Sky computing

A grid of clouds

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http://indico.cern.ch/conferenceDisplay.py?confId=56353

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- Virtual Machine Management

- Batch scheduling and Virtual Machines

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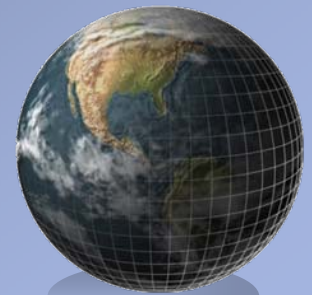
Use Cases (1)

- Resource flexibility
  - E.g. migration from SL4 to SL5
  - Provide both as virtual machine images
  - Balance resources with demand
- Resource management
  - Better scheduling options (preempt, migrate)
  - Difficult to manage many-core machines
  - Best to assign sandboxed resources
  - Virtual machines allow fine grained assignment
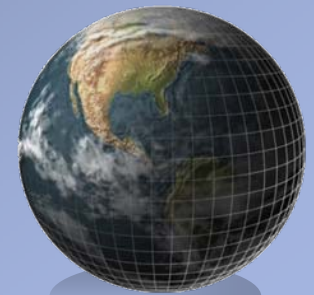 - Simplification for multi-core and MPI jobs?

BIG Grid - Virtualization working group

Multi-core, ATLAS KSM
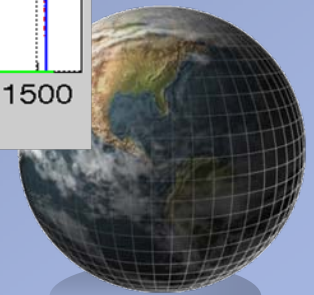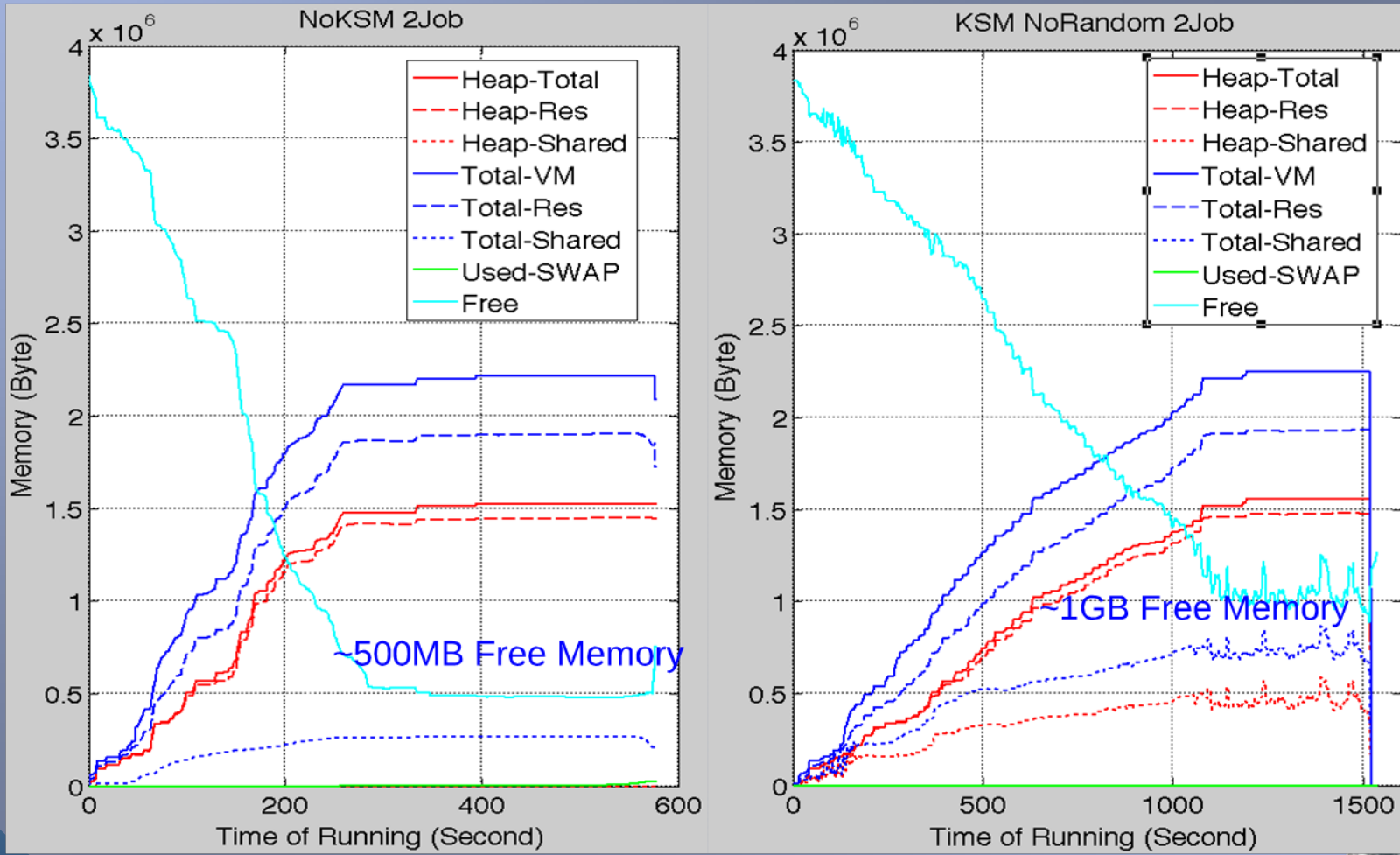
Use Cases (2)

