

Experiences with Eucalyptus: Deploying an Open Source Cloud

Rick Bradshaw - bradshaw@mcs.anl.gov

Piotr T Zbiegiel - pzbiegiel@anl.gov

Argonne National Laboratory

Overview

- Introduction and Background
- Eucalyptus experiences and observations
 - Scalability
 - Security
 - Support
- Our chosen support model
- Conclusions and future work

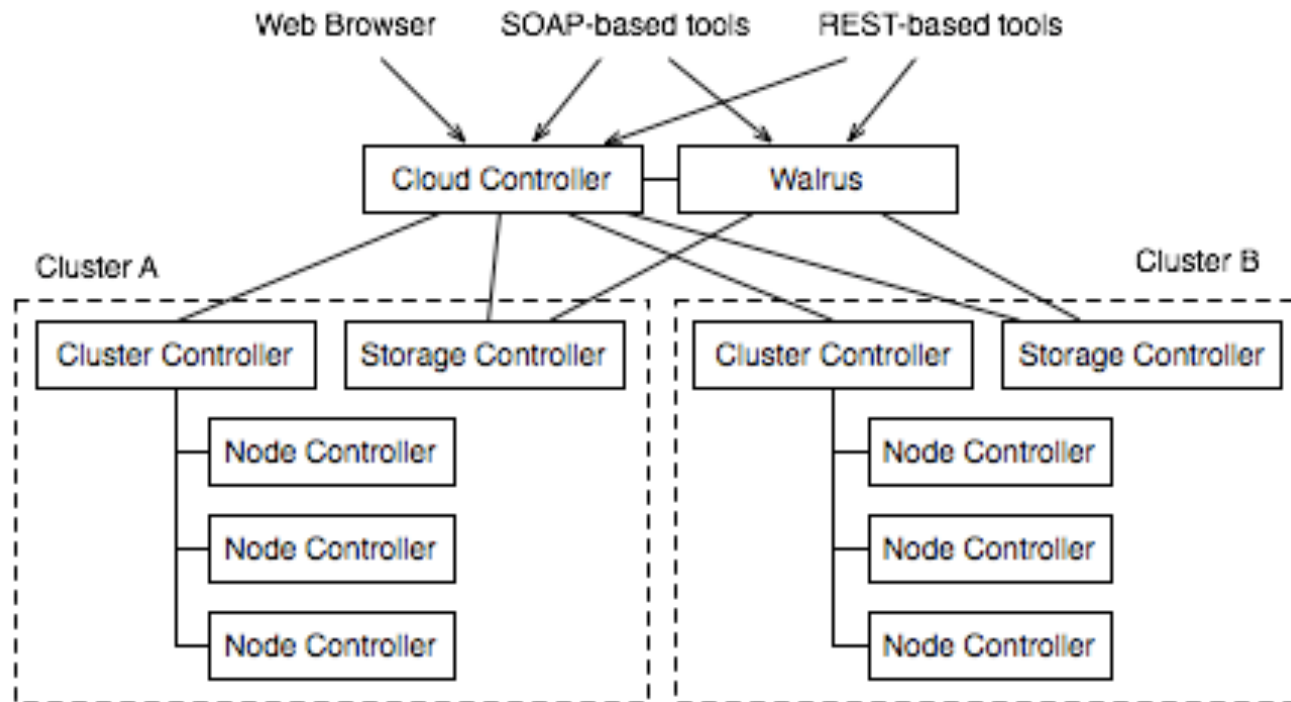


Introduction

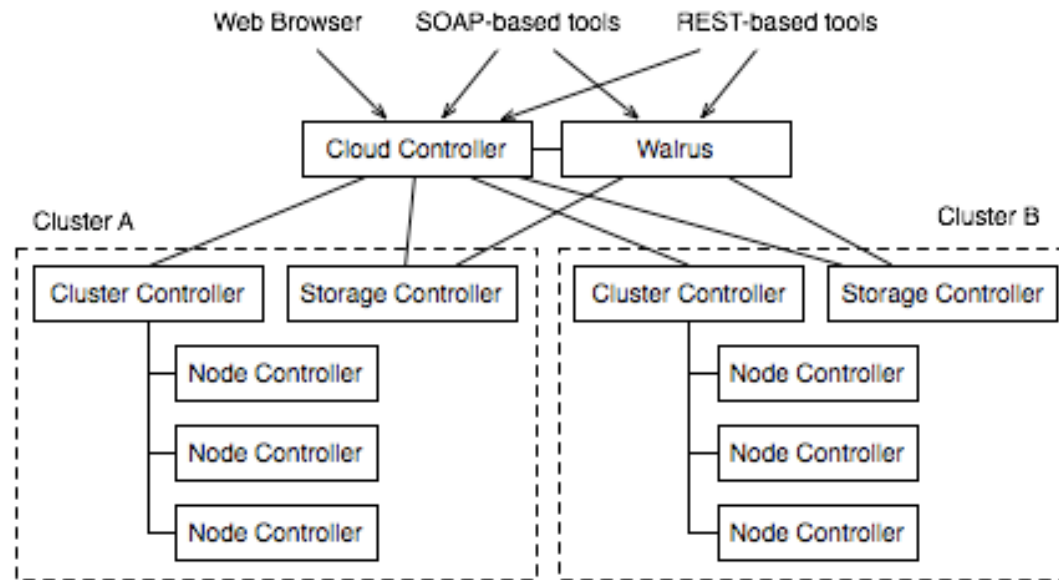
- Clouds for scientific computing?
 - Magellan Project
 - buy or build
- What cloud software is available?
 - Different Cloud APIs
 - EC2 (<http://aws.amazon.com/ec2/>)
 - Rackspace (http://www.rackspacecloud.com/?CMP=Google_rackspace+cloud_exact)
 - Nimbus (<http://www.nimbusproject.org/>)
 - many more out there
- Why did we choose Eucalyptus?
 - EC2 compatibility
 - Open Source / Free
 - UEC from Ubuntu



