CloudMan

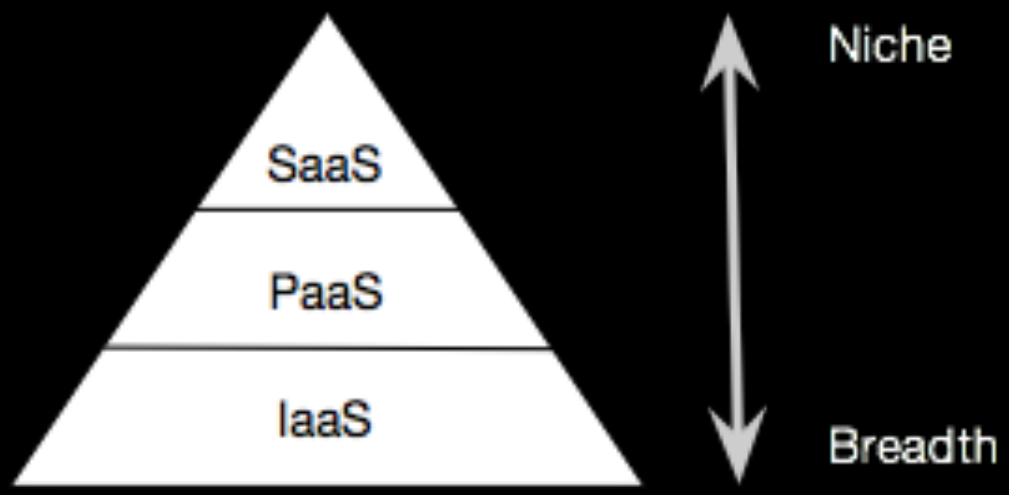
Enabling Ubiquitous, Accessible, Reproducible Research

usecloudman.org

Cloud Computing

- Dynamically scalable shared resources accessed over a network
- Control infrastructure via API
- Private, public, or hybrid
- Virtually unlimited resources: storage, computing, services
  - Only pay for what you use

Approaches to Cloud Computing

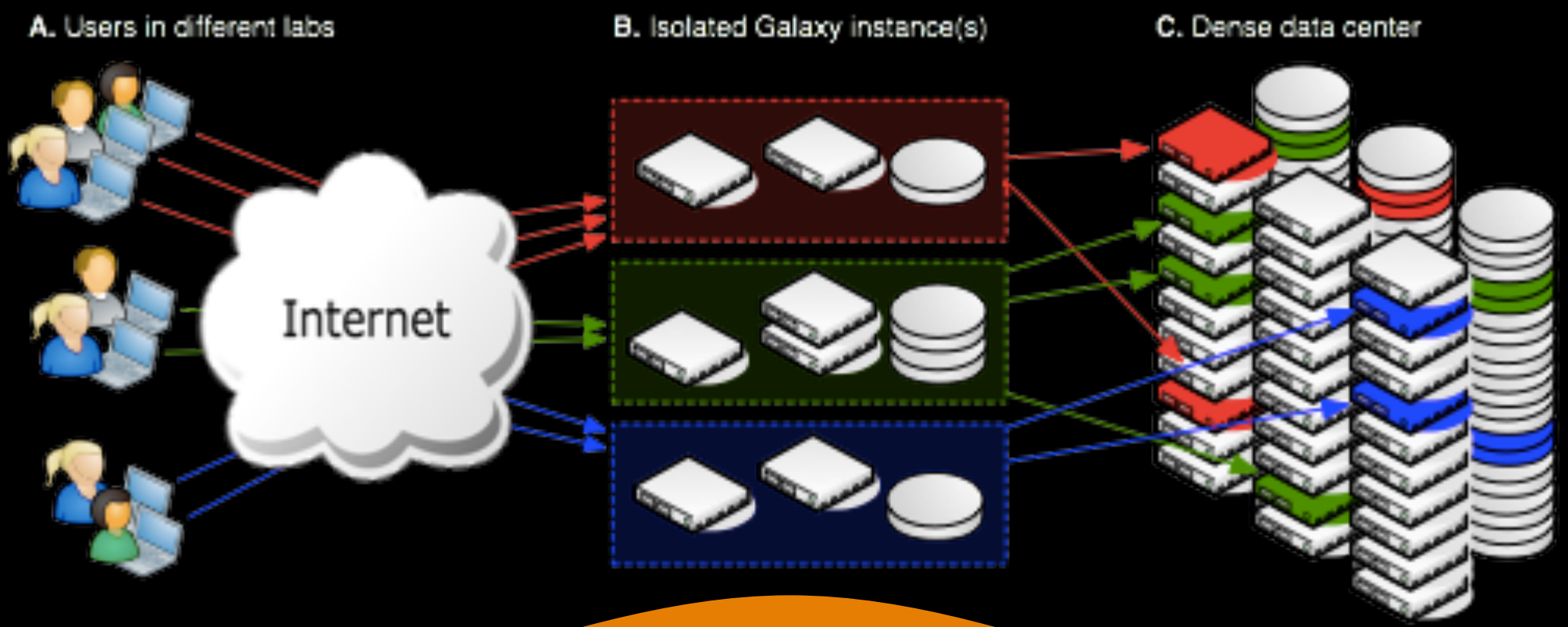


- SalesForce, Google Docs, Zoho, web email
- RightScale, Google App Engine, Microsoft Azure
- Amazon Web Services (AWS), Rackspace, NeCTAR

