**egee**

# Configuring and Maintaining EGEE Production Sites

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**www.eu-egee.org**

e-infrastructure

**Enabling Grids for E-sciencE**

- **Agenda**

  09:00 - 09:10   Welcome and Overview

  09:10 - 09:30   Introduction to the EGEE Infrastructure

  09:30 - 10:00   EGEE in Cyprus

  10:00 - 10:20   EGEE Grid Site Architecture overview

  10:20 - 10:40   gLite Middleware and Services

  10:40 - 11:00   YAIM installation and configuration tool

  11:00 - 11:15   Coffee Break

  11:15 - 13:30   Hands-on Installation and Configuration - Part 1

  13:30 - 14:30   Lunch

  14:30 - 16:00   Hands-on Installation and Configuration - Part 2
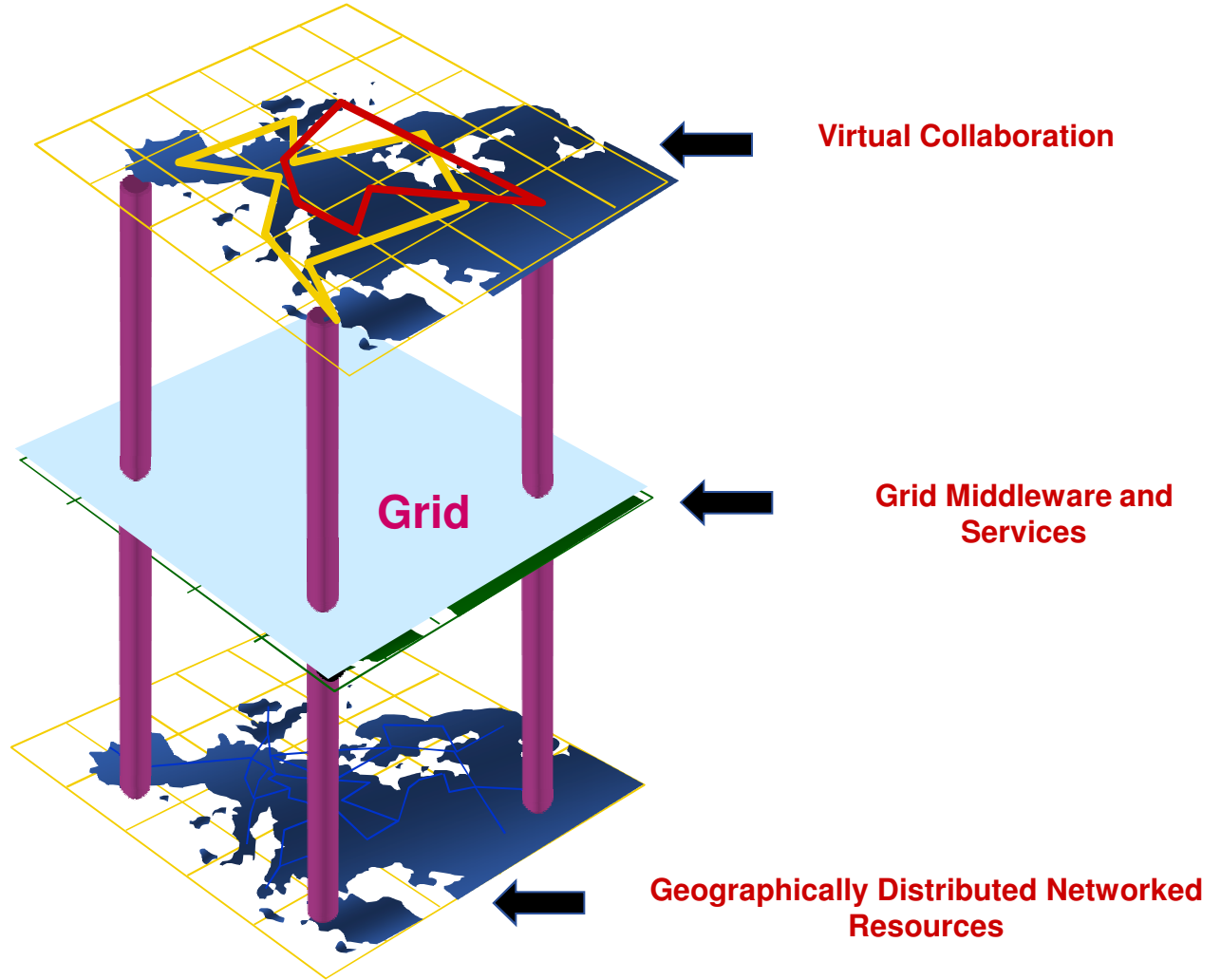
# Introduction to the EGEE Infrastructure

**Enabling Grids for E-sciencE**

- **Formal Definition: -** *Ian Foster and Carl Kesselman*

    *"An infrastructure that enables flexible, secure, coordinated resource sharing among dynamic collections of individuals institutions and resources"*
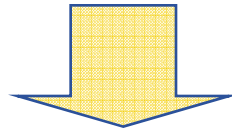
- **Computational Grid :** a huge collection of geographically distributed, high performance computational and storage resources.

