The EU DataGrid Testbed

The European DataGrid Project Team

http://www.eu-datagrid.org
Contents

- User’s Perspective of the Grid
- Grid Services
- Hardware Components of an EDG Testbed
- Code distribution policy
A 3 Tier Business Architecture

Client

User Interface

Application Server

Computing Services (Computing Element)
Storage Services (Storage Element)

Data Server

Worker Nodes
Data Servers
Network

On the EDG:
Situation on a Grid
Information Services

- **Hardware:**
  - EDG Information Service
  - Information Providers

- **Data:**
  - Replica Location Service

- **Software & Services:**
  - EDG Grid Services:
    - Information Service
  - Application Services:
    - Currently only EDG applications directly supported

Machine Types:

- Information Service (IS)
- Replica Catalog (RC)
Situation on a Grid Cont’d
Main EDG Grid Services

- Authentication & Authorization
- Job submission service
  - Resource Broker
- Replica Management
  - EDG-Replica-Manager
  - Replica Location Service
  - (Mass storage system support)
- Logging & Bookkeeping
EDG Logical Machine Types

- **User Interface (UI)**
- **Information Service (IS)**
- **Computing Element (CE)**
  - Frontend Node
  - Worker Nodes (WN)
- **Storage Element (SE)**
- **Replica Catalog (RC)**
- **Resource Broker (RB)**
# Services per Machine Type

<table>
<thead>
<tr>
<th>Deamon</th>
<th>UI</th>
<th>IS</th>
<th>CE (frontend)</th>
<th>WN</th>
<th>SE</th>
<th>RC</th>
<th>RB</th>
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<tbody>
<tr>
<td>Globus Gatekeeper</td>
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<td>-</td>
<td>✓</td>
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<tr>
<td>Replica Catalog</td>
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<td>-</td>
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<tr>
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<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td>-</td>
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<td>✓</td>
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<td>Job submission</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
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<tr>
<td>Information Index</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Logging &amp; Bookkeeping</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
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<tr>
<td>Local Logger</td>
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<td>-</td>
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<td>✓</td>
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<tr>
<td>Grid mapfile Update</td>
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<tr>
<td>sshd</td>
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</table>
A Simple Testbed Configuration

Storage Element 1

Storage Element 2

Computing Element 1

Computing Element 2

User Interface
Resource Broker
Replica Catalog
Information Service

“CLOSE”

“CLOSE”
Testbeds

GriDis dissemination testbed
- Small tutorial and demo testbed
- Has access to application testbed

Application Testbed: End-user Applications
- Software: Stable, certified release (EDG 2.0.15)

Certification Testbed: Extended, Detailed Testing
- Software: Tagged release
- State: Starting...; Collaboration with Testing Group/LCG.

Development Testbed: Integration & Evaluation of SW
- State: Active use; 5 sites involved.

Development Machines: Testing of Middleware in Isolation
- Software: Bleeding edge versions.
- State: Varied; under control of middleware work packages.
General Testbed Overview

Students Terminals

Resource Broker
Computing Elements
Storage Elements
Information Index

Application Testbed

Resource Broker
Computing Elements
Storage Elements
Information Index

http://web.datagrid.cnr.it/GriDis/GriDisWP1.html

NCP Testbed here in Pakistan

enter Grid

UI pcncp21

RB pcncp24

CE pcncp04

WN pcncp20

SE pcncp22

SE pcncp25
DataGrid testbeds

Application testbed:
- More than 1000 CPUs
- 5 Terabyte of storage

EDG sw installed at more than 40 sites

- Dubna
- Moscow

- HEP sites
- ESA sites
Application Testbed Resources

Since Last Year:

- Improved software (EDG 1.4.7).
- Doubled sites. More waiting…
  - Australia, Taiwan, USA (U. Wisc.), UK Sites, INFN, French sites, CrossGrid, …
- Significantly more CPU/Storage.