When to use the cloud?

- Don't have informatics expertise or the infrastructure to run and maintain
- Have variable or particular resource needs
- Cannot upload data to a shared resource
- Need for customization
- Have oscillating data volume

The big picture



SaaS ← **CloudMan** → IaaS

What is CloudMan?

A cloud manager that orchestrates all of the steps required to provision, manage, and share a compute platform on a cloud infrastructure, all through a web browser.

Deploying a CloudMan Platform

1. An account on the supported cloud
2. Start a master instance via BioCloudCentral.org or the cloud web console
3. Use the CloudMan web interface on the master instance to manage the platform

Start an Instance

BioCloudCentral

https://biocloudcentral.herokuapp.com/launch

BioCloudCentral

Easily launch CloudMan, CloudBioLinux and Galaxy platforms on Cloud Computing resources (including Amazon Web Services).

Cluster name	Current Protocols Demo	Name of your cluster used for identification. This can be any name you choose.
Password	••••••••••••••••••	Your choice of password, for the CloudMan web interface and accessing the instance via ssh or FreeNX.
Cloud	Amazon (AWS EC2)	Choose from the available clouds. The credentials you provide below must match (ie, exist on) the chosen cloud.
Access key	AKIAJKMSM6GLSW7V2CPA	Your Access Key ID. For the Amazon cloud, available from the security credentials page.
Secret key	EjvlMvij9SLVuxvb9OgaD58qiUXLkEZLa1	Your Secret Access Key. For the Amazon cloud, also available from the security credentials page.
Instance type	Large (4 ECUs / 7.5GB RAM)	Type (ie, virtual hardware configuration) of the instance to start.

