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## **Migrating Desktop - graphical front-end to grid - On-line Demonstration**

*Wednesday, 1 March 2006 18:30 (20 minutes)*

Demo description:

Demo will show following features and functionality:

- graphical user environment for job submission, monitoring and other grid operations
- running applications from different disciplines and communities
- running within MD platform batch and MPI applications
- running sequential and interactive applications

Two applications had been selected to present MD framework and mentioned above features: parallel ANN training application, MAGIC Monte Carlo Simulation

Parallel ANN training application - Interactive application from CrossGrid  
-(description of usecase in technical background section)

This application is used to train an Artificial Neural Network (ANN) using simulated data for the DELPHI experiment. The ANN is trained to distinguish between signal (Higgs boson) events and background event (in the demo the background used includes WW and QCD events). The evolution of the training can be monitored using the

MD with a graphics presenting current error, and 4 small graphics that show the ANN value vs. an event variable (that can be selected by the user). The application is compiled with MPICH-P4 for intracluster use and with MPICH-G2 for intercluster use. This application uses the interactive input channel to let the user make a clean stop

of the training (instead of killing the job), and also the possibility of resetting the ANN weights to random values, to avoid local minima.

MAGIC Monte Carlo Simulation

The MAGIC Monte Carlo Simulation (MMCS) is one of the generic applications within EGEE. As the simulation of extensive air showers initiated by high energetic cosmic rays is very compute intensive, the MAGIC collaboration -together with Grid resource centers from the EGEE project - migrate the MMCS application within the last years to the EGEE infrastructure to speed up the production of the simulations. To get enough statistics for a physics analysis, many jobs with the same

input parameters but different random numbers needs to be submitted. The submission tools from the MAGIC Grid are integrated in the Migrating Desktop and its underlying infrastructure. Therefore all services and features of the Migrating Desktop like Job

Monitoring, Data management, etc. can be used by members of the MAGIC virtual organization.

Platform and services

Testbed:

- EGEE production, GILDA and CrossGrid testbed

Applications:

- MAGIC application running on EGEE,
- ANN interactive application running on CrossGrid testbed

#### Services:

- usage of following EGEE services:
- WMS: RB, LB, CE
- Data Management: SE, LCG-UTILS (Replica Manager)
- Information Index
- usage of following CrossGrid testbed services
- WMS: RB, LB, CE
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#### Technical background:

A number of Grid middleware projects are working on user interfaces for interaction with grid applications, however due to the dynamic and complex nature of the Grid, it's not easy to attract new users like ordinary scientists. To solve this problem

we

introduce the concept of Migrating Desktop which is a graphical, user oriented tool that simplifies the use of the grid technology in the application area.

The Migrating Desktop (MD) is an advanced graphical user interface and a set of tools combined with user-friendly outlook, similar to window based operating systems. It hides the complexity of the grid middleware and allows to access grid resources in an

easy and transparent way with special focus on interactive and parallel grid applications. These applications are both compute- and data-intensive and are characterised by the interaction with a person in a processing loop. MD can attract new users by its features: easy to use, platform independent, available everywhere, enables possibility to easily add new application that can be batch or interactive, sequential or parallel. Thanks to its open architecture it can easily integrate existing or incoming tools that for example supports grid operations or enables collaborative work.

This research refers to three different grid projects: EU BalticGrid project, EU CrossGrid project, and Progress (co-founded by Sun Microsystems and the Polish State Committee for Scientific Research). As a key product of CrossGrid project, Migrating Desktop has proved its usefulness in everyday work of users community.

#### Technical background

##### Platform overview

The aim of the Migrating Desktop is to provide scientists with a framework which hides the details of most Grid services and allows working with grid application in an easy and transparent way. The graphical user interface integrates and makes use of

number of middleware and integrates the individual tools into a single product providing a complete grid front-end. It is built on base of a mechanism for discovering, integrating, and running modules called bundles based on the OSGi specification. When the MD is launched, the users can work with environment composed of the set of bundles. Usually a small tool is written as a single bundle, whereas a complex tool has its functionality split across several bundles. A bundle is the smallest unit of our platform that can be developed and delivered separately. Such approach allows increasing functionality in an easy way without the need of architecture changes.

