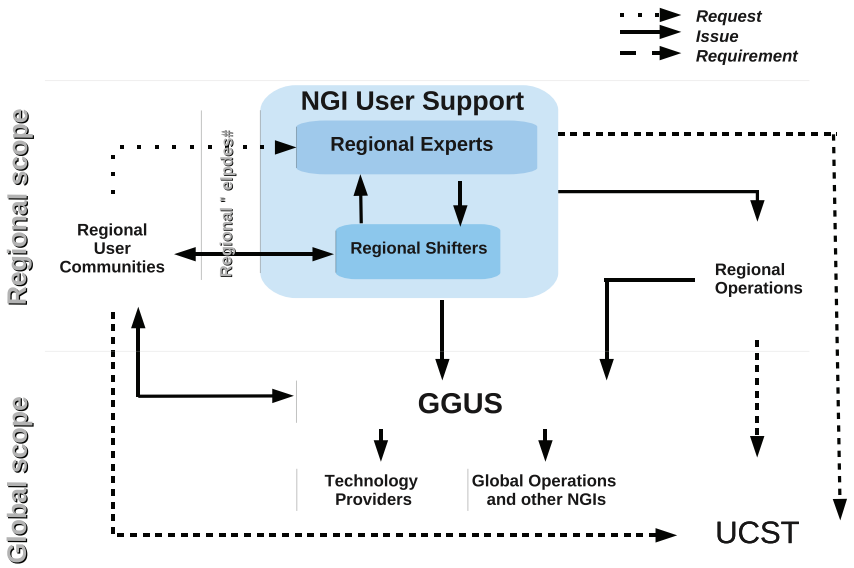

Fig. 3. User support model

3.3 Requirement Gathering Process

When a user request or issue can not be solved due to missing functionalities at the operations or technological level, there is the possibility to transform it in a requirement that can be issued to the User Community Support Team (UCST). Require-

ments from regional bodies can emerge at any stage of the user support model (see Figure 3):

- can be submitted directly by the user community to the UCST
- can be submitted by the NGI user support teams after evaluating regional user community requests and/or issues
- can be submitted by the regional operations staff after evaluating NGI user support request and/or issues.

Several channels [7] are available to communicate requirements to UCST. The preferred way to do so is using the EGI RT [8, 9]. Nevertheless, there are also other mechanisms to submit requirements such as online forms and UCST questionnaires available in EGI major events.

Once UCST has received those requirements, a normalization process follows, checking for correctness and format, and grouping requirements under different categories. The next step is to search for a possible solution involving other members of the `EGI.eu` organization and the EGI-InSPIRE project, user support teams from NGIs and VRCs, to provide solution if they can. The remaining unresolved requirements are prioritized and endorsed by the User Community Board (UCB) to assure that the user communities interests are correctly represented at the Technology Coordination Board (TCB). Once incorporated into the UMD (Unified Middleware Distribution) roadmap, external technology providers develop new enhanced technologies and EGI operators validate and install new tools on the infrastructure.

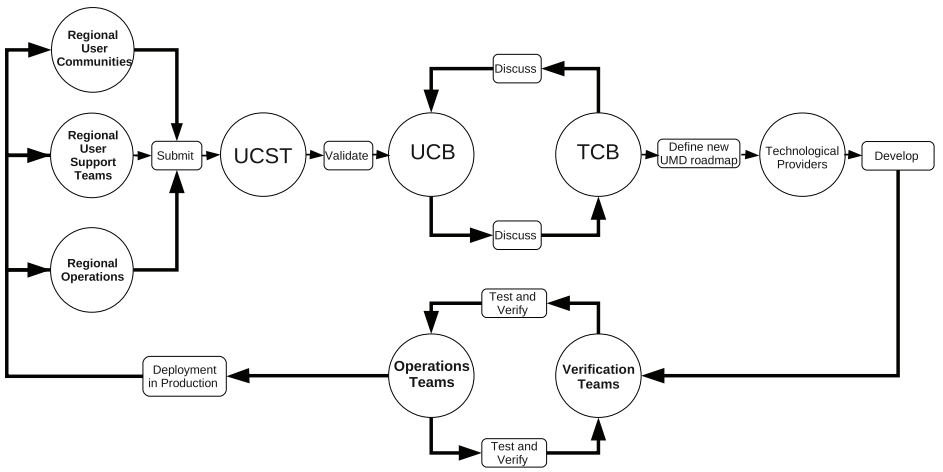

Fig. 4. Regional requirements workflow (from regions to technological providers)

4 REGIONAL TRAINING ACTIVITIES

Once a year, Portuguese and Spanish NGIs organize a major training session attached to the biggest regional event on Distributed Computing Infrastructure – the IBERGRID conference. This is the traditional meeting point for regional DCI users, and we profit from the wide spectrum of users to promote the regional infrastructure and provide tutorial sessions on applications, grid computing and high performance computing. Other user trainings may be scheduled on demand and when regional user communities require. The trainers are recruited among experienced regional staff, and according to the session objectives.

