

XtreemOS

*Enabling Linux
for the Grid*



XtreemOS : des grilles aux nuages informatiques

Christine Morin

Myriads research team

INRIA Rennes-Bretagne Atlantique

XtreemOS scientific coordinator

Séminaire IN'Tech - Virtualisation et cloud computing

XtreemOS IP project

is funded by the European Commission under contract IST-FP6-033576



**Information Society
Technologies**

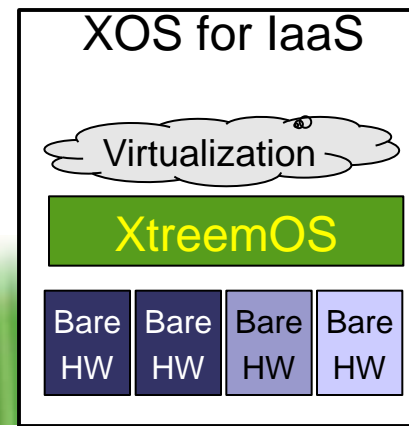
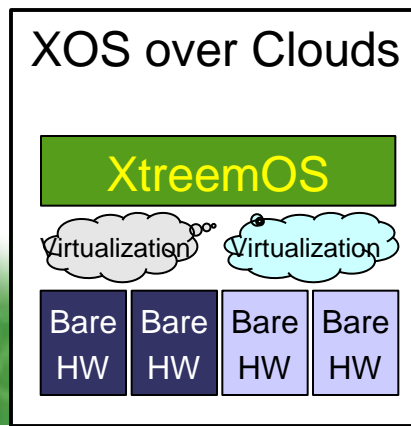




- **XtreemOS: a distributed operating system designed for Grids**
 - Project started in June 2006
- **Cloud computing new era started in late 2007**
 - Lots of media attention, new products announced every day, etc.
- **Question**
 - How relevant is XtreemOS in this new context?



- **Comparison between Grid and Cloud computing paradigms**
- **Feasibility studies**
 - Extending a Grid with resources gathered from Clouds
 - XtreemOS as a system to manage IaaS Clouds
- **Building a Cloud Computing open source software stack based on XtreemOS**
 - CONTRAIL new European Integrated Project under negotiation





- **Cloud computing recognized as an important paradigm**
 - Flexible & efficient resource management
 - Various domains
 - Scalable service hosting platforms
 - Scientific clouds

- **XtreemOS as a reference open source cloud computing software stack for cloud federations**
 - Collaboration over clouds
 - Resource federation



- **Grids vs Clouds**
- **XtreemOS overview**
- **Preliminary studies**
- **Conclusion & future work**



- **Cloud and Grid computing share many characteristics**
 - “*Clouds are the user-friendly version of Grids*” (Trevor Doerksen, CEO of MoboVivo)
 - Large pools of compute resources available as utilities
 - Statistical multiplexing
 - Emphasis on scalability
- **There are also significant differences**
 - Clouds rely on a pay-as-you-go business model
 - New types of Cloud services are being created



Cloud Computing Functionality

- **Infrastructure-as-a-Service (IaaS)**
 - Delivery of computer infrastructure as a service
 - E.g., Amazon.com's EC2 and S3
 - Many (API-*in*compatible) similar offers from other vendors
- **Platform-as-a-Service (PaaS)**
 - Delivery of a computing platform and solution stack as a service
 - E.g., Google's Map/Reduce, BigTable, AppEngine
- **Software-as-a-Service (SaaS)**
 - A model of software deployment whereby a provider licenses an application to customers for use as a service on demand
 - E.g., Gmail, Google Maps



- **Grid distributed operating system**
 - Scalability
 - Scale with the number of entities and adapt to evolving system composition
 - Target large scale highly dynamic grids spanning multiple administrative domains
 - Dependable system
 - Bring the Grid to standard users
 - Ease of use, management & programming
 - Provide Posix/Unix interface
 - Based on Linux operating system
 - Efficient, reliable and secure application execution
 - Legacy applications
 - Grid applications (SAGA)



■ Flavours

- PC, clusters, Mobile Devices

■ Some key features

- Scalable VO management
- XtreemFS Grid file system
 - Transparent & efficient data access
- Unix-like job management
- Support for interactive jobs
- Accurate & adaptable monitoring
- Decentralized resource discovery based on overlays
- Single-Sign-On
- Generic checkpointing service for distributed applications
- Tool for auto-configuration & automatic deployment





- **XtreemOS directly comparable to IaaS clouds**
 - VM management instead of jobs
 - IaaS cloud federation spanning multiple hardware suppliers
- **Supporting cooperation between different institutions using private, commercial clouds & traditional IT infrastructure**
 - Example: extension of a Grid with virtual resources provided by a cloud
- **XtreemOS: a good starting point to build future PaaS services**
 - Example: Hbase port onto XtreemFS
[work done by Guillaume Pierre at Vrije University Amsterdam – See XtreemOS D3.2.15]



