

An Approach for Intra-VO Differentiation of Computing Services in Grid Systems

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The Problem

In current production-quality Grid systems, users belonging to the same Virtual Organization (VO) have typically the same opportunity to access the available resources on a First-In-First-Out (FIFO) approach.

Why it is a Problem

This fact represents an obstacle to the intra-VO fair share of resources, especially for those VO's having a huge number of members classified in many groups/roles.

Our Proposal

We propose an approach for differentiating the access to computing resources among users of the same VO. This approach has been developed in the context of the gLite middleware. Our approach grounds on a **rigorous definition of service classes** in terms of characterizing attributes that describe different quality of service levels other than the best effort.

The important constraint is that jobs submitted to the same computing facility under the same service class must follow a FIFO approach in order to enable some degree of prediction.

Once the service classes are defined and configured at each resource provider, users part of the same VO, but with different credentials regarding their group or role membership can be assigned to different service classes, thus enabling a differentiation of the access to resources of a VO.

This approach requires also mechanisms that enable a VO manager to dynamically change how the VO users are assigned to the different service classes.

Prototype

Our prototype has been setup and is running in the INFN-Grid [3], part of the EGEE infrastructure [1]. The production services were enriched with G-PBox [2], a distributed policy framework relying on XACML for policy definition.

By means of this component, the VO managers can define mapping policies that assign a set of Grid credentials to a certain set of instances of service classes.

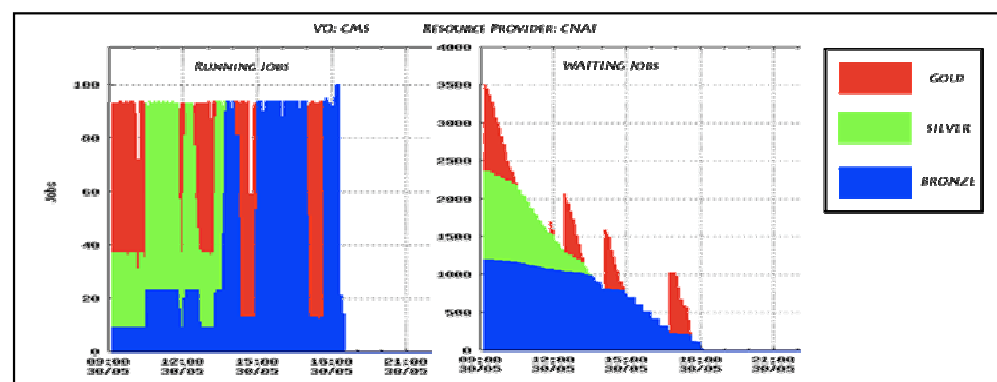
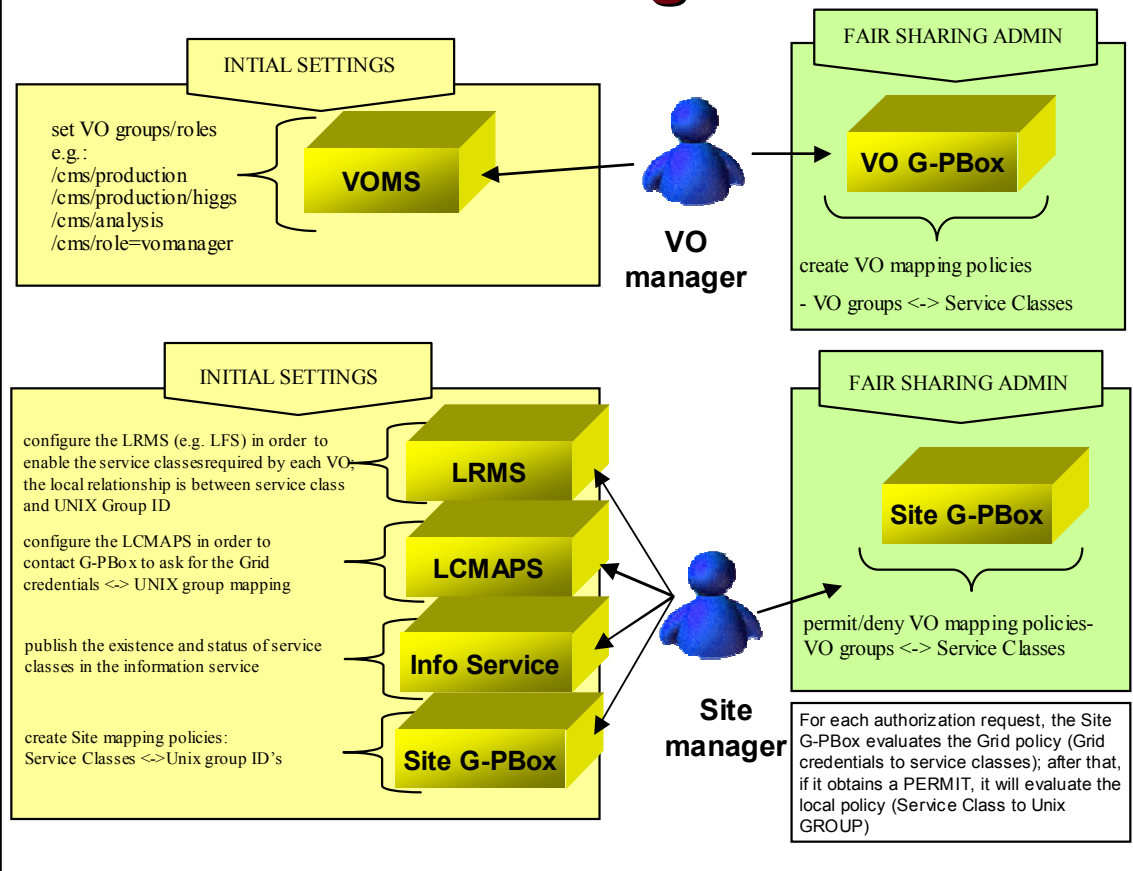
When a job is submitted to a site, the authentication and authorization layer queries the distributed policy framework by passing the Grid credentials of the user (Grid identity and VO membership information). The authorization framework will evaluate which is the service class to which the user should be mapped (using VO policies) and upon a valid mapping, it will return the local UNIX Group ID using the Site policies.