A dedicated VO for tutorials has been set up (`tut.vo.ibergrid.eu`), and Portugal and Spain support worthless Certification Authorities (CAs) which are used in live tutorials running on top of the production infrastructure. The worthless CAs must be installed on the Computing Element, Storage Element and Workernodes sites, to allow the authentication of the users under training. Although not integrated in the international recognized distributions, they are managed with the same mechanims and procedures as the official CAs, in order to minimize any security concerns raised by sites that wish to install them. Nevertheless, the participation in these activities is not mandatory, and sites may be excluded from the training infrastructure, if they wish.

5 SERVICES AND TOOLS

Operating a VO is a complex task that requires an important effort for ensuring a high quality of services. Many tools are available in EGI that rely on the VO information, and sometimes procedures are neither easily available nor complete. LIP and UPV are Ibergrid members that share a common responsibility in EGI (under TNA3.4 VO Services activity [10]) to evaluate and provide access to tools and services aiming to support VOs in the whole process of start-up, management and operation. The activity consists on pointing to documentation and procedural guidelines to maximize the usage of the resources, and/or providing some services to VOs, if necessary. Since two major Ibergrid players are involved in this EGI global task, Ibergrid region could be seen as a nursery for the study and evaluation of VO services. Under this activity, different classes of tools have been evaluated:

- job submission and monitoring oriented tools
- VO infrastructure monitoring oriented tools.

5.1 Job Submission and Monitoring Oriented Tools

The Ibergrid VO Service team has investigated tools and services available within the EGI community that could be adapted by regional VO users. The final goal is to facilitate the access to those tools aiming to foster production quality by the users of regional VOs. Among the evaluated candidates, we propose GANGA [11]

and DIANE [12] as job submission frameworks, and CERN Mini-dashbooards [13] to monitor usage submissions. Relevant information about those tools is aggregated in [14].

5.1.1 GANGA

GANGA aims to be an easy tool for job submission and management. It is built on Python and provides client command tools, a Graphical User Interface (GUI), and a WebGUI. A job in GANGA is constructed from a set of building blocks. All jobs must specify the software to be run (application) and the processing system (backend) to be used. Pragmatically, this means that GANGA can be used to submit jobs to the localhost where it is installed, to a local farm or to a computing grid such as LCG/EGI, as long as the appropriate clients command tools are available to GANGA. Among its valuable key features we give emphasis to its easy installation, how it could be easily extended to several middlewares, its easy command line tools (if you are used to Python) and an easy GUI with the capacity to re-use jobs and job templates. GANGA is a valuable tool aiming to decrease the steep learning curve slope of newly registered users using the infrastructure. It could be installed by the user him/herself, provided as a service by the site administrator to all the VOs supported or even provided as a service by the VO to all the VO users. This last approach is better if the VO would like to enable job monitoring frameworks to assess, at each period in time, their users job production rate. GANGA is presently used by ATLAS and LHCb users among other collaborations.

5.1.2 DIANE

DIANE is a lightweight job execution control framework for parallel scientific applications aiming to improve the reliability and efficiency of job execution by providing automatic load balancing, fine-grained scheduling and failure recovery. The backbone of DIANE communication model is based on master-worker architecture. This approach is also known as agent-based computing or pilot jobs in which a set of worker agents controls the resources. The resource allocation is independent from the application execution control and therefore may be easily adapted to various use cases. DIANE uses the GANGA to allocate resources by sending worker agent jobs, hence the system supports a large number of computing backends: LSF, PBS, SGE, Condor, LCG/EGI Grid. Among its major key features, we emphasize its easy installation and the possibility to increase reliability and success rate for job management. DIANE is a proper tool for VOs which need to send large production runs with high success rates. If a VO wants to monitor its production activity, it is better that the VO offers this tool as a service to its users.