The Migrating Desktop framework allows the user to access transparently the Grid resources, run sequential or interactive, batch or MPI applications, monitoring and visualization, and manage data files. MD provides a front-end framework for embedding

some of the application mechanisms and interfaces, and allows the user to have virtual access to Grid resources from other computational nodes.

The MD is a front end to The Roaming Access Server (RAS), which intermediates to communication with different grid middleware and applications. The Roaming Access Server offers a well-defined set of web-services that can be used as an interface for

accessing HPC systems and services (based on various technologies) in a common and standardised way. All communication bases on web services technology.

Our platform can work with different grid testbeds: based on LCG 2.3/2.4, LCG 2.6,

Progress 1.0. Due to its open system nature it can be easily ported to support other testbeds.

#### Applications use cases

##### MAGIC Monte Carlo Simulation

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last years to the EGEE infrastructure to speed up the production of the simulations.

The simulation of the air showers requires the most computing time, e.g. a request for a Monte Carlo sample of 1.0 million gamma-events would need around 1500 computing

hours on a standard CPU (2MHz PentiumIV). This can be speeded up by using many resources by parallelizing the application, if possible. Therefore the simulation of a Monte Carlo sample is split in subjobs of 1000 events to run in parallel on distributed Grid resources. The resulting 1000 data files are transferred and stored on a dedicated Grid storage center automatically when a subjob is finished. When all files are available, a program merges them to one single file that is processed by the next program of the Monte Carlo workflow.

To track and manage the big number of jobs, a meta database containing information about single jobs, their status and available data was set up. The metadata are stored in a separate relational database combining information from the Grid domain with data needed by MAGIC scientists. A Grid user requests a given number of Monte Carlo events by writing this into the meta database, while a daemon process regularly

submits smaller bunches of subjobs to the Grid resources. The current implementation of the MMCS system does not require any additional software installation on Grid resources.

The submission tools from the MAGIC Grid are integrated in the Migrating Desktop and its underlying infrastructure. Therefore all services and features of the Migrating Desktop like Job Monitoring, Data management, etc. can be used by members of the MAGIC virtual organization.

##### Interactive Application (CrossGrid) –Parallel ANN training application.

The user launches the ANN job wizard from the MD Job Wizard menu or from an already existing job shortcut. After filling all the necessary parameters in Job Wizard the user submits the job. Once it is running the ANN plugin can be launched. In the plugin the user can see a panel with four graphics representing the value of the ANN for a subset of the training events (signal events in green and background events in red) vs. several variables of the events. The user can change the selected variables using the combo list at the bottom of the plugin window. At the right side the user can see the graphic representing the evolution of the ANN training error vs the training epoch. The plugin also includes three options: “reset weights” that resets the values of the ANN weights to random, “Stop application” - the program goes out of the training loop stopping the training and “Exit” for closing the plugin window. The user after the error is more or less in a plateau should press the “Reset weights” button and observe the error evolution. Afterwards, if necessary to finish the demo the user can press the “Stop Application” button.

##### Used technology

The Migrating Desktop bases on the Java applet technology. It can be launched using the Java Webstart technology or using a web browser with the appropriate Java Plug-in

included in the Java Runtime Environment (JRE). We are basing on Swing libraries for

designing graphical user interface, the Java CoG Kit version 1.2 is being used as an interface to Globus (for operation on proxy and GridFTP/FTP) functionality and Axis ver.1.1 web services client for communication with the Roaming Access Server. Migrating Desktop follows OSGi Service Platform specification version 4 (August 2005) and is based on the same plugin engine as Eclipse platform. Currently RAS for cooperation with EGEE infrastructure is using LCG2.6 platform but it is

foreseen to move to gLite.

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