The Cloud for Biologists

using bioinformatics tools

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Why choose for the Cloud?

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- It's **fancy** (Google and Amazon are using it)
- It's **environmental friendly** (Gmail: Its cooler in the cloud)

How do we use the Cloud?

Galaxy

a web-based genome analysis platform[1]

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[1] Slide by Anton Nekrutenko, Galaxy Developer Conference 2011, Lunteren (NL)

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- A free (for everyone) **web service** integrating a wealth of tools, compute resources, terabytes of reference data and permanent storage
- **Open source software** that makes integrating your own tools and data and customizing for your own site simple

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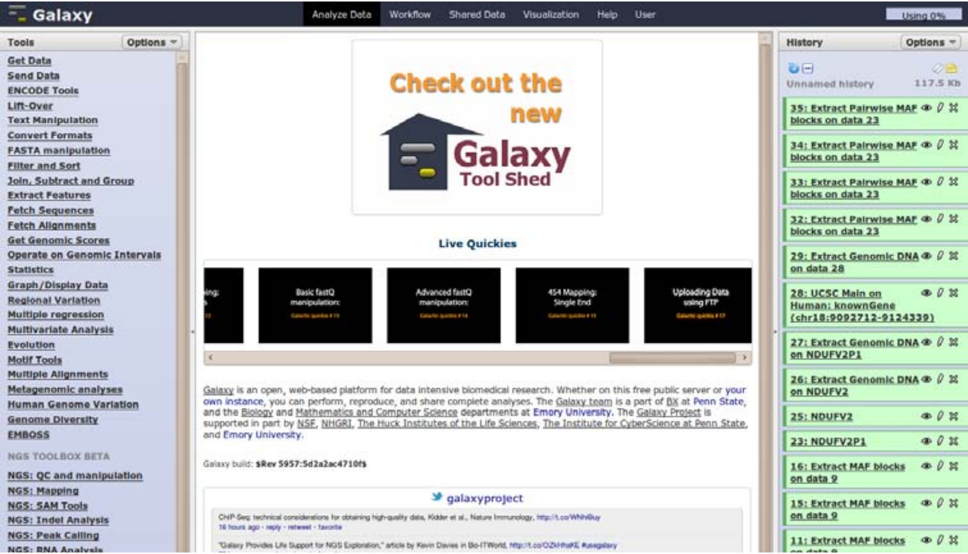

Galaxy is an open, web-based platform for data intensive biomedical research. Whether on this free public server or your own instance, you can perform, reproduce, and share complete analyses. The Galaxy team is a part of BX at Penn State, and the Biology and Mathematics and Computer Science departments at Emory University. The Galaxy Project is supported in part by NSF, NHGRI, The Huck Institutes of the Life Sciences, The Institute for CyberScience at Penn State, and Emory University.

Galaxy build: **$Rev 5957:5d2a2ac4710f$**

galaxyproject

ChIP-Seq: technical considerations for obtaining high-quality data, Kidder et al., Nature Immunology, http://t.co/WNhi9uy
16 hours ago · reply · retweet · favorite

"Galaxy Provides Life Support for NGS Exploration," article by Kevin Davies in Bio-ITWorld, http://t.co/OZkHhaKE #usegalaxy

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- Analyze
  - Interactively **manipulate** genomic data with a comprehensive and expanding 'best-practices' toolset
- Publish and Share
  - Results and step-by-step analysis record (**Data Libraries** and **Histories**)
  - Customizable pipelines (**Workflows**)
  - Share workflows with other users

Cloudman

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- Cloudman is written by Enis Afghan *et.al.*, Emory University and provides a ready-to-run, dynamically scalable version of Galaxy on **Amazon AWS**
- Now it's possible to run it also on the **SARA HPC Cloud / Opennebula** (with some limitations)

