

Overview of the gLite middleware

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EMBRACE-EGEE Tutorial



Grid Systems & Applications aim to:

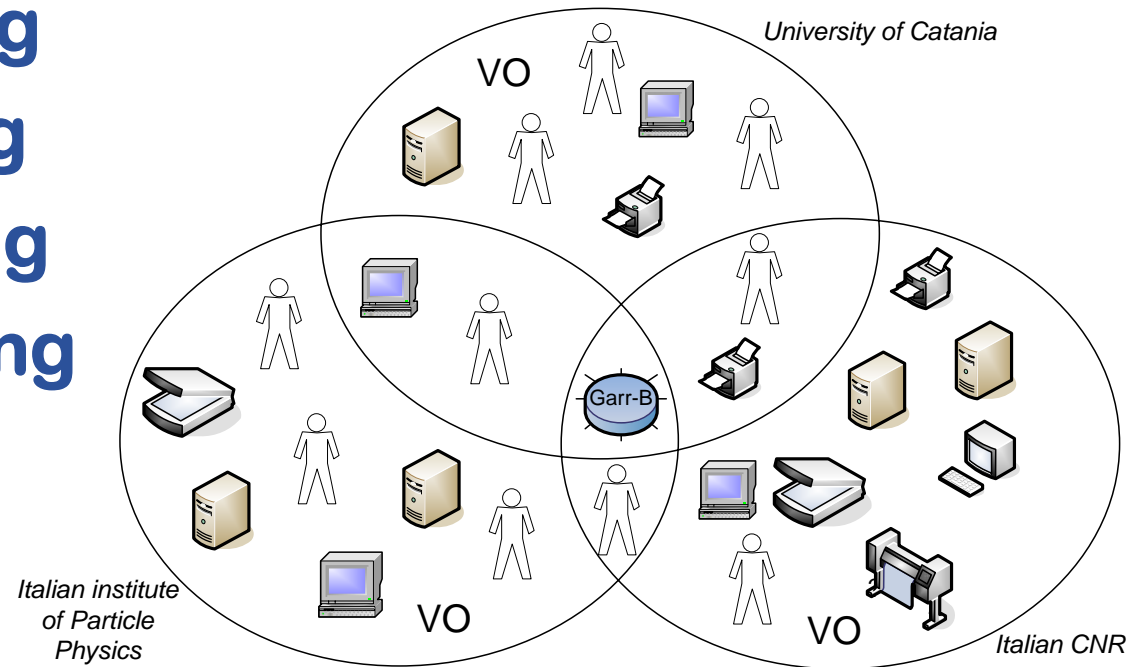
- **Integrate**
- **Virtualise**
- **Manage**



RESOURCEs and SERVICEs across different VOs.

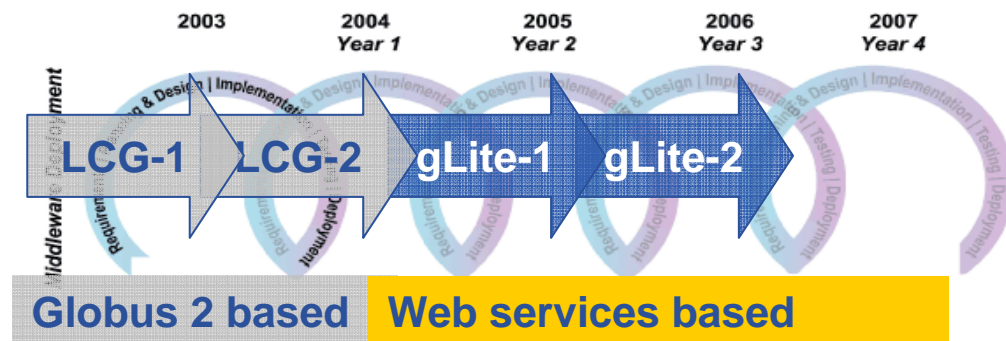
- **VO** – Individuals and/or Institutions having direct access to resources.

- Accessing
- Allocating
- Monitoring
- Accounting



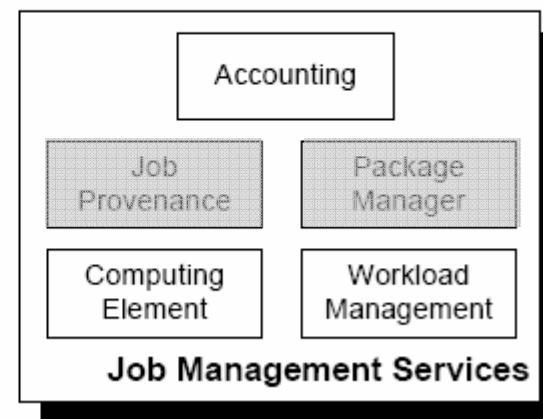
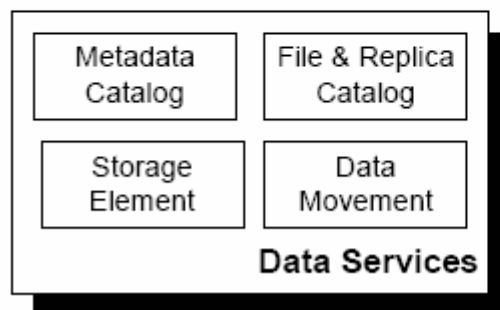
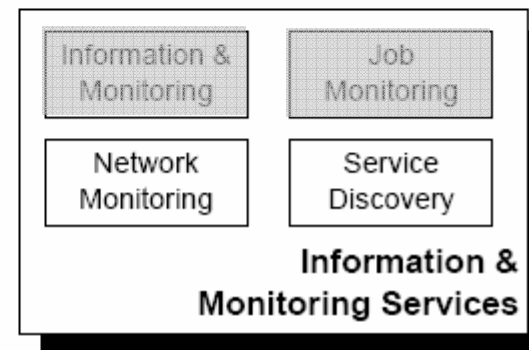
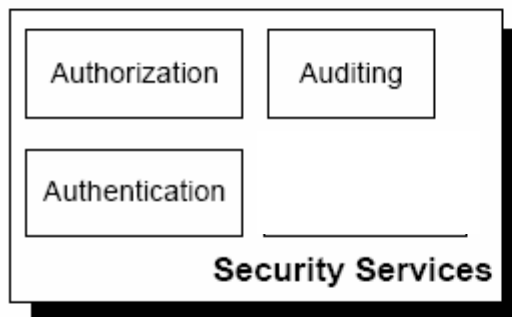
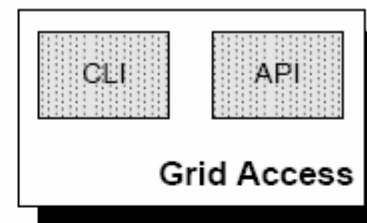
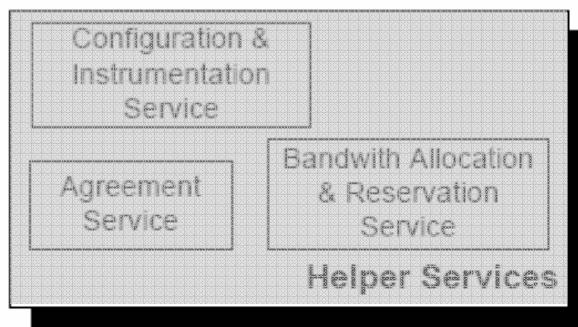
- Grid Middleware - Layer between services and physical resources