Show advanced startup options

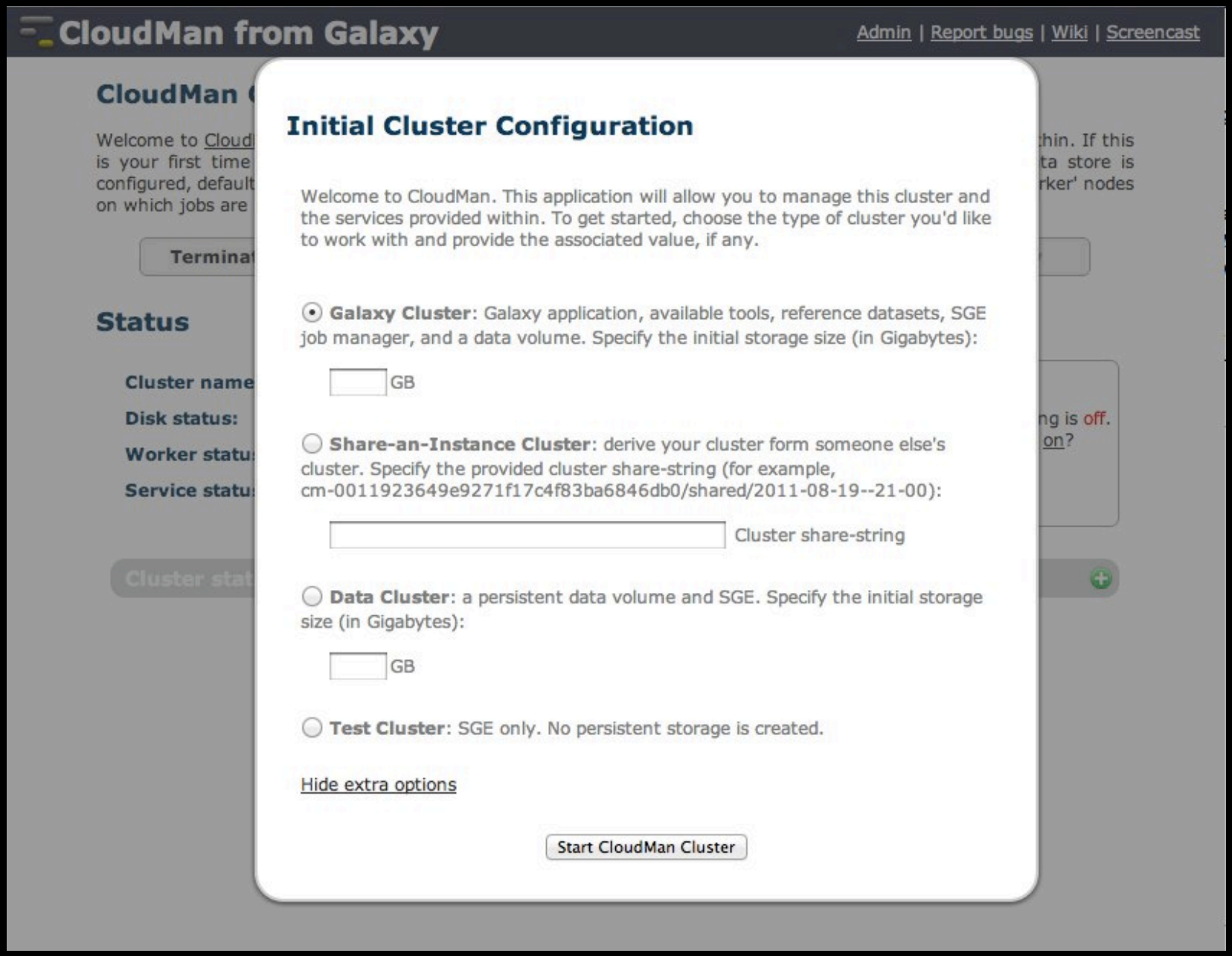
Start an instance

This website is an open service developed by the CloudBioLinux and CloudMan communities. The goal is to make it easy to get started doing scalable biological analysis on cloud resources. See this guide for a detailed usage example when using the Amazon cloud. The open source code is available on GitHub allowing you to also run this service locally.

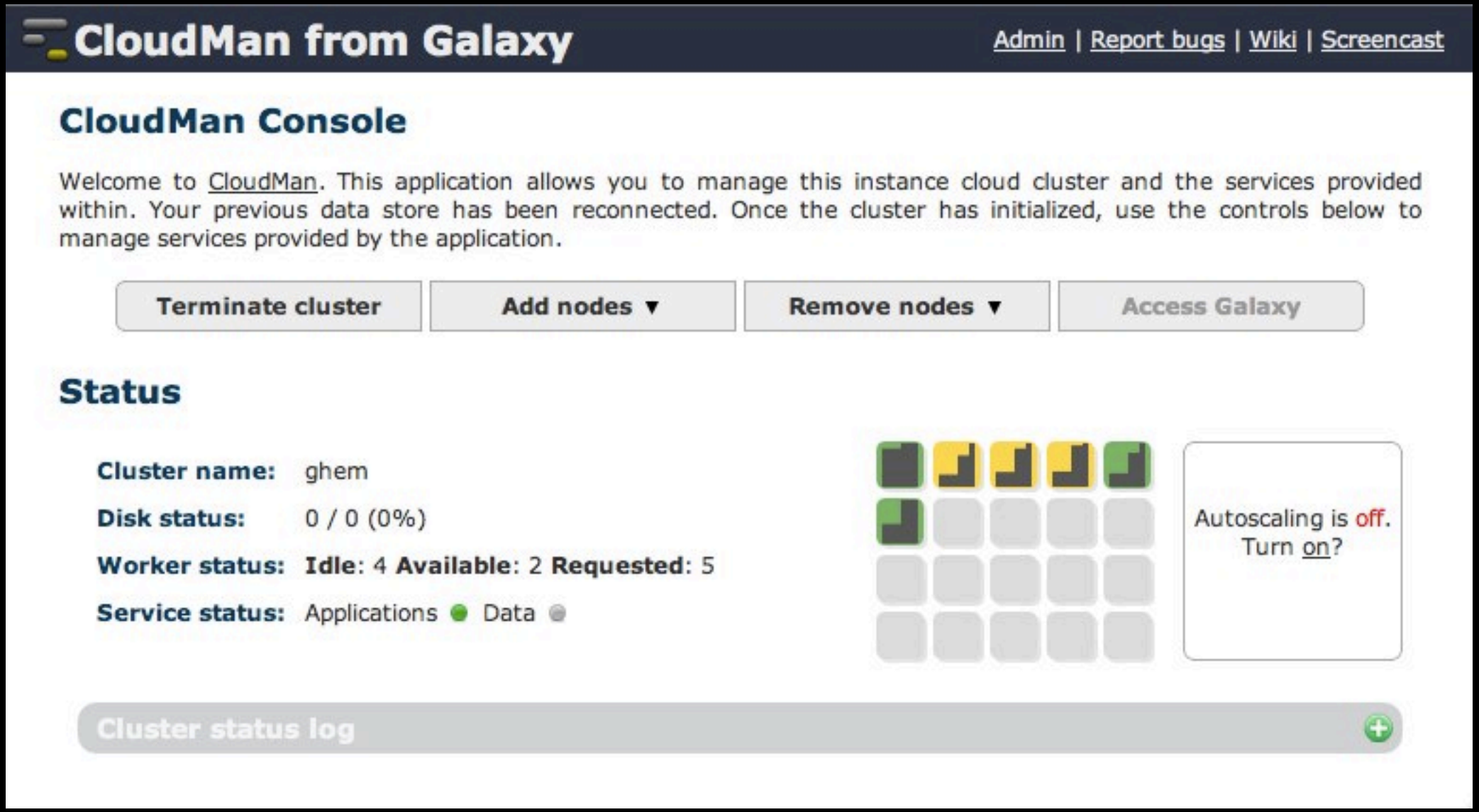
This site can be used for any of the available clouds. Note that you must have appropriate credentials for the chosen cloud. If a desired cloud is not available and you would like to see it there, please contact us.