- This collection of network connected resources and middleware provide services and seamless access to the end-user.

- Users usually are members of virtual groups with common interests.

**Virtual Collaboration**

**Grid**

**Grid Middleware and Services**

**Geographically Distributed Networked Resources**

![egee logo] Enabling Grids for E-sciencE

- **EGEE** (**E**nabling **G**rids for **E**-Scienc**E**) is the largest Grid infrastructure in Europe.

- Aim: "*to establish a seamless European Grid infrastructure for the support of the European Research Area (ERA)*"

- Provides  computing support infrastructure for 13.000 researchers world-wide.

- ~ 260 Resource centres in 48 counter provide:

  - ~ 40.000 CPU's

    - ~ 92.000 cores

  - ~ 20 Peta-bytes of storage
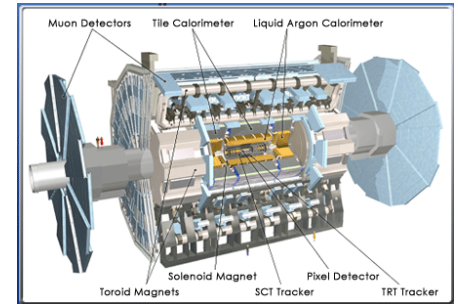
- 162 Virtual Organizations

**Enabling Grids for E-sciencE**
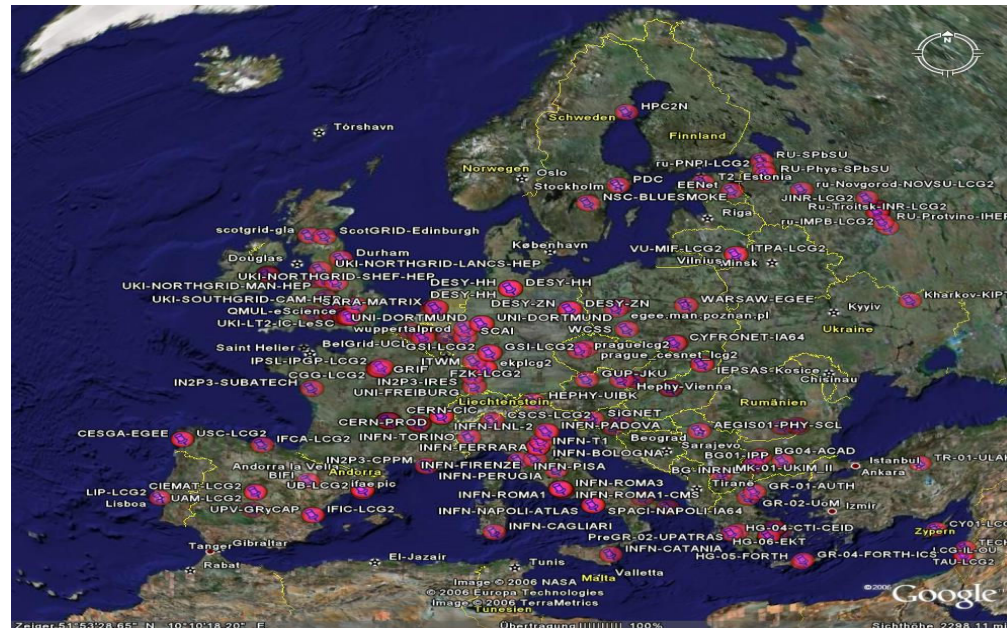
- **Virtual Organizations (VO):** Virtual Groups with members with common research interests.
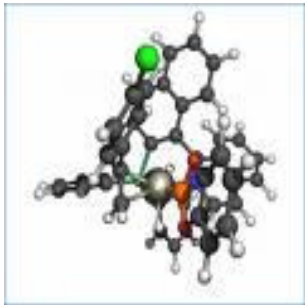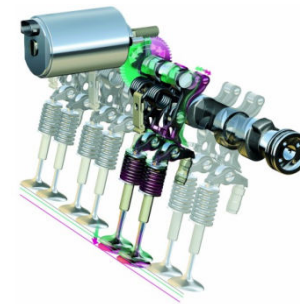
**Computational Chemistry**

