

Introduction to gLite

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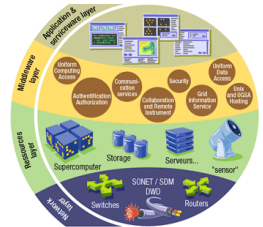
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Santander - Spain

Outline

- 1 Grid Middleware
- 2 gLite architecture
 - Security & Authentication
 - Information System
 - Workload Management
 - Data Management

Middleware

- A middleware is a software that connects other software components or applications.
- Grid architectures are based on the aggregation of several services.
- Thus a Grid Middleware should be a software that enables the integration of several heterogeneous resources (CPU, storage, authentication, accounting, etc.) to provide those services.



Middleware

Grid stacks

- Several middleware stacks (and infrastructures), sometimes overlapping:
 - Globus Toolkit
 - **gLite**
 - int.eu.grid
 - ARC
 - Naregi
 - Unicore
 - ...
- There are neither a common Grid middleware nor a unique Grid infrastructure.
- A Grid can be built using one or several of the above stacks.

gLite Middleware

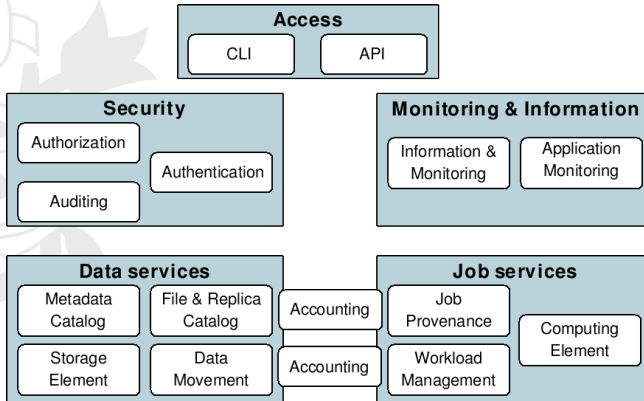


- *gLite* is the Grid middleware distribution developed within the EGEE project.
- Developed and released under APACHE License ¹
- Widely used and extended in several other EU Grid projects.
- Set of components that enables a production quality Grid.

¹ <https://twiki.cern.ch/twiki/bin/view/EGEE/EGEEgLiteSoftwareLicense>

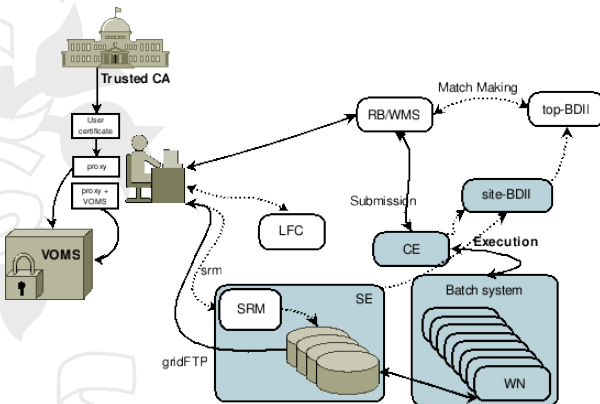
gLite services

gLite stack



gLite services

Overview



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Authentication and Authorization

How do I access the Grid?

- Authentication is based on personal X.509 Certificates (issued by trusted CAs).
- User authorization on the Grid is made by using short lived proxies.
 - Include additional VO attributes (by using VOMS service).
 - Can be delegated, renewed, etc.
- gLite is VO (Virtual Organization) based.
 - One user can be member of several VOs.
 - Resource negotiation is made by the VOs.
 - Resource access is granted to VO members.

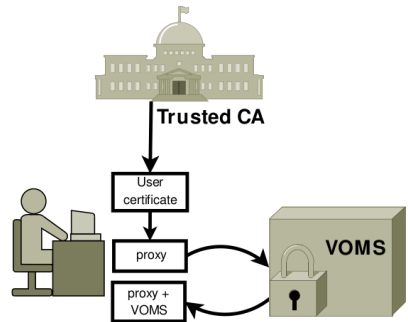
Authorization and VOMS

VOMS: VO Membership Service

- Multiple VOs per user.
- Different subgroups and/or roles within a VO, allowing fine grained ACLs for services.

Groups Regional groups, etc.

Roles Software administrator, infrastructure tests, etc.



Outline

1 Grid Middleware

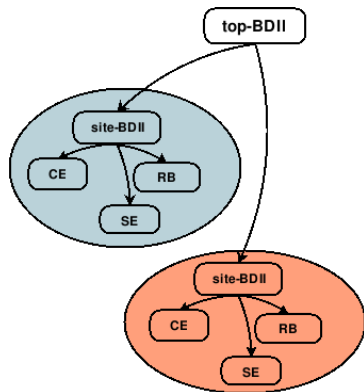
2 gLite architecture

- Security & Authentication
- **Information System**
- Workload Management
- Data Management

Information System

Where will my jobs be executed?

- Aggregates information from different sites.
 - Computing capacity (job slots).
 - Storage capacity (disk space).
 - Accepted VO's (ACLs).
 - Monitoring information.
- Information structured using the GLUE Schema v1.3.
- gLite service: BDII (Berkeley Database Information Index).
 - Aggregates information from several resources within a site.
 - Publish this information using a LDAP server.