- Open Grid Services Architecture – OGSA
- EU DataGrid (<http://www.edg.org>)
- AliEn (<http://alien.cern.ch>)
- Globus (<http://globus.org>)
- Condor (<http://www.cs.wisc.edu/vdt/>)
- NorduGrid (<http://www.nordugrid.org>)
- LHC Computing grid (<http://cern.ch/lcg>)



The gLite Middleware

**5 High level services
+ CLI & API**

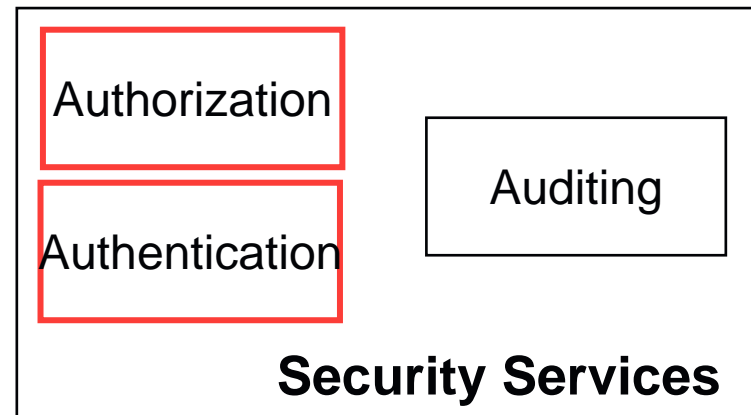


Legend:

-  Available
-  Soon Available

The Security Services

- **Consists of three main services:**
 - **Authentication (AuthN).** WHO a user is
 - **Authorization (AuthZ).** WHAT a user is allowed to do
 - **Auditing.** Post-mortem analysis of security related events



- **Authentication based on X.509 PKI infrastructure**
 - **Certificate Authorities (CA)** issue (long lived) **certificates** identifying individuals
 - Commonly used in web browsers to authenticate to sites
 - Trust between CAs and sites is established (offline)
 - In order to reduce vulnerability on the Grid user identification is done by using (short lived) **proxies** of their certificates
- **Proxies can**
 - Be **delegated** to a service such that it can act on the user's behalf
 - Include **additional attributes** (like VO information via the VO Membership Service VOMS)
 - Be stored in an **external proxy store** (MyProxy)
 - Be **renewed** (in case they are about to expire)

Allows or denies access to services, based on policies.

- **Agent:** The user interacts with a centralized Authorization Server
- **Push:** Authorization Services issue Tokens.
- **Pull:** The resource asks to the Authorization Services.

Authorization Sources:

- **Attribute Authority (AA).** User \leftrightarrow Set of Attributes. (VOMS)
- **Policy Assertions.** Third party policies. (CAS)

Auditing - Monitoring and Post-Mortem analysis of security related events.

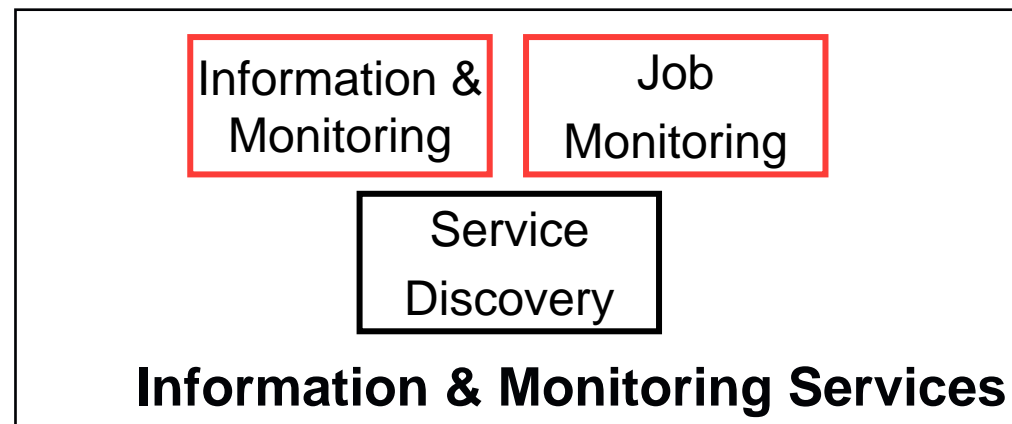
In computational grids It goes hand by hand with the accounting.