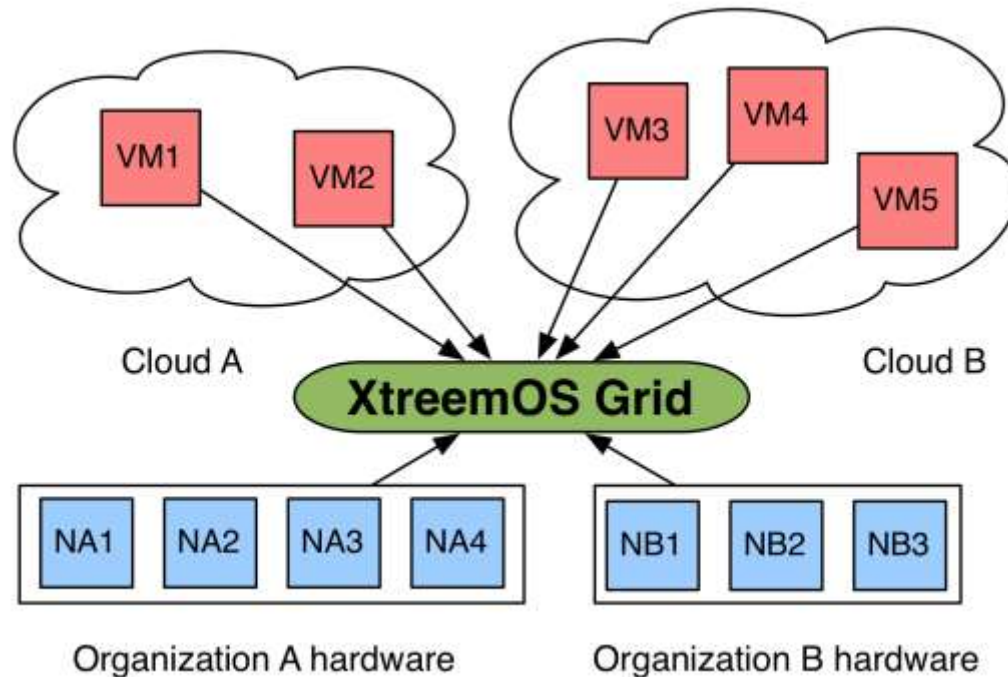
IaaS Cloud Federation Spanning Multiple Hardware Suppliers





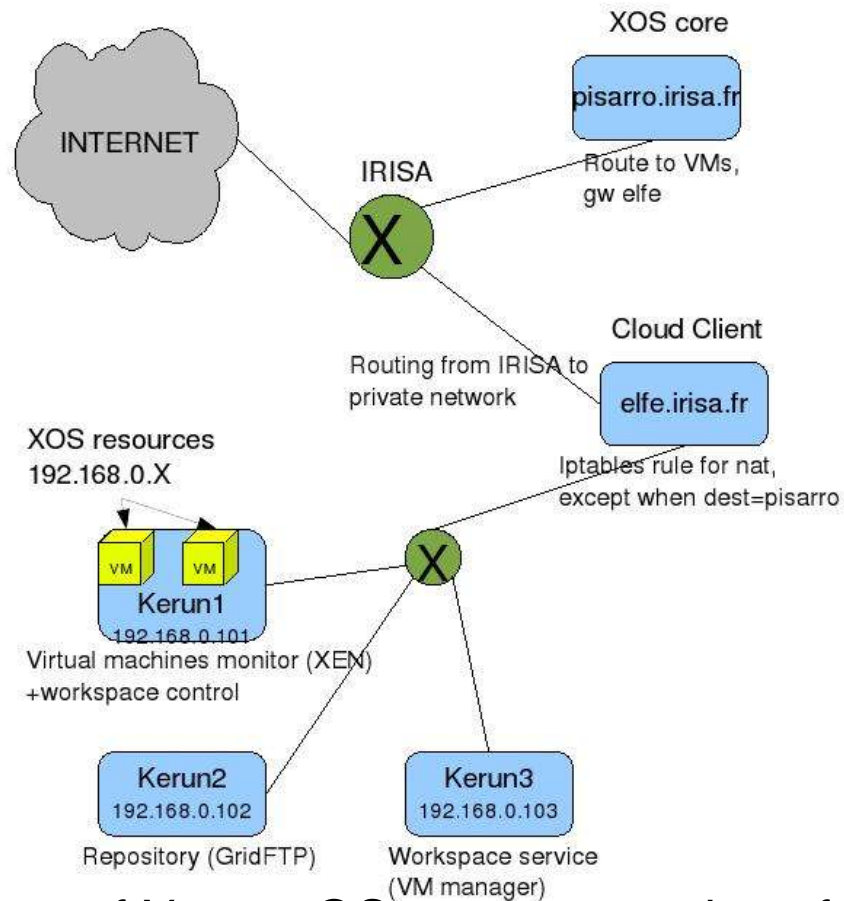
Supporting cooperation between different institutions using private, commercial clouds & traditional IT infrastructures

- Extension of an XtreemOS Grid with virtual resources obtained from commercial clouds
 - Dynamic resource provisioning





