

# BazaarSAT: SLA Translated to LRMS Configuration

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## 1. Introduction

Research teams are currently becoming more organized as research they conduct becomes more and more planned activity. Computational part of research activity should be predictable to fit into overall plan. That is why resources allocation to users understood as managing capacity of available resources is preferred over idea of just sharing a pool of resources on best effort basis.

In PL-Grid infrastructure a customer is empowered to negotiate Service Level Agreement (SLA) with a resource provider [2] that describes in details limitations and guaranties applied to computational resources. Those SLAs, stored in the Bazaar system, when becomes active usually triggers a change in the configuration of the resources. In this paper we describe Bazaar Site Admin Toolkit (BazaarSAT) - a set of tools that enable automatic reconfiguration of resources based on site admin policies applied to currently active SLAs.

## 2. Description of a problem solution

Facing the challenge of based on SLAs automatic cluster configuration requires intervention in at least two components: first is a process of accepting compute jobs, and second is scheduler configuration.

In the process of accepting jobs the tool focuses on two goals:

1. supplement job description with missing parameters that are established in the SLA; this may include to add default SLA identity (SLA ID);
2. verify acceptance criteria established in SLA including validity of SLA ID given, authorization of a user to submit a job with a given SLA ID, limits of jobs parameters such as wall-time or memory-required; in case of verification criteria are not met the job is refused.

To face this, the actual configuration of SLAs must be transferred to the site, in a form of computer-readable specification, like XML. Then the logic must be implemented and run early in the process of job submission. In many resource brokering system such extensions are possible in the form of submit filter or plug-in that filter jobs.

When the job is accepted, a cluster scheduler system must be instructed on how to prioritize the jobs assigned to specific SLA. Archiving this require translating definite SLA metrics into relational priorities and other system parameters like fair-share, that is used to define scheduling policy on the cluster. It is crucial to retain flexibility at this stage, as the way to set this values is the core of site management art. At any case, automation should not deprive site manager of control of the scheduling. Therefore, we implemented a tool translating SLAs according to rules and parameterization expressing site policy into configuration of scheduler. Using this tool many parameters such as fair-share and priorities and various limits can be controlled according to parameters of applied SLA.

### 3. Results

As a result of this work, we have implemented a toolkit that covers majority of the aspects needed to enable or disable an SLA on sites. At the same time site managers retain full control of site configuration and their ability to intervene is not restricted by enabling BazaarSAT.

BazaarSAT implementation was done to support PBS-Pro [3] resources broker and Moab scheduler [4]. Due to different configuration details, supporting other resource brokers and schedulers require some adaptation. Currently released version is running in production mode on Zeus Cluster at ACC Cyfronet AGH [5].

Automation done in the configuration enable more fine-grained control on resources without overhead of manual configuration. In other words, configuration of a site might be adapted to specific user-group based on SLA which can be detailed if needed. Before, typical approach was to make users fit into some of pre-defined queues or service-levels. Progress achieved by this work makes cluster computing closer to the vision of per-purpose, on-demand computing.

### 4. Conclusions and future work

Solution of automatic reconfiguration of a cluster, delivered by BazaarSAT, is an important element of fully SLA-aware operation in PL-Grid. Automation enables possibility for more fine-grained SLAs without additional administration overhead. Site managers can focus on decision making and tuning site policy. Additionally, this solution allows for different mode of operation depending on daytime, weekends, etc.

### References

1. PL-Grid Infrastructure official web-site: <http://plgrid.pl>
2. T.Szepieniec, M. Tomanek, M. Radecki, M. Szopa, M. Bubak: Implementation of Service Level Management in PL-Grid, in M. Bubak, T. Szepieniec, PL-Grid: Building a National Distributed e-Infrastructure. Springer 2012.
3. PBS Professional: <http://www.pbsworks.com/Product.aspx?id=1>
4. AdaptiveComputing HPC products web-page: <http://www.adaptivecomputing.com/products/hpc-products/>
5. ACC Cyfronet AGH Zeus Cluster web-site, <https://kdm.cyfronet.pl/portal/Zeus>