XtreemOS : des grilles aux nuages informatiques

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Introduction

- **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
Opportunities

- 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
Outline

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

- **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-incompatible) 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
XtreemOS Open Source Grid System

- 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

Cloud service supplier 1

Iceland

Cloud service supplier 2

Canada

Alaska
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
More Information

- **Web site:** http://www.xtreemos.eu

- **Software:** http://gforge.inria.fr/projects/xtreemos/
  - GPL/BSD licence

- **Email:** contact@xtreemos.eu