When to use the cloud?

• Don’t have informatics expertise or infrastructure to run/maintain
• Have extended or particular resource needs
• Cannot upload data to a shared resource
• Need for customization
• Have oscillating data volume
The big picture

A. Users in different labs
B. Isolated Galaxy instance(s)
C. Dense data center

SaaS

Galaxy CloudMan

IaaS
Galaxy CloudMan

- Complete solution for instantiating, running and scaling cloud resources with automatically configured Galaxy
  - Scope of tools and reference datasets exceed Galaxy Main
- Deployment on Amazon Web Services Cloud
  - Wizard-guided setup: requires no computational expertise, no infrastructure, no software
- Automated configuration for machine image, tools, and data
- Self-contained deployment
- Dynamic persistent storage
- Sharing of derived cluster instances
- Elastic resource scaling: manual or automatic

- Deploy a Galaxy cluster in minutes!
Deploying Galaxy on the AWS Cloud

1. **Create an AWS account** and sign up for EC2 and S3 services

2. Use the AWS Management Console to **start a master EC2 instance**

3. **Use the Galaxy CloudMan web interface** on the master instance to manage the cluster
2. Start an EC2 Instance
3. Configure Your Cluster

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)
  - 1000 GB OK

Show more startup options

Start Cluster
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:** Heteroplasmy study
- **Disk status:** 50M / 1000G (1%)
- **Worker status:** Idle: 0 Available: 0 Requested: 0
- **Service status:** Applications: 0 Data: 0
- **External Logs:** Galaxy Log

**Cluster status log**
Welcome to Galaxy on the Cloud

Your history is empty. Click 'Get Data' on the left pane to start.
Components \(\rightarrow\) deployment

- Machine image (OS)
- Galaxy & tools
- CloudMan
- Reference genomes
- User data
- Compute resources
- Storage resources

**Deployment versioning**

- Galaxy & tools
- Reference genomes
- CloudMan
- Machine image (OS)

**Accessibility**

- User data

**Configuration**

- Storage resources

**Infrastructure management**

- Compute resources
Building CloudMan machine image

- Dependencies and tools
- Automated the configuration process
- Go from bare bones OS to Galaxy-ready machine
- Applicable outside the cloud
- Build-a-machine (yourself)
- Based on Python Fabric
- Easily extensible: add your own tool
Galaxy VM

- Built a Galaxy pre-configured VM image
- Galaxy and a range of tools
- Reference genomes will need to be downloaded (but it’s automated)
- Available from S3 bucket `usegalaxy`
CloudMan instances

- **Self-contained configuration**: CloudMan, Galaxy & tools, reference genomes, data
- Thus:
  - Reproducible
  - Customizable
  - Extensible
Data

- It is only yours
- Preserved while the cluster is off
- Can grow as the analysis grows
  - Up to 1,000GB currently
The importance of sharing

- **Share entire Galaxy CloudMan** cluster instances
- Publish an analysis
  - In progress or otherwise
- Use CloudMan as PaaS
  - Deploy your own tool and make it available
- Snapshot your instance
  - Data
  - Configuration
Deployment sharing

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)

- **Share-an-instance**
- `x6176224e8e18e8b911a05c3ea4/shared/2011-04-06--21-20` Shared instance bucket path

- **Data volume and SGE only.** Specify initial storage size (in Gigabytes)

- **SGE Only.** No persistent storage created.

Hide extra options

Start Cluster
Grow and Shrink
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: share-an-instance demo
Disk status: 84M / 10G (1%)
Worker status: Idle: 0 Available: 0 Requested: 0
Service status: applications Data
External Logs: Application Log Data
Cluster status log

Galaxy Cloudman Console

Autoscaling Configuration

Autoscaling attempts to automate the elasticity offered by cloud computing for this particular cluster. Once turned on, autoscaling takes over the control over the size of your cluster.

Autoscaling is simple, just specify the cluster size limits you want to work within and use your cluster as you normally do. The cluster will not automatically shrink to less than the minimum number of worker nodes you specify and it will never grow larger than the maximum number of worker nodes you specify.

While respecting the set limits, if there are more jobs than the cluster can comfortably process at a given time autoscaling will automatically add compute nodes; if there are no free nodes sitting idle at the end of an hour autoscaling will terminate those nodes reducing the size of the cluster and your cost.

Once turned on, the cluster size limits respected by autoscaling can be adjusted or autoscaling can be turned off.

Autoscaling is on. Turn off? Min nodes: 0 Max nodes: 15 Adjust limits?
Don’t waste the resources

- Once the need for a given cluster subsides, you can always start it back up.
- Data is preserved while a cluster is down.
Summary of the CloudMan architecture

- Minimum setup time and cost
- No need for an external broker
- Automated configuration
- Data persistence
- Built-in support for managing the oscillating data volume
- Self-contained deployment
  - Customizable instances: CloudMan as PaaS
  - Versioning of tools, data, and configurations
Questions & Comments

http://usegalaxy.org/cloud