The Globus Framework

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February 5, 2001
The First NorduGRID project meeting


**Background**

What is the Grid?

- Computer infrastructure for the future

What is Globus?

- An implementation of the software infrastructure for a Grid

Principal Authors:

- Ian Foster & Carl Kesselman

- The Grid book

Global testbed:

- GUSTO (Globus Ubiquitous Supercomputing Testbed)

70+ Institutions worldwide
Approach

- Toolbox with tools
- Not a complete solution (take what you need and ignore the rest)
- Respect different site policies (No enforced arbitrary standards)
- Access to distributed resources without heavy rewriting of existing programs
## Core Globus Services

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The Grid Architecture

Applications

High-level Services and Tools

Testbed Status

Core Services

Local Services

Applications
Globus Services explanation 1

- Communication Infrastructure (Nexus)
  Allows processes to communicate with each other over a variety of protocols.
- Metacomputing Directory Service (MDS)
  Provides properties of all resources currently available to Globus on the Grid.
- Network performance monitoring (Gloperf)
  Starts a daemon at either end of a connection and runs experiments to determine
  the network performance available to Globus over that connection.
- Hearbeat Monitor (HBM)
  Starts a daemon that any given process can register with - Informs the user if the
  process dies.
- Remote file and executable management (GASS and GEM)
  Provides access to secondary storage over Globus. Remote storage is made
  available to the running application as if it were local.
**Globus Services explanation 2**

- **Resource management (GRAM)**
  Processes requests for resources for remote application execution, allocates the required resources, and manages the active jobs.

- **Globus Security Interface (GSI)**
  "Authenticate-Once" security for Globus is implemented via public/private key pairs and a special version of SSL.

- **DUROC: co-allocation of multiple systems**
  Handles submission of multiple simultaneous jobs across the Grid.

- **Nimrod: high-throughput computing**
  Enables parameter-testing by allowing automated submission of a job with many different sets of parameters.
Resource Management

GRAM - Globus resource allocation manager (Resource Broker)
- Resource allocation, process creation and management services
- Provides interface to resource management systems via standard API
- Scheduling Systems:
  Unix fork, Condor, PBS, LSF, Loadleveler,
- Resource requests are expressed in a unified Resource Specification Language (RSL)
- RSL "Hello World":
  ```
  & (count=1)
  (executable=/bin/echo)
  (arguments="Hello Globus World!")
  ```
- MPICH-G (Globus enabled MPI)
Security

- Authentication using gssapi_ssl

  Generic Security Service API based on Secure Socket Layer (SSL)

- Relies on X509 certification

- The Certificate Authority (CA) creates certificates based on user requests

- Creation of user certificate is based on public key encryption

- Globus supports multiple CA’s

- Security policy is site based

- Each resource has an Access Control List (ACL)
Information

Grid Information Services (GIS)
aka
Metacomputing Directory Service (MDS)

- Implemented as a pull model
- Distributed information services
  "Grid Resource Information Service" (GRIS)
- Each resource runs a GRIS (LDAP server)
  Provides information such as:
  Hostname, OS version, CPU availability,…
- Central Information Service
  "Grid Index Information Service" (GIIS)
- Provides information about all resources
- Each resource has a "distinguished name" unique to the Grid
Future

Data Grid (work in progress)

Fundamental basic services:

- Storage systems (data access)
- Metadata management

  How to publish and access information about file instances, the contents of file instances and the storage systems in the data grid
Local testbed

NorduGRID - South:

Quark — Kosufy

NBI — CERN