Eucalyptus User's Guide (1.6)

This guide is meant for people interested in using an existing installation of Eucalyptus. (If you have a cluster that you would like to install Eucalyptus on, then take a look at the Administrator's Guide first.)

Getting Started Using Eucalyptus (1.6)

These instructions will walk you through the essential steps for using a Eucalyptus-based cloud. Those who have worked with Amazon's EC2 system will find most of these instructions familiar (in fact, you may continue using Amazon's command-line tools with Eucalyptus).

1. Install command-line tools

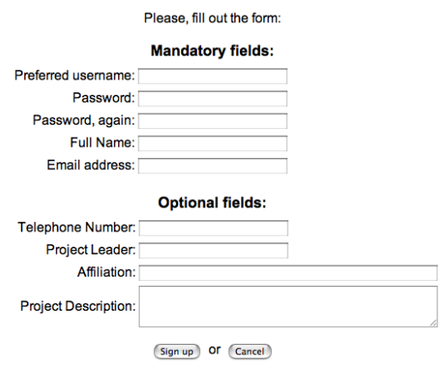
The instructions below rely on the euca2ools command-line tools distributed by the Eucalyptus Team. Please, install them if you haven't done so already.

2. Sign up

If you are using the Eucalyptus Community Cloud, use ecc.eucalyptus.com instead of **your.cloud.server**.

Load in your browser the Web page of the Eucalyptus cloud installation that you would like to use. Ask your system administrator for the URL if you don't know it. (The URL will be of the form *https://your.cloud.server:8443/*, where *your.cloud.server* is likely to be the front-end of the cluster.)

Click the "Apply" link and fill out the form presented to you. You may not be able to use the system until the (human) administrator receives the notification of your application and approves it. The more information you supply the easier it may be for the administrator to make the decision.



Load the confirmation URL that you receive in the approval email message from the cloud administrator. **Log in** to the system with the login and password that you chose when filling out the application form.

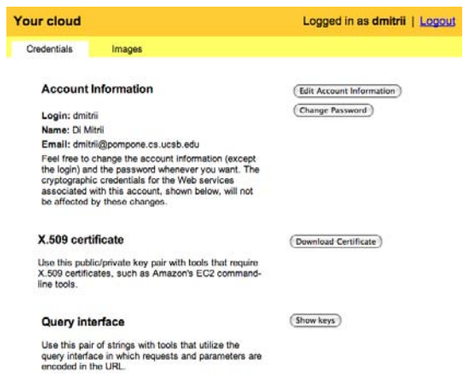
```
Your Eucalyptus account was approved!  Please, click on the
following link to log into the system (with the login and password
that you've chosen when signing up) and confirm your account:

https://localhost:8443/?
action=confirm&code=4f53646f72796c50736c77735867734654e5f53697343
786d476f2e

However, if you never requested a Eucalyptus account then, please,
disregard this message.
```

3. Obtain Credentials

Once you have logged in, you will see the 'Generate Certificate' button under the 'Credentials' tab. Generating a certificate for your account is necessary before you can use Amazon's EC2 command-line tools for querying and controlling Eucalyptus instances. Currently, the Web interface to Eucalyptus is limited and, hence, the use of command-line tools is practically inevitable.



Click the button to generate the certificate and save it. You can keep these keys in a secure place on any host. The following command-line instructions apply to any Unix-flavored machine with bash (not necessarily the cluster where Eucalyptus was installed). (See Amazon's Getting Started Guide for the similar instructions to use under Windows.)

Unzip the keys using the following command and **protect** them from exposure. The zip-file contains two files with the .pem extension; these are your public and private keys.

```
mkdir ~/.euca
cd ~/.euca
unzip name-of-the-key-zip.zip
chmod 0700 ~/.euca
chmod 0600 ~/.euca/*
```

Finally, ensure that the environment variables necessary for euca2tools to work are set by sourcing the `eucarc` file:

```
. ~/.euca/euca2-*/eucarc
```

4. Quick Start

Now you can begin running VM instances on the Eucalyptus cloud. Using the EC2 command-line tools, you can learn about installed images, start VM instances using those images, describe the running instances, and terminate them when you're finished with them.

