Booting a Galaxy Instance
Create Security Groups

First time Only
Create Security Group for Galaxy
Name the group “galaxy”
Click “Manage Rules” for “galaxy”
Click “Add Rule”
Choose “HTTPS” and Click “Add”
Manage Security Group Rules: galaxy (4ff326ce-5fcf-431b-9fe4-4a3bd99d6863)

<table>
<thead>
<tr>
<th>Direction</th>
<th>Ether Type</th>
<th>IP Protocol</th>
<th>Port Range</th>
<th>Remote IP Prefix</th>
<th>Remote Security Group</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egress</td>
<td>IPv6</td>
<td>Any</td>
<td>Any</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>Egress</td>
<td>IPv4</td>
<td>Any</td>
<td>Any</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>Ingress</td>
<td>IPv4</td>
<td>TCP</td>
<td>443 (HTTPS)</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
</tbody>
</table>

Displaying 3 items
Repeat Security Group Creation for “rdp”
Instead of “HTTPS”, choose “RDP” for the rule
Manage Security Group Rules: rdp (d4c90357-7149-44fb-a2d4-31d0fe2b4b46)

<table>
<thead>
<tr>
<th>Direction</th>
<th>Ether Type</th>
<th>IP Protocol</th>
<th>Port Range</th>
<th>Remote IP Prefix</th>
<th>Remote Security Group</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egress</td>
<td>IPV6</td>
<td>Any</td>
<td>Any</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>Egress</td>
<td>IPV4</td>
<td>Any</td>
<td>Any</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>Ingress</td>
<td>IPV4</td>
<td>TCP</td>
<td>3389 (RDP)</td>
<td>0.0.0.0/0</td>
<td>-</td>
<td>Delete Rule</td>
</tr>
</tbody>
</table>

Displaying 3 items
Boot VM

Once per VM
Click “Launch Instance” to Boot a new VM
Name the VM
Choose the Galaxy VM image (Specify >= 20gb)
Decide how many vCPUs and size of RAM

Launch Instance
Look for Launched Instance
Remember to attach security groups

Add RDP for remote desktop

Add Galaxy, if you:

a) want to access Galaxy from both your laptop web browser and the remote desktop, and

b) intend to **properly** manage users in the Galaxy application (!!!)
   - This requires restricting user registration, rotating passwords & api keys, creating data libraries, etc.
Wait 30 Minutes for Galaxy to Boot

- The instance will automatically:
  - Install and configure Galaxy inside Docker
  - Download system security updates
  - Install and configure Remote Desktop
- Before Galaxy is ready, you can setup your remote desktop!
  - [Jump to Remote Desktop](#)
Interacting with a Galaxy Instance
Connecting to Galaxy

Everytime
Connection Options (Choose Carefully!)

**Laptop to VM via HTTPS**

Pros:
- direct connection
- boot to Galaxy
- local web browser, no need for client

Cons:
- Galaxy visible to all campus
- requires additional management (galaxy users, passwords, roles to restrict data library visibility)

To use: add “galaxy” or “https” security group to VM, connect with browser

**Remote Desktop (RDP) to VM, VM Browser to HTTPS (Preferred)**

Pros:
- less management needed for passwords, users, roles (private by default)
- Galaxy hidden from campus
- No SSHing to VM; use Terminal in RDP

Cons:
- requires remote desktop image ([...]._desktop)
- requires remote desktop client

To use: remove “galaxy” and “https” security groups from VM, add “rdp”, and connect with RDP client
Open a Browser on your Remote Desktop or your Laptop

Connect to https://<IP>
- or -
https://<vmname>.<projectname>.stratus.msi.umn.edu

(via RDP): “https://localhost”

NOTE: the “s” is important above.
Accept the self-signed certificate

Proceed to the VM
Hello, your Galaxy Docker container is running!

To customize this page you can create a welcome.html page in your directory mounted to /export.

- Configuring Galaxy
- Installing Tools
- Guided Tour

Galaxy is an open platform for supporting data intensive research. Galaxy is developed by The Galaxy Team with the support of many contributors. The Galaxy Docker project is supported by the University of Freiburg, part of de.NBI.