- User perspective, isolation from environment
  - Run exactly the same on desktop and grid
  - Run a Virtual Machine on the desktop
  - Run the same Virtual Machine on the grid
- Non-batch processing, e.g. pilot jobs overlay or
  - Run some of the workflow tasks locally
  - Replicate Virtual Machine on the grid
  - Run intermediate tasks on the grid
  - Run final tasks on the desktop

Classification of Virtual Machines

Classification of Virtual Machines

- Different levels of trust
  - Class 1: Site generated Virtual Machines
    - E.g. worker node on SL4 or worker node on SL5
    - Equivalent setup as with existing physical nodes
  - Class 2: VO generated Virtual Machines
    - E.g. CERNVM images with ATLAS software
    - Establish policies between site and VO
    - Inspection and certification
    - Batch system integration and monitoring tools
  - Class 3: User generated Virtual Machines
    - Requires sandboxing and a lot more…

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Security issues - scope

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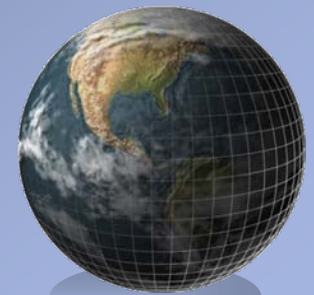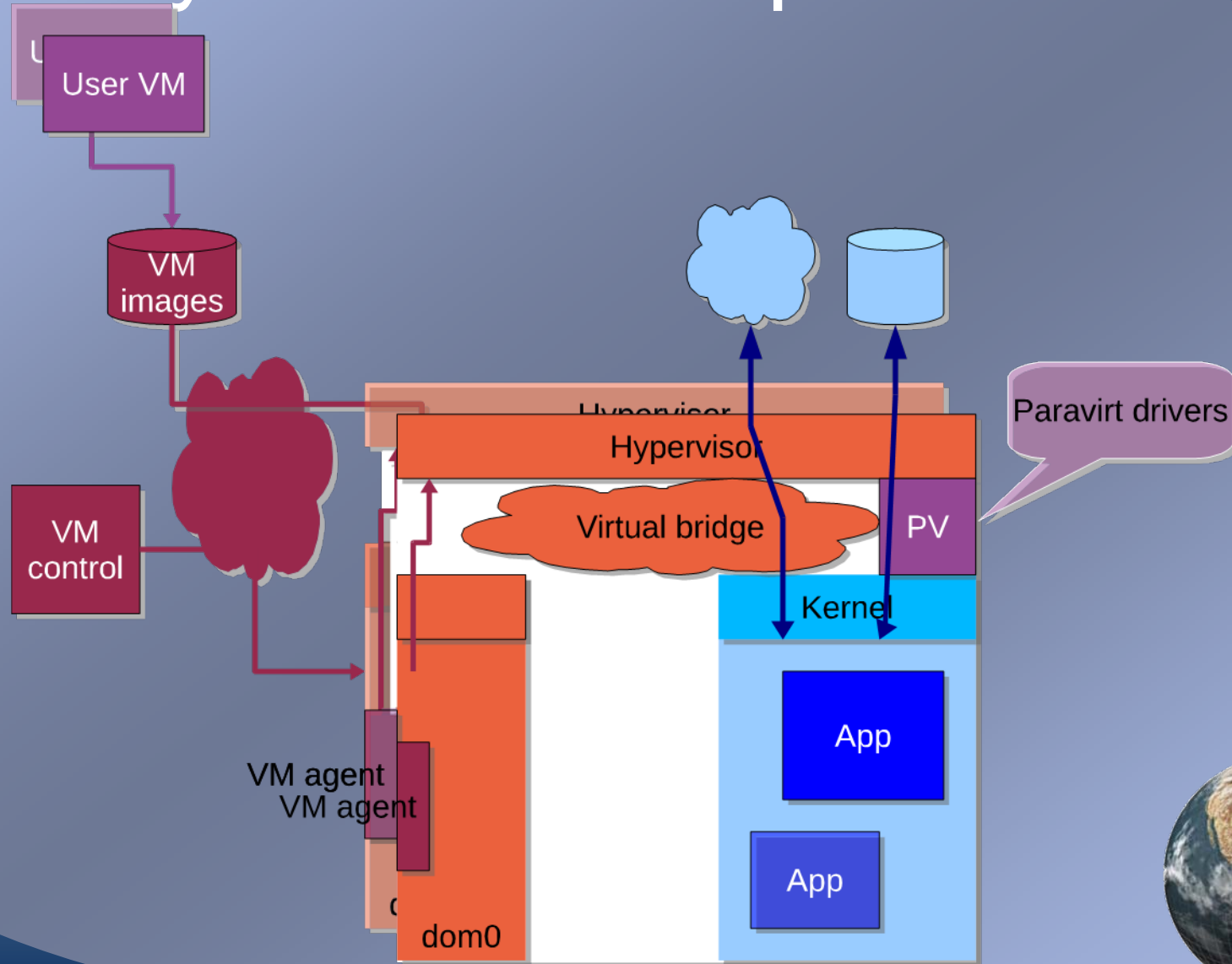
Security issues

- Site generated Virtual Machines
  - User accessible weaknesses in virtualization layer
  - VM break out, VM network, Para virtual drivers
- VO generated Virtual Machines
  - Management and trust infrastructure (suppliers?)
  - IP-based access control (e.g. NFS, firewalls)
  - Responsibility (patches) and reputation (legislation)
- User generated Virtual Machines
  - Transparency, traceability, provenance
  - Job management, credentials
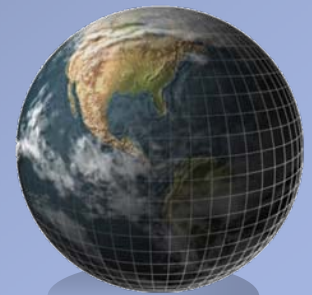
Virtual Machine management

- The Virtual Workspace Service (Nimbus)
- Separating resource and job management