- Who did what?
- Where and when?

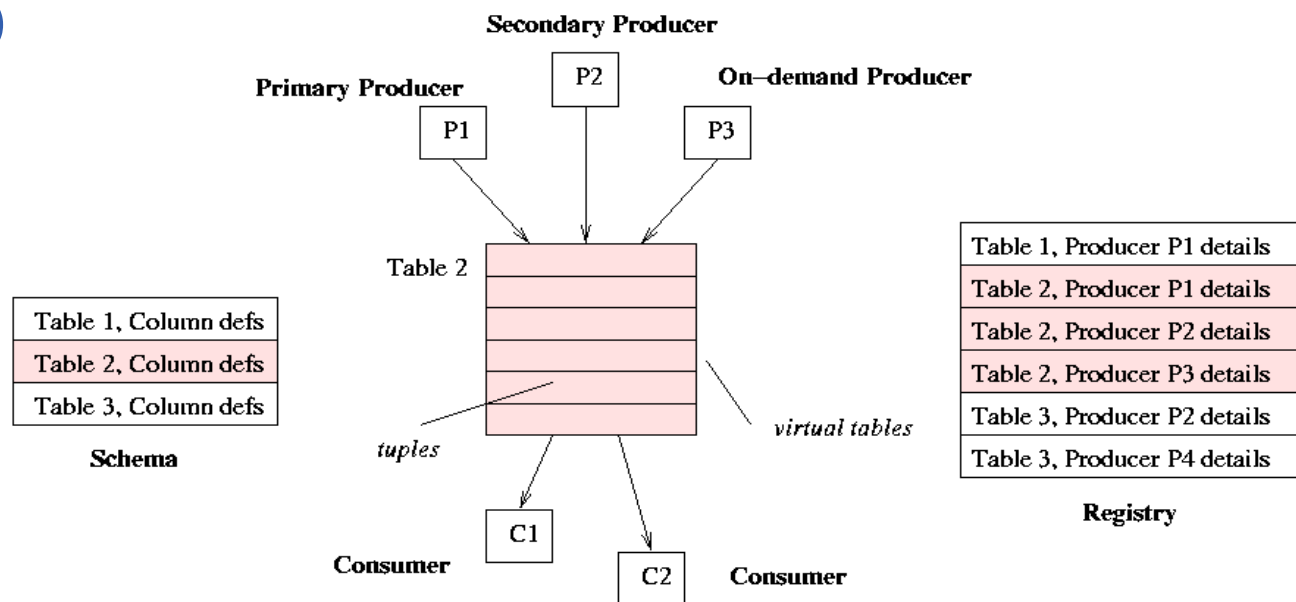
The Information & Monitoring Services

- **Now the user can access the Grid. But how does he find information about resources available?**

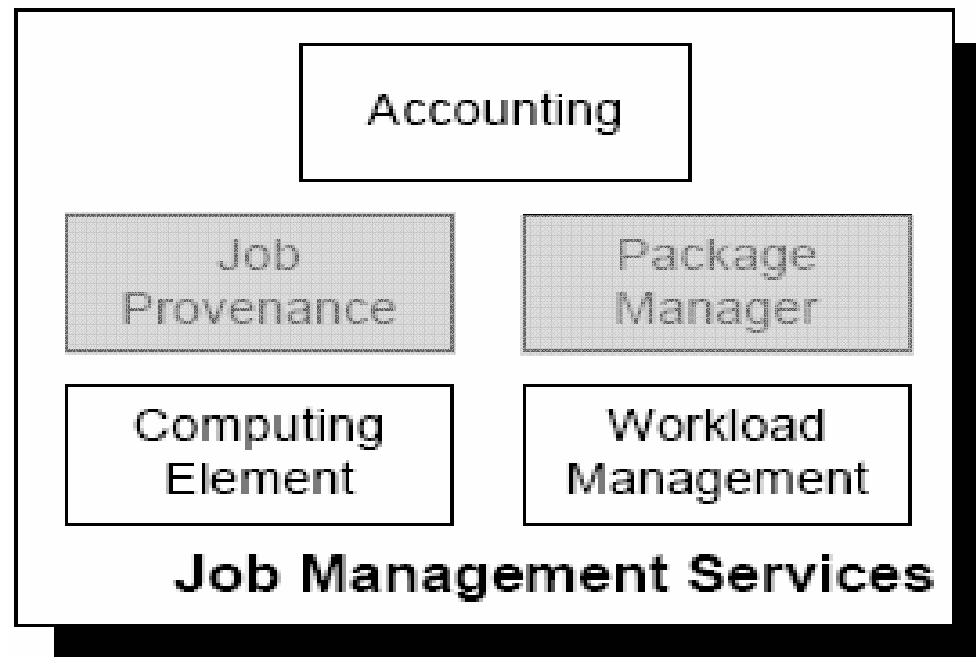
- **Information Systems are used to:**
 - gather information about grid resources
 - gather job information



- Information is provided by a **Publish and Consume** mechanism.
- Each **VO** has a **VDB**.
 - **Schema** - Contains tables (*GLUE*)
 - **Registry** – List of available sources of information (Mediation)
 - **Producers** – Source of information (Primary, Secondary, On-demand)
 - **Consumers** – Make queries against tables (Continuous, Latest, History)



Job Management Services



- Accumulates information about the resource usage done by users or groups of users (VOs).
- Information on Grid Services/Resources needs sensors (Resource Metering, Metering Abstraction Layer, Usage Records).
- Records are collected by the **Accounting System** (Queries: Users, Groups, Resource)
- Grid services should register themselves with a pricing service when accounting for billing purposes.