Hidden Infrastructure

- MDS Hierarchy
- Resource Brokers
- User Interfaces
- VO Replica Catalogs
- VO Membership Servers
- Certification Authorities

<table>
<thead>
<tr>
<th>Site</th>
<th>Country</th>
<th>CPUs</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-IN2P3*</td>
<td>FR</td>
<td>620</td>
<td>192 GB</td>
</tr>
<tr>
<td>CERN*</td>
<td>CH</td>
<td>138</td>
<td>1321 GB</td>
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<tr>
<td>CNAF*</td>
<td>IT</td>
<td>48</td>
<td>1300 GB</td>
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<tr>
<td>Ecole Poly.</td>
<td>FR</td>
<td>6</td>
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<tr>
<td>Imperial Coll, Liverpool</td>
<td>UK</td>
<td>92</td>
<td>450 GB</td>
</tr>
<tr>
<td>Manchester</td>
<td>UK</td>
<td>9</td>
<td>15 GB</td>
</tr>
<tr>
<td>NIKHEF*</td>
<td>NL</td>
<td>142</td>
<td>433 GB</td>
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<td>Oxford</td>
<td>UK</td>
<td>1</td>
<td>30 GB</td>
</tr>
<tr>
<td>Padova</td>
<td>IT</td>
<td>11</td>
<td>666 GB</td>
</tr>
<tr>
<td>RAL*</td>
<td>UK</td>
<td>6</td>
<td>332 GB</td>
</tr>
<tr>
<td>SARA</td>
<td>NL</td>
<td>0</td>
<td>10000+ GB</td>
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<tr>
<td>TOTAL</td>
<td></td>
<td>107</td>
<td>14969 GB</td>
</tr>
</tbody>
</table>

*also Dev. TB; +200 TB including tape
Example IS Content

Site: NIKHEF

CE tbn09.nikhef.nl:2119/jobmanager-pbs-qlong:
- PBS queue "qlong" with 96 hours time limit
- Software installed: CMS-1.0.2 ATLAS-1.3.0 ALICE-3.07.01 LHCb-1.1.1 IDL-5.4 NIKHEF D0MCC-0.1-1
- There are 0 jobs running and 0 waiting, with 16 CPUs free
Close SE tbn03.nikhef.nl with mount point /flatfiles

CE tbn09.nikhef.nl:2119/jobmanager-pbs-qshort:
- PBS queue "qshort" with 240 minutes time limit
- Software installed: CMS-1.0.2 ATLAS-1.3.0 ALICE-3.07.01 LHCb-1.1.1 IDL-5.4 NIKHEF D0MCC-0.1-1
- There are 0 jobs running and 0 waiting, with 16 CPUs free
Close SE tbn03.nikhef.nl with mount point /flatfiles

SE tbn03.nikhef.nl close to 2 CEs:
- tbn09.nikhef.nl:2119/jobmanager-pbs-qshort
- tbn09.nikhef.nl:2119/jobmanager-pbs-qlong
- VOs supported: alice atlas biomedical cms earthob lhcb iteam
- gridftp on port 2811
- rfio on port 3147
- file
- 31744 Mb of free space
EDG Software Distribution

- All software available as binary RPMs
- Binaries for RedHat 7.3 > 600 packages including
  - Complete globus distribution
  - EDG packages (~50 packages)
  - Support tools (perl, ant, jdk, ...)
- Pre-packaged for different machine types
Issues when Adding new Sites to the Testbed

- EDG is currently setting-up procedures explaining how to add new sites
  - Variations already tested with Taiwan and Romania
  - Step-by-step instructions produced which we expect to become simpler over time

- Need to clarify the “minimum requirements” for a site to become a member of the testbed
  - A number of regular tasks have to be performed by the sites administrators
  - A maximum delay needs to be defined for responding to requests/problems if the testbed is to run efficiently

- Sites from new countries have to identify/create a supporting CA
  - Since CAs need mutual trust this could lead to an explosion of inspection activities

- Some tasks will fall on the people responsible for managing the VOs
  - HEP experiment secretariats already perform some level of authentication of their institutes and members. How can we get some leverage from this?
Summary

- Logical machine types of an EDG Testbed
- Mapping of services to logical machines
- Example and current EDG Testbed configuration
- Code distribution strategy
Further Information

- EDG Testbed homepage:

- Fabric management:

- LCFG on EDG Testbed information:
  [http://www.lnl.infn.it/datagrid/wp4-install/](http://www.lnl.infn.it/datagrid/wp4-install/)