Outline

1 Grid Middleware

2 gLite architecture

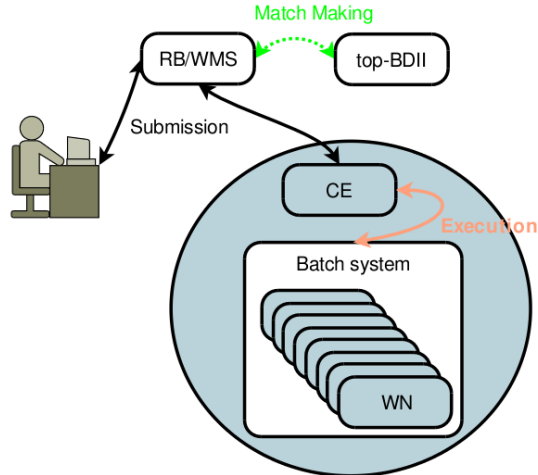
- Security & Authentication
- Information System
- **Workload Management**
- Data Management

Workload Management

What is happening with my jobs?

Several steps.

- 1 Job description.
- 2 Job match making.
- 3 Job submission.
- 4 Job execution.



Job description

JDL Job description is made using JDL (Job Description Language) ².

```
[  
    Type                = "Job";  
    JobType              = "Normal";  
    RetryCount           = "1";  
  
    Executable           = "application";  
    StdOutput            = "stdout.txt";  
    StdError             = "stderr.txt";  
    InputSandbox         = {"application"};  
    OutputSandbox        = {"stdout.txt", "stderr.txt"};  
]
```

² <https://edms.cern.ch/file/590869/1/EGEE-JRA1-TEC-590869-JDL-Attributes-v0-8.pdf>

Job Submission

RB/WMS

The JDL and the Sandboxes are submitted to a RB (Resource Broker) or WMS (Workload Management System).

- Finds a suitable location for a job (match making), using the Information System.
- Match making can be made without actually submitting the job.
 - Useful to check JDLs.
- Keeps track of job status (Logging and Bookkeeping).
 - Once the job has finished on the site, gets the SandBox.

Job execution

Once the RB/WMS has found a suitable site, the job is submitted to one *CE* (Computing Element)

- Interface between a site and the Grid.
- Several queues, ACLs, job slots, priorities, etc. for different VO/Groups/Roles.
- Gateway to the local batch system (Torque, LSF, SGE, etc).
- Currently: lcg-CE.
- Coming: CREAM-CE.

Batch System and *WNs* (Worker Nodes)

- The job is finally executed on a batch system queue.
- gLite middleware installed on the nodes.
- Shared VO software directory across the *WNs*.

Accounting

How much have I executed?

CPU Accounting records are prepared on each site (APEL or DGAS) and submitted to a central repository (RGMA)

APEL runs on the site part.

- Collects records from different points (GK, Batch Server, etc).
- Joins them in an unique MySQL record.

RGMA

- Collected data is published to a central RGMA server.
- Accounting portal fetch data from here.

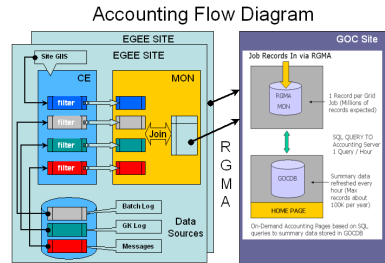


Image from APEL FAQ.

Outline

1 Grid Middleware

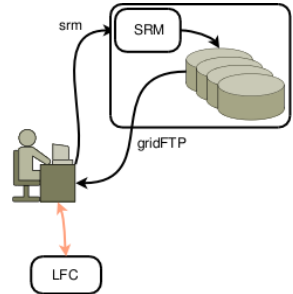
2 gLite architecture

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SE (Storage Element)

Where is the data stored?

- Interface to the local storage.
- SRM (Storage Resource Manager) v2.2 protocol.
 - Protocol to ask a storage system (tape, disk) to make a file ready for transfer or to allocate space to upload one.
 - The transfer is made using a TURL (Transport URL).
- TURLs
 - Several protocols: GridFTP, rfio, etc.
- gLite SE: DPM, dCache.
- Non gLite but used within WLCG: StoRM.



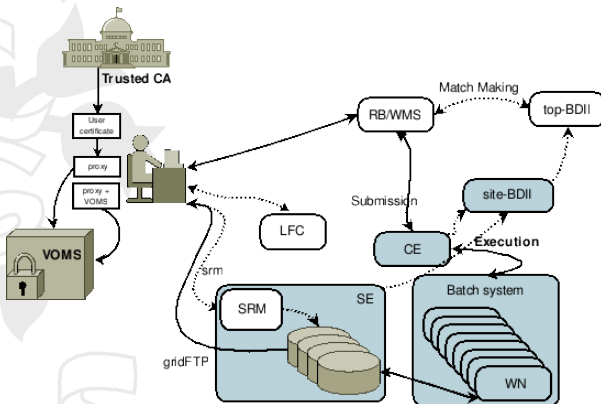
File Catalogs

How do I access the data?

- Storage Elements handle the data using SURLs.
 - Non readable.
 - Example: `srm://storm.ifca.es/dteam/generated/2008-03-26/filec0c4ad48-33fd-4d8d-9c88-f362c9ec5ab8`
- The LFC (LCG File Catalog) maps names in a filesystem-like namespace to SURLs.
 - Human readable.
 - One LFC entry can point to one or more SURLs (replicas of the same file).
 - Example for the SURL above:
`lfn:///grid/dteam/alog/textdpm2`

gLite services

Overview



The end

Any questions?
¡Muchas gracias!

For Further Reading I



EGEE JRA1

JDL Attributes

[https://edms.cern.ch/file/590869/1/
EGEE-JRA1-TEC-590869-JDL-Attributes-v0-8.pdf](https://edms.cern.ch/file/590869/1/EGEE-JRA1-TEC-590869-JDL-Attributes-v0-8.pdf)



E. Laure et al.

Programming the Grid with gLite

[http://doc.cern.ch//archive/electronic/egee/tr/
egee-tr-2006-001.pdf](http://doc.cern.ch//archive/electronic/egee/tr/egee-tr-2006-001.pdf)