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Next Steps in the Evolution of GridICE: a Monitoring Tool for Grid Systems

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Abstract. GridICE is a monitoring tool for Grid systems that support the operations and management activities of different types of users: site administrators, VO managers, Grid operators and end-users. The tool is designed to deal with the dynamics, diversity and geographical distribution of the observed resources. It is continuously evolved driven by user requirements. The purpose of this paper is to disseminate the evolution strategy in order to solicit for a community feedback.

1. Introduction

GridICE [1, 2] is an open source distributed monitoring tool for Grid systems that is integrated in the gLite middleware and provides continuous monitoring of the EGEE infrastructure. The project was started in late 2002 within the EU-DataTAG project and is evolving in the context of EU-EGEE and related projects.

The main goals of GridICE are: to provide both summary and detailed view of the status and availability of Grid resource, to highlight a number of pre-defined fault situations and to present usage information.

In this document, we present the next steps in the GridICE development as driven by user requirements. The purpose is to disseminate our evolution strategy in order to solicit for a community feedback.

2. 3-layer Data Distribution Architecture

GridICE consists of three main components (see Figure 1). The sensors, performing the measurement process on the monitored entities; the site collector aggregating the information produced by the different sensors installed within a site domain for the publication using the Grid Information Service; the server performing several functions: (1) discovery of new available resources to be monitored; (2) periodical observation of the information published by the sites; (3) storage of the observed information in a relational database; (4) presentation of the collected information by means of HTML pages, XML documents and charts; they can be accessed by
end-users or consumed by other automated tools; (5) processing of the information in order to identify malfunctions and send the appropriate notifications to the subscribed users.

A key design choice of GridICE is that all monitoring information should be distributed outside each site using the Grid Information Service interface. In gLite [3], this service is based on the Lightweight Directory Access Protocol.

3. Available Measurements
GridICE collects observations for a large set of measurements. The core set of measurements is the GLUE Schema in its version 1.2 [4]. The information providers for the GLUE-related information are already part of the standard gLite middleware and the measured values are exposed by the gLite Information Service.

GridICE relies on this core of measurements and extend it in a number of areas: (1) rich job description (name, local identifier, Grid identifier, local user, VO of submitting user, queue, creation time, start time, end time, status, CPU usage, wall-time, main memory usage, virtual memory usage, execution host, batch system exit status, user DN, VOMS attributes of the user); (2) detailed host monitoring; (3) process monitoring, critical processes are monitored depending on the role of each machine (example parameters are process name, POSIX status, number of instances, start time-stamp for first instance, start time-stamp for last instance, CPU, memory and time usage); and (4) aggregated information for computing resources (the number of the available CPUs accessible by Grid jobs; the used and the off-line ones; the average farm load; the total, available and used memory; the running and waiting job).

4. The Presentation Layer
The Web presentation of GridICE relies on an XML abstraction built on top of the data stored in a relational database part of the GridICE server. The XML documents are transformed into HTML pages via XSLT transformations. A rich set of charts is also available.

The design of the presentation is based on requirements from Grid operators, VO managers, Site administrators and End-users. For Grid operators, summary views about aspects such as information resources status, services and host status are provided. Site administrators can appreciate the job monitoring capability showing the status and computing activity of the jobs.
accepted in the managed resources. VO managers and End-users can rely on GridICE to verify the available resources and their status before starting the submission of a huge number of jobs and, after the submission, to follow the jobs execution. Grid operators and site administrators also rely on the notification capability to drive their attention towards emerging problems.

In Figure 2, it is possible to observe the summary information for the site view, where, for each site of the monitored infrastructure, aggregate information about computing and storage resources are provided.

In Figure 3, it is possible to observe one of the many charts that can be dynamically generated by GridICE; the provided one shows the number of computing hours provided by each site.

**Figure 2.** Site View - Summary Information

**Figure 3.** Computing Hours per Site

5. Next Steps
GridICE is continuously evolved in order to meet user requirements. In the next months, the effort will concentrate in a number of aspects that can be classified in three categories: consolidation, development of new features, and integration. The overall activity is targeted at progressing beyond the results presented in [5].

In the consolidation category, we need to improve the reliability and stability of the job monitoring sensor in large farms such as Tier 1. Another relevant aspect is the continuation of a data quality auditing starting from the validation of the measurement process and moving in the several stages of the distribution chain. The last activity in this category is the improvement
of server performance by analyzing query plans for most resource consuming queries, by tuning PostgreSQL configuration, and by adding tables with periodically aggregated values.

In the area of development of new features, we include the improvement of the notification system to aggregate events happened in the same time period to be sent in a single message; to extend the job monitoring sensor in order to observe local jobs (job submitted without using the Grid layer) and to extract the user VO and group from the proxy certificate; to extend the Web interface with a server status page for diagnostic of server status. Finally, we plan to add new format for the sensor output according to the syntax defined by the WLCG monitoring Working Group.

In the area of integration, we need to adopt the new LCG (LHC Computing Grid) GOCC (Grid Operation Center) Database API in order to collect information on scheduled downtime for resources. We need also to provide a new server release that smoothly installs on Scientific Linux 4 via RPM. This will be issued together with an administrator guide for the server.

6. Conclusion
In this paper, we have presented the next evolution of GridICE, a monitoring tool for Grid systems. After a brief introduction, we have described the future steps classified in three categories: consolidation, development of new features and integration. The selection of these activities was based on user requirements and feedback. The goal is to evolve and consolidate the GridICE monitoring tool.

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