Experiment: XtreemOS & Nimbus



Automatic deployment of XtreemOS resource node software on Nimbus VMs



Conclusion

- **XtreemOS software available for the community**
 - Open source development
 - XtreemOS 2.1 fresh new release out
 - XtreemOS open testbed under construction

- **XtreemOS & Clouds**
 - XtreemOS is directly comparable to an IaaS platform
 - XtreemOS: a sound platform for providing PaaS
 - XtreemOS Grids extensible with cloud resources

**Next goal: making XtreemOS a major platform
for utility computing in the coming years**

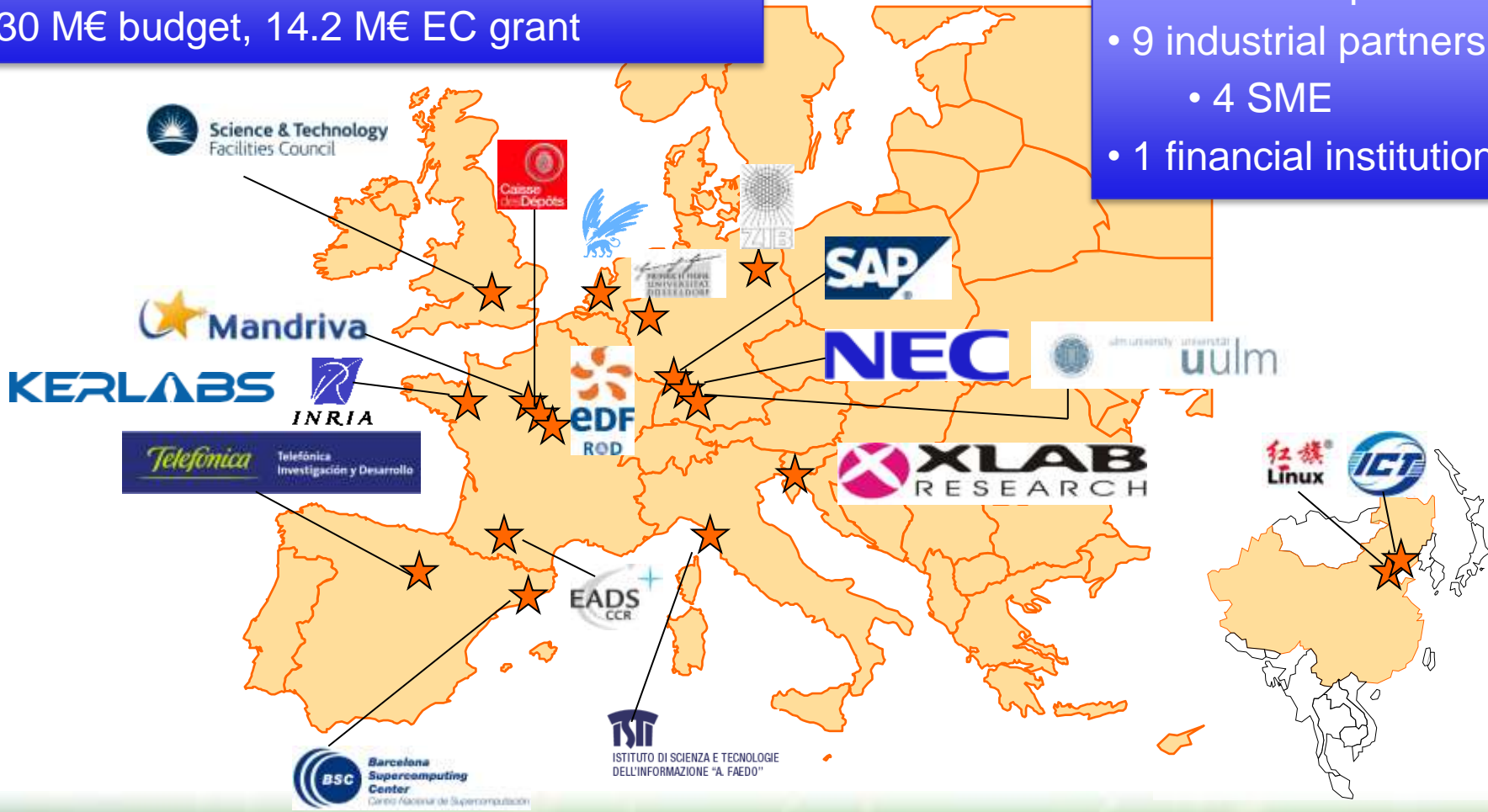
CONTRAIL European Project opportunity



XtreemOS European Project

- 4-year IP project started in June 2006 in the FP6 framework
- 30 M€ budget, 14.2 M€ EC grant

- 9 academic partners
- 9 industrial partners
 - 4 SME
- 1 financial institution





- **Web site: <http://www.xtreemos.eu>**
- **Software: <http://gforge.inria.fr/projects/xtreemos/>**
 - GPL/BSD licence
- **Email: contact@xtreemos.eu**