gLite Information System

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EPIKH-ASIA 1 school
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Introduction
The Information System

- **What?**
  - System to collect information on the state of resources

- **Why?**
  - To discover resources of the grid and their nature
  - To check for health status of resources
  - To provide data in order to manage the workload more efficiently

- **How?**
  - Monitoring and publishing fresh data on the state of resources
  - Adopting a well known data model
Who and how use the IS

- **Users**
  - Retrieve information about resources:
    - Where can I run my job?
    - Where can I copy my files?
    - Which software packages are available on a given CE?

- **Site managers**
  - Publish information about the resources and services they provide

- **Middleware**
  - WMS: matching job requirements and allocating the resources
  - Monitoring Services: retrieving information about the status and availability of resources
The gLite Data Model uses **GLUE Schema**

**Two IS systems** available in gLite: BDII and R-GMA

- The **Berkeley DB Information Index** (BDII)
  - has been the LCG middleware Information System provider
  - is an evolution of Globus Meta Directory System (MDS)
  - is based on Lightweight Directory Access Protocol (LDAP) servers

- The **Relational Grid Monitoring Architecture** (R-GMA)
  - is an implementation of the Grid Monitoring Architecture (GMA) standardised by the Open Grid Forum (OGF)
  - is a relational implementation of the GMA
  - is strongly Web Services Oriented
Background
Why is an Information schema required?

- Resources are geographically dispersed, span multiple trust domains and are heterogeneous.
- Resources can be dynamically contributed by different owner institutions.
  - A precise and shared description of resources among information consumers and resource providers is necessary.
- The same resources description has to be readable from different Grid infrastructures to allow interoperability among them.
GLUE stands for Grid Laboratory Uniform Environment

Describe the Grid resources information stored in the IS

Independent from the underlying technology

Actual release is mapped on
  - LDAP
  - XML
  - ClassAd (Condor Matchmaking language)
The Grid components are represented as objects which have attributes and relations to other objects.

The entities of the GLUE Schema are organised hierarchically.

- Include the concept of Site, Cluster, Computing Element, Storage Element, and an abstraction of service.
GLUE Schema Structure

- **Site**: Collection of resources owned by a single organisation. Contains info on the location, the administrator, web page and so on.
- **Cluster**: Set of heterogeneous resources. Contains info on shared directory.
- **Host**: Contains details of hardware (features and performance) and software.
- **Sub-Cluster**: Set of homogeneous resources. Contains the size of the set.
- **Service**: Description of deployed service.
- **VOview**: Contains information on VO views.
- **Job**: Associated with a specific job.
- **State**: Information about the state of the system.
- **Policy**: Information about system policies.
- **Info**: Detailed information about a specific component.
- **StorageElement**: Associated with storage elements.
- **ComputingElement**: Associated with computing elements.
• It is a protocol that defines the method by which directory data is accessed
• Optimised for reading, browsing and searching information (write-once-read-many-times service)
• Data is represented as a hierarchy of objects (entities) forming a tree structure
  • Data Information Tree (DIT)
- **Distinguished Name (DN)**
  - Unique name that unambiguously identifies an entry
  - Es.
    - `dn: o=INFN,c=Italy,dc=grid`

- **Attributes Types**

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<th>Meaning</th>
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<td>Organisation Unit Name</td>
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<td>Common Name</td>
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• An LDAP server can store a partial DIT
• To obtain the DIT all servers need to be linked together
• All client requests have to start at the global directory LDAP 1
Abbreviations:

**BDII**: Berkeley DataBase Information Index

**GIIS**: Grid Index Information Server

**GRIS**: Grid Resource Information Server

Each site can run a **BDII**. It collects the information given by the local BDII.

At each site, a *local* **BDII** collects the information given by the GRISs.

**Local GRISes** run on CEs and SEs at each site and report dynamic and static information.
gLite IS Architecture

- Client
- FCR
- Provider
- BDII
- Site
- Resource

Top-level BDII
Site-level BDII
Resource-level BDII
The BDII

Diagram:
- Query flows to 2170 LDAP.
- LDAP sends a Query to LDIF DIFF.
- LDIF DIFF outputs a Update LDIF action.
- Update LDIF outputs LDAP_ADD, LDAP MODIFY actions.
- LDAP_ADD flows to LDIF.
- LDAP MODIFY flows to Provider.
- Provider flows to Plugin.
- Plugin merges with New LDIF to form New LDIF.
- BDII servers use standard LDAP protocols
- All LDAP client are able to access BDII information
- Command line or Graphical application for every OS are available to access an LDAP server
Es. JXplorer

Connected To ldap://infn-wms-01.ct.pi2s2.it:2170

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</table>

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gLite provides several tools to manage the IS

- Two gLite commands in the UI for the IS queries
  - `lcg-infosites`: shows some information related to a Grid component
  - `lcg-info`: supports complex queries to retrieve more specific information
Usage

lcg-infosites –vo voname -[v] -f [site name] [option(s)] [-h | –help] [–is BDII]

- The options can be one among the following:
  - se, ce, closeSE, rb, lrc, lfc, vobox, fts, sitenames, tag, all
Usage


- One or more attributes can be retrieved for specific sites:
  - The query element allows to identify the site
R-GMA
R-GMA Overview

- R-GMA is based on Grid Monitoring Architecture (GMA) standard defined by the GGF
- Implements a Consumer-Producer model
- Information are stored in a SQL relational database using a virtual DB per VO
  - Information are always updated because the consumer get information directly from the provider
  - Users can query information using a subset of the SQL
- Web service oriented
- CLI and Web user interface
R-GMA Producer-Consumer Model

- The Producer stores its location (URL) in the Registry
- The Consumer looks up producer URLs in the Registry
- The Consumer contacts the Producer to get all the data or to listen for new data
- Data flows directly from the Producer to the Consumer
Monitoring
• Several centralised monitoring systems available
• Official monitoring are:
  • GridMap managed by CERN at http://gridmap.cern.ch
  • GStat managed by Academia Sinica at http://goc.grid.sinica.edu.tw/gstat
Conclusions
Conclusions

- Two Information System are provided by gLite: BDII and R-GMA
- Information are organised following the GLUE Schema
- Users can contact the top BDII in the hierarchy to get the information of all the resources
- Current implementation use only BDII to check the state of the resources
Some References

- **gLite 3.1 User Guide**
  https://edms.cern.ch/file/722398/1.2/gLite-3-UserGuide.html

- **Wiki CERN**
  https://twiki.cern.ch/twiki/bin/view/EGEE/InformationSystem
Questions!!!