The Galaxy Project is supported in part by NIH, NSF, The Hack Institute of the Life Sciences, The Institute for CyberScience at Penn State, and Johns Hopkins University.
Sign into Galaxy as the “admin” user

Password “admin”

Reset the password ASAP!!!
Satisfy the dbGaP requirements:

- Minimum length of 12 characters
- Does not contain user names, real names or company names
- Does not contain a complete dictionary word
- Contains characters from each of the following groups: lowercase letters, uppercase letters, numerals, and special characters
- Passwords should expire every 120 days or at the rate required by institutional policies, whichever is more frequent.
Create an Unprivileged User for Galaxy

Admin > Users > Create new user
Create a Role to Hide Data from the Public

Admin > Roles > Add new Role

Be sure to add your admin and unprivileged account to the role (you can modify this later if necessary)
Installing Galaxy Tools
Go to the Admin panel
Use the “Search Toolshed” link on the left menu

Choose the “Galaxy Main Tool Shed”
Search for a Tool
Choose Preview and Install for the tool
Specify the Menu or Create a New One

This is the tool group on the main Workflow menu.

Click “Install” when finished
Wait for the Tool to Install

Status indicates whether the installation is complete
Extending Galaxy Storage

As Necessary
If you run out of space...

This is easy to do with Galaxy on a 20gb filesystem.
Via Horizon, Create a Snapshot of the Existing Volume (Just in Case)
You might need to force the snapshot
Next, Create a new Galaxy Data Volume
Specify a large size (>900gb)

Remember: leave enough available to snapshot a backup if desired.
Manage Attachments and connect the Volume to the Galaxy VM
Accept the default mount point
SSH to stratus-bastion.msi.umn.edu
SSH to your VM (Get the IP from the instances page)

ssh centos@<IP>
On the VM, check the device name (/dev/vdb)
Make a mount point and format the device filesystem

```
sudo mkdir -p /mnt/new_galaxy_storage

[centos@myfirst-galaxyvm ~]$ sudo mkfs.ext4 /dev/vdb
```

```
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
62259200 inodes, 249036800 blocks
12451840 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2397044736
7680 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
     32768, 98304, 163840, 229376, 294912, 360468, 425024, 489580, 555136, 620692, 686248, 751804, 817360, 882916, 948472, 1014028, 1079584, 1145140, 1210696, 1276252, 1341808, 1407364, 1472920, 1538476, 1604032, 1669588, 1735144, 1800700, 1866256, 1931812, 2007368, 2072924, 2138480, 2204036, 2269592, 2335148, 2400704, 2466260.
Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```
Mount the new Storage

```bash
sudo mount /dev/vdb /mnt/new_galaxy_storage
```
Stop Galaxy using Docker

docker ps

docker stop <CONTAINER ID>

NOTE: Get the container ID from docker ps
Copy old data to the new Volume

```bash
sudo cp -a /mnt/galaxy_storage /mnt/new_galaxy_storage
```

df -h
Unmount the new Volume to flush written data

```bash
sudo umount \\
/mnt/new_galaxy_storage
```
Move old data

```bash
sudo mv /mnt/galaxy_storage /mnt/bak_galaxy
```
Mount the new Volume to /mnt/galaxy_storage

```
sudo mkdir -p /mnt/galaxy_storage
```

```
sudo mount /dev/vdb /mnt/galaxy_storage
```

```
df -h
```

```
[centos@myfirst-galaxymv ~]$ sudo mkdir -p /mnt/galaxy_storage
[centos@myfirst-galaxymv ~]$ sudo mount /dev/vdb /mnt/galaxy_storage
[centos@myfirst-galaxymv ~]$ df -h
```

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/vda1</td>
<td>19G</td>
<td>18G</td>
<td>483M</td>
<td>98%</td>
<td>/</td>
</tr>
<tr>
<td>devtmpfs</td>
<td>5.9G</td>
<td>0</td>
<td>5.9G</td>
<td>0%</td>
<td>/dev</td>
</tr>
<tr>
<td>tmpfs</td>
<td>5.9G</td>
<td>0</td>
<td>5.9G</td>
<td>0%</td>
<td>/dev/shm</td>
</tr>
<tr>
<td>tmpfs</td>
<td>5.9G</td>
<td>65M</td>
<td>5.9G</td>
<td>2%</td>
<td>/run</td>
</tr>
<tr>
<td>tmpfs</td>
<td>5.9G</td>
<td>0</td>
<td>5.9G</td>
<td>0%</td>
<td>/sys/fs/cgroup</td>
</tr>
<tr>
<td>tmpfs</td>
<td>1.2G</td>
<td>12K</td>
<td>1.2G</td>
<td>1%</td>
<td>/run/user/42</td>
</tr>
<tr>
<td>tmpfs</td>
<td>1.2G</td>
<td>32K</td>
<td>1.2G</td>
<td>1%</td>
<td>/run/user/1001</td>
</tr>
<tr>
<td>tmpfs</td>
<td>1.2G</td>
<td>0</td>
<td>1.2G</td>
<td>0%</td>
<td>/run/user/0</td>
</tr>
<tr>
<td>/dev/vdb</td>
<td>935G</td>
<td>116G</td>
<td>877G</td>
<td>2%</td>
<td>/mnt/galaxy_storage</td>
</tr>
</tbody>
</table>
[centos@myfirst-galaxymv ~]$
```
Start Galaxy

