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ON HIGH PERFORMANCE COMPUTING AND GRIDS
Cetraro (Italy), June 30 - July 4, 2008**

Panel: “From Grids to Cloud Services”

**Towards a New Model for the
Infrastructure Grid**

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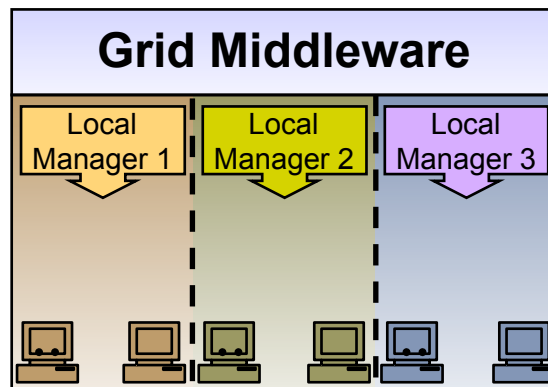
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**Distributed Systems Architecture Research Group
Universidad Complutense de Madrid**



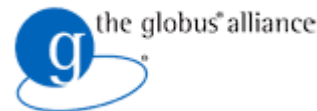
Interoperability across Administration Domains

- Grid technology enables the **integration, virtualization, and management of services and resources in a distributed, heterogeneous environment**
- **Grid mw stacks** supports the deployment of partner grid infrastructures



➔ **Common Interface for Each Type of Resources:** User can access a wide set of resources.

➔ **Types of Resources:** Computational, storage, network...



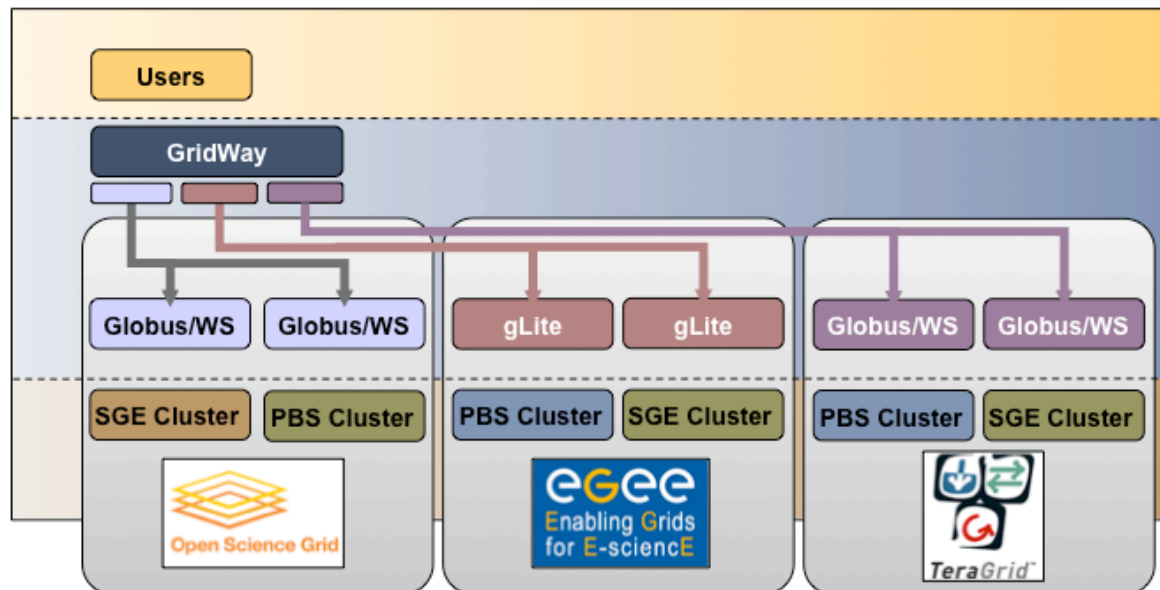
- **OGSA and its building services and blocks** are being defined in



Compute Grid Infrastructures

Grid Technology for the Federation of Computing Platforms

- Compute Grid infrastructures use Grid technology to federate computing resources spanning multiple sites for job execution and data processing
- Sites provide:
 - **Services to access specific basic resources**, such as Security, Information & Monitoring, Data Management and Execution
 - **Tools to orchestrate the federation between sites and even the interoperation between Grid infrastructures**, such as the GridWay meta-scheduler