...alization working group
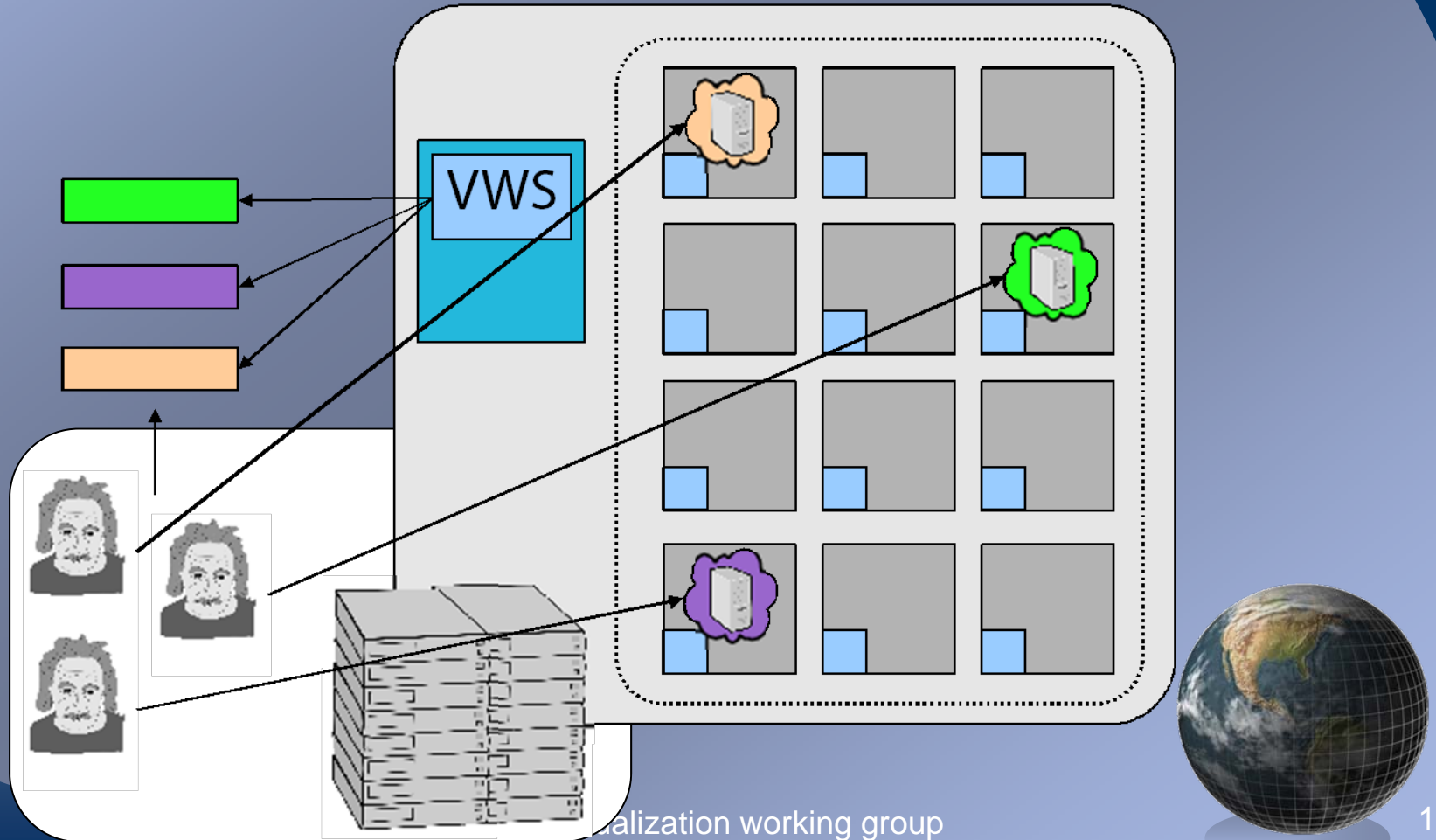
Batch scheduling and VMs

- More than 1 resource management layer
  - Batch job scheduling
  - Virtual Machine Management
  - (Pilot job frameworks)
- How to make them cooperate
  - LSF/VMO: adapt resources automatically
  - Nimbus/Haizea: Virtual Machine scheduler
  - Desy/INFN: Virtual Machines on demand