The following EC2 commands will allow you to query the system:

```
euca-describe-images
IMAGE <emi-id> ...

euca-describe-instances
(will be empty until you start an instance, as shown below)

euca-describe-availability-zones

euca-describe-keypairs
(will be empty until you add key pairs, as shown below)
```

Before starting a VM, you need to create at least one key pair. This key pair will be injected into the VM, allowing you to SSH into the instance. Below we will use *mykey* as a handle, but you may choose any string you like instead:

```
euca-add-keypair mykey >mykey.private
('mykey' is the name for the key in Eucalyptus, 'mykey.private' is the file to be used by ssh)

chmod 0600 mykey.private

euca-run-instances -k mykey -n <number of instances to start> <emi-id>
```

```
euca-describe-instances
(should now show the instance)
```

If your administrator has configured Eucalyptus to provide security groups and elastic IPs, you may be required to allow logins to your instance, allocate a public IP (if you have not done so before, check 'euca-describe-addresses' as a reminder), and assign it to your running instance:

Allow 'ssh' connections from the Internet:

```
euca-authorize -P tcp -p 22 -s 0.0.0.0/0 default
```

Allocate a public IP if you have not done so already:

```
euca-allocate-address
```

Associate an allocated IP with your running instance:

```
euca-associate-address <IP from allocate> -i <instance ID>
```

Once the instance is shown as 'Running', it will also show two IP addresses assigned to it. You may log into it with the SSH key that you created:

```
ssh -i mykey.private root@<accessible-instance-ip>
```

To terminate instances, use:

```
euca-terminate-instances <instance-id1> <instance-id2> ... <instance-idn>
```

Please, see Amazon's EC2 Getting Started Guide for more information about these command-line tools. Keep in mind that, depending on how the administrator has configured Eucalyptus, not all tools/operations are necessarily supported (security groups/elastic IPs). Consult your administrator for more information.

Euca2ools User Guide

Euca2ools are command-line tools for interacting with Web services that export a REST/Query-based API compatible with Amazon EC2 and S3 services.The tools can be used with both Amazon's services and with installations of the Eucalyptus open-source cloud-computing infrastructure. The tools were inspired by command-line tools distributed by Amazon (api-tools and ami-tools) and largely accept the same options and environment variables. However, these tools were implemented from scratch in Python, relying on the Boto library and M2Crypto toolkit.

Summary of Features

- Query of availability zones (i.e. clusters in Eucalyptus)
- SSH key management (add, list, delete)
- VM management (start, list, stop, reboot, get console output)
- Security group management
- Volume and snapshot management (attach, list, detach, create, bundle, delete)
- Image management (bundle, upload, register, list, deregister)
- IP address management (allocate, associate, list, release)

Installation from source

Euca2ools can be installed from source or as a binary package (DEB or RPM). The latest source tarball and binary packages can be found here:

http://www.eucalyptus.com/download/eucalyptus

Please, download the correct package for your distribution or the tarball. Euca2ools are written in Python, relying on the Boto library and the M2Crypto cryptography and SSL toolkit. The acceptable versions for the dependencies are:

- Python 2.5 (dev) or higher
- Boto 1.9b
- M2Crypto 0.20.2 or higher

In what follows substitute the desired version (e.g., 1.3,1) for $VERSION either manually or by setting a shell variable. For example

```
export VERSION="1.3.1"
```

You will need to download euca2ools-$VERSION-src-deps.tar.gz, which contains boto-1.9b.tar.gz and M2Crypto-0.20.2.tar.gz.

Build the dependencies and install as follows.

You will need to install python-dev, swig, help2man, and libssl-dev to build the following libraries.

- Download euca2ools-$VERSION.tar.gz and euca2ools-$VERSION-src-deps.tar.gz. Below, we will assume that these tarballs are located in the current directory.
- Install Boto

```
tar zvxf euca2ools-$VERSION-src-deps.tar.gz
cd euca2ools-$VERSION-src-deps
tar zxvf boto-1.9b.tar.gz
cd boto-1.9b
sudo python setup.py install
cd ..
```

- Install M2Crypto

```
tar zxvf M2Crypto-0.20.2.tar.gz
cd M2Crypto-0.20.2
sudo python setup.py install
cd ..
```

- Install Euca2ools in /usr/local/bin, adding it to your $PATH, if necessary

```
cd ..
tar zxvf euca2ools-$VERSION.tar.gz
cd euca2ools-$VERSION
sudo make
export PATH=/usr/local/bin:$PATH  # not necessary on most installations
```

- Uninstalling

```
sudo make uninstall
```

You may also wish to delete euca2ools, boto and M2Crypto from your python package installation directory.