- The Computing Element (CE) is the service representing a computing resource.
- The main functionality that the Computing Element has to provide is **Job Management** => it has to provide facilities

To **run jobs** (including the staging of all the required files).
 To **get** an assessment of the foreseen “quality of service” for a given job.
 To **cancel** previously job submitted.
 To **send** signals to jobs.
 To get the **status** of the submitted jobs.

- A given Computing Element can work in *push* or *pull* model.

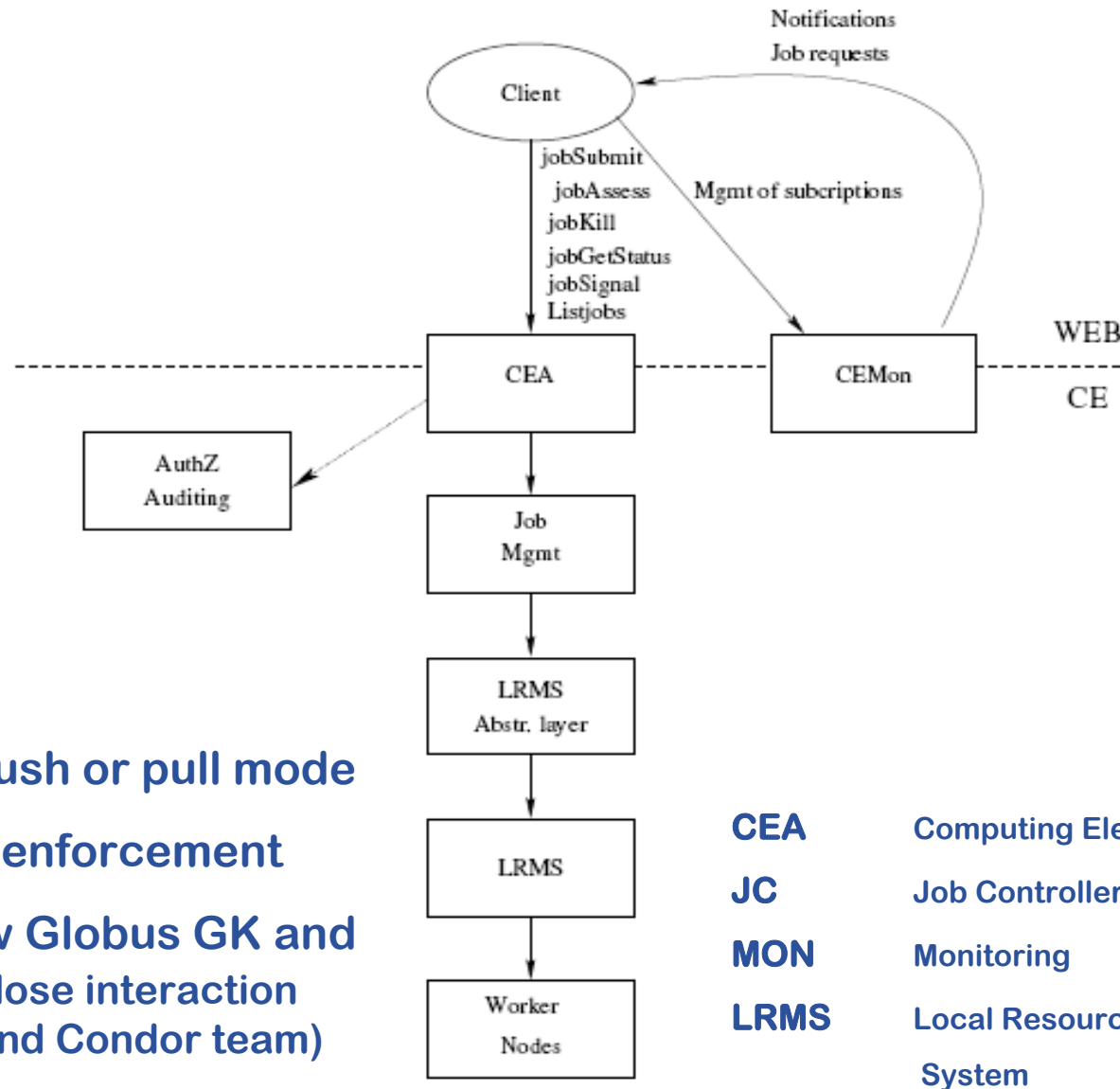
- **PUSH Model.**

In this case the job is pushed to the best CE that fits

with its requirement for its execution.

- **PULL Model.**

The CE asks the WMS for jobs.