Launching servers on the Amazon cloud will incur usage fees from Amazon for their resources. By using this service you acknowledge your sole responsibility for any costs accrued.

Configure Your Cluster



Manage Your Cluster



Galaxy

Analyze Data | Workflow | Shared Data | Visualization | Help | User

Using 0%

Tools

search tools

- Get Data
- Send Data
- ENCODE Tools
- Lift-Over
- Text Manipulation
- Filter and Sort
- Join, Subtract and Group
- Convert Formats
- Extract Features
- Fetch Sequences
- Fetch Alignments
- Get Genomic Scores
- Operate on Genomic Intervals
- Statistics
- Wavelet Analysis
- Graph/Display Data
- Regional Variation
- Multiple regression
- Multivariate Analysis
- Evolution
- Motif Tools
- Multiple Alignments
- Metagenomic analyses
- FASTA manipulation
- NCBI BLAST+
- NGS: QC and manipulation
- NGS: Picard (beta)
- NGS: Mapping
- NGS: Indel Analysis
- NGS: RNA Analysis
- NGS: SAM Tools
- NGS: GATK Tools (beta)

Welcome to Galaxy on the Cloud

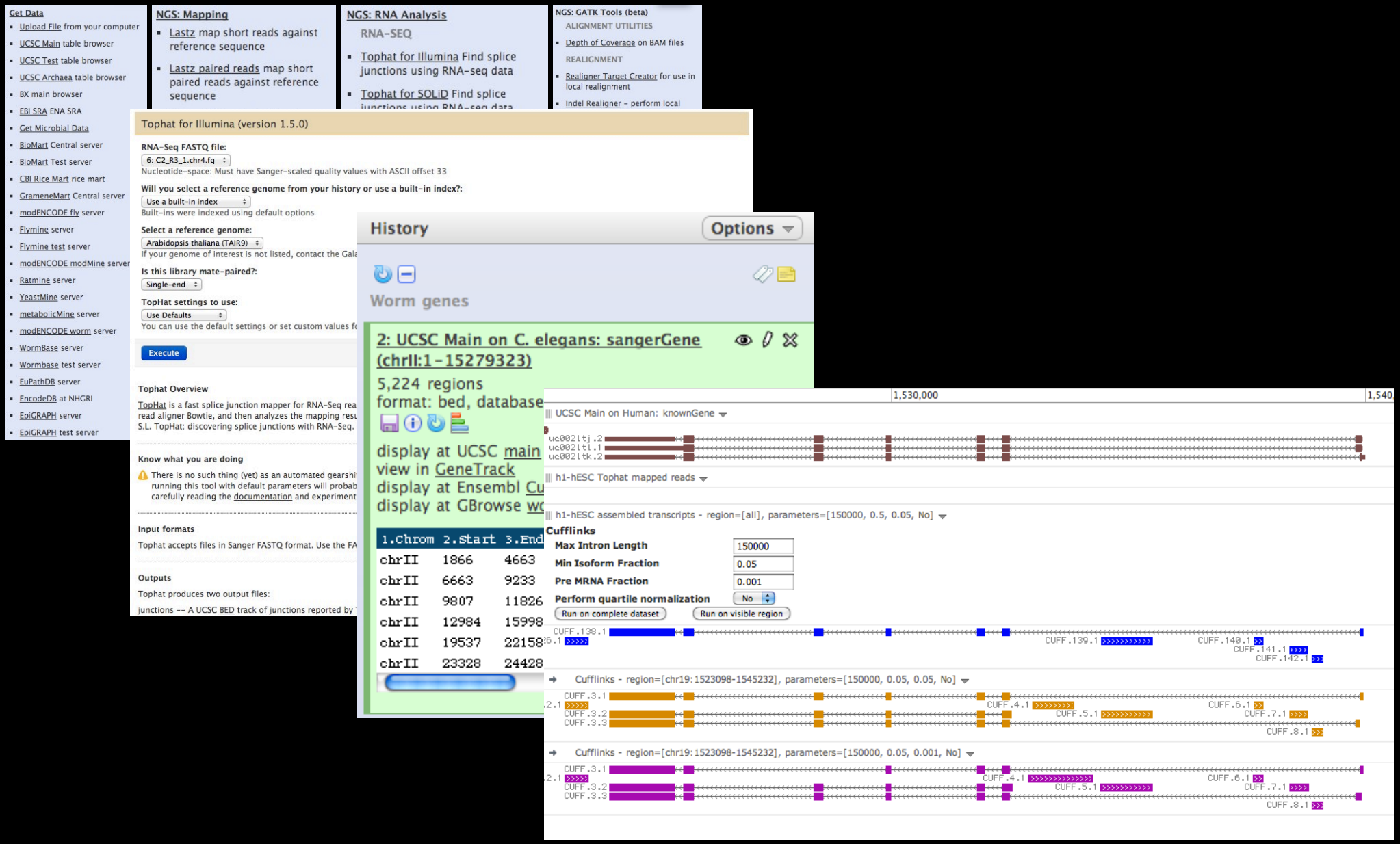
managed by CloudMan

History

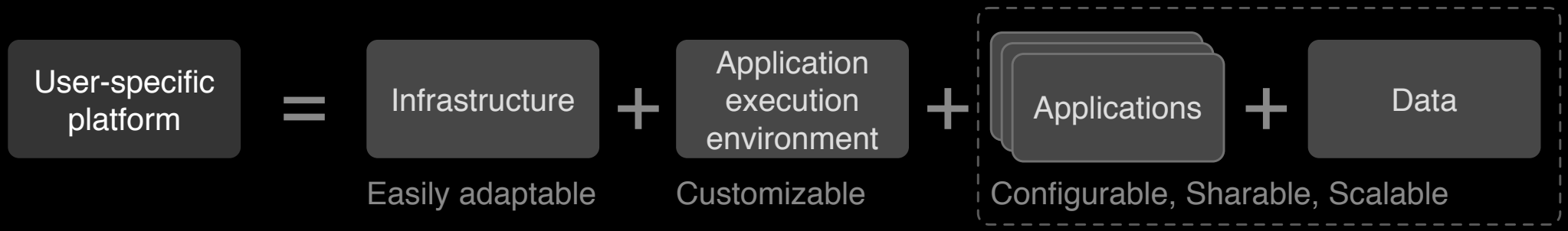
0 bytes

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

Galaxy – Ready for Use



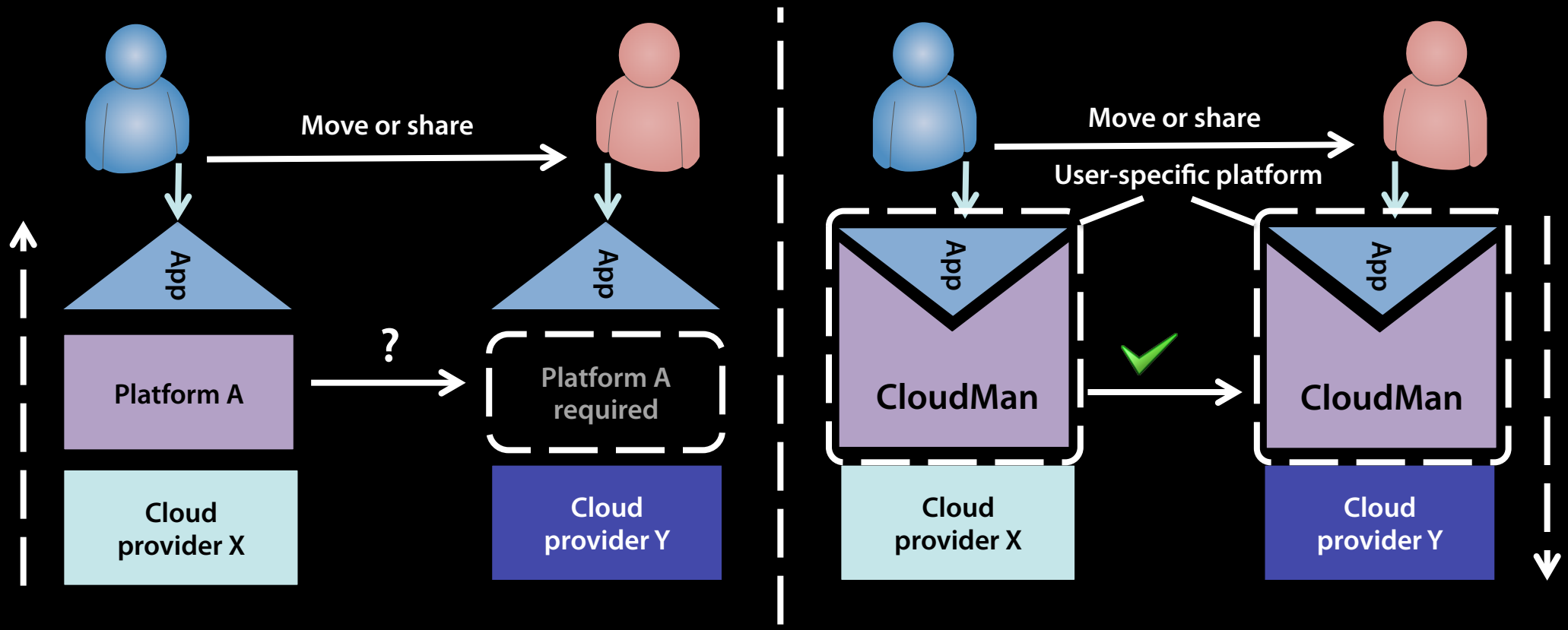
CloudMan-as-a-Platform



Enable easy creation of user-specific cloud platforms

Couple the infrastructure, complex and functional application execution environments, applications, and data into a single unit that can easily be used and manipulated by a user.

Packaged Platform Enables Reproducibility



CloudMan Platform Features

- A complete solution for instantiating, running and scaling cloud resources
  - Get a scalable compute cluster (SGE)
- Get an automatically configured Galaxy application
  - Scope of tools and reference datasets exceed Galaxy Main
- Deployment on AWS, OpenStack, and OpenNebula clouds