**Mathematics**

**High Energy Physics**

**Computing**

**Engineering**

**Enabling Grids for E-sciencE**

- **Simulation**
  - Large number of similar, independent jobs – parameter study

- **Bulk Processing**
  - Widely-distributed input data, Sophisticated data management

- **Workflow**
  - Complex dependencies between individual tasks

- **Legacy Applications**
  - Licenses: control access to software on the grid
  - No recompilation $\Rightarrow$ no direct use of grid APIs

- **Parallel Jobs**
  - Many CPUs needed simultaneously, Use of MPI libraries
  - *Currently limited support in gLite: MPI configuration is not uniform*

- **Responsive Apps.**
  - Short response time

- **Production service**
  - Resource centres around the world
  - Running only well-tested and reliable middleware releases
  - 260 site, 48 countries, ~ 40.000 CPUs, ~64 PB storage
  - Separated into ~200 Virtual Organizations

- **Pre-production service**
  - Runs in parallel with the production service (restricted number of sites)
  - First deployment of new versions of the gLite middleware

- **Training  Infrastructure - GILDA**
  - Complete suite of Grid elements
  - Everyone can register and use
  - GILDA for training and application
  - Porting – https://gilda.ct.infn.it/

**Enabling Grids for E-sciencE**

- **Middleware runs on each shared resource to provide**
  – Data services
  – Computation services
  – Security service

- **Resources and users form VO's as basis for collaboration**

- **Distributed services (both people and middleware) enable the grid**

**INTERNET**

# EGEE In Cyprus

**Enabling Grids for E-sciencE**
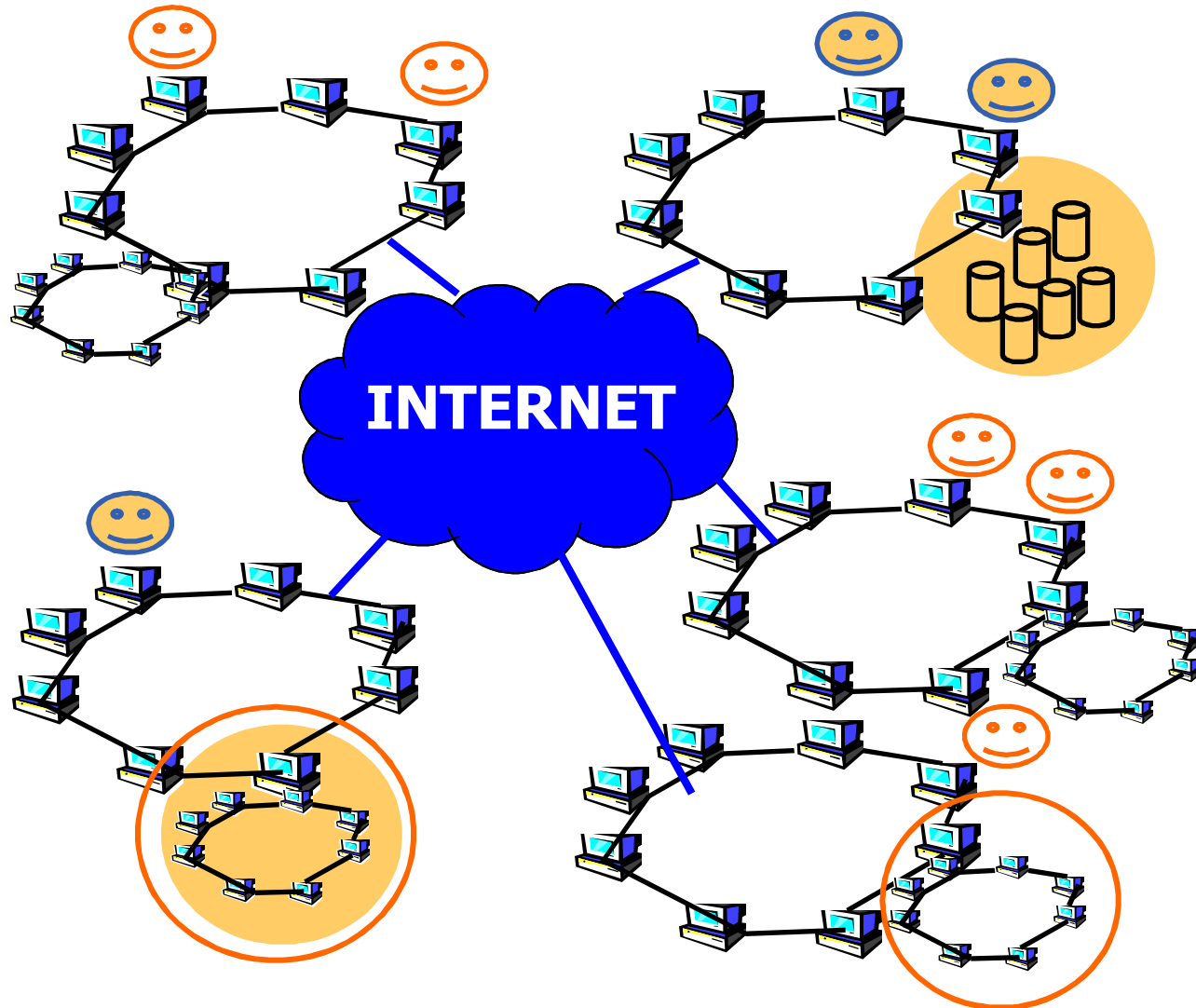
- **EGEE**
  - 1 April 2004 – 31 March 2006
  - 71 partners in 27 countries, federated in regional Grids
  - Cyprus among those 27 countries.
    - Establishment of **CyGrid** – The Cyprus Grid Initiative
    - First EGEE site at University of Cyprus – HPCL