Adapt resources automatically

- Virtual Machine Orchestrator
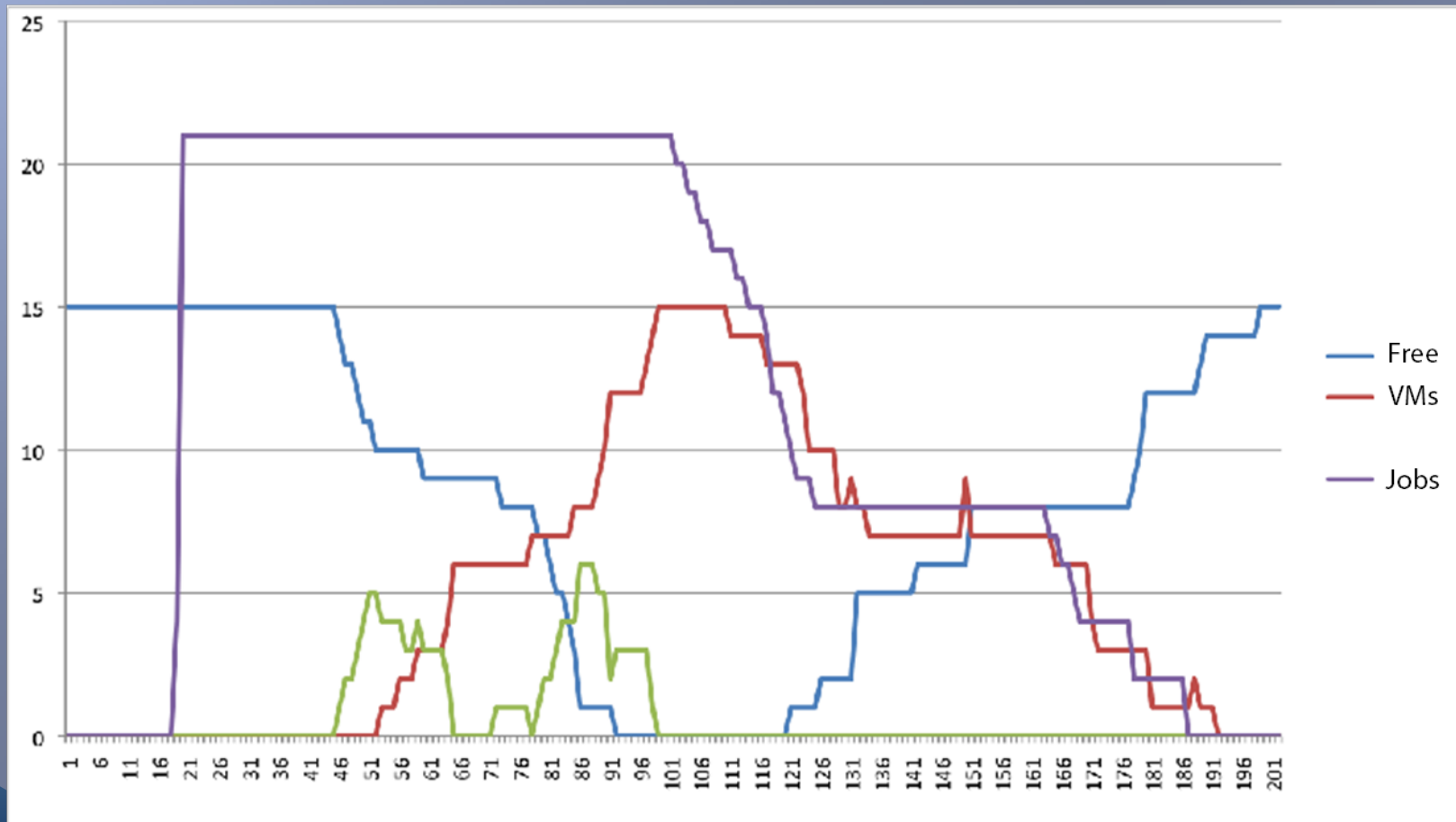
Virtual Machines on Demand (1)

Virtual Machines on Demand (2)