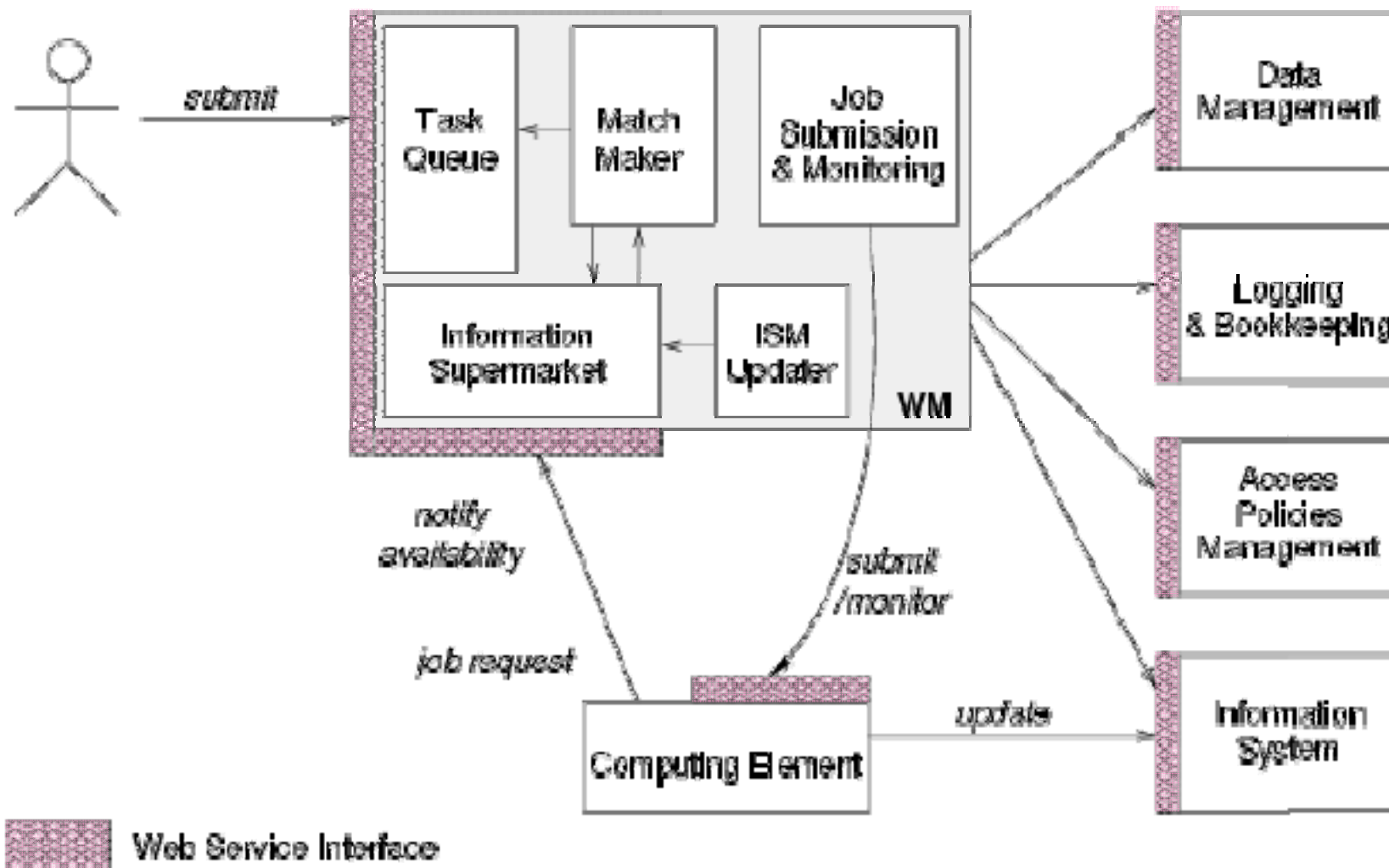


- Works in push or pull mode
- Site policy enforcement
- Exploit new Globus GK and Condor-C (close interaction with Globus and Condor team)

CEA Computing Element Acceptance
JC Job Controller
MON Monitoring
LRMS Local Resource Management System

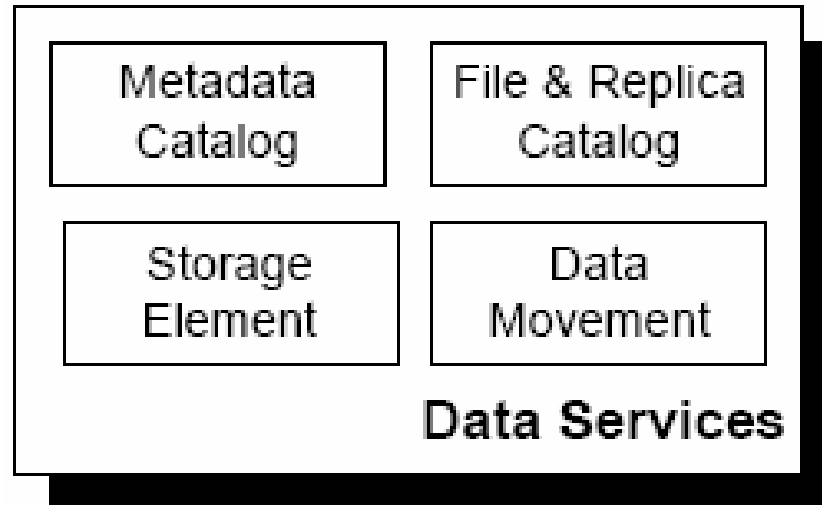
- **WMS** set of middleware components responsible of distribution and management of jobs across Grid resources.
- **Two core components of WMS:**
 - **WM:** accepts and satisfy requests for job management. Matchmaking is the process of assigning the best available resource.
 - **L&B:** keeps track of job execution in term of events: (Submitted, Running, Done,...)

