Grid based processing and data management

MINISTRY OF EDUCATION AND RESEARCH
TECHNICAL UNIVERSITY OF CLUJ-NAPOCA
CGIS Computer Graphics and Interactive Systems

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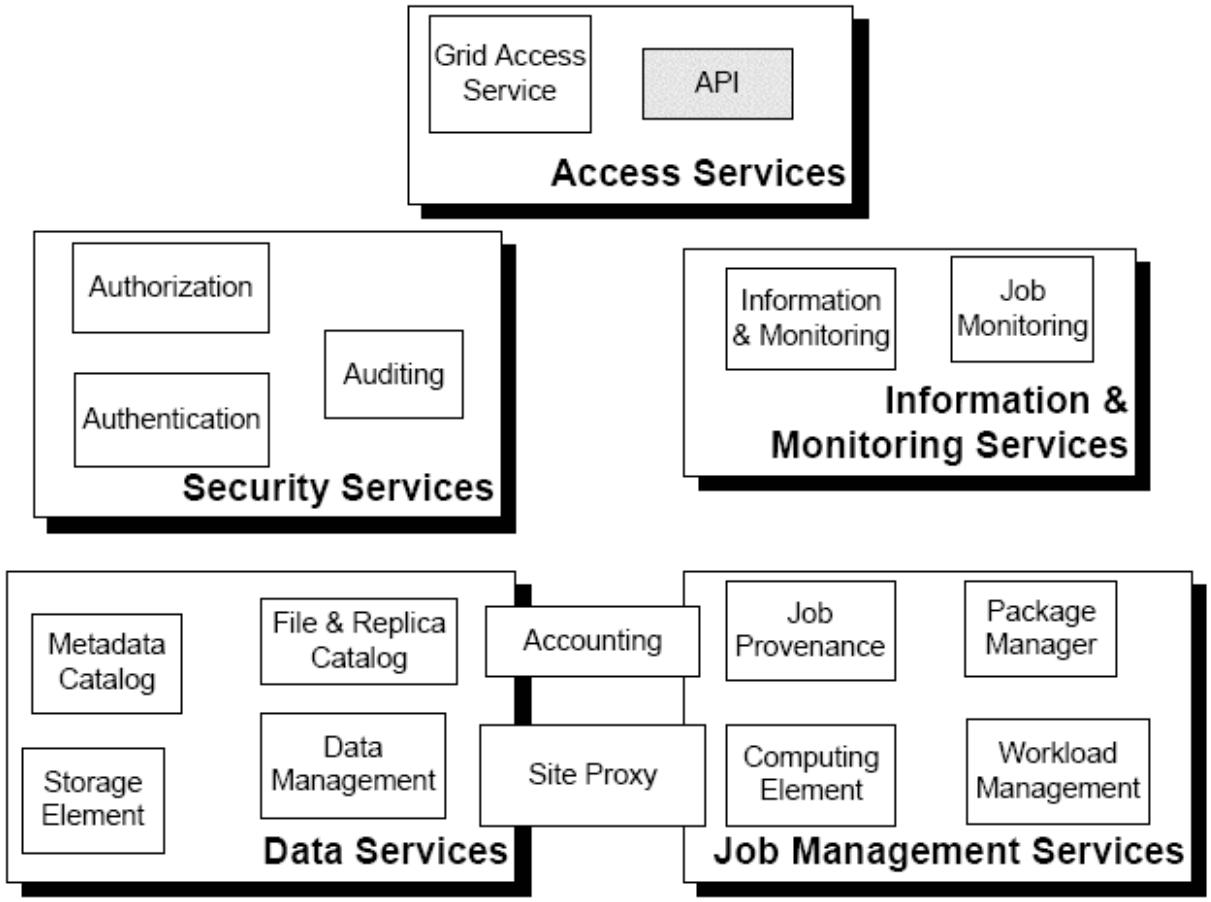
Overview of the gLite Middleware