  - Wizard-guided setup: requires no computational expertise, no infrastructure, no software
- Automated configuration for machine image, tools, and data
  - Replicate EXACT environment anywhere (cloud, local, VM) & quickly
- Self-contained deployment
- Elastic resource scaling: manual or automatic
  - On AWS, support for Spot instances
- Dynamic persistent storage
- Use any S3 bucket as a local file system
- Share your instance: including all customizations (data, tools & configurations)

- Deploy a (Galaxy) cluster in minutes!

Value Added Features

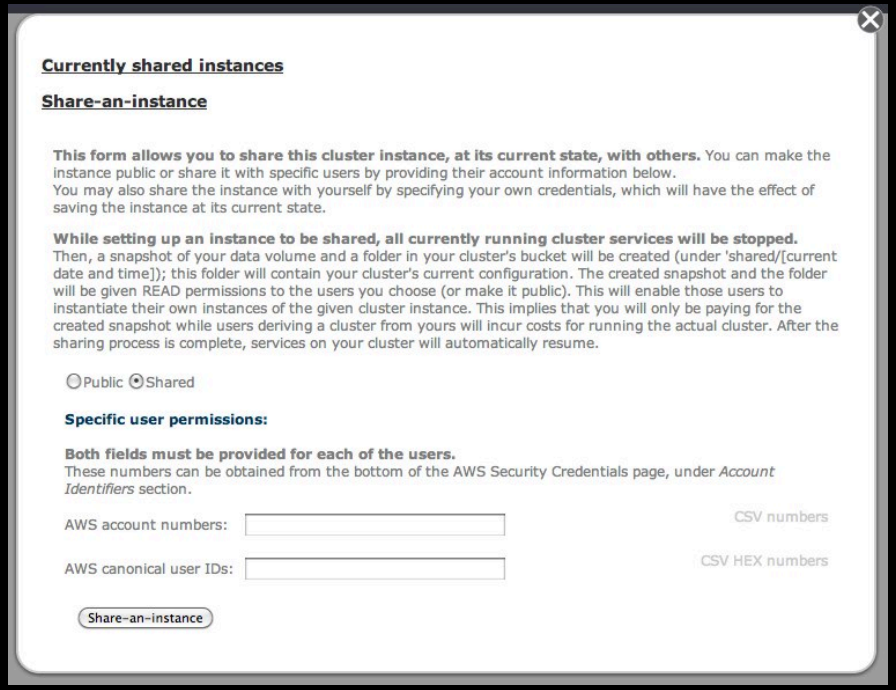
Customizing, Sharing, Scaling

Customize Your Instance

- Each CloudMan instance is self-contained, meaning that it can be built upon
- Deploy a tool and make it available
  - With all the configurations and sample data
- Upload data and share it with others
- Snapshot your own instance to capture:
  - Data
  - Configuration