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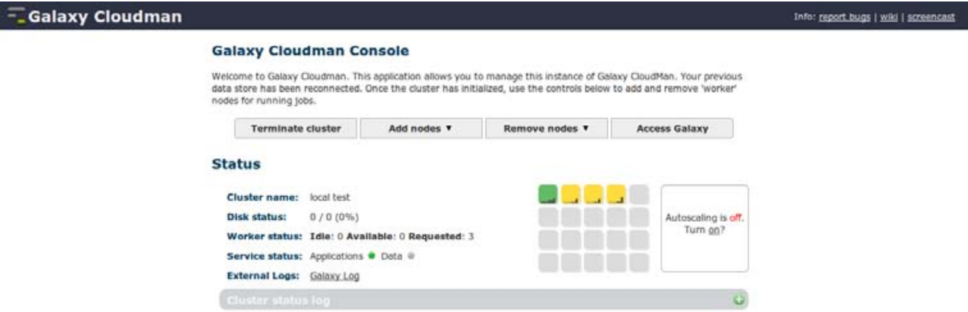
- Jobs are queued using **SGE**
- Galaxy is served using nginx **webserver**

Workers instances are being configured



Galaxy Cloudman Console

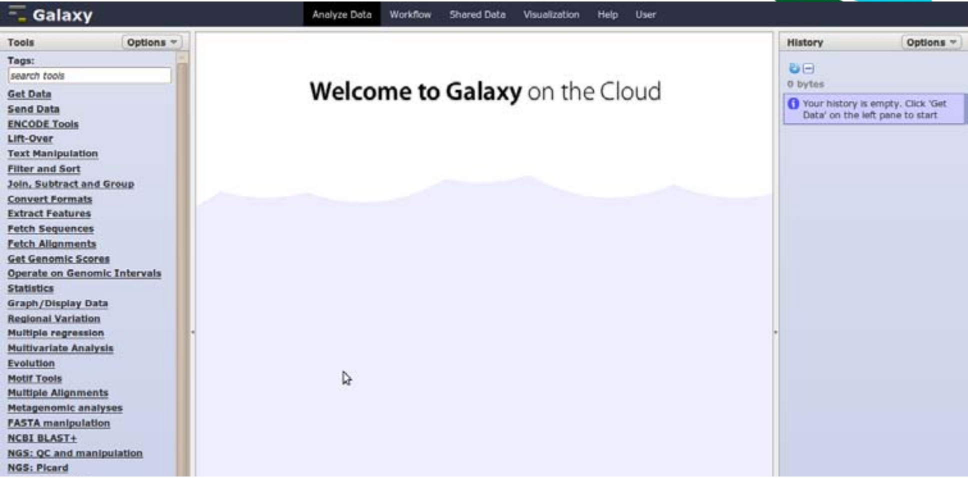
Welcome to Galaxy Cloudman. This application allows you to manage this instance of Galaxy CloudMan. Your previous data store has been reconnected. Once the cluster has initialized, use the controls below to add and remove 'worker' nodes for running jobs.

Status

Cluster name: local test
Disk status: 0 / 0 (0%)
Worker status: **Idle**: 0 **Available**: 0 **Requested**: 3
Service status: Applications ● Data ●
External Logs: Galaxy Log

Autoscaling is off. Turn on?

Galaxy is accessible



Welcome to Galaxy on the Cloud

Your history is empty. Click 'Get Data' on the left pane to start

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  - and more!

Thanks!

Thanks to the Galaxy Cloud Team

Questions?

Extra slides

Limitations of Opennebula

- Create instances providing user data (available in production cloud?)
- No support for growing qcow filesystem
- Would be create to access the cloud the ON API from outside
- Cloned instances have not a working network

More info at

- My notes: https://www.cloud.sara.nl/projects/galaxy/wiki
- Galaxy Cloud on Amazon: http://usegalaxy.org/cloud
- Cloudman scripts: https://bitbucket.org/galaxy/cloudman/
- Install tools: https://bitbucket.org/afgane/mi-deployment
- Bio-linux repository: http://nebc.nerc.ac.uk/tools/bio-linux/bio-linux-6.0

Launch Cloudman Console

Initial Cluster Configuration

Welcome to Galaxy Cloudman. This application will allow you to manage this cluster and the services provided within. To get started, choose the type of cluster you'd like to work with and specify the size of your persistent data storage, if any.