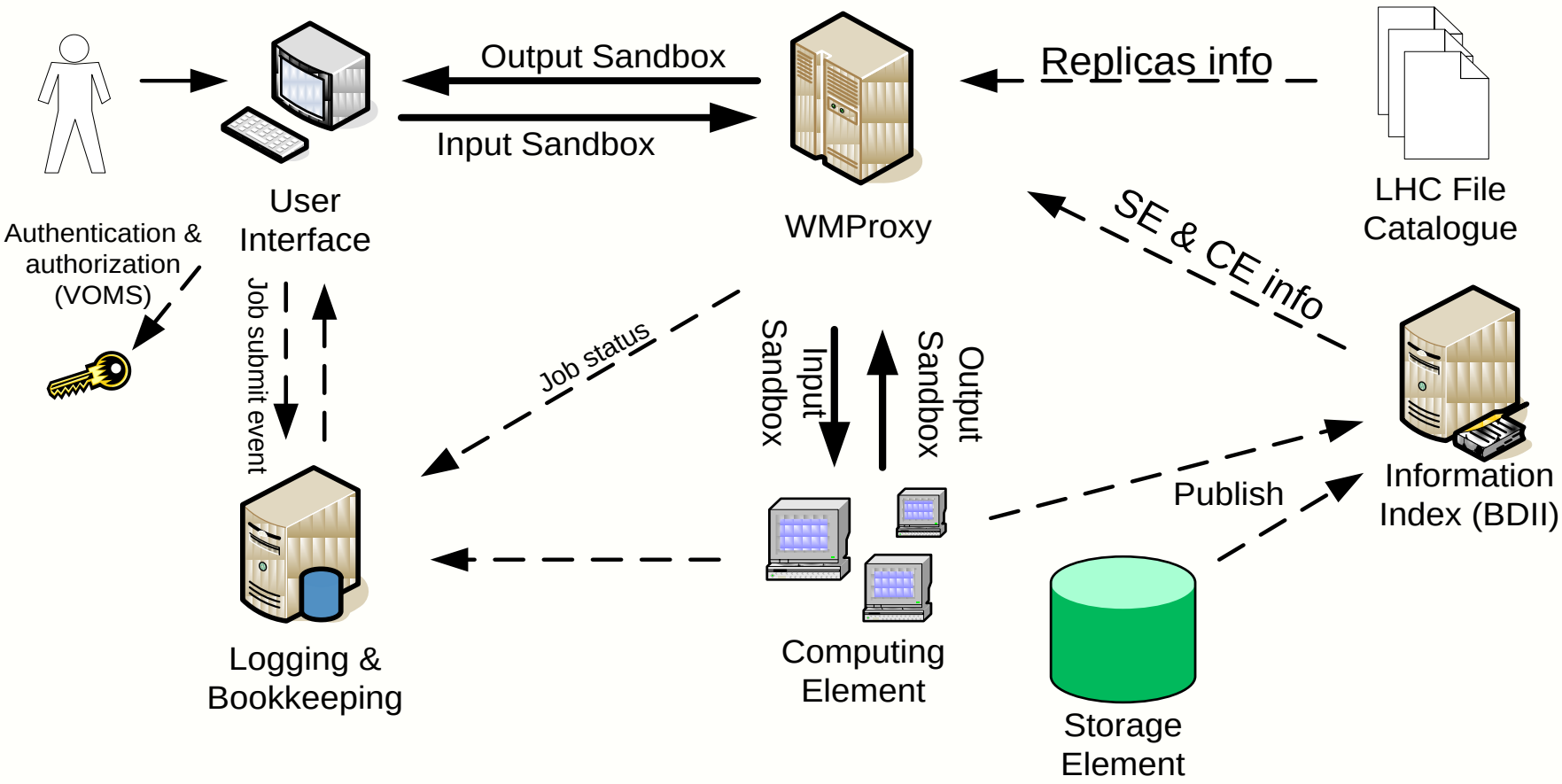
gLite's main components

- **User Interface (UI)**: The place where users logon to the Grid
- **Resource Broker (RB)** (Workload Management System (WMS): Matches the user requirements with the available resources on the Grid
- **Information System**: Characteristics and status of CE and SE
- **File and replica catalog**: Location of grid files and grid file replicas
- **Logging and Bookkeeping** (LB): Log information of jobs
- **Computing Element** (CE): A batch queue on a site's computers where the user's job is executed
- **Storage Element** (SE): provides (large-scale) storage for files

Process execution

- **Typical UI scenario** (UI is central for the VO)
  - Upload program to UI with SCP
  - Login to UI with SSH
  - Compile code
  - Write job description (JDL file)
  - Create proxy certificate
  - Submit job
  - Check job status, download result from grid to UI when DONE
  - Download result from UI with SCP

Process execution



Process execution

- The Workload Management System (WMS) allows users to submit jobs, and performs all tasks required to execute them, without exposing the user to the complexity of the Grid.
  - It is the responsibility of the user to describe his jobs and their requirements, and to retrieve the output when the jobs are finished.
- The Job Description Language (JDL) is a high-level language based on the Classified Advertisement (ClassAd) language, used to describe jobs and aggregates of jobs with arbitrary dependency relations.