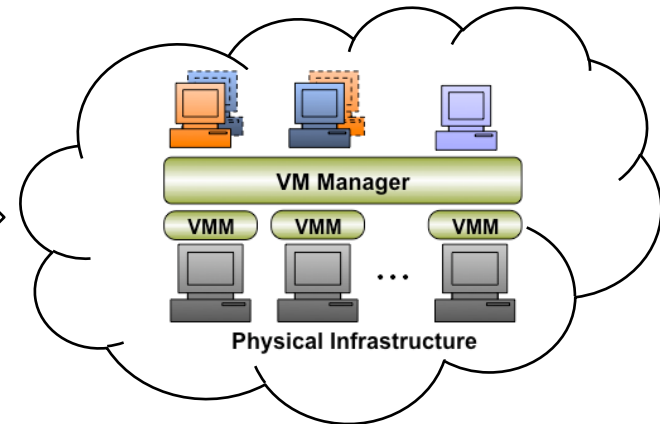
Cloud Systems as Infrastructure Sites

A Service to Provide Hardware on Demand

- Cloud systems provide **virtualized resources as a service**
- Provide **remote on-demand access to infrastructure** for the execution of virtual machines, so supporting the execution of any any service

Simple Interfaces for VM Management

- Submission
- Control
- Monitoring



- Main components of a **Cloud architecture**:
 - Front-end: Remote interface => Grid service for VM management
 - Back-end: Local VM manager => Site autonomy

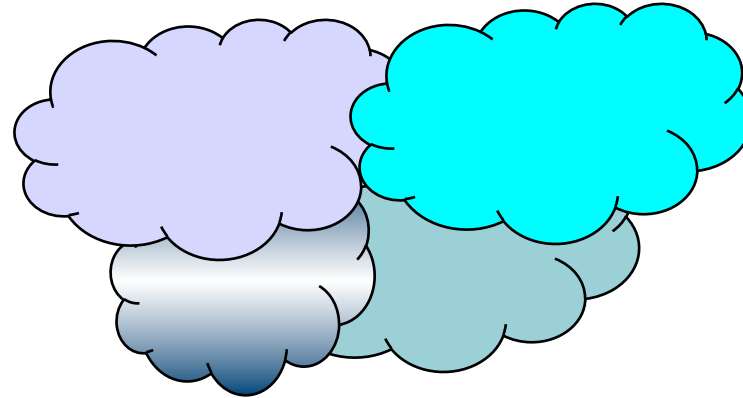
Infrastructure Cloud Services

- **Commercial Cloud**: Amazon EC2
- **Scientific Cloud**: Nimbus (University of Chicago)

Federation of Clouds

Grid Technology could be used for the Federation of Cloud Systems

- Cloud sites may share their hardware resources to **support the distributed execution of groups of virtualized resources**



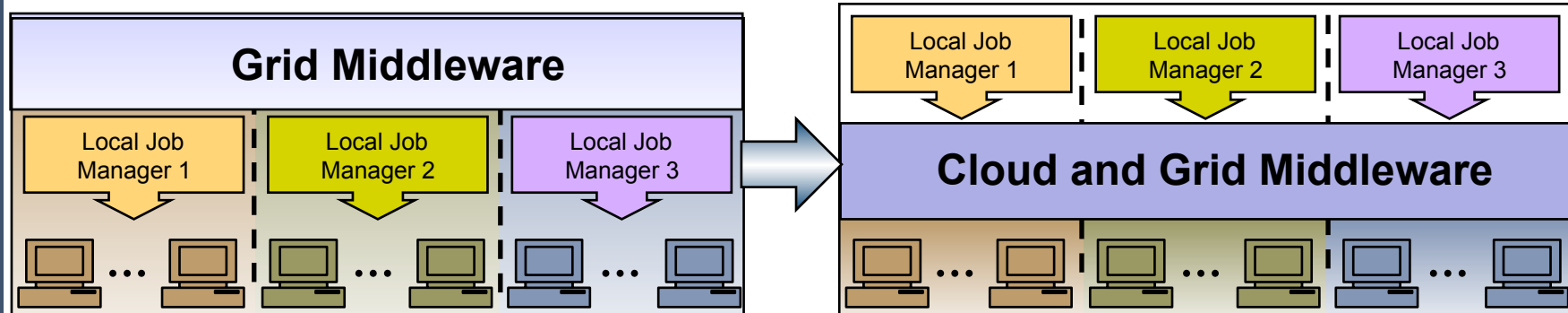
- Grid interfaces and protocols may enable the **interoperability between the clouds or infrastructure providers to create a distributed virtual infrastructure**

