



# NGS

## Cloud Technology and the NGS

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Connecting Infrastructure

Connecting Research



# NGS

## Head in the clouds?

- Dynamic (service) provisioning
- How is it applicable to the NGS?
- Training
  - Rapidly deploy NGS services for training
  - Isolate training from production
- Other
  - Specialised research environments
  - Rapid deployment
- Identify use cases and gather requirements



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## NGS 3 EWP2

- “NGS Agile Deployment Environments”
- EPSRC funded, 2 years
- People
  - Matteo Turilli (OeRC, Oxford) [0.75 FTE]
  - Steve Thorn (NeSC, Edinburgh) [0.5 FTE]
  - David Fergusson (NeSC, Edinburgh) [WP Leader]



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## Overview

- Agile service deployment
- Virtualization vs. Cloud?
- Use cases and requirements gathering
  - Training
  - Identify other (scientific) communities
- Create images
  - NGS Services. Which ones?



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## Overview (cont.)

- Realistic usage
  - Training event on virtualized infrastructure
- Hosting infrastructure?
  - Amazon EC2 compatible
    - De facto standard currently, with open source implementation
  - Ease of deployment
  - Eucalyptus, Nimbus and others
- Hardware
  - Edinburgh: 8 cores  $\Rightarrow$  16+ dual cores
  - Oxford: 64 cores (older)



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## Eucalyptus

- “Elastic Utility Computing Architecture Linking Your Programs To Useful Systems”
- Open source and Commercial
- Amazon Web Services API compatible
  - EC2, storage - S3, Elastic Block Store (EBS)
- Easy to install
- Xen and KVM hypervisors
  - Commercial version supports others (inc. VMWare)



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## In the past

- We have worked with Xen in the past to have Live CDs
- Virtualisation
- Works, but
  - Issues with security setups
  - networking



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## Eucalyptus vs EC2

- Eucalyptus is a reverse engineered version from the EC2 API.
- Independent company (not Amazon)



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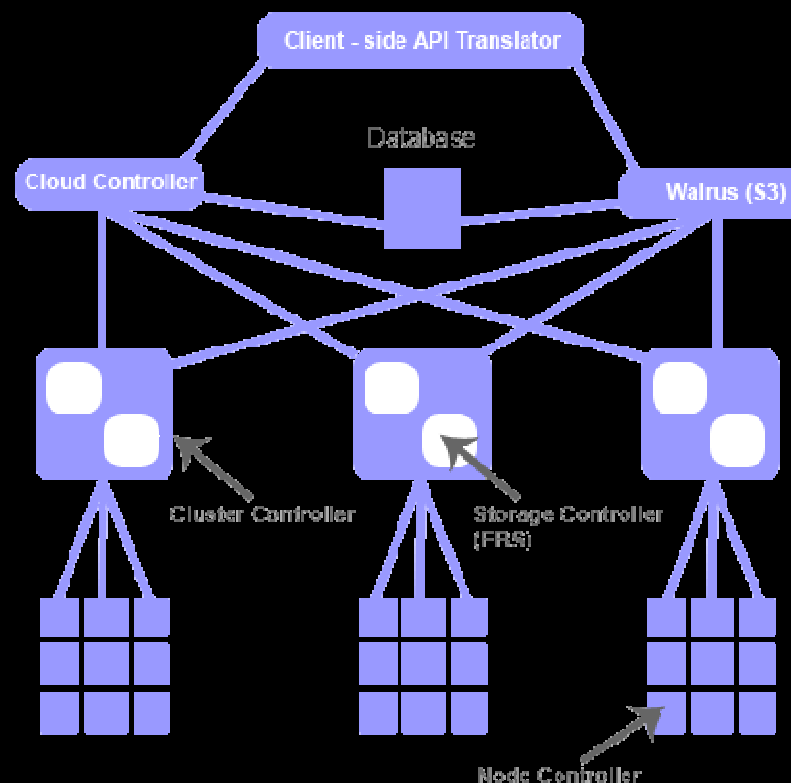
## Eucalyptus architecture

- Cloud controller
  - Entry point
  - Gathers information
- Cluster controller
  - Schedules VM execution
  - Manages virtual network
- Node controller
  - Controls VM execution
- (Xen running on node)

### – Storage controller (Walrus)

- implements Amazon's S3 interface

Client - side Interface (via network)



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# NGS Eucalyptus networking challenges

- Eucalyptus 'Managed' networking
  - Different networking modes
  - 'Managed' is the most flexible and feature rich – more complex
  - Allows elastic IP pool and image isolation.
- VMs have private and public IPs
- Elastic IP
  - User assignable (may be somewhat different from Amazon)
- X509 Service certificates (NGS Host)



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cont.....

- Security Groups (EC2)
  - Implemented in Eucalyptus
  - isolate VMs
- VM public traffic routed through Cluster controller
  - Instance doesn't have knowledge of its public IP
  - Bit like a NAT
- Implications for GSI: \$GLOBUS\_HOSTNAME



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## Clouds vs Virtualisation

- Similar security and networking issues in Clouds and Virtualised instances
  - Virtualisation – virtualise instance
  - Clouds – virtualise the network (and other things) too
- All arise from the requirements for rapid, automated, dynamic, reliable, reproducible, robust, provisioning



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- Can snap shooting in Clouds side step packaging issues in middleware?
  - By automating the copying and re-deployment of successful server installs.
  - Not just having a machine but a set of services which can be copied and deployed directly



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## Progress

- Started with Eucalyptus 1.4.2
- Eucalyptus 1.5.2 deployed at Oxford and Edinburgh
- Existing Images:
  - GSI-OpenSSH server
  - 'Single node cluster': torque/maui + Globus GRAM & GridFTP
- Next step – some real world testing of phase1 images.
- Image snapshots – not straightforward



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## Further work

- Re-evaluate hosting infrastructure
- Develop more images
  - Distributed torque/maui cluster + GRAM & GridFTP
  - Condor & GRAM?
  - 'Core site'
- Training event in near future
- Identify pilot community & gather requirements
- Deploy fledgling cloud infrastructure