Security

- Authentication based on X.509 PKI infrastructure
  - Certificate Authorities (CA) issue (long lived) certificates identifying individuals
  - In order to reduce vulnerability, the 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)

Security

- The security mechanism is based on public-private keys
  - A user uses the private key to sign/encrypt a message
  - Other users use the public key to verify/decrypt the message
- A user's digital signature is safe if:
  - He's private key is not compromised
  - Other user knows only he's public key

Data Management

- **Heterogeneity**
  - Data stored on different storage systems using different access technologies
- **Distribution**
  - Data stored in different locations – in most cases there is no shared file system or common namespace - **File and Replica Catalogs**
  - Data need to be moved between different locations - **File transfer service**

Data Management

- **Files**
  - Mostly, write once, read many
  - Located in Storage Elements (SEs)
  - Several replicas of one file in different sites
  - Accessible by Grid users and applications from “anywhere”
  - Locatable by the WMS (data requirements in JDL)
  - WMS can send (small amounts of) data to/from jobs: Input and Output Sandbox
  - Files may be copied from/to local filesystems (WNs, UIs) to the Grid (SEs)

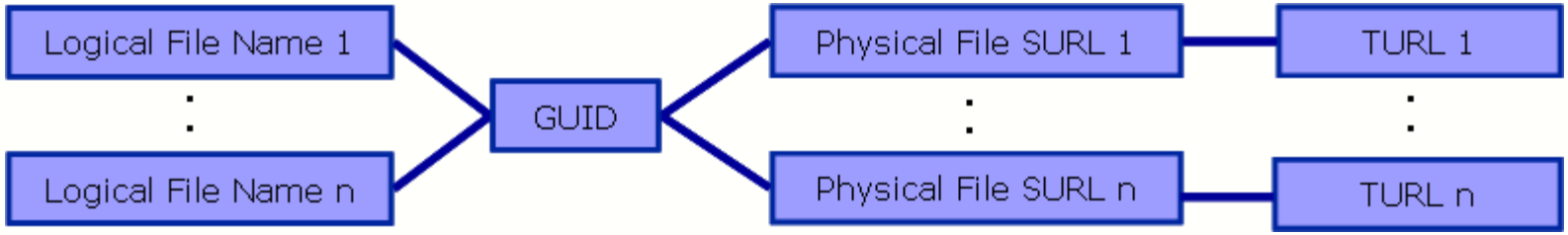
Data Management

- **File naming**
  - Users are using the “logical file name” (LFN)
  - LFN must be unique:
    - includes logical directory name
    - in a VO namespace
  - E.g. /gLite/envirogrids.vo.eu-egee.org/gSwat/DanubeSWATModel.tar
- 3 service types for data
  - Storage
  - Catalogs
  - Movement