User interface → WMS → CE & Batch Server → Worker node & Batch Client

User interface → WMS → CE & Batch Server

DESY

- Prologue: Start VM
- Run job in VM
- … wait …
- Stop VM

Physical host & batch client

Virtual worker node
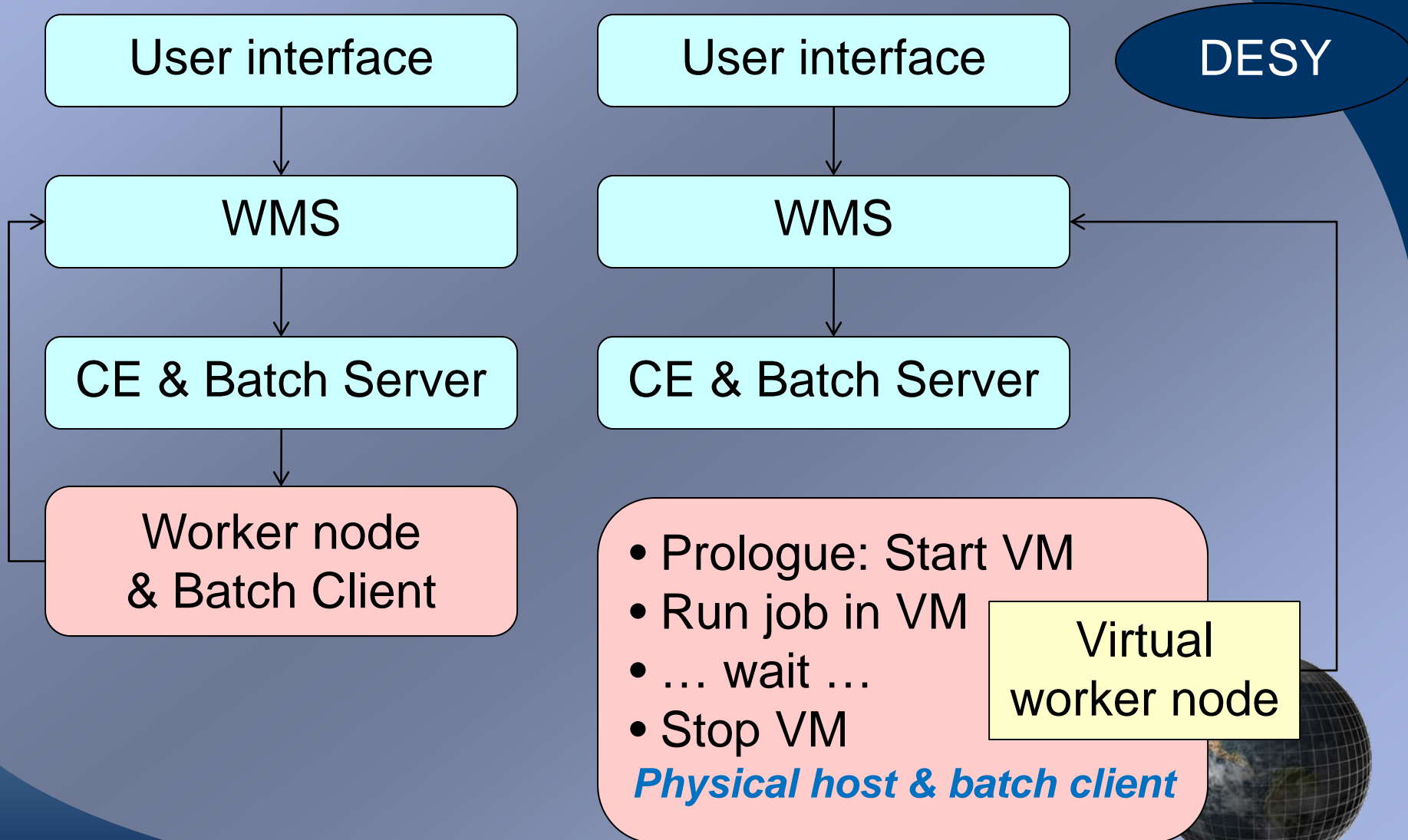
Virtual Machine scheduler