Share Your Instance

- Share entire (Galaxy) CloudMan platform
  - Even the customized ones (including data and/or tools)
  - Fully automated solution
- Publish a self-contained analysis
  - In progress or otherwise



Name	Instance ID	References
Exome sequencing pipeline	cm-b53c6f1223f966914df347687f6fc818/shared/2011-10-07--14-00	Pipeline description

Scaling the Infrastructure with the Computation

ec2-50-17-119-106.compute-1.amazonaws.com/cloud

Galaxy Cloudman

Info: report bugs | wiki | screencast

Galaxy Cloudman Console

ec2-50-17-119-106.compute-1.amazonaws.com/cloud

Galaxy Cloudman

Info: report bugs | wiki | screencast

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 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 cluster 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.

ec2-50-17-119-106.compute-1.amazonaws.com/cloud

Galaxy Cloudman

Info: report bugs | wiki | screencast

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.

Terminate cluster | Add nodes | Remove nodes | Access Galaxy

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: Galaxy Log

Autoscaling is on.
Turn off?

Min nodes: 0
Max nodes: 15
Adjust limits?

Cluster status log

Exercising Elasticity with AutoScaling

Fixed cluster size

5 nodes

Computation time: 9 hrs

Computation cost: $20

20 nodes

Computation time: 6 hrs

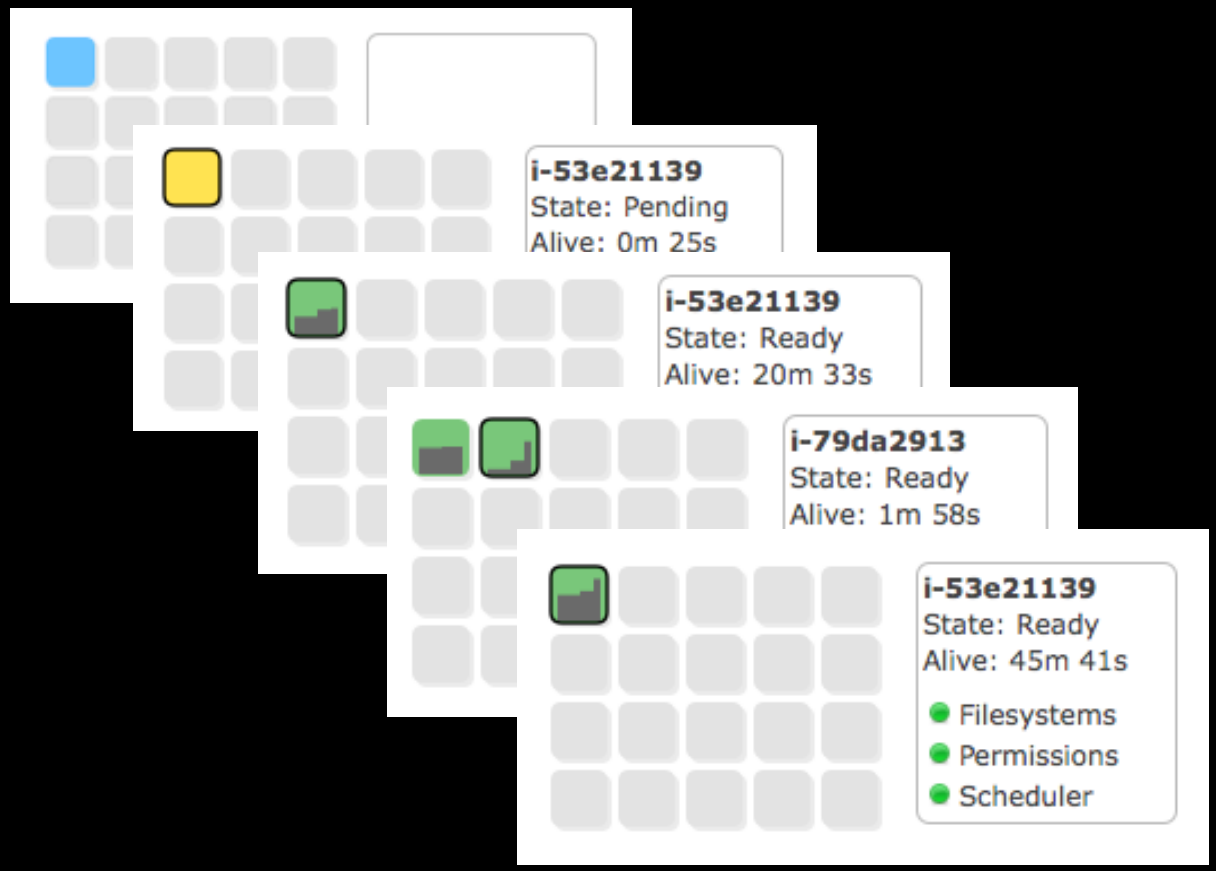
Computation cost: $50

Dynamic cluster size

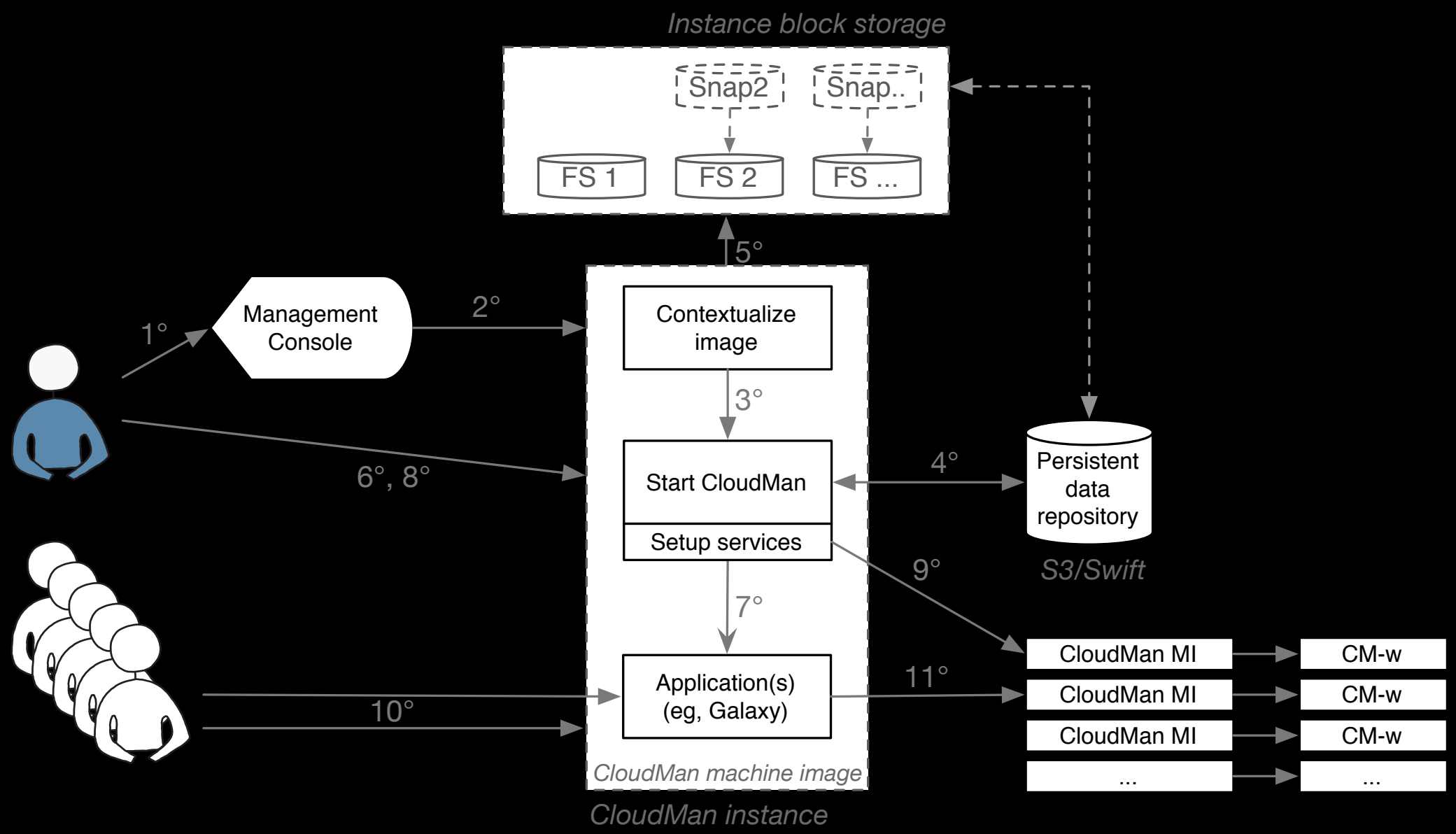
1 to 16 nodes

Computation time: 6 hrs

Computation cost: $20



Flexible Architecture



What the Future Holds?

Standards, APIs, Apps

CloudMan and interoperability

Interoperable w/ multiple cloud platforms

Use open standards (OCCI, CDMI)

Become the default cloud manager for research clouds

CloudMan as a platform

Enable easy use of value added services via automation

Advanced autoscaling, data management

Deployment customizations

(REST) API

CloudMan and applications

A range of application execution environments

Embedded integration for support for a range of applications

Reproducible, customizable, sharable cloud environments

Significance of CloudMan

An accessible and reproducible cloud environment that enables decentralization of services and realizes a scalable model, thus supporting some of the core pillars of science.

usecloudman.org