● Start a full Galaxy Cluster. Specify initial storage size (in Gigabytes)

☐ GB

Master node is online

Galaxy Cloudman Console

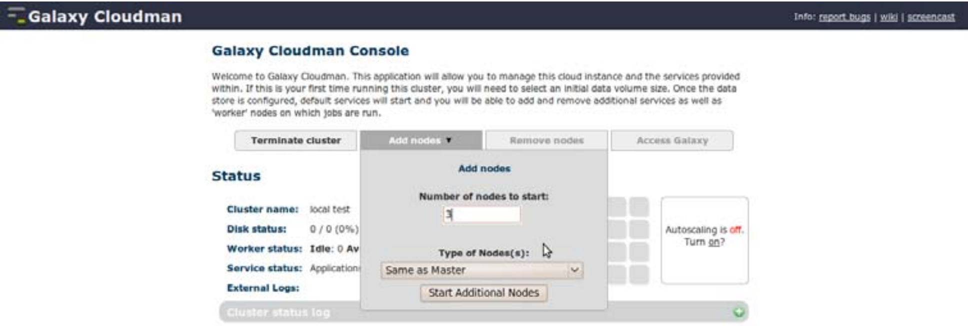
Welcome to Galaxy Cloudman. This application will allow you to manage this cloud instance and the services provided within. If this is your first time running this cluster, you will need to select an initial data volume size. Once the data store is configured, default services will start and you will be able to add and remove additional services as well as 'worker' nodes on which jobs are run.

Status

Cluster name: local test
Disk status: 0 / 0 (0%)
Worker status: **Idle:** 0 **Available:** 0 **Requested:** 0
Service status: Applications ● Data ●
External Logs:

Autoscaling is off. Turn on?

Add extra worker nodes



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Status

Cluster name: local test
Disk status: 0 / 0 (0%)
Worker status: **Idle:** 0 **Av**
Service status: Application
External Logs:

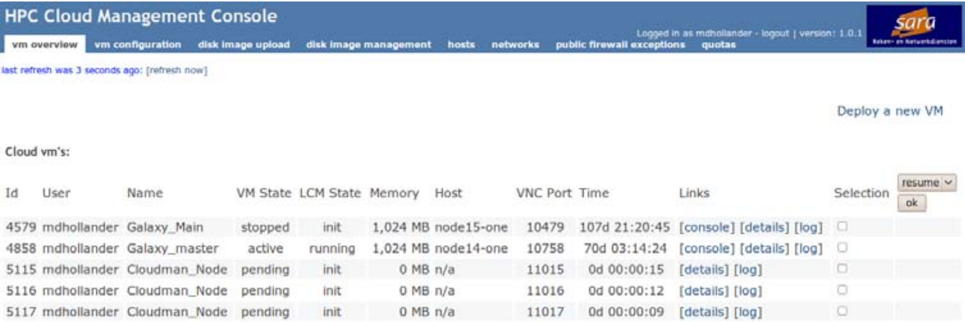
Add nodes

Number of nodes to start: 3

Type of Nodes(s): Same as Master

Autoscaling is off. Turn on?

New instances are pending



Logged in as mdhollander - logout | version: 1.0.1

last refresh was 3 seconds ago: [refresh now]

Deploy a new VM

Cloud vm's:

Id	User	Name	VM State	LCM State	Memory	Host	VNC Port	Time	Links	Selection
4579	mdhollander	Galaxy_Main	stopped	init	1,024 MB	node15-one	10479	107d 21:20:45	[console] [details] [log]	☐
4858	mdhollander	Galaxy_master	active	running	1,024 MB	node14-one	10758	70d 03:14:24	[console] [details] [log]	☐
5115	mdhollander	Cloudman_Node	pending	init	0 MB	n/a	11015	0d 00:00:15	[details] [log]	☐
5116	mdhollander	Cloudman_Node	pending	init	0 MB	n/a	11016	0d 00:00:12	[details] [log]	☐
5117	mdhollander	Cloudman_Node	pending	init	0 MB	n/a	11017	0d 00:00:09	[details] [log]	☐

New instances are pending #2

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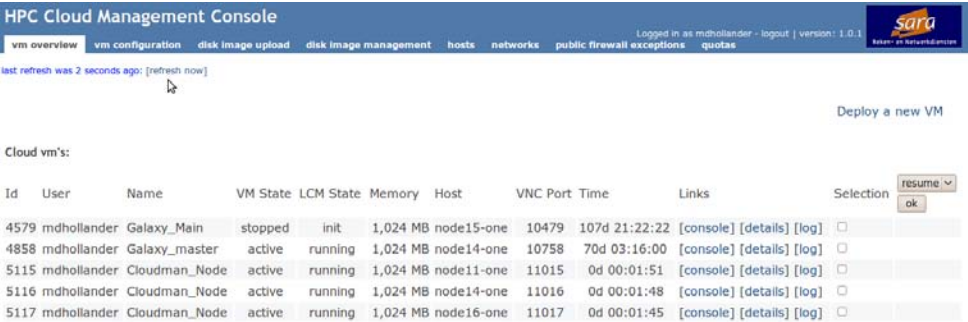
Worker status: **Idle:** 0 **Available:** 0 **Requested:** 3
Service status: Applications ● Data ●
External Logs: Galaxy Log

Autoscaling is off. Turn on?