- **EGEE-II**
  - 1 April 2006 – 30 April 2008
  - Expanded consortium
  - 2$^{nd}$ production site added to **CyGrid** – University of Nicosia

- **EGEE-III**
  - 1 May 2008 – 30 April 2010
  - Transition to sustainable model: European Grid Initiative (EGI)
  - National Grid Initiatives (NGI's)
  - 3$^{rd}$ production site added to **CyGrid** – Univ. Of Cyprus (Dept. Of Physics)

**Enabling Grids for E-sciencE**

- **CY-01-KIMON**
  - <u>Location</u>: University of Cyprus (Dept. Of Computer Science)
  - <u>State</u>: Production
  - 82 CPU's
- **CY-02-TESTBED**
  - <u>Location</u>: University of Cyprus (Dept. Of Computer Science)
  - <u>State</u>: Pre-Production
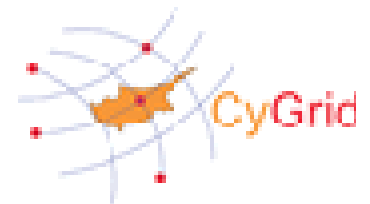  - 10 CPU's
- **CY-03-INTERCOLLEGE**
  - <u>Location</u>: University of Nicosia (Dept. Of Computer Science)
  - <u>State</u>: Production
  - 10 CPU's
- **CY-04-\***
  - <u>Location</u>: University of Cyprus (Dept. Of Physics)
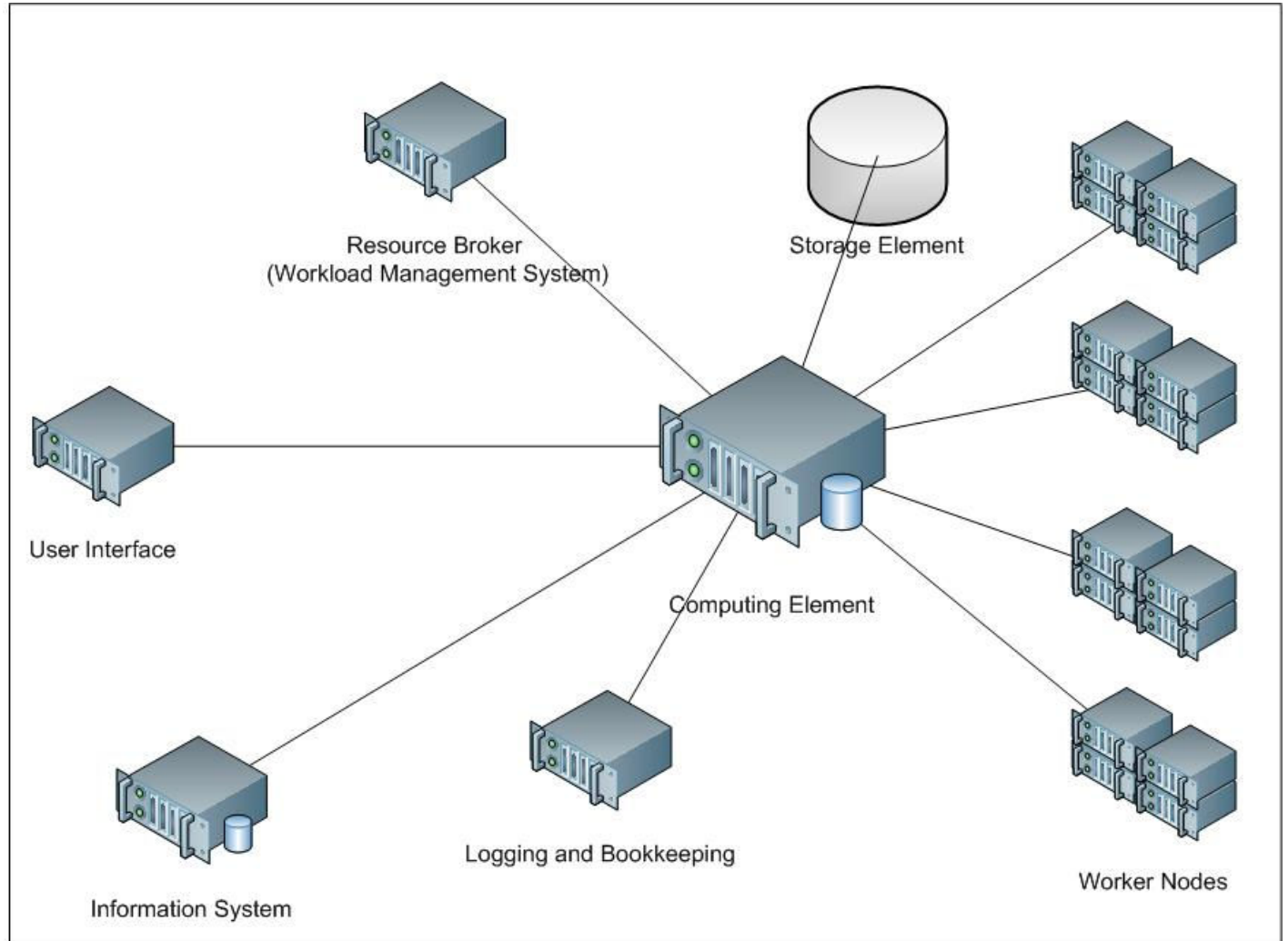  - <u>State</u>: Production
  - 12 CPU's

