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GridLab - A Grid Application Toolkit and Testbed

## Production testbed

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Author(s):	Luděk Matyska, Miroslav Ruda, Martin Kuba, Petr Holub
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**Abstract:** This document provides basic information about the production phase of the project testbed.



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## 1 Overview

This document describes the GridLab testbed environment in its production phase. It is an evolution of the Deliverable 5.2 *Prototype testbed*. It summarizes current testbed status together with changes and differences from the prototype.

All the information about the GridLab testbed environment, including step by step description of adding a new node into the testbed, can be found on the GridLab testbed web pages (<http://www.gridlab.org/WorkPackages/wp-5/testbed.html>).

### 1.1 GridLab Testbed Purpose

The GridLab testbed purpose has not changed since the prototype. It provides a stable and reliable Grid environment for the *development* of GAT and various Grid Services. *Proof of concept* production runs are also anticipated on this testbed.

While called “production” testbed, it is not meant to be used for long production runs— instead it is the production-level stability and quality that we are achieving.

### 1.2 GridLab Testbed Availability

The GridLab testbed is fully available (without any specific restrictions) for all the GridLab project participants. New users are added by the GridLab Testbed Operation Centre (GTOC), established in Brno, at the Masaryk University. However, as there are GridLab testbed resources not associated with any particular project member (e. g., the Hitachi machine in Munich), people outside the GridLab project can also use the testbed to some extent. The access to the GridLab testbed is formally approved by GridLab project Steering Committee.

## 2 Security and Accounts

Grid Security Infrastructure (GSI) is used as the only security infrastructure for the GridLab testbed. It is widely accepted by many Grids and provides framework for authentication (public key cryptography and X.509 certificates) and for secure communication (using Secure Sockets Layer, SSL, communication protocol). All the services used and developed by the GridLab are GSI enabled.

X.509 certificate used to authenticate a Grid entity needs to be signed by some certification Authority (CA). Though any site has a right to accept or reject any particular CA, all the GridLab testbed nodes agreed to accept following list of generally accepted CAs:

- DataGrid CAs,
- CrossGrid CAs,
- NCSA,
- US Department of Defense,
- UK e-Science,
- a special purpose-build GridLab CA, which covers cases where other CAs are not usable or available.

Up-to-date version of the list of trusted CAs is maintained on the GridLab testbed web pages.

### 2.1 User Accounts

An access to the individual computing nodes requires use of local accounts. The Grid-wide user identity is provided by certificates, whose subjects are mapped to local login names via a `grid-mapfile` on each local resource. The user information is maintained by the GTOC in a database, which is used to generate master `grid-mapfile` used by all GridLab sites.

Currently, users related to the Gridlab are accepted by all sites. User certificate maps to a user local account (if available), otherwise a specific local login name is created having form `glabXXX` (i.e., `glab001`, `glab002` etc). This differs from what was envisioned for testbed prototype (`gridlabXXX`) since login name length is restricted to 8 characters on some platforms. The dynamic account sharing mentioned in the GridLab testbed prototype description has not been fully developed yet.

GTOC maintains a master `grid-mapfile` which is downloadable from testbed web pages. All site administrators are notified whenever a change in this file occurs. We allow existence of multiple user certificates signed by different CAs. All certificates of one person (provided in master `grid-mapfile`) are mapped to the same local account.

## 3 Information Service

Information services are represented by MDS (Monitoring and Discovery Service) version 2.2, extended by WorkPackage 10 to support additional data. The information available via Information Service can be divided into following groups:

- *Basic information on machines* including information on hardware configuration, job scheduling systems information etc. This is provided by default Globus GRIS providers.

- *Extended information on machines and sites* including information about firewalls, software, running services, and grid services. This is provided by the WP-10 GRIS providers from a database which is modifiable via GSI-secured web service.
- *Extended information on users and CA* which is read directly from the host configuration by WP-10 GRIS providers.

## 4 Required Software on Nodes

There is a list of software required on all testbed machines available in “Rules for software installed on GridLab testbed” guide available at <http://www.gridlab.org/WorkPackages/wp-5/documents/software.pdf>.

To provide uniform environment settings, each site provides a configuration file located at the agreed location `/etc/gridlab.conf`. This file contains specification of locations of all required software. Each submitted job is expected to read this file to get the uniform environment.

## 5 Accounting

The current GridLab testbed version does not deploy any GridLab related accounting system. It is assumed that each site runs its own local accounting system, which is capable of reporting basic accounting information (CPU time and probably wall clock time as well) about completed jobs.