- Haizea
  - Works with OpenNebula (VM management)
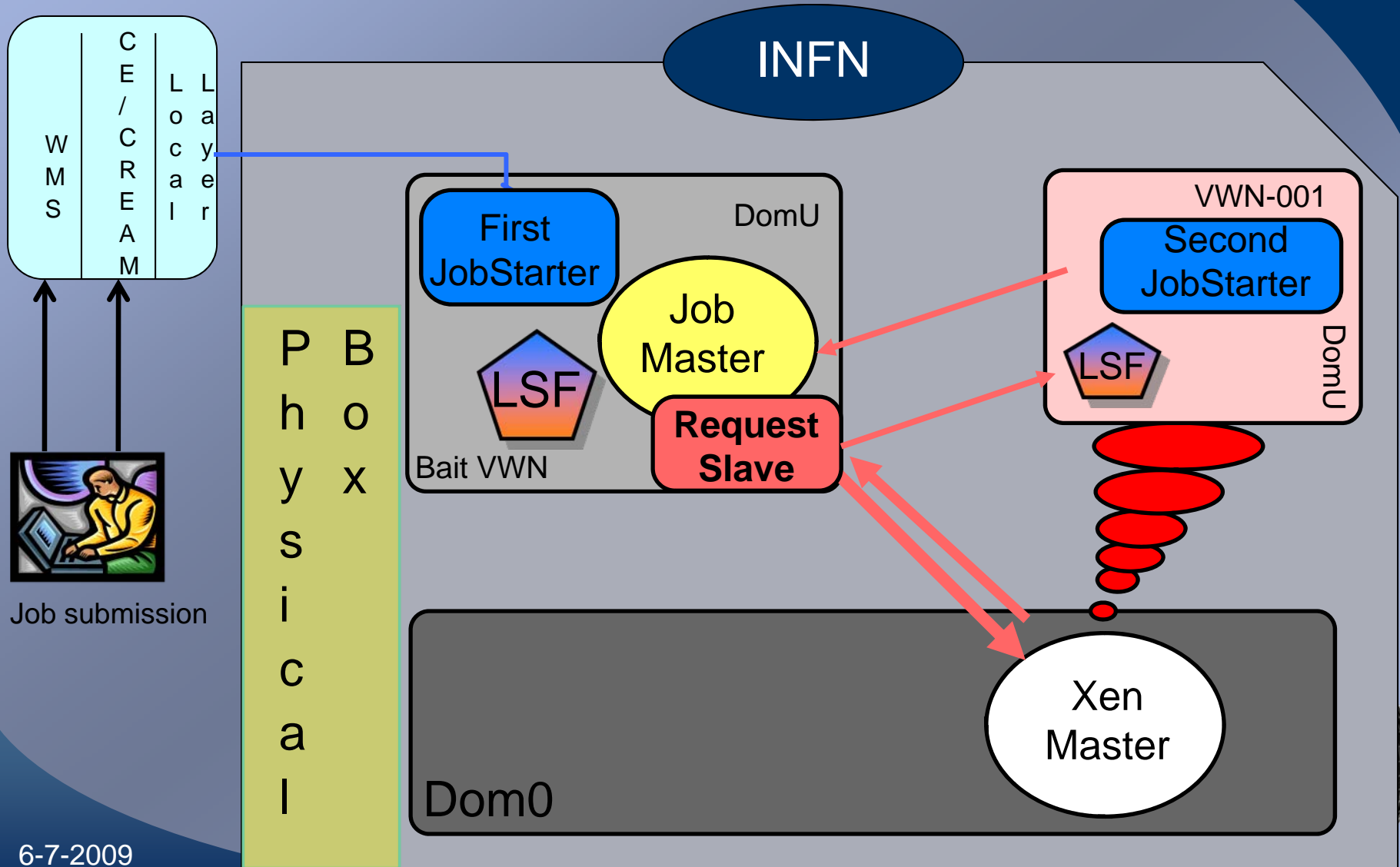 - Backend for torque or Sun Grid Engine
  - Allows combination with Nimbus (cloud model)

