



A Cloudy Future Panel at CCGSC '08

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Topics

- Defining a usable subset of Cloud Computing
- Clouds for HPC? A Long Way to Go but not for the reasons you think
 - It's not about the performance
- It's My cluster.
 - Campus cloud provisioning. Extending My Cluster using Rocks.

Possible Definitions of Clouds

- Anything that is a distributed resource
- Another word for Grid or High-Throughput Computing.
- Write your program (workflow) by calling web-services
 - Integrate Google Maps, Weather.com radar, etc
- Software as a Service (SaaS)
 - Mosso Hosting “Cloud”
 - Google Docs (Can I do Computing Here?)
- Infrastructure as a Service (IaaS)
 - Sun’s Network.com
 - Amazon EC2 – Run your Software Stack .

Applications/Workflows using web services.

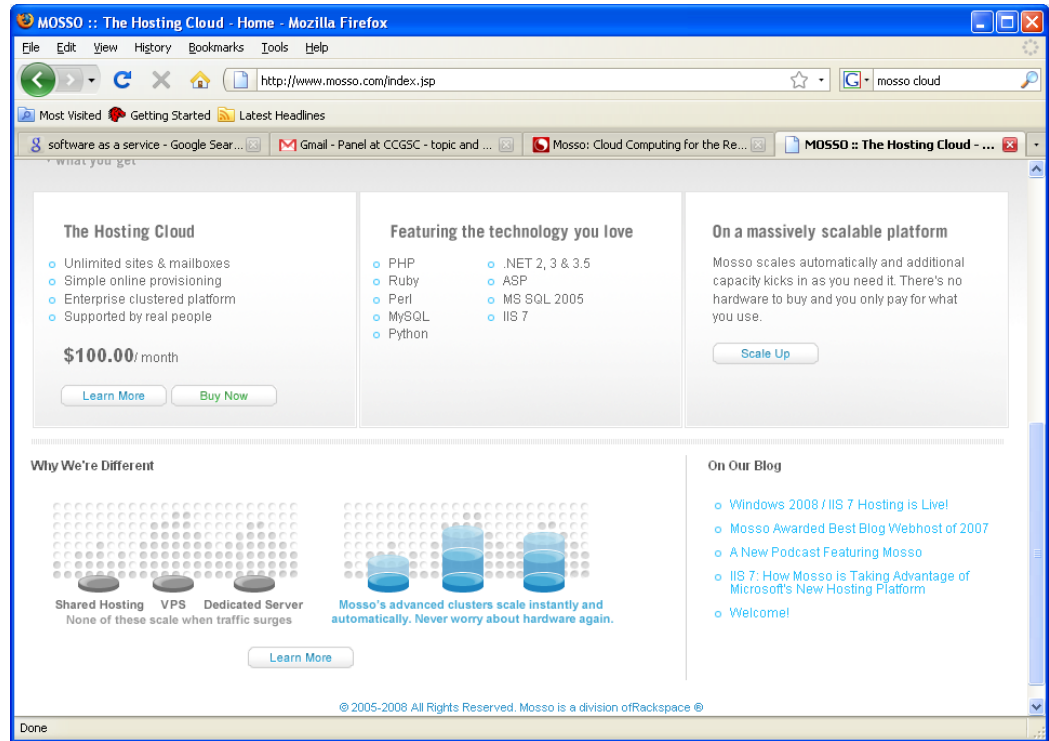
The image shows two overlapping browser windows. The top window is the Hilton website search results page for San Diego, California. It features a search bar, a map of San Diego, and various search filters. The bottom window is the Taverna web service interface, displaying a workflow diagram with nodes like 'getMISequence', 'getPhyloSequence', 'CreateData', 'micro', and 'genma'. The Taverna interface also includes a sidebar with navigation options and a search bar.

- They have using web services for 4+ years
- What about Condor, Globus-based, Avaki-based Grids?



Calling by different name does not a cloud make

SaaS



- If you web server uses (a combination) of 9 software packages, then this works
- Just because you don't know exactly what the hardware is, doesn't make it a cloud.
- Verdict: Mosso (and things like it) are not clouds (opaque to inspection)

IaaS – Cloud with the most promise

The left side of the image shows three overlapping browser windows. The top window is the Sun Network.com website, featuring the Sun logo and the headline "TAP INTO THE POWER OF NETWORK.COM". The middle window is the 3Tera website, displaying a sunflower image and the text "3Tera". The bottom window is the IBM Cloud Computing Journal website, with the IBM logo and the headline "IBM Building its Eighth & Ninth Clouds".

The right side of the image shows two overlapping browser windows. The top window is the Amazon EC2 website, featuring the Amazon logo and the headline "Amazon EC2". The bottom window is the GoGrid website, featuring a globe and the headline "GoGrid".

Run (virtual) computers to solve your problem, using your software

Cloud Definition

- Remote resources that
 - Run your application in a way that is comfortable to you (interactive, batch-scheduler, web/grid services, ...)
 - Complete software stack OS → Application can be inspected
 - Controlled completely, if desired

Clouds for HPC?

