



Enabling Grids for E-scienceE

Virtualization of Grid Infrastructure

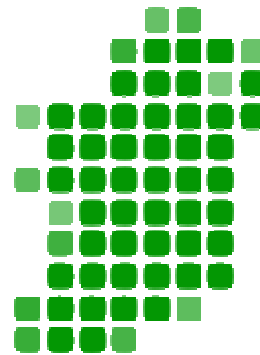
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www.eu-egee.org



- **Introduction**
- **Virtualizing grid gateways**
- **A virtual TestGrid**
- **Virtual worker nodes**
- **Replicating virtual machine hosts**
- **Future directions**

- **Grid-Ireland is NGI for Ireland**
- **e-INIS is developing Irish national e-Infrastructure**
- **Computer Architecture & Grid research group at TCD**
Operates Grid-Ireland OpsCentre and EGEE ROC for Ireland



e-INIS

The Irish National e-Infrastructure

Virtualization

(and centralized management) has allowed a **small national grid** to make the most of limited resources by **reducing hardware requirements and operational effort**

Deployment of Grid Gateways Using Virtual Machines

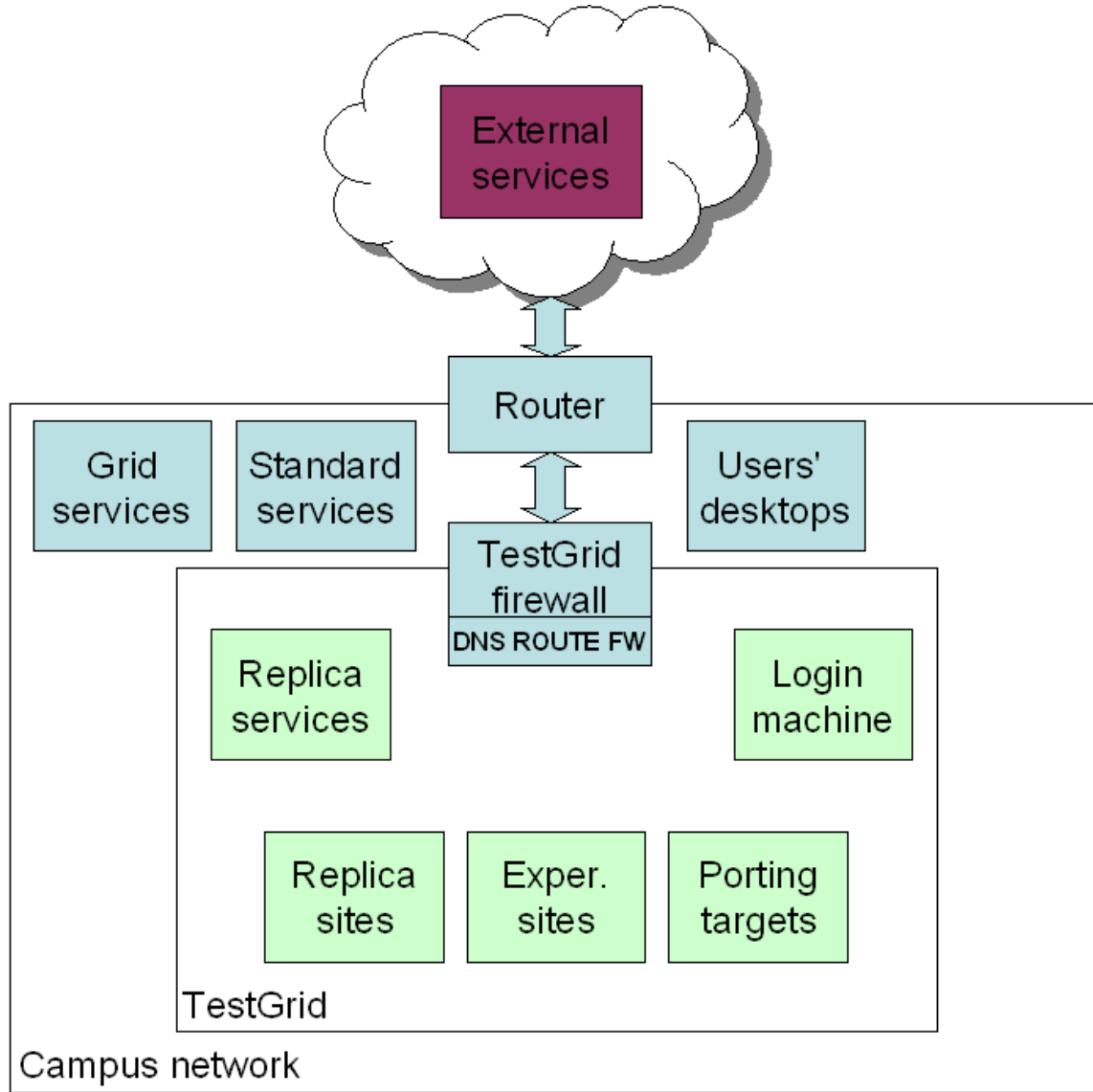
- Gateway = Install server + CE + SE + ssh UI (+ more)
- Initial deployment in 2004 with **User-mode Linux** (and LCFGng for configuration) at six sites
- **Management benefits**
 - Single connection for power & network
 - Backup VM filesystems
 - Console access to remote VMs via host
- **Performance of UmL was poor: 10 × slower than Xen**
- **Switched to Xen to deploy ten more sites (and later Quattor for configuration)**