Eucalyptus 1.6.2



Eucalyptus Scalability: Cluster sizes



- Tested Eucalyptus with various sized clusters (40, 80, 160, 240 nodes behind one cluster controller)
- All-around performance best with smaller clusters
- Performance deteriorated as clusters size grew due to iterative operations
- Eucalyptus instance termination operation is serial
 - Instances that don't terminate in a timely manner are communicated to all nodes
 - The process delays other activities while it works on terminating instances
 - Naturally, larger clusters result in longer execution times for such operations
 - Instance requests which never left the cluster controller due to errors are still "terminated" on the node controllers!

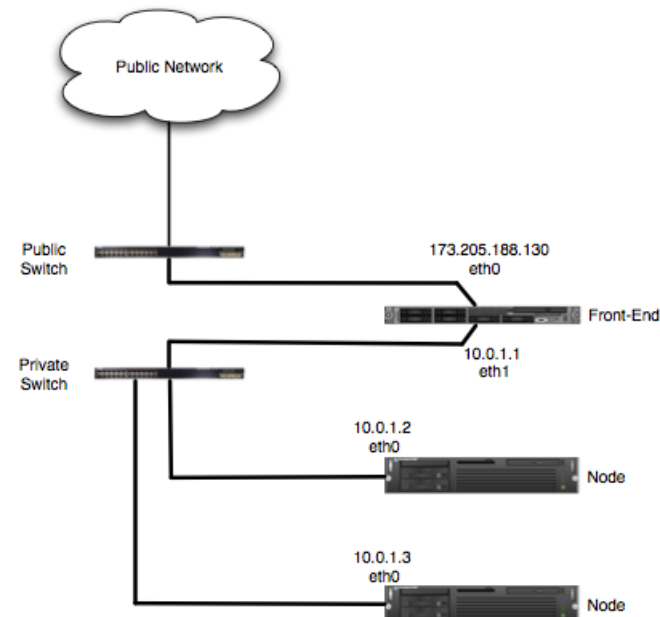
Eucalyptus Scalability: Load Testing

- Load tests were done to stress the software.
- Eucalyptus performed acceptably given enough time to complete requests
- Rapid churning (starting and stopping instances) gives Eucalyptus heartburn.
- Ran into hard limit on a single cluster controller
 - Somewhere between 750 and 800 running VMs
 - Caused by message size limitation in cloud and cluster controller communication protocol



Security: Network Security

- Eucalyptus network mode: MANAGED-NOVLAN
- VM network traffic masquerades as Cluster Controller
- By default, VMs can communicate with Node Controllers and other internal systems. **(BAD)**
- iptables rules on node controllers
 - prevents VMs from making unwanted connections
 - No impact to cloud operation



Security: IDS

- Risk areas identified for the VMs
 - Outside IPs scanning/attacking VMs
 - VMs scanning/attacking outside IPs
 - VMs running suspect services
- Eucalyptus MANAGED-NOVLAN network model provides suitable IDS access
- IDS watches internal Cluster Controller interface
- Monitors all inbound and outbound traffic to the VMs
- Also monitors communication between security groups
- Can not see VMs communicating within a security group.



Security: Image Security Concerns

- Users can upload and register customized disk images
- Sys Admins must register kernel and ramdisk images
- Uploaded images automatically made public
 - Users must choose to change permissions
 - Contents of image can be inadvertently leaked
- Users can upload compromised images
 - A myriad of ways to backdoor
 - Bucket naming is fairly open
 - This even happened accidentally
- Users can upload images with exploitable vulnerabilities
 - Every user is a sys admin
 - We can recommend but not require best practices



User Support

The image shows a composite of three web pages related to the Magellan project. The top page is the main website header with the logo "Magellan a cloud for science" and navigation links: Home, Architecture, Science, Cloud Research, and User Support. Below this is a banner image of server racks with the text "Active Storage ~100 Compute/Storage Nodes; ~10TB FLASH/SSD Storage; ~500TB Disk Storage".

The middle page is the "About Magellan" page, featuring the Argonne National Laboratory logo and two columns of text. The "About Magellan" section describes the project's goal of establishing a nationwide scientific mid-range distributed computing and data analysis testbed. The "Our Goals" section lists three objectives: 1. turnaround time for results, 2. faster science results than local clusters, and 3. ease of use.

The right page is a Wiki page titled "Main Page" for the "Magellan Cloud Computing Project Wiki". It includes a navigation menu, a search box, and several content sections: "Getting Started on Magellan" (with links to Quickstart and Initial Setup), "Computing on Magellan" (with links to Working with VM images and Working with IP addresses), "Current Magellan Status" (stating "Magellan is up!"), "Magellan News" (with links to MPICH2, MPI, and Quickstart assistance), and "Support" (with links to Known Magellan Issues and Discussion List).



User Support

- We chose a community based support model
 - forums(still haven't found one everyone agrees on)
 - wikis
 - mailing lists
 - best effort documentation
- The difference between Job support and OS/VM support
 - the complexity is greatly increased
 - learning curve for users is steep
 - pre-built images do not always work without effort
 - Kernels
 - KVM vs. Xen
 - startup environment



Conclusions

- Works but still evaluating other solutions
 - Nimbus
 - OpenStack
- Don't believe the hype
 - every cloud stack has its qualities and faults
 - usage/API should help make the choice