Installing Euca2ools on CentOS 5

In what follows, the value of $VERSION must be substituted accordingly (e.g., as 1.1, 1.2, etc.) for example we can set the value of 1.2 using bash:

```
export VERSION=1.2
```

There are 2 ways to obtain the packages:

1. **Yum option:** Packages are available from our yum repository. To use it, create '/etc/yum.repos.d/euca.repo' file with the following four lines:

   ```
   [euca2ools]
   name=Euca2ools
   baseurl=http://www.eucalyptussoftware.com/downloads/repo/euca2ools/$VERSION/yum/centos/
   enabled=1
   ```

   and install euca2ools

   ```
   yum install euca2ools.$ARCH --nogpgcheck
   ```

   where $ARCH is either i386 or x86_64 and $VERSION is either 1.1 or 1.2

2. **Tarball option:** Download the appropriate tarball from http://www.eucalyptus.com/download/eucalyptus

   Untar the bundle in a temporary location, install Python 2.5, and install euca2ools

   ```
   tar zxvf euca2ools-$VERSION-*.tar.gz
   cd euca2ools-$VERSION-*
   sudo -s
   yum install -y swig
   rpm -Uvh python25-2.5.1-bashton1.x86_64.rpm python25-libs-2.5.1-bashton1.x86_64.rpm euca2ools-$VERSION-*.x86_64.rpm (replace x86_64 with i386 for 32-bit hosts)
   ```

   NOTE: please use '-Uvh' and not '-i'.

Installing Euca2ools on OpenSUSE 11

In what follows, the value of $VERSION must be substituted accordingly (e.g., as 1.1, 1.2, etc.) for example we can set the value of 1.2 using bash:

```
export VERSION=1.2
```

There are 2 ways to obtain the packages:

1. **Zypper option:** packages are available from our repository. To use it:

   ```
   zypper ar --refresh http://www.eucalyptussoftware.com/downloads/repo/euca2ools/$VERSION/yum/opensuse Euca2ools
   ```

   answer question about trusting packages from this repository then refresh it

   ```
   zypper refresh Euca2ools
   ```

   and now install it

   ```
   zypper install euca2ools
   ```

2. **Tarball option:** Download the appropriate tarball from http://www.eucalyptus.com/download/eucalyptus

   Untar the bundle in a temporary location, and install euca2ools

   ```
   tar zxvf euca2ools-$VERSION-*.tar.gz
   cd euca2ools-$VERSION-*
   sudo -s
   zypper install swig
   rpm -Uvh  euca2ools-$VERSION-*.x86_64.rpm
   ```

   NOTE: please use '-Uvh' and not '-i'.

Ubuntu Jaunty

Euca2ools 1.1 can be installed on Ubuntu Jaunty using binary DEB packages. To do so, add somewhere in `/etc/apt/sources.list` file the following line:

```
deb http://www.eucalyptussoftware.com/downloads/repo/euca2ools/1.1/ubuntu jaunty universe
```

And run:

```
apt-get update
apt-get install euca2ools
```

You will have to type "Y" if you see a warning like,

```
WARNING: The following packages cannot be authenticated!
...
Install these packages without verification [y/N]? y
```

After installation you may remove the entry from `sources.list` if you don't want to update Eucalyptus packages automatically.

Debian Squeeze

Euca2ools can be installed on Debian squeeze using binary DEB packages. To install them, add our repository to the list of repositories for your system to use. To do so, add somewhere in /etc/apt/sources.list file the following line:

For 1.1:

```
deb http://www.eucalyptussoftware.com/downloads/repo/euca2ools/1.1/debian squeeze contrib
```

For 1.2 (including release candidates):

```
deb http://www.eucalyptussoftware.com/downloads/repo/euca2ools/1.2/debian squeeze main
```

And then run:

```
apt-get update
apt-get install euca2ools python-boto=1.8d-1
```

You will have to type "Y" if you see a warning like,

```
WARNING: The following packages cannot be authenticated!
...
Install these packages without verification [y/N]? y
```

After installation you may remove the entry from `sources.list` if you don't want to update Eucalyptus packages automatically.