- Yes. Inevitable.
- Why? (incomplete list)
 - Bring your software environment with you
 - Performance of Hypervisor:Guest interface improves
 - EC2 monetized CPU hours (it's good business)
 - So cheap that it's "free" for small-scale use.
 - Loads at about 50% are financial break even for cloud provider
 - Not worried about supporting your software.
- Will force HPC centers to support the IaaS paradigm
 - Expensive for traditional HPC providers (eg. Teragrid) to support N x K versions of software packages
 - Machines designed for HPC and IaaS can have much higher I/O rates than EC2

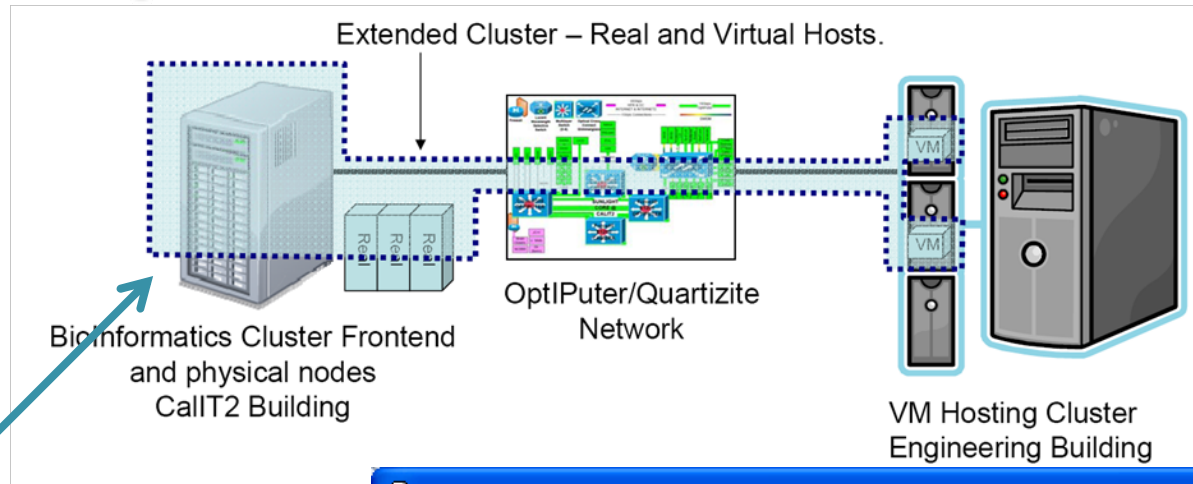
High-level observations

- “Clouds. It’s all new, have to learn a whole new vocabulary, software, a whole new way of doing things”
 - This is doomed to failure
- IaaS Clouds will turn all scientists into sysadmins
 - If not addressed, Doomed to failure
- 1992:Vaidy, Bob M. Al, Jack= PVM3. Learn from them . PVM provided a personal “cluster”. The personal notion was right on target.

The Neonatal stages of clouds

- (Nearly) everybody focusing on starting virtual machine images
 - E.g., RightScale “dashboard”, 3Tera and others
- How are the contents of the VM Defined?
 - Start with “base image,” use sysadmin super-skills to make it what you want.
 - Run and scream as we re-invent 1995 Beowulf
 - Use a predefined image on EC2, take what you get.
- What if I want a cluster of VMs with my software?
- What if I want a cluster of 1000 VMs?
- How are the last two different from a real cluster?

Campus Cloud: Cluster Extension



- VMs: Software/OS defined by the frontend:
 - Users, file system mount, queuing system, software versions, etc

```
root@compute-0-0:~#
login as: root
root@ikelite2.rocksclusters.org's password:
Last login: Mon Sep 15 14:05:23 2008 from 12-218-193-156.client.mchsi.com
Rocks 5.0 (V)
Profile built 23:23 01-Jul-2008

Kickstarted 16:44 01-Jul-2008
[root@ikelite2 ~]# ssh compute-0-0
Last login: Mon Sep 15 14:05:39 2008 from ikelite2.local
Rocks Compute Node
Rocks 5.0 (V)
Profile built 12:15 15-Sep-2008

Kickstarted 12:30 15-Sep-2008
[root@compute-0-0 ~]# lspci
[root@compute-0-0 ~]# lsmod | grep xen
xennet                28617  0 [permanent]
xenblk                 19473  5
[root@compute-0-0 ~]#
```

Clusters in Clusters

```
# rocks create cluster vi-1 137.110.119.137 numnodes=3
```

```
root@vi-1:~  
[root@espresso ~]# rocks list cluster  
FRONTEND          CLIENT NODES      TYPE  
espresso.rocksclusters.org: ----- physical  
:                 vm-container-0-2  physical  
:                 vm-container-0-1  physical  
:                 vm-container-0-0  physical  
vi-1.rocksclusters.org: ----- VM  
:                 hosted-vm-0-1-0    VM  
:                 hosted-vm-0-0-0    VM  
:                 hosted-vm-0-2-0    VM  
[root@espresso ~]# ssh vi-1.rocksclusters.org  
root@vi-1.rocksclusters.org's password:  
Last login: Fri Sep 12 17:56:25 2008 from calit2-137-110-119-112.ucsd.edu  
Rocks 5.0 (V)  
Profile built 18:29 09-Sep-2008  
  
Kickstarted 11:42 09-Sep-2008  
[root@vi-1 ~]# rocks list host  
HOST             MEMBERSHIP CPUS RACK RANK COMMENT  
vi-1:           Frontend   1   0   0   -----  
compute-0-0:    Compute   1   0   0   -----  
compute-0-1:    Compute   1   0   1   -----  
compute-0-2:    Compute   1   0   2   -----  
[root@vi-1 ~]#
```

- Espresso is a VM hosting Cluster
- Vi-1 is virtual – configured to the needs of the owner.