Stephen Childs, Brian Coghlan, David O'Callaghan,
Geoff Quigley and John Walsh, EGC 2005.

...or how to replicate a national Grid

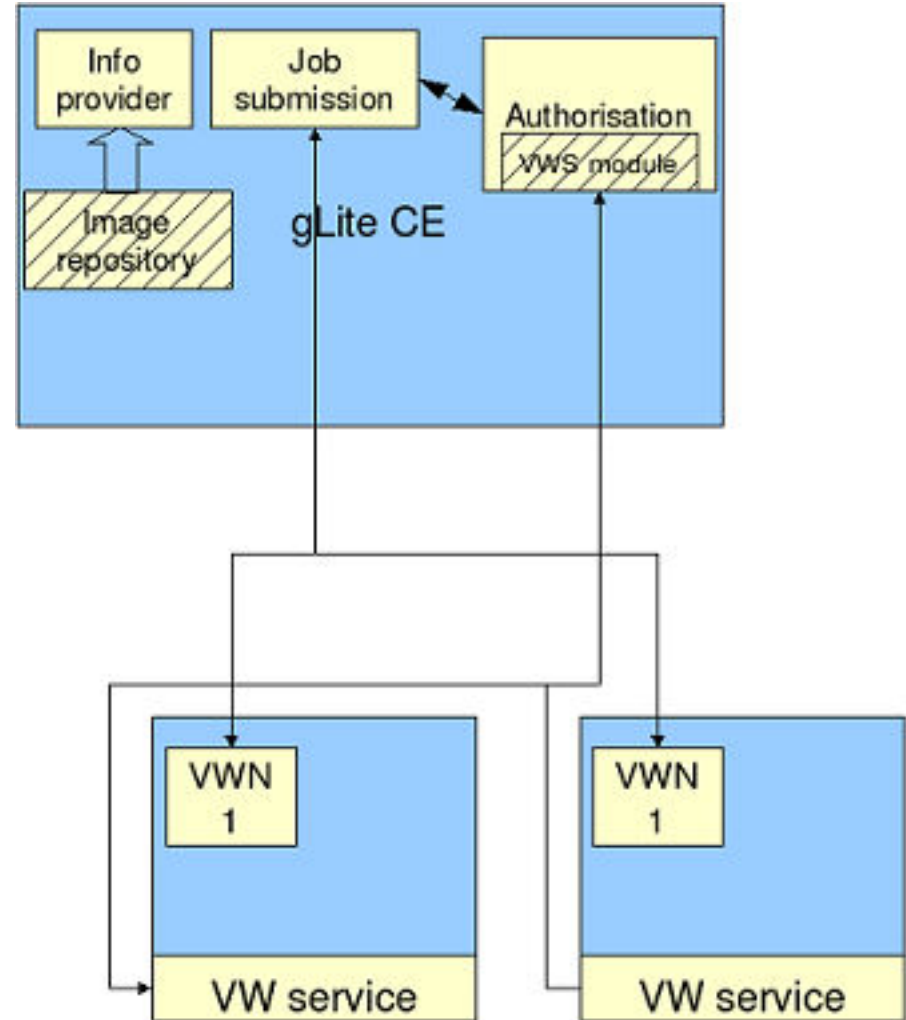
- **Using Xen VMs for cost-effective, efficient use of hardware**
 - Quattor for consistent fabric management
 - Firewall / router configuration for network replication & isolation
- **Allows development and testing in a replica grid**
 - With central and site services, and compute and data resources
 - With real network addresses, or on a private network (.testgrid)
- **Used now for EGEE SA3 Certification and gLite porting**
 - A similar model is used for a training and e-learning replica
 - Investigating ‘cloudification’ for more dynamic reconfiguration of the test infrastructure