Using Euca2ools Overview

Euca2ools use cryptographic credentials for authentication. Two types of credentials are issued by EC2- and S3-compatible services: x509 certificates and keys. While some commands only require the latter, it is best to always specify both types of credentials. Furthermore, unless the Web services reside on 'localhost', the URLs of the EC2- and S3-compatible service endpoints must also be specified.

The credentials and URLs can be specified via the command line option or by setting environment variables as follows:

Variable	Option	Explanation
EC2_URL	-U or --url [url]	http://host:8773/services/Eucalyptus or http://ec2.amazonaws.com or https://ec2.amazonaws.com:443
S3_URL	-U or --url [url]	http://host:8773/services/Walrus or http://s3.amazonaws.com or https://s3.amazonaws.com:443
EC2_ACCESS_KEY	-a or --access-key [key]	Access Key ID / Query ID
EC2_SECRET_KEY	-s or --secret-key [key]	Secret Access Key / Secret Key
EC2_CERT	-c or --cert [file]	user's PEM-encoded certificate
EC2_PRIVATE_KEY	-k or --privatekey [file]	user's PEM-encoded private key
EUCALYPTUS_CERT	--ec2cert_path [file]	OPTIONAL path to cloud cert

If you are running Euca2ools against Eucalyptus, sourcing the **eucarc** file that is included as part of the credentials zip-file that you downloaded from the Eucalyptus Web interface should be enough to set up all of the above variables correctly.

Commands start with `euca-` and typing `<command name> --help` will print a basic help message. In addition, running `man <command name>` will bring up a man page.

Image Management

In order to use run instances from images that you have created (or downloaded), you need to bundle the images with your cloud credentials, upload them and register them with the cloud. Following examples show how you would perform the necessary steps.

Bundling images

The examples here assume that you have sourced the **eucarc** config file obtained when you downloaded user credentials.

"euca-bundle-image" can be used to bundle an image for use with Eucalyptus or Amazon. A bundled image consists of a manifest file and several image parts.

For instance, to bundle an image "image.img" for user id "123456789111" in the directory "image-dir"

```
euca-bundle-image -i image.img -u 12345678111 -d image-dir
```

OR, if you wish to specify credentials separately ("cert-xyz.pem" and "pk-xyz.pem" are the user certificate and private key PEM files, respectively).

```
euca-bundle-image -i image.img -u 123456789111 -d image-dir -c cert-xyz.pem -k pk-xyz.pem
```

To bundle an image for use with Amazon, make sure you locate the Amazon ec2 cert file that is provided as part of the EC2 AMI tools. This file is generally located in $EC2_AMITOOL_HOME/etc/ec2/amitools/cert-ec2.pem

```
euca-bundle-image -i image.img -u 123456789111 -d image-dir -c cert-abc.pem -k pk-abc.pem --ec2cert $EC2_AMITOOL_HOME/etc/ec2/amitools/cert-ec2.pem
```

Make sure that the "cert-abc.pem" and "pk-abc.pem" files in the above example are your Amazon credentials (not your Eucalyptus credentials).

For more options, type,

```
euca-bundle-image --help
```

or refer to the manpage for "euca-bundle-image."

Uploading an image

To upload an image bundled with "euca-bundle-image" you can use "euca-upload-bundle."

For example, to upload the bundle corresponding to the manifest "image.img.manifest.xml" to the bucket "image-bucket," you would run the following command,

```
euca-upload-bundle -b image-bucket -m image.img.manifest.xml
```

For more options, type

```
euca-upload-bundle --help
```

or refer to the manpage for "euca-upload-bundle."

Registering an image

Bundle images that have been uploaded to the cloud need to be registered with the cloud prior to running instances.

For instance, to register a bundled image referenced by the manifest file "image.img.manifest.xml" that has been uploaded to the bucket "image-bucket" type the following command,

```
euca-register image-bucket/image.img.manifest.xml
```

For more options, refer to the manpage for "euca-register" or type,

```
euca-register --help
```

Downloading an image

Bundled images that have been uploaded may also be downloaded or deleted from the cloud.