**Enabling Grids for E-sciencE**

- **CyGrid –** The Cyprus Grid Initiative ( http://cygrid.org )

- The top-level Grid authority in Cyprus.

- Responsible for all Grid activities on the island.

- Houses the Certification Authority (CA) through which access to the EGEE infrastructure is obtained.
    - Signs and issues X.509 Certificates for Grid Users / Hosts / Services.

- Provides User support and Application Porting

- Training.
    - Administrators
    - Current and New Users

# EGEE Grid Site Architecture Overview

**Minimal Services**



Resource Broker
(Workload Management System)

Storage Element

User Interface

Computing Element

Information System

Logging and Bookkeeping

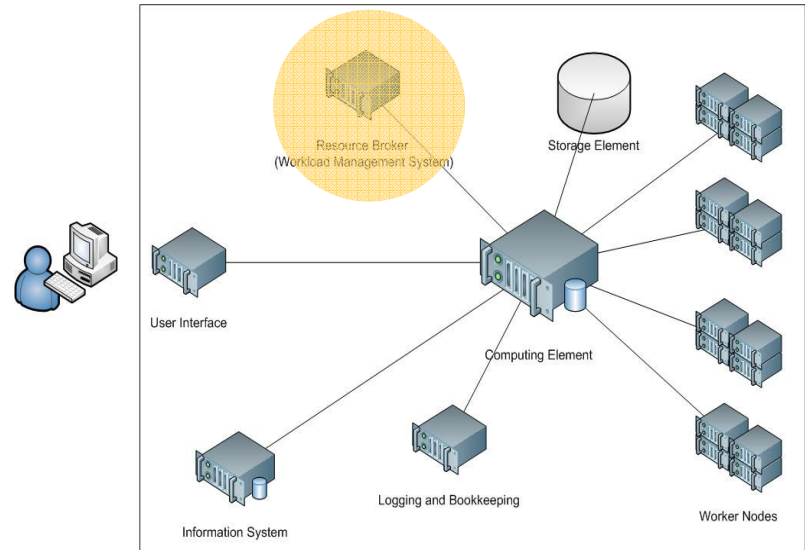Worker Nodes

**Enabling Grids for E-sciencE**

- **User Interface(UI):** Gateway for the end-user to the Grid.

