An Approach for the Co-existence of Service and Opportunistic Grids: The EELA-2 Case

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• **Outline**

  – Motivation

  – Service grids vs. opportunistic grids
    - gLite
    - OurGrid

  – Our approach for the co-existence of such grids in the same architecture
    - Using service grid resources opportunistically
    - Exposing opportunistic grid resources to service grids

  – Current status and future work
• Motivation
  – Grids have become a reality with many infrastructures currently in place
    ▪ EGEE, TeraGrid, SETI@home, Grid 5000, Condor pools, OurGrid communities and many others
  – These infrastructures can be broadly divided into two classes
    ▪ Service grids
      • High performance dedicated machines and large data storage elements
      • Spread over a relatively small number of sites
      • High and well defined level of QoS
    ▪ Opportunistic grids
      • “lightweight” grid infrastructures based on the scavenging of idle computing cycles from non-dedicated resources
      • Able to assemble large amounts of resources
      • Best-effort grids, appropriate to run BoT applications
Motivation

- A natural step forward is to allow these infrastructures to interoperate somehow
  - GIN working group at OGF
  - Several gateways between grid infrastructures have been proposed and implemented
- We advocate that co-existence (instead of interoperation) is a better strategy to explore synergy between grids of different kinds
  - In particular, the co-existence of a service and an opportunistic grid allow:
    - *Idle resources from the service grid to be used in an opportunistic way*
    - *Increase the size and reach of the grid infrastructure*
    - *More suitable platform to run BoT applications, possibly liberating service grid resources to run essentially the tightly-coupled applications*
• **The gLite Middleware**
  – Created in the context of the EGEE Project
  – Exploit *experience and existing components* from Condor, Globus, EDG/LCG, AliEn, and others
  – Develop a *stack of generic middleware* useful to EGEE applications (HEP and Biomedics are pilot applications)
  – Pluggable components – cater for different implementations
gLite follows a Service Oriented Architecture

- Facilitate interoperability among Grid services
- The services work together in a concerted way but can also be deployed and used independently, allowing their exploitation in different contexts

Services communicate through the exchange of messages

- Slowly moving to WS-* interfaces
- Activity inside OGF-GIN
### Middleware Structure

- Applications have access both to **Higher-level Grid Services** and to **Foundation Grid Middleware**
  - Higher-Level Grid Services are supposed to help the users building their computing infrastructure but should not be mandatory
  - Foundation Grid Middleware will be deployed on the EGEE infrastructure
E-science grid facility for Europe and Latin America

UI JDL

Logging & Book-keeping

Resource Broker

LFC Catalog

Information Service

Storage Element

Author. & Authen.

Job Submit Event

Job Status

Job Submission Service

Globus RSL

Computing Element

Expanded JDL

Output "sandbox" + Broker Info

Input "sandbox"

DataSets info

Input "sandbox"

Output "sandbox"

Job Status

Job Status

voms-proxy-init

Job Query

Publisher
• What is an OurGrid grid?

Resource Centre Manager
Grid-wide Resource Sharing

Sandboxing
(WM+WN)

User Interface
Application Scheduling
What kind of applications are supported by an OurGrid grid?

- It will depend on the virtual machines that will be made available by the managing agent of the worker nodes.

- Currently we have support for BoT applications that:
  - Have relatively short tasks
  - *Due to the best-effort nature of the worker nodes*
  - Have no inter-task communication
  - Are self-contained
    - *no need for special dynamically linked libraries*
Roadmap for allowing the co-existence of a service grid based on gLite and an opportunistic grid based on OurGrid
The first step is to allow EELA-2 OurGrid Resource Centres to be created

- Provide support for the use of the gLite PKI by OurGrid resource centres
The second step is to allow idle resources in an EELA-2 gLite resource centre to be exposed as OurGrid resources.
The final step is to allow resources of an OurGrid resource centre to be exposed as gLite resources

- This will be achieved in two sub-steps
  - Firstly, allow clusters to be exposed as a single resource in an OurGrid resource centre
The final step is to allow resources of an OurGrid resource centre to be exposed as gLite resources

- This will be achieved in two sub-steps
  - Firstly, allow clusters to be exposed as a single resource in an OurGrid resource centre
  - Secondly, make these resources available at the gLite grid
• Current status and future work
  – Latest version of OurGrid just released with support to X.509 certificates
  – Support for the exploitation of idle cycles in service grids will be available soon and will be part of the production infrastructure in operation from November 2008
  – Cluster worker planned for early 2009
  – Evaluate the impact of the co-existence in a production environment