## 6 Testbed Management

GTOC is responsible for maintaining basic services for the GridLab testbed. They include:

- GIIS (Grid Index Information Service) server
- testbed user database and master `grid-mapfile`
- testbed status monitoring
- testbed status webservice
- GridLab CA

The testbed management relies heavily on information provided by the status monitoring. While any failure or unexpected event is sent both to the GTOC and to the appropriate local administrator, the GTOC is responsible for problem tracking and eventual problem escalation in case the local administrators do not act. The current state of the testbed status is described in Deliverable D5.6: Prototype Tool. Both node-associated and general services are being monitored by the status monitoring system.

The testbed status webservice makes results of status monitoring available as a grid service. The service is used by GRMS (Grid Resource Management System) to obtain more accurate information about resources status compared to what is available in information services.

### 6.1 Testbed versions

In order to have compatible middleware installed at all sites, deployment of new software versions is coordinated by the testbed group (WP-5).

## 7 Testbed composition

Currently, the testbed does contain the following machines:

- skirit.ics.muni.cz (MU, Brno, Czech Republic)
- fs0.das2.cs.vu.nl (VU, Amsterdam, The Netherlands)
- origin.aei.mpg.de (AEI, Golm/Potsdam, Germany)
- sr8000.lrz-muenchen.de (Leibniz-Rechenzentrum (LRZ), Munich, Germany)
- hitcross.lrz-muenchen.de (Leibniz-Rechenzentrum (LRZ), Munich, Germany)
- litchi.zib.de (ZIB, Berlin, Germany)
- onyx3.zib.de (ZIB, Berlin, Germany)
- grape.man.poznan.pl (PSNC, Poznan, Poland)
- rage1.man.poznan.pl (PSNC, Poznan, Poland)
- eltoro.pcz.pl (IMI, Politechnika Czestochowska, Czestochowa, Poland)
- n0.hpcc.sztaki.hu (SZTAKI, Budapest, Hungary)
- bouscat.cs.cf.ac.uk (Cardiff University, Cardiff, Wales)
- inca.cs.cf.ac.uk (Cardiff University, Cardiff, Wales)
- gridentry.uni-paderborn.de (PC, Paderborn, Germany)
- sierra0.unile.it (ISUFI/HPCC, Lecce, Italy)
- mike4.lsu.edu (LSU, Baton Rouge, Louisiana , USA)
- pclab120.telecom.ece.ntua.gr (NTUA, Athens, Greece)

As easily seen from this list, practically all the project members provide resources to the testbed.

### 7.1 Available services

The testbed status monitoring currently checks for the state of the following services

- services which must be provided by each node:
  - GIIS - registration into the main Grid Index Information Service
  - GRIS - Grid Resource Information Service from Globus
  - GridFTP - grid-enabled GSI-secured FTP server from Globus
  - Gatekeeper - job submission service from Globus
  - GSISsh - GSI-secured shell for remote command-line access
  - jobmanagers - all types of job management systems provided by each node
  - extensions to GRIS developed by WorkPackage-10
  - webservice for writing into GRIS developed by WorkPackage-10

- Mercury - GMA-compliant monitoring system developed by WorkPackage-11
- GRMS - Grid Resource Management System developed by WorkPackage-9
- CAs - all required Certificate Authorities' certificates installed
- required software - as defined in `/etc/gridlab.conf`
- grid-mapfile - all testbed users have an account
- mpicc - MPI (Message Passing Interface) C compiler
- MPI-C - programs compiled with mpicc can be really submitted as jobs
- mpif77 - MPI Fortran compiler
- MPI-F77 - programs compiled with mpif77 can really be submitted as jobs
- web services with one instance per testbed
  - Grid Resource Management System service - developed by WP-9
  - Adaptive service - developed by WP-7
  - Data Movement service - developed by WP-8
  - Data Browsing service - developed by WP-8
  - Replica Catalog - developed by WP-8
  - Metadata service - developed by WP-8
  - Authorization service - developed by WP-7
  - Message Box service - developed by WP-12
  - Testbed Status service - developed by WP-5

## 8 Conclusions

The current production GridLab testbed is fully operational and available for the GAT development and testing. The extensive Grid status monitoring takes care of identification of any node or service failure and simple notification of GTOC and appropriate local administrator triggers a repair. The production-level is not achieved by zero node/service failure rate, but by reliable failure detection—even the production-level Grid must not expect zero failure rate.