- At the UI users have a personal account where their user certificate (X.509) is installed

- Through CLI it provides basic operations to Grid resources:
  - Candidate resource listing for job execution.
  - Job submission and monitoring.
  - Job output retrieval.
  - Copy / replicate / delete data from the Grid.
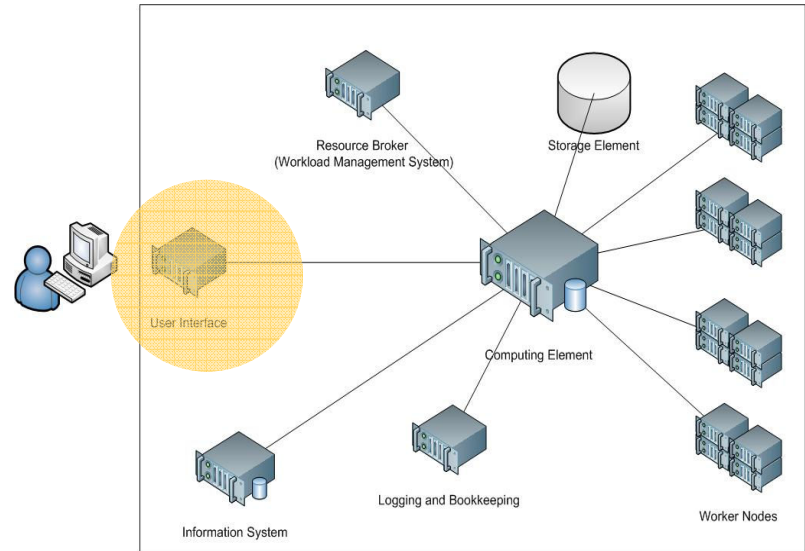
- **Information Service (S-BDII):** publishes the state of the resources of an individual Grid site.

- The Berkley Database information index (BDII) is an Information Service (IS), which uses the standard LDAP database.

- A Top Level BDII collects the information from this Site BDIIs to make them accessible by the Grid Services and applications.
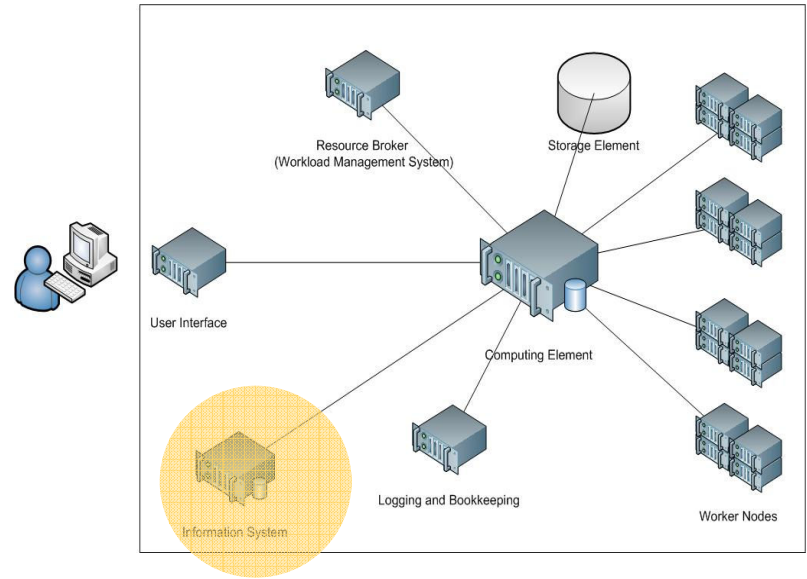
- **Workload Management System (WMS):** Responsible for matching the user requirements with the available resources on the Grid.

- Available resources are retrieved from Information Services.

- After matching is completed, accepts submitted jobs and sends them to the appropriate Computing Element

**Enabling Grids for E-sciencE**

- **Computing Elemet (CE):** Gateway to the computing resources of the localized Grid site.

- Jobs enter a batch queue to be sent to the resources.

- At the CE, a process is being executed that accepts jobs and dispatch them for execution to the Worker nodes (WNs)

- The CE is responsible to watch the state of an executing job
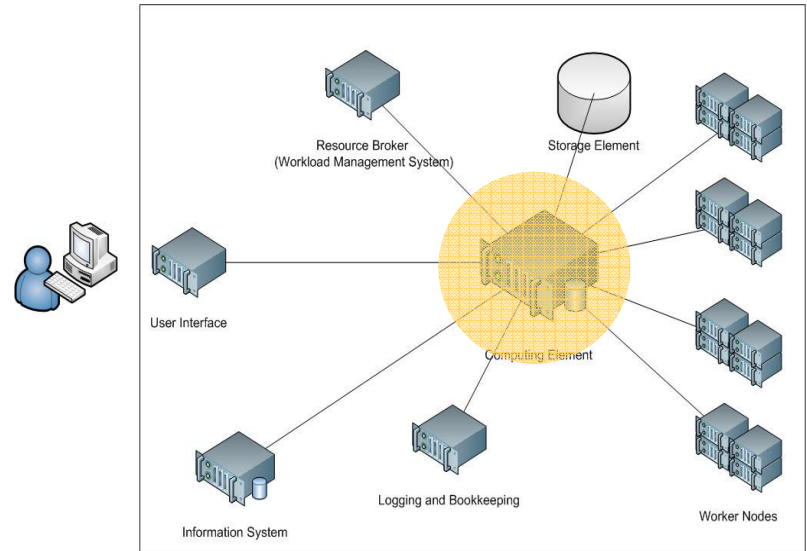
**Enabling Grids for E-sciencE**