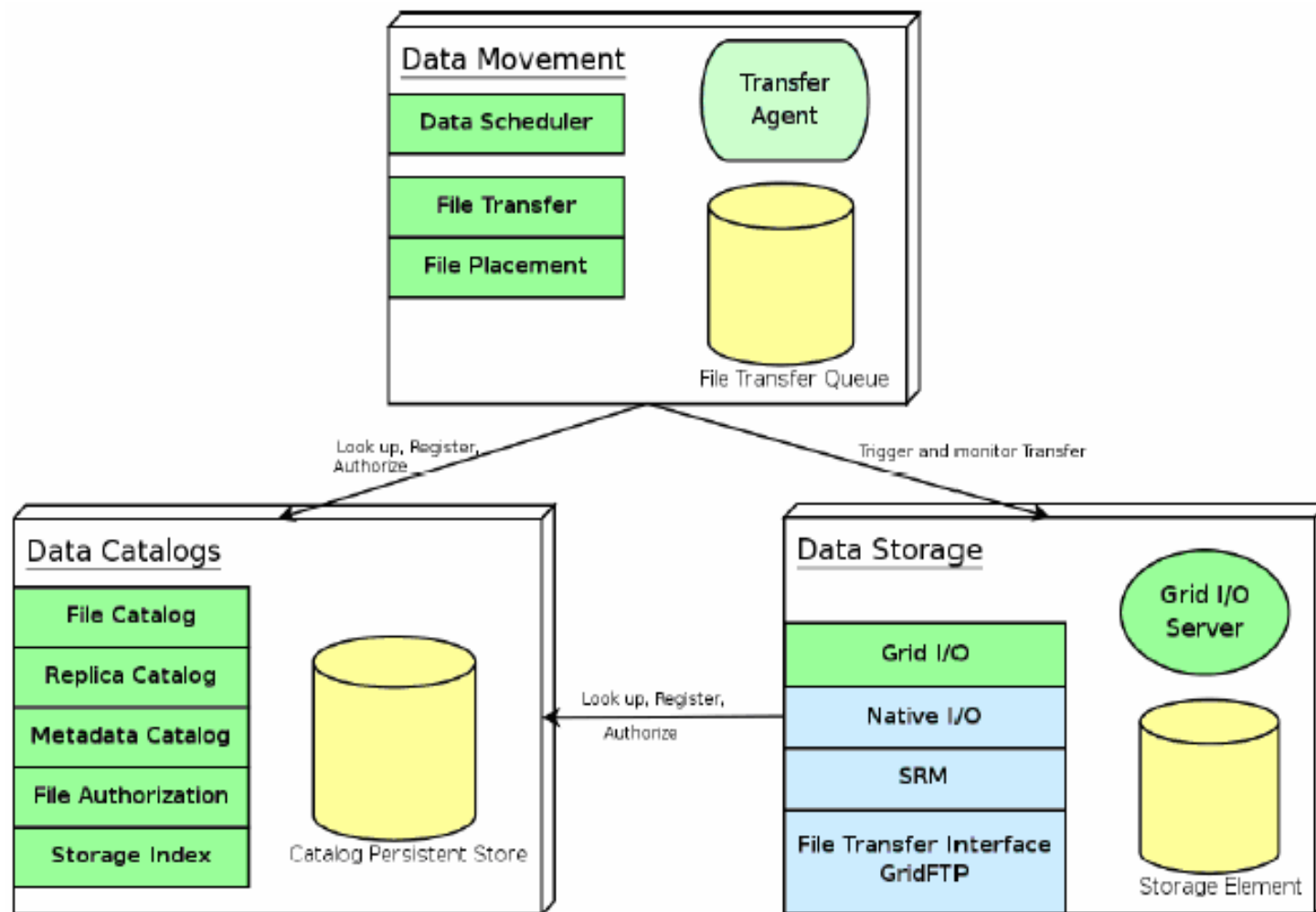
Internal architecture of the WMS



- **Job Provenance** - Keeps track of submitted jobs for long periods (months, years). Those data can be used for debugging and post-analysis.
- **Package Manager** – Helper service to automate: installing, configuring, updating and removing of software components. (RPM, dpkg/APT, Portage, ...)