5.1.3 Mini-Dashboards

The Mini-Dashboards are part of the introductory package offered by CERN to EGI users. It provides a framework to monitor GANGA and DIANE jobs consisting

of a web-based interface where users may easily keep track of their jobs. It runs a MySQL DB at the backend and implements the same web interface technologies as the dashboards implemented for HEP communities. With some customization it should be possible to offer an aggregated graphical view of individual usage at a given time.

5.2 VO Infrastructure Oriented Tools

The EGI operations model forces that each NGI must deploy and operate their own Service Availability Monitoring (SAM) system to monitor the fraction of the EGI production infrastructure under their scope. The SAM instance triggers the execution of probes in grid sites to fully exercise job and data oriented activities, and raise critical operational alarms in case of failures. The problem is that it is not extensible to the monitoring of other VOs different from the operations one. Moreover, monitoring seems constrained to NGI regions.

Ibergrid members have developed a customized recipe so that SAM can be used to monitor resources under the scope of a VO, or multiple VOs [15] (see Figure 5). The benefit of the service is clear since VO representatives and users will have an automatic way to check how available and reliable their infrastructure is. In order to accomplish this multi-VO monitoring role, the SAM service was adapted in the following way:

- The topology generation was changed so that resources to be tested are properly configured. The difference with respect to the service used in operations is that VO resources may not be restricted to a single region, and may be spread along the whole EGI infrastructure.
- The services which interoperate with the SAM services (the WMS which is used to submit jobs, default SRM used to replicate files, ...) have to be properly set up to support the relevant VOs.

This experience has been documented so that VRCs (or VOs associated to a VRC) could assume the operation of the service and customize it according to their own needs. One of the clear advantages of a VO installing and deploying their dedicated SAM is that the VO can then develop and integrate their own probes. While EGI operation teams test and monitor the status of resources through generic tests, they can be considered insufficient for certain communities. This approach allows those communities to define custom test suites and to insert them in their SAM system. Presently, the service does not allow an easy integration of VO specific probes since this would imply the definition of a new customized profile for VO. However, after Ibergrid experience, SAM developers have agreed to insert a generic VO profile in future releases that could be further enhanced by different VOs.

In case the VO is unable to provide their own instances of those services, the Ibergrid partners may offer a VO SAM as a service on a temporary basis. The scalability of the service (How many VOs? How many sites? How many resources?

How many probes?) is still under study in order to understand the VO SAM limits so that it continues to deliver a reliable and performant service. Ibergrid regional VOs are already being monitored through a dedicated VO SAM, and its input will be used by the regional NGI user support shifters to start trouble tickets on critical sites.

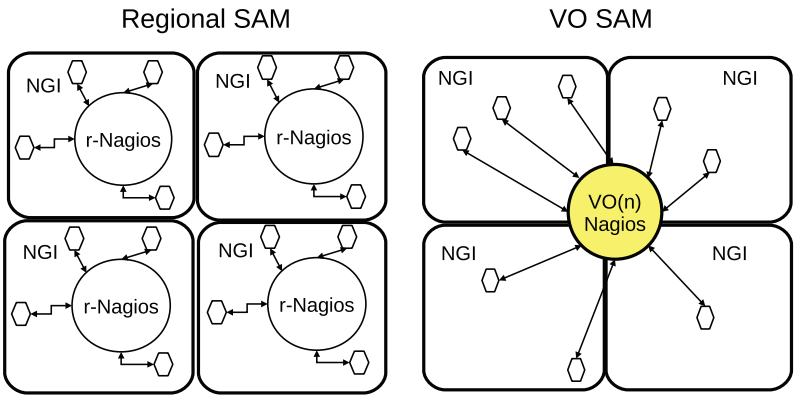

Fig. 5. Evolution from a regional SAM to a VO SAM

6 CONCLUSIONS

After the first year integrated in EGI operations, Portuguese and Spanish NGIs have extended their close operation relationships also to the user support area. User enrolment procedures are currently in place mapping regional user communities to a flexible scientific VO hierarchic schema enabling collaboration at national and/or international level. The user support model serving Portuguese and Spanish user is prepared to handle regional issues and requests, and to forward problems with a well located source outside of the Iberian region. A training infrastructure is in place for user and site administrator tutorials. Finally, Ibergrid region is profiting from the fact that two of its major members contributing to the VO Services global tasks, and has become a nursery for the services and tools found useful for Ibergrid VOs.

Acknowledgments

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