- **Storage Element (SE):** Provides an interface to the large-scale storage hosted by a particular site.

- SE may control simple disk servers, large disk arrays or Mass Storage Systems.

- Each site may provide one or more SE's
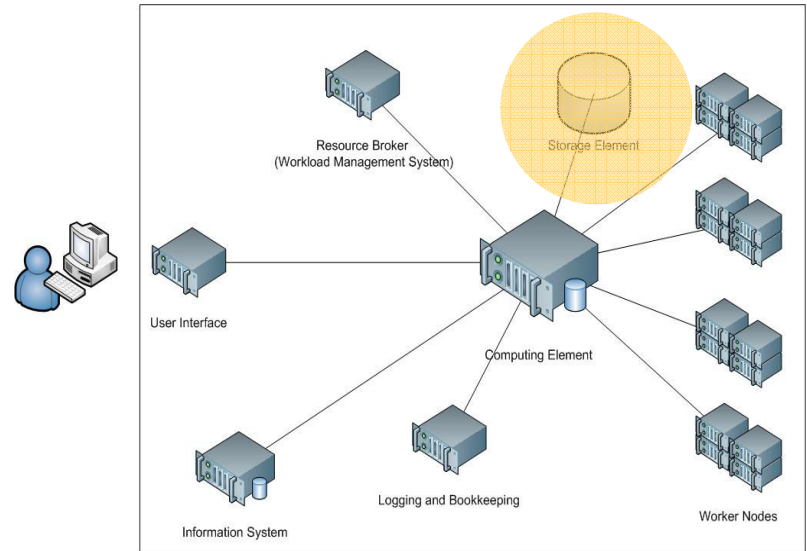
- **Worker Nodes (WN):** Computing nodes where the actual user's Grid jobs are executed.

- Only basic services of middleware are required to be provided by the Worker Nodes such as:
  - Application libraries.
  - Application Programming Interfaces (API) .
  - Commands for performing actions on Grid resources and Grid data.
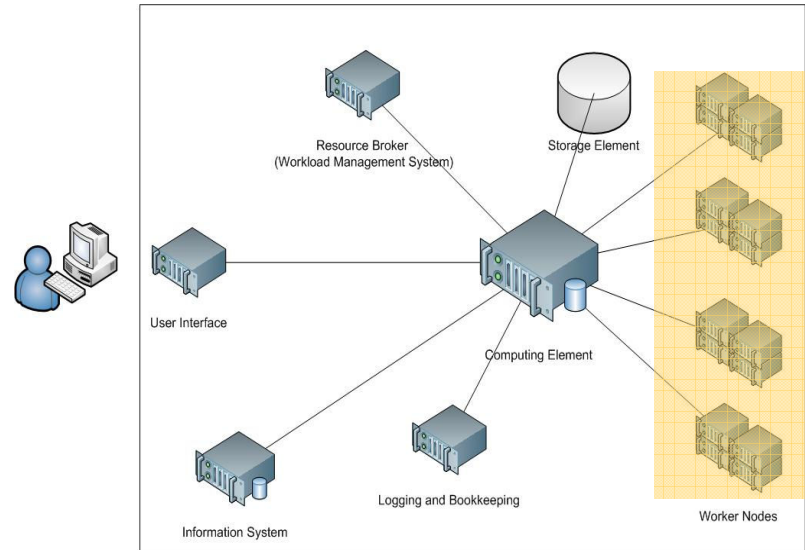
# EGEE Grid Site Overview

- **Computing Elemet (CE):** gateway to the computing resources of the localized Grid site. Jobs enter a batch queue to be sent to the resources.

- **User Interface (UI):** access point for the user to the Grid.

- **Information Service (S-BDII):** publishes the state of the resources of an individual Grid site. Berkley Database Information Index (BDII).

- **Storage Element (SE):** provides an interface to the large-scale storage hosted by a particular site.

- **Worker Nodes (WN):** Computing nodes where the actual user's Grid jobs are executed.