Drivers for the Federation of Clouds

- **Sharing of resources between partners**
- **No single facility/provider can create a seemingly infinite infrastructure capable of serving massive amounts of users at all times, from all locations**

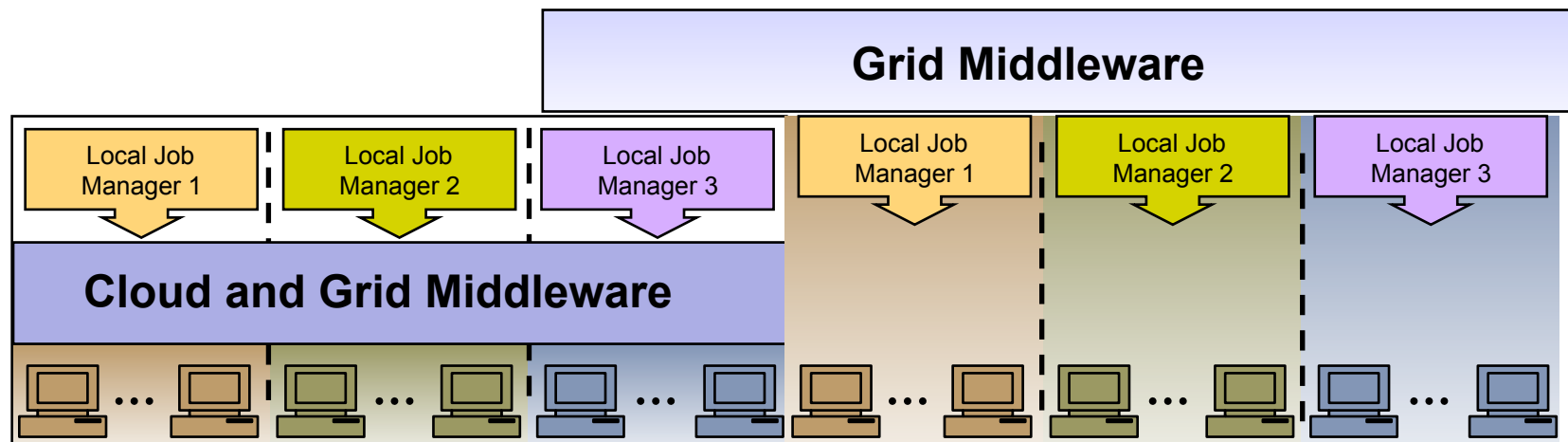
A New Model for the Infrastructure Grid

From Sharing of Services to Sharing of Physical Infrastructure



- **Scale out your local cluster** using resources in other sites (including commercial clouds)

Compatible with Grids at Service Level





A New Model for the Infrastructure Grid

Advantages

- Fully adaptive and flexible
- Support any service, not only computing services
- Seamless integration with **any** service middleware stack
- Completely transparent to the service and so end users
- Quality of service
- Full control over virtualized resources

=> OVERCOME MAIN OBSTACLES FOR GRID ADOPTION...

Disadvantages

- Virtualization Overhead



A New Model for the Infrastructure Grid

"Any problem in computer science can be solved with another layer of indirection... *But that usually will create another problem.*" David Wheeler

The Challenges of the Federation of Clouds

- Definition and standardization of interfaces between layers
- Dynamic management of VMs on highly distributed environments: migration, capacity provision, contextualization, security...
- Requirements from the service management layer on elasticity, management of VM groups...
- Management of VM images
- ...



A New Model for the Infrastructure Grid

"It is not the strongest of the species that survive, nor the most intelligent, but *the one most responsive to change*." Charles Darwin

The Questions

- Are the existing compute Grid Infrastructures going to evolve to Grids of Clouds?
- Which model is better for end users and site administrators?, to share basic infrastructure services or the physical infrastructure?