For instance, to download the image(s) that have been uploaded to the bucket "image-bucket" you may use the following command,

```
euca-download-bundle -b image-bucket
```

For more options, type,

```
euca-download-bundle --help
```

Deleting a bundled image

To delete a bundled image, use "euca-delete-bundle."

For instance, to delete the images in bucket "image-bucket" you can use the following command,

```
euca-delete-bundle -b image-bucket
```

You can specify a manifest using the "-m" or "--manifest" argument if you wish to delete a specific bundle.

To delete the bucket after deleting the bundled image,

```
euca-delete-bundle -b image-bucket --clear
```

A bucket can only be deleted when it is empty.

For more options, type,

```
euca-delete-bundle --help
```

Unbundling an image

To unbundle a previously bundled image, use "euca-unbundle"

For instance, to unbundle the bundled image referenced by the manifest "image.img.manifest.xml" to the directory image-dir, use the following command,

```
euca-unbundle -m image.img.manifest.xml -d image-dir
```

For more options, try,

```
euca-unbundle --help
```

VM Control

A cloud will let users control virtual machine (VM) instances using uploaded images as a template. The following commands can be used to control VM instances.

Displaying instances currently running

You may use "euca-describe-instances," which will display a list of currently running instances.

```
euca-describe-instances
```

To get information about a specific instance, you can use the instance id as an argument to euca-describe-instances. For example,

```
euca-describe-instances i-43035890
```

For more options, type,

```
euca-describe-instances --help
```

Running instances

"euca-run-instances" will allow you to deploy VM instances of images that have been previously uploaded to the cloud.

For instance, to run an instance of the image with id "emi-53444344" with the kernel "eki-34323333" the ramdisk "eri-33344234" and the keypair "testkey" you can use the following command,

```
euca-run-instances -k testkey --kernel eki-34323333 --ramdisk eri-33344234 emi-53444344
```

To run more than one instances, you may use the "-n" or "--instance-count" option.

For more help, try,

```
euca-run-instances --help
```

or refer to the manpage for "euca-run-instances."

Shutting down instances

You may shutdown running instances using the "euca-terminate-instances" command. For example, to terminate an instance "i-34523332"

```
euca-terminate-instance i-34523332
```

For more options, type,

```
euca-terminate-instances --help
```

or refer to the manpage.

Rebooting instances

To reboot running instances, you can use "euca-reboot-instances." For example, to reboot the instance "i-34523332"

```
euca-reboot-instances i-34523332
```

A reboot will preserve the root filesystem for the instance across restarts.

Networking and Security

You can assign IP address to instances dynamically, unassign addresses, create security groups and assign networking rules to security groups.

Allocating and associating IP addresses

You may use "euca-allocate-address" and "euca-associate-address" to allocate IP addresses and associate public IP addresses with instances, respectively.

In the following example, we will allocate an IP address and associate it with the instance "i-56785678".

```
euca-allocate-address
ADDRESS    a.b.c.d

euca-associate-address -i i-56785678 a.b.c.d
```

Disassociating and Releasing addresses

You may use "euca-disassociate-address" and "euca-release-address" to disassociate an IP address from an instance and to release the IP address to the global pool. For instance, to release and disassociate the address "a.b.c.d."

```
euca-disassociate-address a.b.c.d

euca-release-address a.b.c.d
```

Creating a security group

You can create a security group using the "euca-add-group" command. For instance, to create a group named "mygroup," you may use the following command,

```
euca-add-group -d "mygroup description" mygroup
```

Security groups may be specified when running instances with "euca-run-instances" using the "-g" parameter.

Adding networking rules to security groups

By default, a security group denies incoming network traffic from all sources. You may add networking related rules to security groups using the command "euca-authorize."

To see the entire list of options, type,

```
euca-authorize --help
```

For example, to allow incoming ssh (port 22) traffic to the security group "mygroup" you may use the following command, which specifies a protocol (tcp) a port (22) and a CIDR source network (0.0.0.0/0, which refers to any source):

```
euca-authorize -P tcp -p 22 -s 0.0.0.0/0 mygroup
```

Instead of specifying a CIDR source, you may instead specify another security group to allow access from:

```
euca-authorize --source-group someothergroup --source-group-user someotheruser -P tcp -p 22 mygroup
```

Revoking networking rules from security groups

Revocation works the same way as addition (i.e. the command takes the same parameters), except that you should use the "euca-revoke"

```
euca-revoke -P tcp -p 22 -s 0.0.0.0/0 mygroup
```

```
euca-revoke --help
```

will list all options.