New instances are running

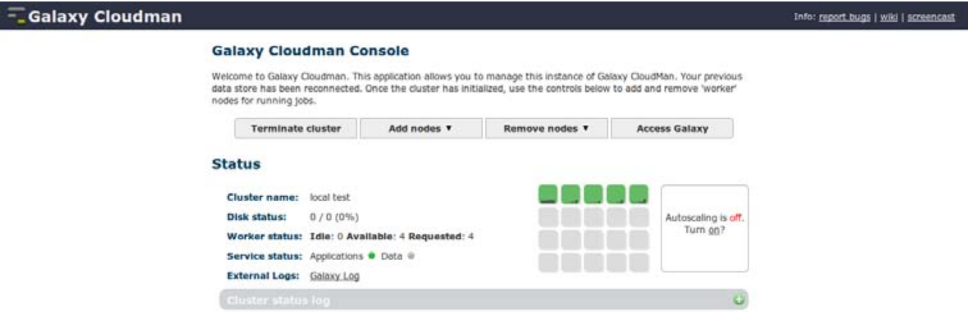


last refresh was 2 seconds ago: [refresh now]

Cloud vm's:

Id	User	Name	VM State	LCM State	Memory	Host	VNC Port	Time	Links	Selection
4579	mdhollander	Galaxy_Main	stopped	init	1,024 MB	node15-one	10479	107d 21:22:22	[console] [details] [log]	☐
4858	mdhollander	Galaxy_master	active	running	1,024 MB	node14-one	10758	70d 03:16:00	[console] [details] [log]	☐
5115	mdhollander	Cloudman_Node	active	running	1,024 MB	node11-one	11015	0d 00:01:51	[console] [details] [log]	☐
5116	mdhollander	Cloudman_Node	active	running	1,024 MB	node14-one	11016	0d 00:01:48	[console] [details] [log]	☐
5117	mdhollander	Cloudman_Node	active	running	1,024 MB	node16-one	11017	0d 00:01:45	[console] [details] [log]	☐

New instances are online



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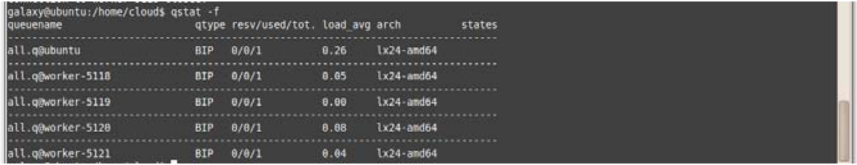
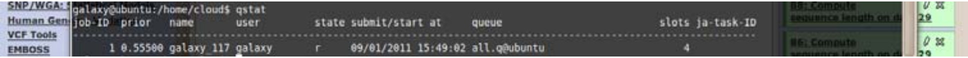


```
galaxy@ubuntu:/home/cloud$ qstat -f
queuename                      qtype resv/used/tot. load_avg arch          states
---------------------------------------------------------------------------------
all.q@ubuntu                   BIP   0/0/1          0.26     lx24-amd64
---------------------------------------------------------------------------------
all.q@worker-5118              BIP   0/0/1          0.05     lx24-amd64
---------------------------------------------------------------------------------
all.q@worker-5119              BIP   0/0/1          0.00     lx24-amd64
---------------------------------------------------------------------------------
all.q@worker-5120              BIP   0/0/1          0.08     lx24-amd64
---------------------------------------------------------------------------------
all.q@worker-5121              BIP   0/0/1          0.04     lx24-amd64
```



```
galaxy@ubuntu:/home/cloud$ qstat
job-ID  prior   name       user         state submit/start at     queue                          slots ja-task-ID
-----------------------------------------------------------------------------------------------------------------
      1 0.55500 galaxy_117 galaxy       r     09/01/2011 15:49:02 all.q@ubuntu                       4
```