External Use

Nimbus

Local Use

Public Cloud Interface

Haizea

OpenNebula Core

Scheduler

Torque/SGE

Or Eucalyptus

XEN / KVM Plugins

Cloud Plugins

OpenNebula

Local Infrastructure

Public Cloud

Site impact

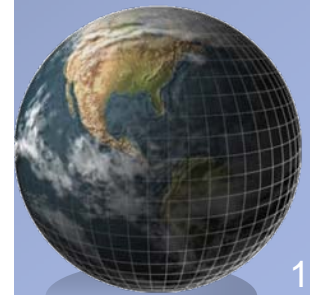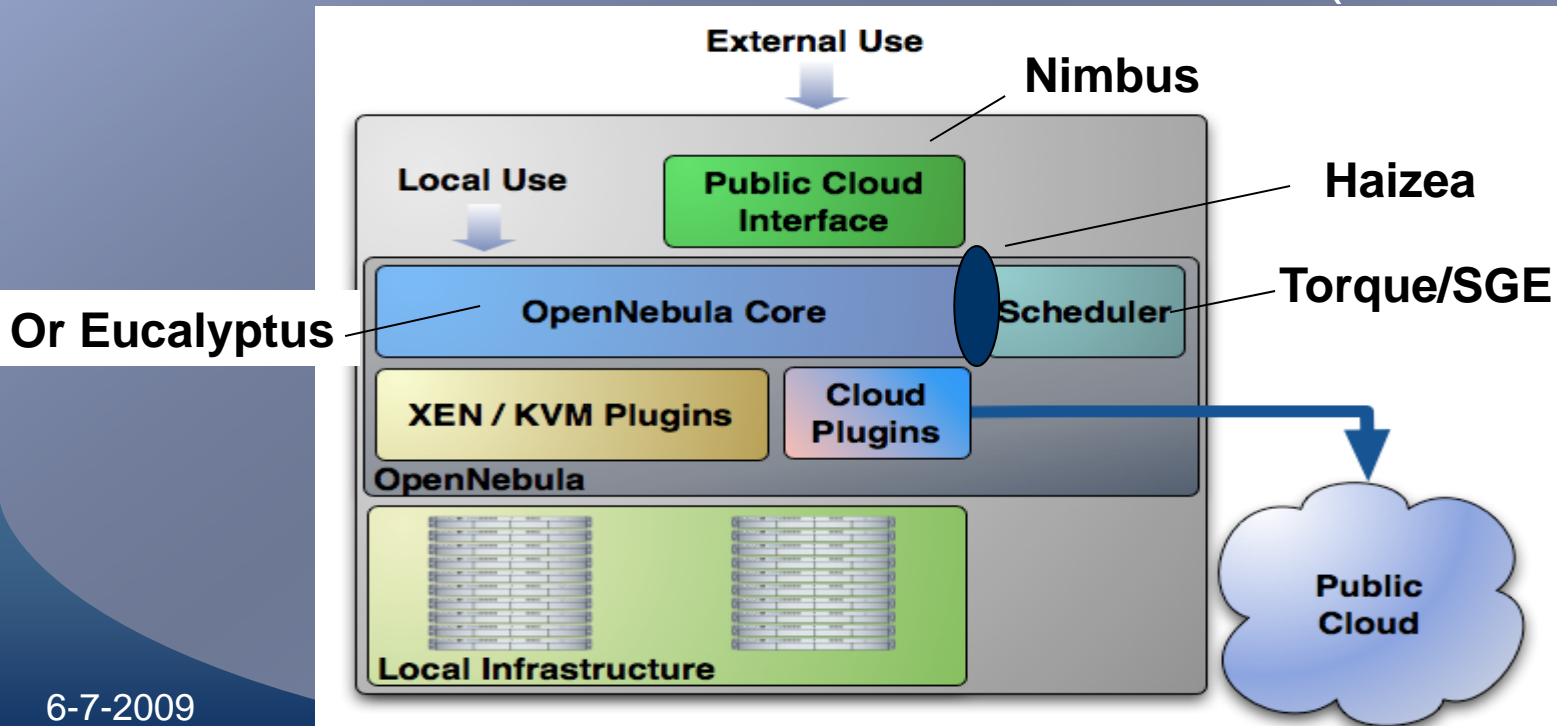- Site generated virtual machines
  - Fabric management changes (quattor/jaime, cfengine)
  - IP addressing issues

- VO generated virtual machines
  - Scheduler changes
    - Torque integration with VM management
  - Policy and trust infrastructure development
  - VM/batch integration issues

Conclusions

- Use Cases
  - Infrastructure as a service based
- Security issues
  - Depends heavily on VM classification
  - User generated VMs not (yet) feasible
- Resource management
  - Many efforts (Coordination: EGEE/Reservoir)
  - Site generated: fairly easy and site beneficial
  - VO generated: mostly site solvable
  - User generated: a separate project

Project Scope

- Deploy a system to manage VO generated Virtual Machines at Nikhef.

- Sub efforts
  - Investigate use cases
  - Determine site policy
  - Assess security implications
  - Solve technical issues
  - Generalize (document, disseminate, etc.)