Data management

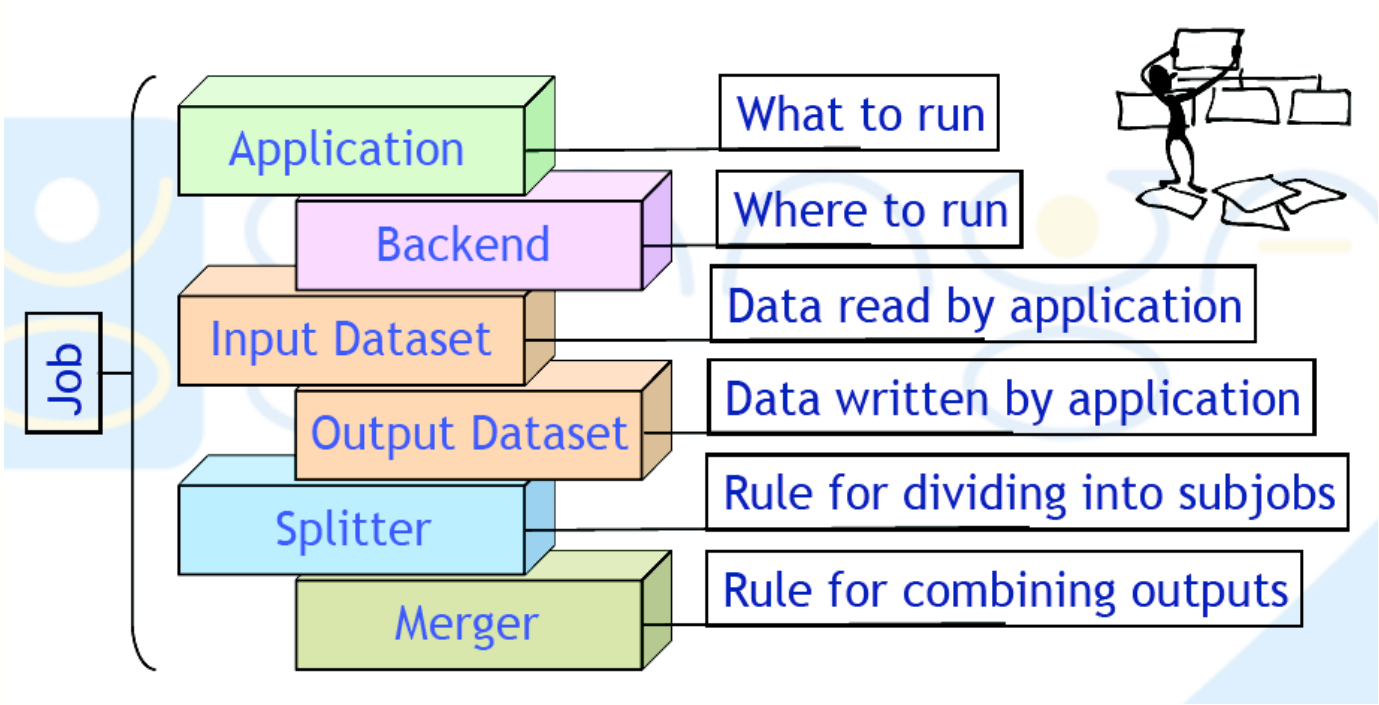
- Logical File Name (LFN)
  - An alias created by a user to refer to some item of data, e.g. “lfn:/grid/envirogrids.vo.eu-egee.org”
- Globally Unique Identifier (GUID)
  - A non-human-readable unique identifier for an item of data, e.g.

    “guid:3a69a819-2023-4400-a2a1-f581ab942044”
- Site URL (SURL)
  - Gives indication on which place (Storage Element) the file is actually found.
  - Understood by the SRM interface
- Transport URL (TURL)
  - Temporary locator of a replica+access protocol