Deleting a security group

You may use "euca-delete-group" to delete a security group. For example,

```
euca-delete-group mygroup
```

will delete the security group "mygroup."

Using Block Storage

You can create dynamic block volumes, attach volumes to instances, detach volumes, deletes volumes, create snapshots from volumes and create volumes from snapshots with your cloud. Volumes are raw block devices. You can create a filesystem on top of an attached volume and mount the volume inside a VM instance as a block device. You can also create instantaneous snapshots from volumes and create volumes from snapshots.

Creating a volume

To create a dynamic block volume, use "euca-create-volume."

For instance, to create a volume that is 1GB in size in the availability zone "myzone" you may use the following command,

```
euca-create-volume --size 1 -z myzone
```

To list availability zones, you may use "euca-describe-availability-zones"

You may also create a volume from an existing snapshot. For example, to create a volume from the snapshot "snap-33453345" in the zone "myzone" try the following command,

```
euca-create-volume --snapshot snap-33453345 -z myzone
```

For more options, type,

```
euca-create-volume --help
```

Attaching a volume to an instance

You may attach block volumes to instances using "euca-attach-volume." You will need to specify the local block device name (this will be used inside the instance) and the instance identified. For instamce, to attach a volume "vol-33534456" to the instance "i-99838888" at "/dev/sdb" use the following command,

```
euca-attach-volume -i i-99838888 -d /dev/sdb vol-33534456
```

You can attach a volume to only one instance at a given time.

Detaching a volume

To detach a previously attached volume, use "euca-detach-volume." For example, to detach the volume "vol-33534456"

```
euca-detach-volume vol-33534456
```

You must detach a volume before terminating an instance or deleting a volume. If you fail to detach a volume, it may leave the volume in an inconsistent state and you risk losing data.

Delete a volume

To delete a volume, use "euca-delete-volume." For example, to delete the volume "vol-33534456" use the following command

```
euca-delete-volume vol-33534456
```

You may only delete volumes that are not currently attached to instances.

Creating a snapshot

You may create an instantaneous snapshot of a volume. A volume could be attached and in use during a snapshot operation. For example, to create a snapshot of the volume "vol-33534456" use the following command

```
euca-create-snapshot vol-33534456
```

Deleting a snapshot

To delete a snapshot, use "euca-delete-snapshot." For example, to delete the snapshot snap-33453345, use the following command,

```
euca-delete-snapshot snap-33453345
```

Changelog

Version 1.1 (2009-11-05)

- Addresses incompatibilities in some uncommon command line options
- A number of bug fixes including #461301 #450044 #444747 #444105 #444097 #436950 #436947 #404951 #429010 #427367 #424212 #423500 #419583 #417937 #413735 #409732 #407710 #401225 #403244 #402670 #401172 #401222 #401190 #404951 #429010 #427367 #424212 #423500 #419583 #417937 #419583 #413735 #409732 #407710 #401225 #403244 #402670 #401172 #401222 #401190
- Addressed incompatibility in several command line options.
- Number of fixes for euca-bundle-vol
- euca-describe-availability-zones accepts "--region"
- Better error reporting for fault strings.
- Incorporated changes to debian rules from Steffen Moeller et al

Version 1.0 (2009-07-17)

License

Interacting with Walrus (1.6)

Walrus is a storage service included with Eucalyptus that is interface compatible with Amazon's S3. Walrus allows users to store persistent

data, organized as buckets and objects (see Amazon's S3 Getting Started Guide for more information). Walrus system options can be modified via the administrator web interface.

If you would like to use Walrus to manage Eucalyptus VM images, you can use Amazon's tools to store/register/delete them from Walrus.

Otherwise, you may use other third party tools to interact with Walrus directly. For a list of Walrus/S3 compatible tools, see our tools page.

Interacting with Block Storage (1.6)

The Block Storage Service in Eucalyptus is interface-compatible with Amazon's Elastic Block Store. You can therefore use either EC2 commands or euca2ools commands to control it.