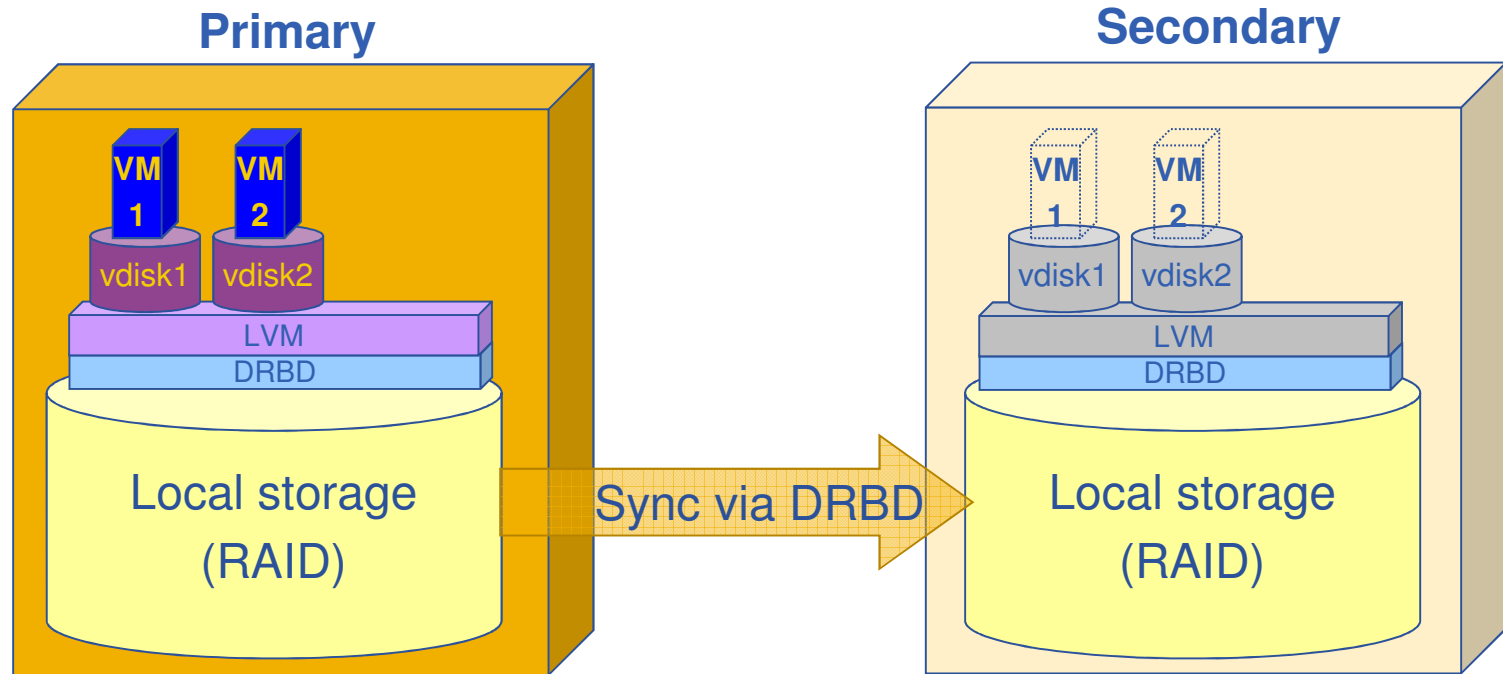
Stephen Childs, Brian Coghlan, John Walsh, David O’Callaghan,
Geoff Quigley, Eamonn Kenny. ExpGrid workshop at HPDC2006



A proposal for transparently providing dynamically-instantiated VM-based worker nodes in the EGEE production grid

Stephen Childs, Brian Coghlan, and Jason McCandless.
XHPC 06





- **DRBD under LVM and Xen provides simple and effective redundancy**
- **Replicating whole storage is straightforward**
 - No need to individually replicate VMs' storage
 - But means “all or none” failover for VMs

Stephen Childs, e-INIS All Hands Meeting 2009

- **Social Grid Agents for Cloud Provisioning**

- Users submit grid work to agents
- Agents can access multiple grid infrastructures and use resources according to social and economic models
- A system is under development to provision grid resources on cloud infrastructures

Gabriele Pierantoni and others

- **e-INIS Irish National Datastore**

- Provide data storage and management services to Irish academic researchers
- Each user community has access to a restricted portion of storage through a *bridge*: analogous to virtualized storage on a private cloud.

Geoff Quigley and others

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