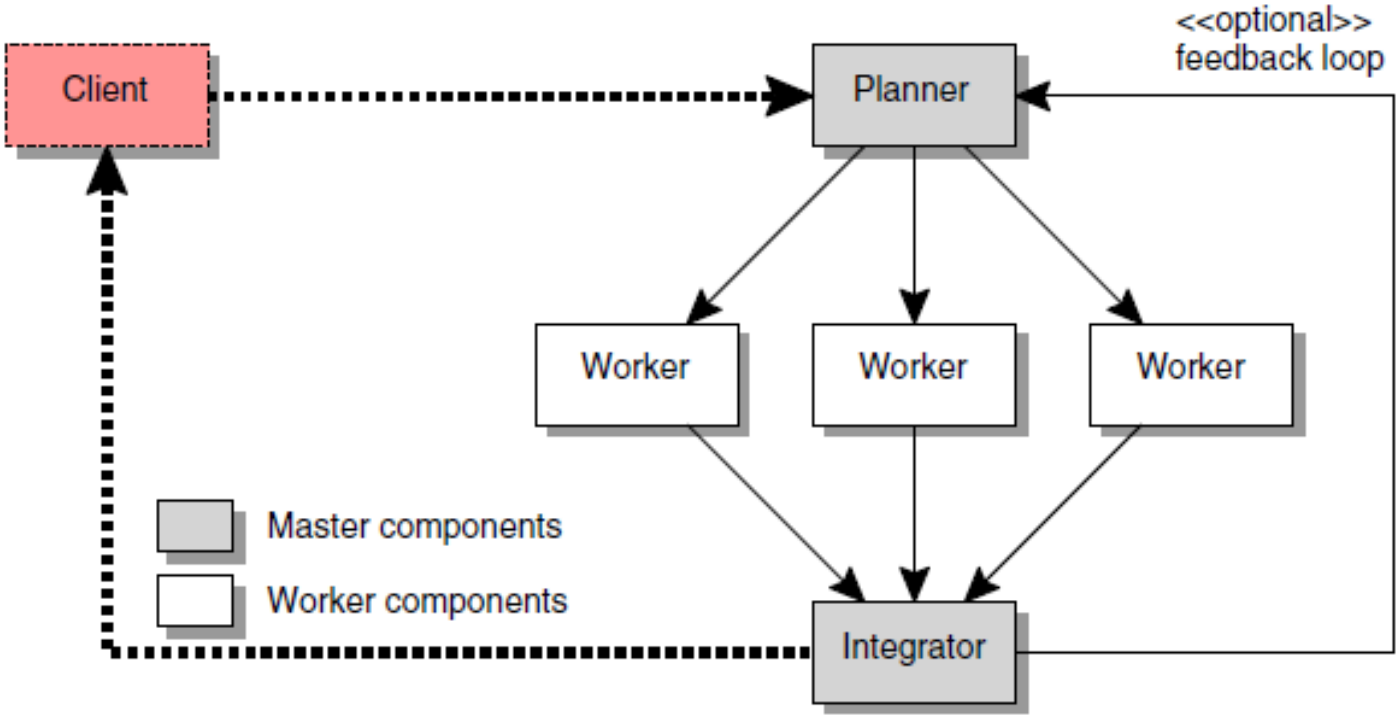
GANGA

- Allows users to run jobs locally, on batch systems or on Grid.
- Is written in Python.

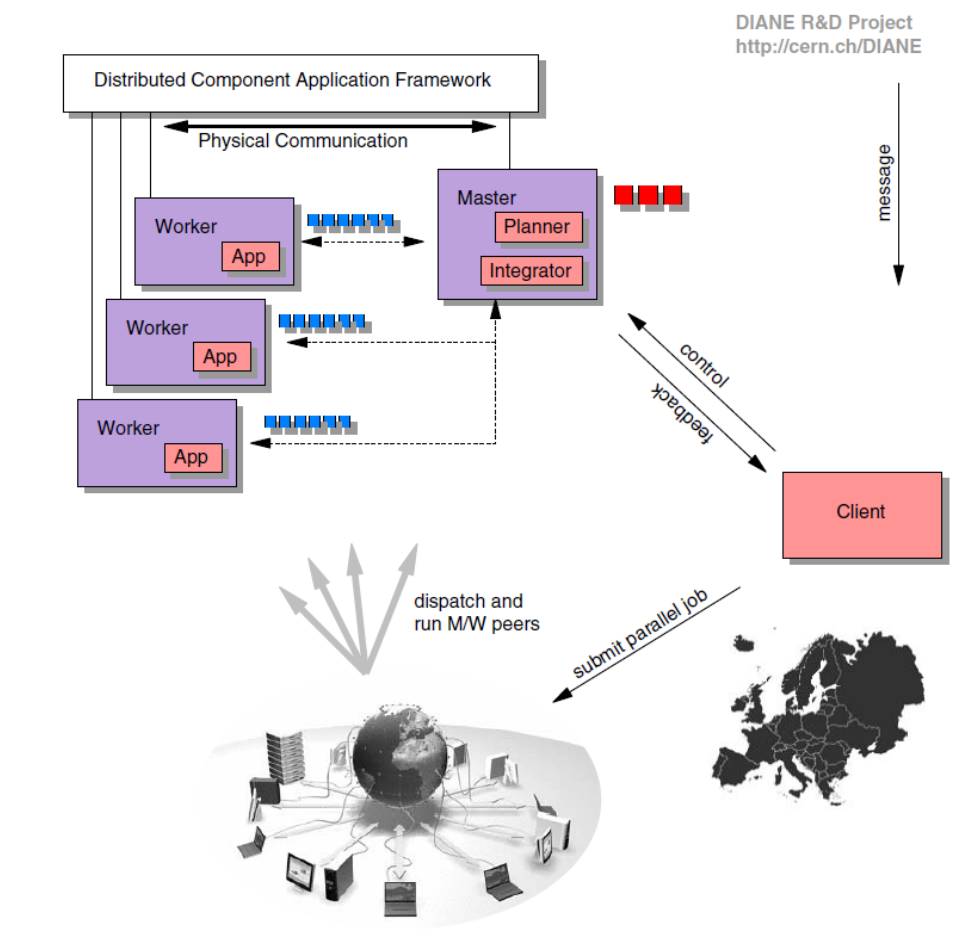


DIANE

- DIstributed ANalysis Environment
- software tool that provides a more efficient usage of the distributed computing infrastructures



DIANE


DIANE R&D Project
http://cern.ch/DIANE
Distributed Component Application Framework
Physical Communication
Worker
App
Worker
App
Worker
App
Master
Planner
Integrator
message
control
feedback
Client
dispatch and
run M/W peers
submit parallel job

Thank you for your attention!

Questions?

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