- **Workload Management System(WMS):** Matches the user requirements with the available resources on the Grid.

# gLite Middleware and Services

**Enabling Grids for E-sciencE**

- **The Grid relies on advanced software, called middleware, which interfaces between resources and the applications**

- **The Grid middleware:**
  - Basic services
    - Secure and effective access to resources
  - High level services
    - Optimal use of resources
    - Authentication to the different sites that are used
    - Job execution & monitoring of progress
    - Problem recovery
    - Transfer of results back to the use

**Enabling Grids for E-sciencE**
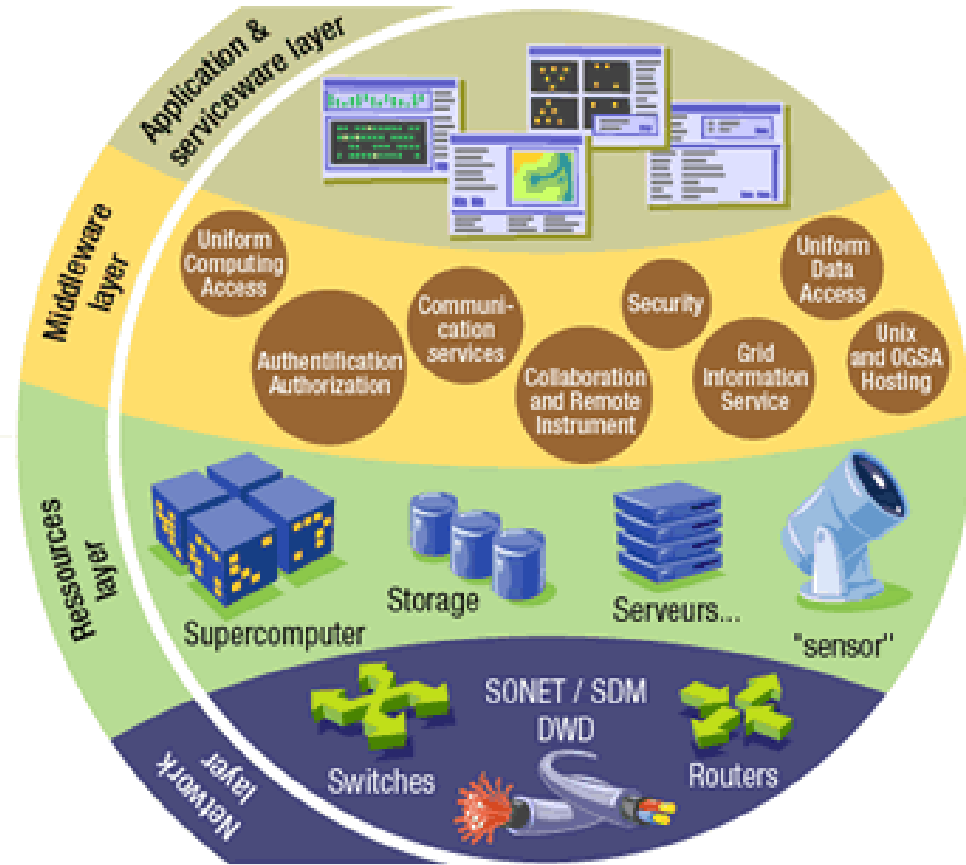
- **When using a PC or workstation you**
  - Login with a username and password ("Authentication")
  - Use rights given to you ("Authorization")
  - Run jobs
  - Manage files: create them, read/write, list directories
- **Components are linked by a bus**
- **Operating system**
- **One admin. domain**

- **When using a Grid you**
  - Login with digital credentials – single sign-on ("Authentication")
  - Use rights given you ("Authorisation")
  - Run jobs
  - Manage files: create them, read/write, list directories
- **Services are linked by the Internet**
- **Middleware**
- **Many admin. domains**

- **The current release is gLite 3.2**
  - **Compatible with Scientific Linux 5**
    - Some services also work with Debian and/or older SL distributions
- **gLite is…**
  - A distribution
  - With its own large development effort
  - **It is updated almost every week**

**eGee**

Enabling Grids for E-sciencE

EGEE Maintained Components

• User Access

User Interface

User Interface

• General Services

• BDII

Workload Management Service

Logging & Book keeping Service

Hydra

• Virtual Organisation Membership Service

• Information Services

File Transfer Service

LHC File Catalogue

• AMGA

• Proxy Server

• Security
• Services

• Compute Element

• Storage Element

CREAM

• LCG-CE

• Disk Pool Manager

• SCAS

Authz. Service

• MON

BLAH

dCache

LCAS & LCMAPS

gLExec

• Worker Node

• Physical Resources