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Grid'5000: A Production-grade Testbed for Experiment-driven Computer Science on HPC and Clouds

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Grid'5000

A Production-grade Testbed for Experiment-driven Computer Science on HPC and Clouds

http://www.grid5000.fr/

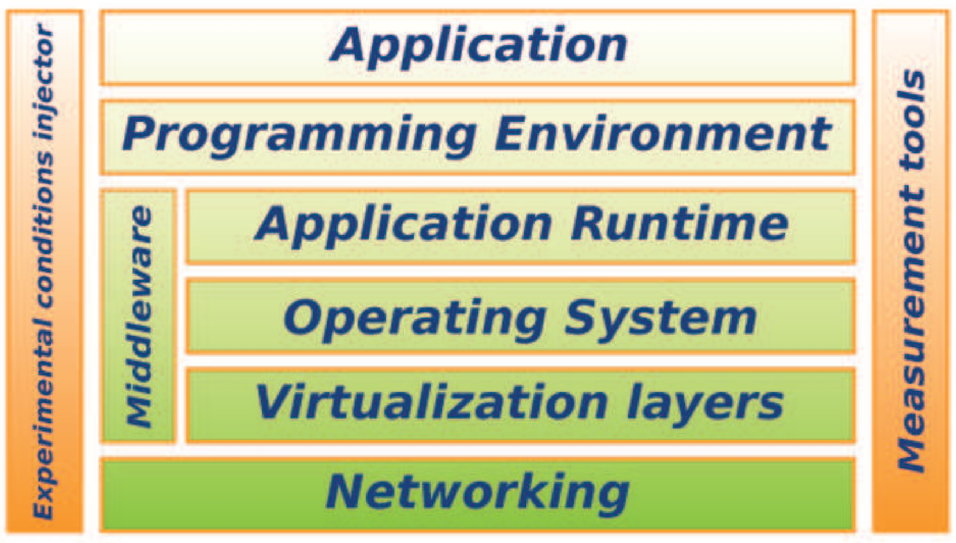
Overall Goal

Design & provide a testbed that supports high-quality experimental science

- Large scale, complex experiments
- Trustworthy results
- Reproducible experiments

Key features

- **Experiment on all layers : fully reconfigurable**



  - **Software stack** (root on bare metal)
  - **Network isolation** (intrusive security-sensitive protocols)
  - **Experimental conditions** (fault injection)
  - **Resources reservation** (nodes, network, storage)
  - **REST API** for XP control tools (Expo, XPFlow, Execo)
  - **Measurement and monitoring** infrastructure
  - Support for **Big Data** and **Open Science**

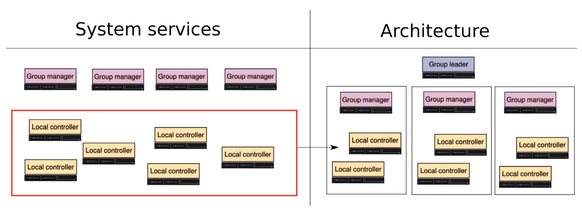
- **Access high end hardware networks**
  - **High performance networks :** Infiniband, Myrinet
  - **Accelerators** (GPU, MIC)
  - **Dedicated 10 Gbps backbone** (RENATER)

Get a free account
http://www.grid5000.fr/open-access

1200 nodes (8000 cores) in 10 sites
500+ users per year since 2006

Ground-breaking experiments

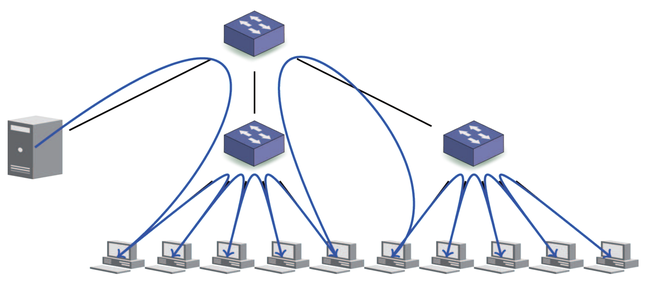
- **Snooze Autonomic Cloud Management System**

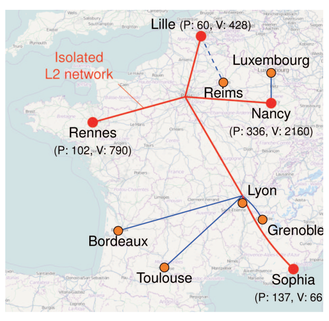


Time \ Topology	GL scalability 1 GL 5K GMs	GM scalability 1 GL - 1 GM 5K LCs	System scalability 1 GL - 1K GMs 10K LCs
30 seconds	1485 GMs	509 LCs	-
1 minutes	3861 GMs	1043 LCs	979 GMs - 482 LCs
3 minutes	4656 GMs	2520 LCs	983 GMs - 1492 LCs
10 minutes	4689 GMs	2633 LCs	1000 GMs - 7436 LCs
15 minutes	4645 GMs	4283 LCs	1000 GMs - 9593 LCs
20 minutes	**4629 GMs**	**4300 LCs**	**1000 GMs - 10000 LCs**

Scalability evaluation on 538 nodes / 5 sites

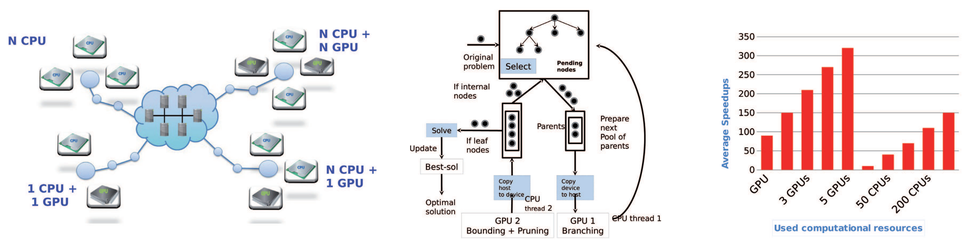
- **Testing of the Kadeploy3 provisioning system**





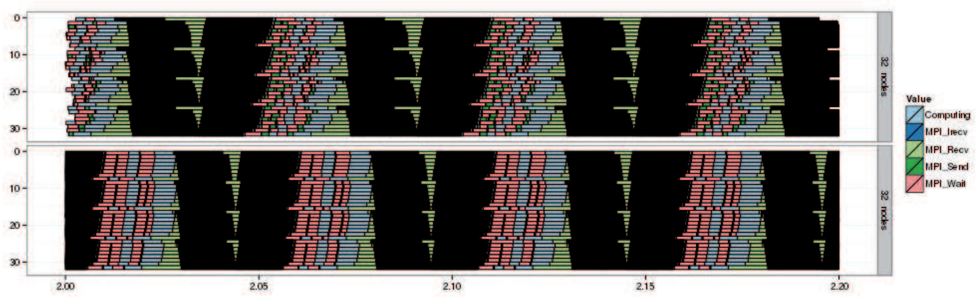
4000 virtual machines in a global VLAN

- **Solving combinatorial optimization problems**



Hybrid multi-core and GPU computing

- **Calibration of the SMPI simulator models**



Combining real and simulated executions

Software stack

- **Kadeploy** : http://kadeploy3.gforge.inria.fr
- **OAR** : http://oar.imag.fr
- **Distem** : http://distem.gforge.inria.fr
- **Expo** : http://expo.imag.fr
- **XPFlow** : http://xpflow.gforge.inria.fr
- **Execo** : http://execo.gforge.inria.fr

and several French universities