Other components that needed to be adapted in order to interact with G-PBox are: the Workload Management System (WMS), the Site identity mapping service (LCMAPS), and the GLUE Schema [4] for Service Classes representation in the information service.

Contract Service Class Specification	
VO Name: _____	Resource Provider Name: _____
Service Class Name: _____	
Guaranteed Share <input type="checkbox"/>	Optional <input type="checkbox"/>
RelativeShare: _____	MaxRunJobs: _____
TimePeriod: _____	MaxWaitJobs: _____
Best Effort <input type="checkbox"/>	SpecINTxTime: _____
Express <input type="checkbox"/>	...: _____
MaxRunJobs: _____	
RelativePrio: _____	

VO Service Model Example	
VO Name: CMS	Resource Provider Name: CNAF
Service Class Model: Olympic	
Service Class Name: Gold	RelativeShare: 60
Service Class Name: Silver	RelativeShare: 20
Service Class Name: Bronze	RelativeShare: 10

VO and Site Managers Actions



Benefits

Our approach enables a contract-based intra-VO computing resources differentiation. By means of the proposed solution, we showed that a VO manager can dynamically change the mapping of different groups of users to different service classes without intervention at the sites.

References

- [1] Laure E et Al.. Programming the Grid with gLite. EGEE Technical Report EGEE-TR-2006-001.
- [2] G-PBox Website: <http://gpbox.forge.cnaf.infn.it>
- [3] INFN-Grid. <http://grid.infn.it>
- [4] GLUE Schema. <http://glueschema.forge.cnaf.infn.it>