The instructions below rely on the euca2ools command-line tools distributed by the Eucalyptus Team. Please, install them if you haven't done so already.

The following operations are possible,

1. Creating volumes

You may create a volume either from scratch or from an existing snapshot.

```
euca-create-volume --size <size> --zone <zone>
```

where <size> is the size in GB and <zone> is the availability zones you wish to create the volume in (use euca-describe-availability-zones to discover zones).

For instance,

```
euca-create-volume --size 1 --zone myzone
```

will create a 1GB volume in the availability zone "myzone"

To create a volume from a snapshot,

```
euca-create-volume --snapshot <snapshot id> --zone <zone>
```

where <snapshot id> is the unique identifier for a snapshot and <zone> is the availability zone you wish to create the volume in.

For instance,

```
euca-create-volume --snapshot --zone myzone snap-EF4323
```

will create a volume from the snapshot "snap-EF4323" in the zone "myzone"

2. Query the status of volumes

```
euca-describe-volumes
```

Volumes marked "available" are ready for use.

3. Attaching a volume

You can attach volumes to existing instances (that have been started with euca-run-instances). You may attach a volume to only one instance at a time.

```
euca-attach-volume -i <instance id> -d <local device name> <volume id>
```

where <volume id> is the unique identifier for a volume (vol-XXXX), <instance id> is a unique instance identifier and <local device name> is the name of the local device in the guest VM.

For instance,

```
euca-attach-volume -i i-345678 -d /dev/sdb vol-FG6578
```

will attach the previously unattached volume "vol-FG6578" to instance "i-345678" with the local device name "/dev/sdb"

4. Detaching a volume

```
euca-detach-volume <volume id>
```

where <volume id> is the unique identifier for a previously attached volume (vol-XXXX).

For instance,

```
euca-detach-volume vol-FG6578
```

!"##$%&'()*$+,#-.&$/+,#0123456/

7.8,9'(:';$<*&$-=&9$,>$'*&$":='(:)&$"=$9&=8,:="?#&$>,9$.(@":A$=-9&$'*('$'*&$?#,)@$%&+")&$"=$-:.,-:'&%$?&>,9&$($%&'()*B$C&'()*$)(::,'
&:=-9&$'*&$),:="='&:)D$,>$-=&9$%('($">$'*&$-=&9$%&'()*&=$($+,#-.&$'*('$"=$":$-=&B

4B$C&#&'":A$($+,#-.&

```
euca-delete-volume <volume id>
```

!*&9&$E+,#-.&$"%F$"=$'*&$-:"G-&$"%&:'">"&9$>,9$($+,#-.&$H+,#0IIIIJB

3B$K9&('":A$($=:(8=*,'$>9,.$($+,#-.&

L,-$)(:$=:(8=*,'$($+,#-.&$=,$'*('$D,-$)(:$)9&('&$+,#-.&=$":$'*&$>-'-9&$>9,.$'*&$=:(8=*,'B

```
euca-create-snapshot <volume id>
```

!*&9&$E+,#-.&$"%F$"=$'*&$-:"G-&$"%&:'">"&9$>,9$($+,#-.&$H+,#0IIIIJB

1,9$":='(:)&M

```
euca-create-snapshot vol-GH4342
```

!"##$=:(8=*,'$'*&$+,#-.&$/+,#02NOPOQ/

<*&$+,#-.&$',$?&$=:(8=*,''&%$:&&%=$',$?&$/(+("#(?#&/$,9$/":0-=&B/$L,-$)(::,'$=:(8=*,'$($+,#-.&$'*('$"=$":$'*&$/)9&('":A/$='('&B

5B$R-&9D":A$'*&$='('-=$,>$=:(8=*,'=

```
euca-describe-snapshots
```

L,-$.(D$)9&('&$+,#-.&=$>9,.$=:(8=*,'=$'*('$(9&$.(9@&%$/),.8#&'&%B/

6B$C&#&'":A$($=:(8=*,'

```
euca-delete-snapshot <snapshot id>
```

!*&9&$E=:(8=*,'$"%F$"=$'*&$-:"G-&$"%&:'">"&9$>,9$($=:(8=*,'B