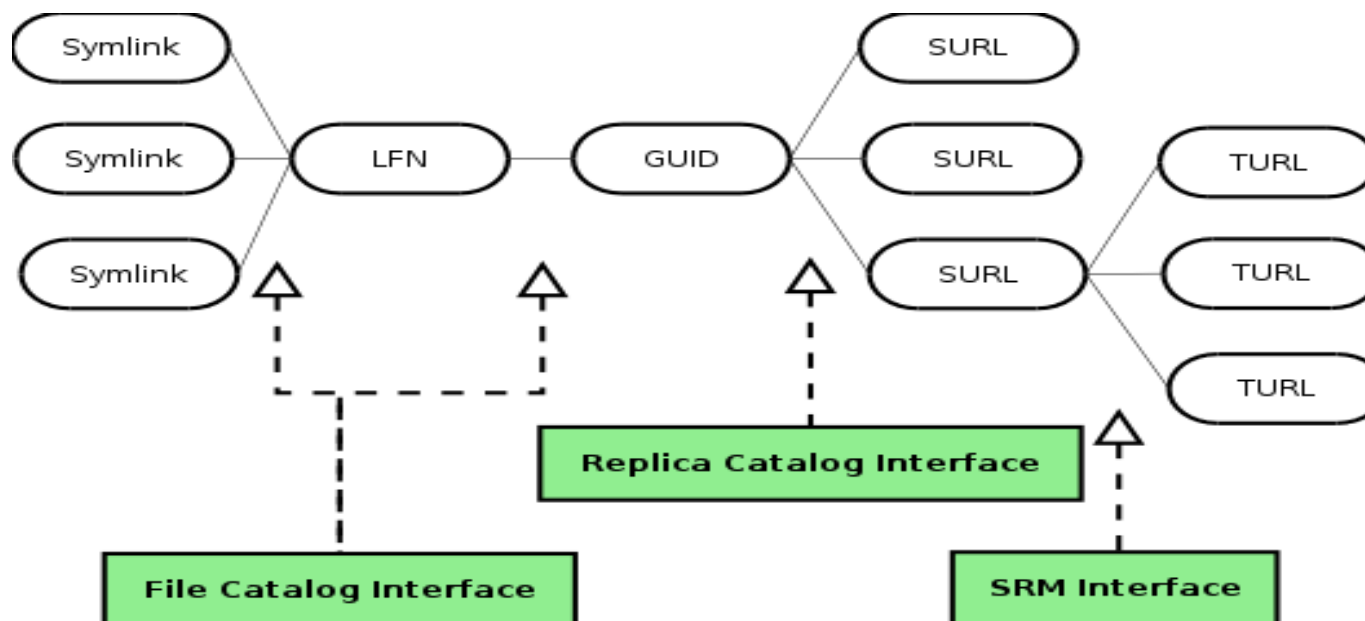
Data Services

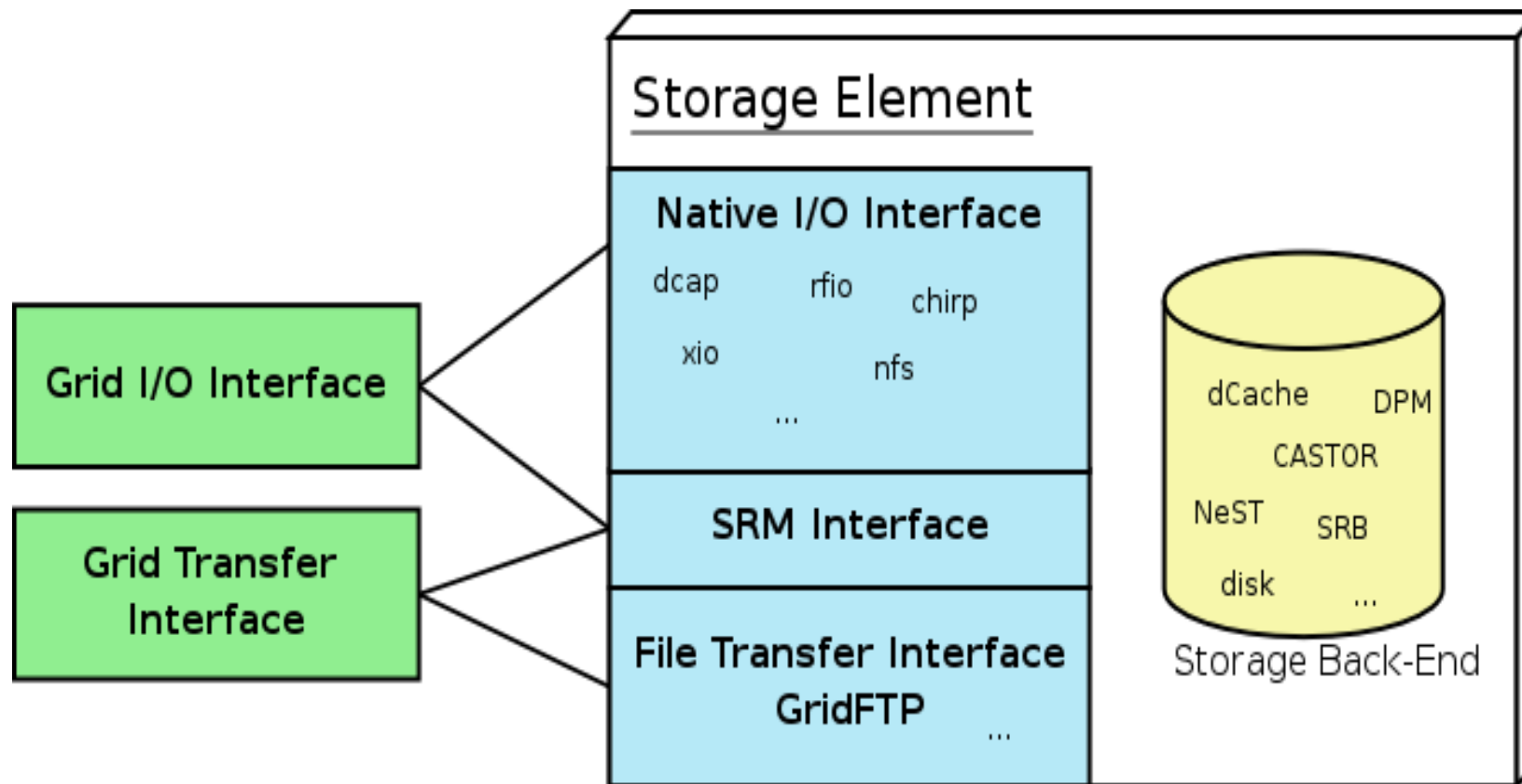


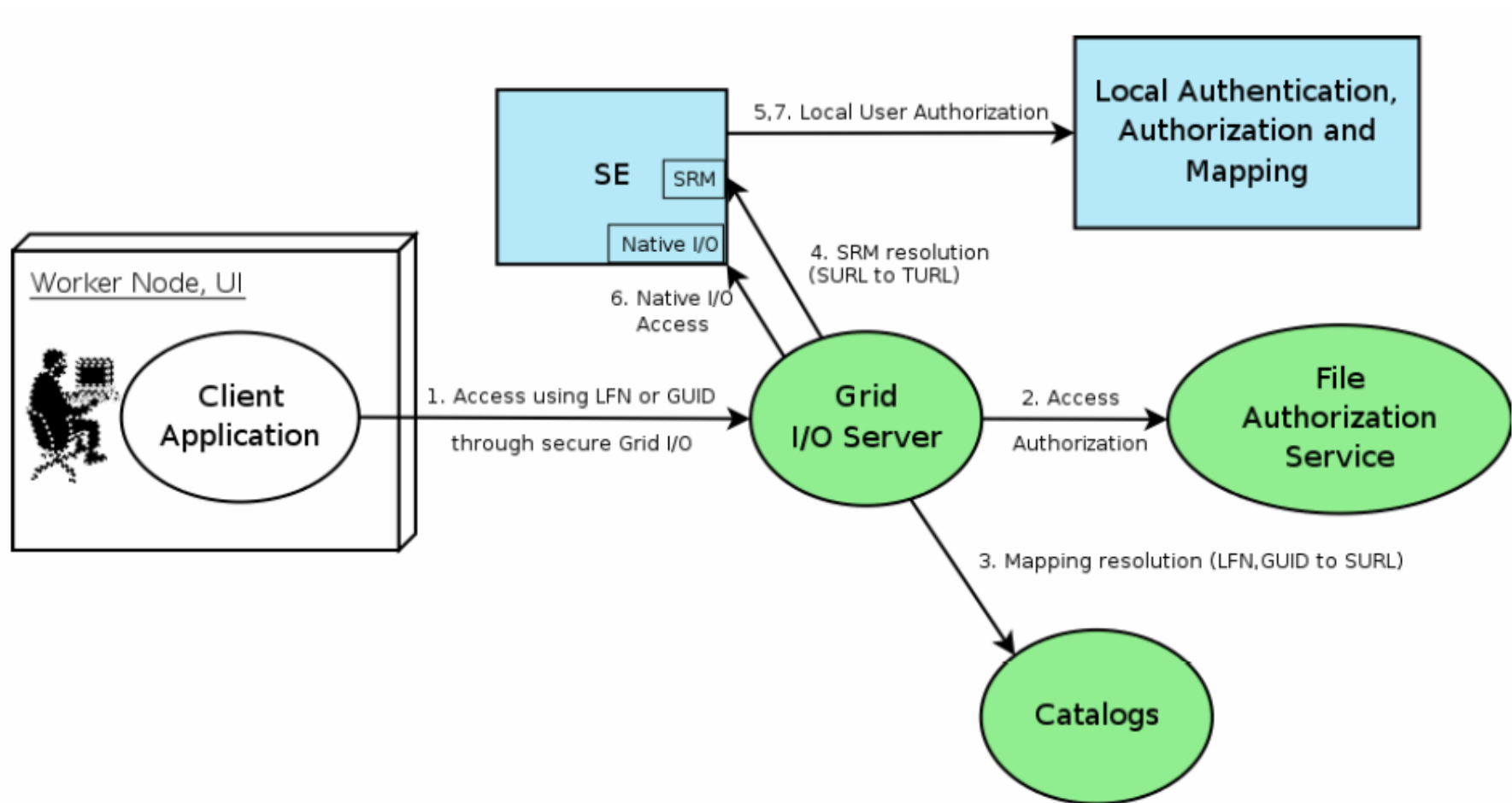


Different way to identify a file in Grid.

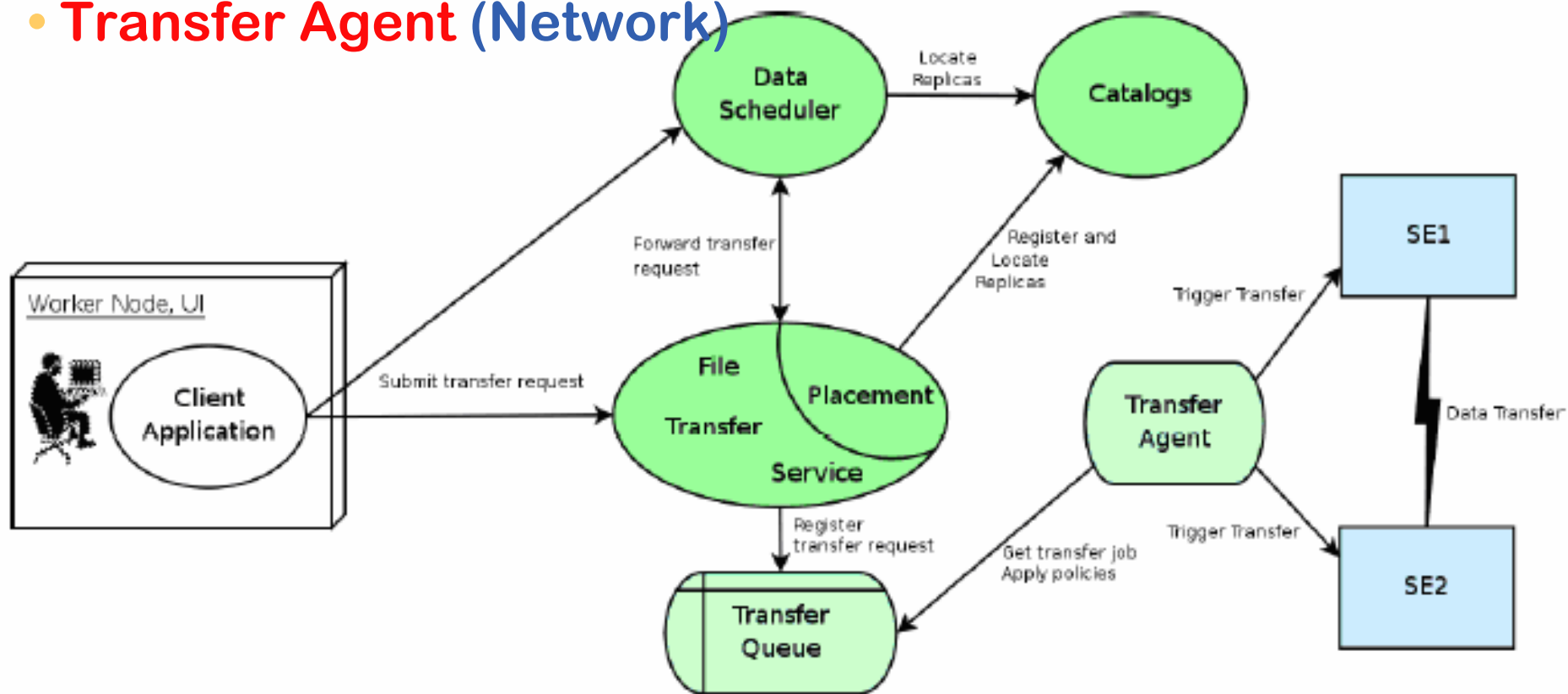
- LFN (Logical file name)
- GUID (Grid unique identifier)
- SURL (Site URL)
- TURL (Transfer URL)
- SimLinks







- **Data Scheduler (DS)** Keeps track of user/service transfer requests
- **File Transfer/Placement Service (FTS/FPS)**
- **Transfer Queue (Table)**
- **Transfer Agent (Network)**



- **gLite homepage**

<http://www.glite.org>

- **gLite Architecture Document**

<https://edms.cern.ch/file/476451/1.0/architecture.pdf>

