SURFnet Cloud Computing Solutions

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SURFnet

February 3, 2010
Overview

Introduction Cloud Computing

The Project

Use Cases

Comparison

Conclusion

Future Research

Questions
What is Cloud Computing?

- **Resource Pooling**
  - Resources are bundled
  - High Level of Abstraction of Resources
- **On Demand Services**
  - Only use what you need
- **Rapid Elasticity**
  - Automatic assign and reassign resources on users demand
- **Measured Service**
  - Control and Optimize Resources
  - Monitoring
Deployment Models

Private Cloud  Cloud for internal usage
Public Cloud  Cloud managed by external company
Hybrid Cloud  Multiple clouds combined
Community Cloud  Shared cloud by several organisations
Which Cloud Computing platform meets the requirements best, to share resources between SURFnet and their institutions?

- Requirements
  - Private cloud platform
  - Coöperation with other private cloud(s)
  - Offloading to public clouds

- Comparing Criteria
  - Live Migration
  - Redundant Front-End
  - Open Standards etc.
Hybrid Cloud

SURFnet’s Private Cloud
Hybrid Cloud

SURFnet’s Private Cloud
Relation’s Private Cloud(s)
Hybrid Cloud

SURFnet’s Private Cloud
Relation’s Private Cloud(s)
Public Cloud +
Hybrid Cloud

SURFnet’s Private Cloud
Relation’s Private Cloud(s)
Public Cloud +

SURFnet’s Hybrid Cloud
Hybrid Cloud

- “Unlimited Resources”
  - Handle Flash Crowds
    - Visited Websites in Holidays
  - Handle High Server Load
    - SURFnet Spam Filter
  - No Investments for Peaks

- Minimal Overall Investment
  - All Resources can be used
Community Cloud

Donate Hardware for the Cloud

- Develop Environment
  - Together Build an Environment based on interested
  - Contribute in Interesting Projects
- Test Environment
  - Pilot Environment for new services
- Backup Environment
  - Offloading Ability
  - Backup Site
Most Promising Solutions

- AbiCloud
- Eucalyptus
- OpenNebula
- openQRM
- VMware vSphere
Eucalyptus & OpenNebula

- **Eucalyptus**
  - Based on Amazon
  - Private cloud
  - Offloading to Amazon
  - Enterprise and Open source (Ubuntu)
  - Hypervisors: VMware, Xen and KVM

- **OpenNebula**
  - Private cloud
  - Offloading to Amazon & ElasticHosts
  - Open source
  - Hypervisors: VMware, Xen and KVM
Eucalyptus Demo
Eucalyptus Demo

Diagram showing the architecture of a private cloud with the following components:

- **Front-end (CC1)**: CLC, SC, Walrus, CC, Ubuntu
- **Node controller (NC1)**: Eucalyptus, Apache, Ubuntu, KVM
- **Node controller (NC2)**: VM

The diagram illustrates the use of SSH for communication between the components.
Eucalyptus Demo

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Eucalyptus Demo
OpenNebula Demo
## Compare Matrix

<table>
<thead>
<tr>
<th></th>
<th>Offload to private</th>
<th>Offload to public</th>
<th>API</th>
<th>Open Standards</th>
<th>VM isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eucalyptus</strong></td>
<td>no</td>
<td>public clouds with EC2 API</td>
<td>EC2</td>
<td>none</td>
<td>yes</td>
</tr>
<tr>
<td>1.6.1</td>
<td></td>
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<tr>
<td><strong>OpenNebula</strong></td>
<td>same platform, Eucalyptus, UEC</td>
<td>public clouds with EC2 API</td>
<td>EC2 &amp; OCCI compatible</td>
<td>OVF &amp; OCCI (Others in development)</td>
<td>yes</td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

- Best solution for SURFnet: OpenNebula 1.4
- Create Private Cloud Environment
- Offloading
  - Public Clouds (EC2)
  - other OpenNebula implementations and Eucalyptus
  - Future: other Private Clouds
Conclusion

- Best solution for SURFnet: OpenNebula 1.4
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  - Future: other Private Clouds

- But...
Success Factors

- Implementation of Cloud Solution by SURFnet’s relations

- Future Development in OpenNebula (compatibility with other platforms)
  - Open Standards
Future Research

- Security of Private and Public Clouds
- Effects in performance offloading internal services
- High Available Front-End
- Managing Hybrid Cloud
  - Who is responsible?
  - Offload less sensitive services
Questions

Questions?