

# SURFnet Cloud Computing Solutions

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# Overview

Introduction Cloud Computing

The Project

Use Cases

Comparison

Conclusion

Future Research

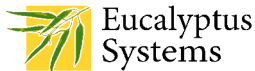
Questions

# Introduction Cloud Computing

## 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

## Available Solutions



OpenNebula.org



NIMBUS



## 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

## Research question

*Which Cloud Computing platform meets the requirements best, to share resources between SURFnet and their institutions?*

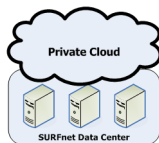
- ▶ Requirements

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

- ▶ Comparing Criteria

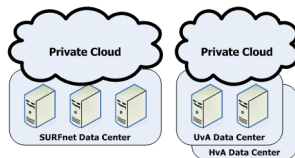
- ▶ Live Migration
- ▶ Redundant Front-End
- ▶ Open Standards etc. . .

# Hybrid Cloud



SURFnet's Private Cloud

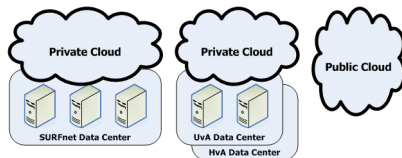
# Hybrid Cloud



SURFnet's Private Cloud  
Relation's Private Cloud(s)

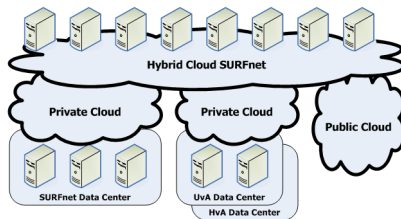


# Hybrid Cloud



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

# Hybrid Cloud



$$\begin{array}{r} \text{SURFnet's Private Cloud} \\ \text{Relation's Private Cloud(s)} \\ \text{Public Cloud} \\ \hline \text{SURFnet's Hybrid Cloud} \end{array} +$$

# 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

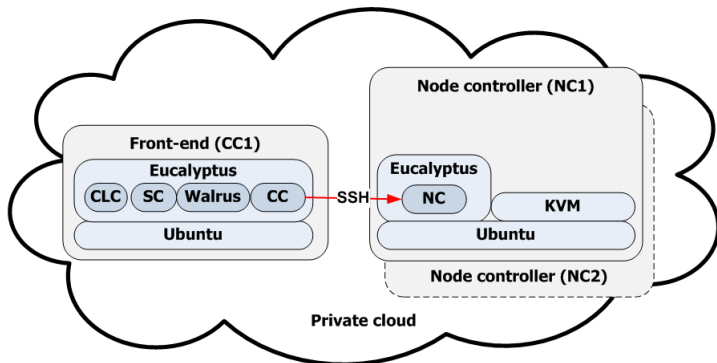
## Most Promising Solutions

- ▶ AbiCloud
- ▶ **Eucalyptus**
- ▶ **OpenNebula**
- ▶ openQRM
- ▶ VMware vSphere