docker ps -a

docker start <CONTAINER ID>
Confirm storage is visible to the Galaxy container

docker ps

docker exec -it \ <CONTAINER ID> \ df -h

NOTE: storage is visible to Container at /export (/dev/vdb -> /export)
Clean up old data

df -h

sudo rm -rf /mnt/bak_galaxy

df -h
Optional: take a new snapshot of your volumes before continuing

Also: delete any old snapshots you no longer need
Extending a Galaxy Volume
As Necessary
Extend your Galaxy Volume (part 1)

docker ps

docker stop <CONTAINER_ID>
sudo umount \ 
/mnt/galaxy_storage

(continued...)
Extend your Galaxy Volume (part 2)

1. Manage Attachments in Horizon

2. Detach the Volume

(continued…)

![Image of managing Galaxy Volume in Horizon](https://storage.googleapis.com/assistant-images/extend_galaxy_volume_part2.png)
Extend your Galaxy Volume (part 3)

1. Extend the Volume
2. Manage attachments
3. Attach Volume

(continued…)

![Image of Galaxy Volume interface]

- [Image of Galaxy Volume interface]
Extend your Galaxy Volume (part 4)

```bash
sudo mount /dev/vdb /mnt/galaxy_storage

sudo resize2fs /dev/vdb

df -h

docker start <CONTAINER_ID>
```
Getting Data into Galaxy Instances

As Necessary
General Workflow for Getting Data In

1. SSH to the VM (through stratus-bastion.msi.umn.edu)
2. cd to the Galaxy ftp directory: /mnt/galaxy_storage/ftp
3. Make directory /mnt/galaxy_storage/ftp/<user.email>
4. Pull the data to the VM
5. chown all data to galaxy:galaxy
Create a data folder for user files

```bash
cd /mnt/galaxy_storage/ftp
sudo -u galaxy \
mkdir -p <user.email>

NOTE: user.email is the email you registered for your local Galaxy account (default: admin@galaxy.org)
```
Pull files into the VM as the Galaxy User (use SCP, SFTP, etc.)

```bash
sudo -u galaxy \
scp -r user@host.com:files .
```

NOTE: If you transfer as another user (centos or root), or the user.email directory is not owned by galaxy, you must grant Galaxy ownership:

```bash
sudo chown -R galaxy:galaxy \
/mnt/galaxy_storage/ftp
```
Create a Data Library in Galaxy

+ New Library
Modify the Visibility of Data

By default, all libraries are public.

Click: “Manage ‘My dbGap Reference Data’”, add “Private Data” role for **Access**

NOTE: If you added the Galaxy Security Group (port 443), then you must restrict data access to authenticated users.
Logout and Confirm Data Library is Not Public
Login and Add Files from User Directory

Shared Data > My dbGap Reference Data

Add Datasets to Current Folder > from User Directory
Choose your files to Link**

Select Files and Specify Options

Click Import

NOTE: Always click “Link files Instead of copying”. If you don't, Galaxy will duplicate the data into an internal database and you will consume 2x storage. Alternatively, if you trust galaxy, then copy data in and clean up your FTP directory.
The data is in a Data Library, Now you can use it

Select Files and click “to History”
Get started with your analysis
Interacting with a VM Desktop
Setup Remote Desktop

Once per VM
Requires the “[...]_desktop” Image Type
SSH to stratus-bastion.msi.umn.edu
SSH to your VM (Get the IP from the instances page)

ssh centos@<IP>
Set a New Password for the centos User

```
sudo passwd centos
```

```
[centos@myfirst-galaxyvm ~]$ sudo passwd centos
Changing password for user centos.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[centos@myfirst-galaxyvm ~]$ 
```
Install a Remote Desktop Client on Your Workstation (First Time Only)

On OSX, get “Microsoft Remote Desktop” from the App Store

On Windows use “Remote Desktop Connection”
Create a New Connection to your VM IP

Specify the username (centos) and password, or you will be prompted every time you login.
Connect

Approve the certificate when prompted. This secures your connection to the VM.
If you see this screen, login with your user and password
If you see this screen lock, hit spacebar and login with the password
You now have a remote desktop
Jump back to Interacting with a Galaxy Instance