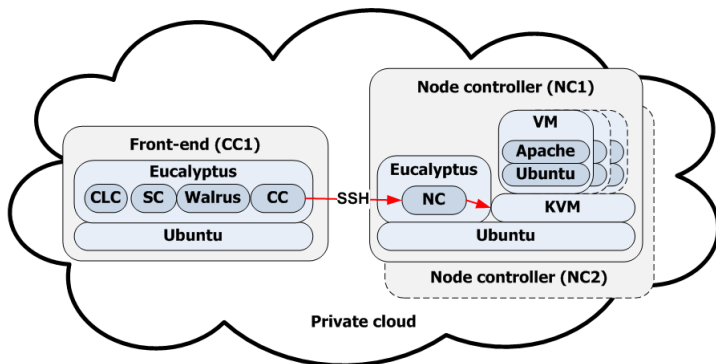
# Eucalyptus & OpenNebula

- ▶ 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

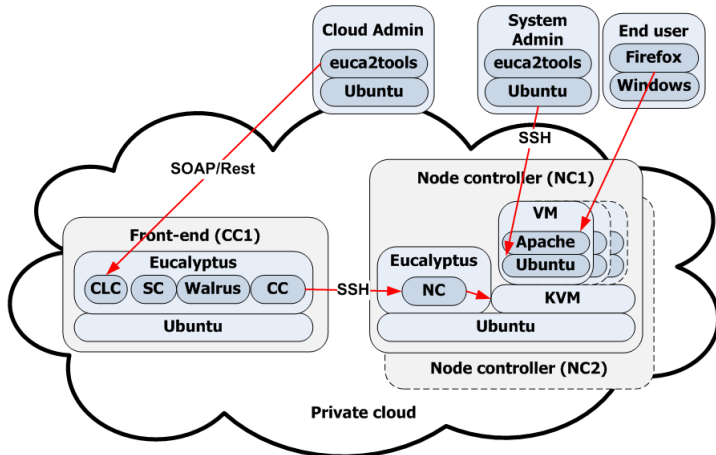


# Eucalyptus Demo

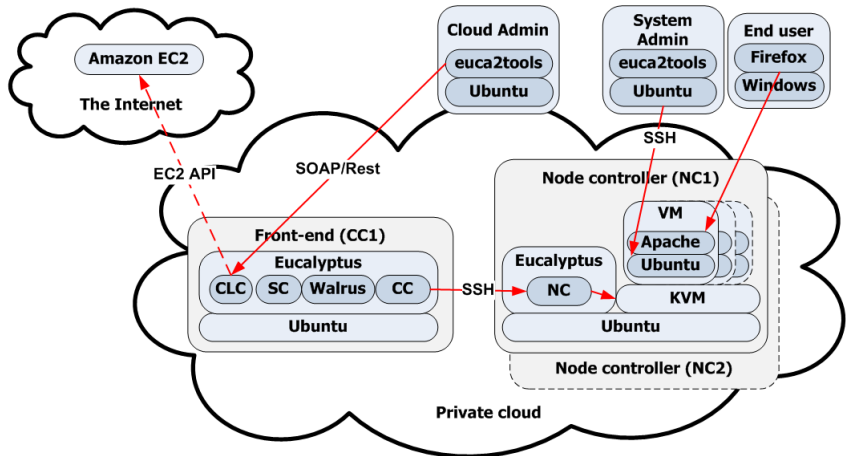




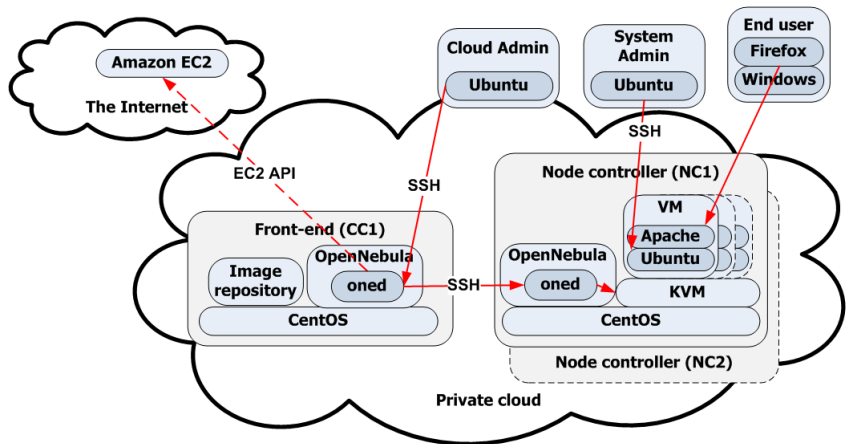
# Eucalyptus Demo



# Eucalyptus Demo



# OpenNebula Demo



# Compare Matrix

	Offload to private	Offload to public	API	Open Standards	VM isolation
<b>Eucalyptus</b> 1.6.1	no	public clouds with EC2 API	EC2	none	yes
<b>OpenNebula</b> 1.4	same platform, Eucalyptus, UEC	public clouds with EC2 API	EC2 & OCCI compatible	OVF & OCCI (Others in development)	yes

# 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
- ▶ Create Private Cloud Environment
- ▶ Offloading
  - ▶ Public Clouds (EC2)
  - ▶ other OpenNebula implementations and Eucalyptus
  - ▶ 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?

