ConPaaS – Administrator guide

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1 Creating a ConPaaS image for Amazon EC2

The Web Hosting Service is capable of running over the Elastic Compute Cloud (EC2) of Amazon Web Services (AWS). This section describes the process of configuring an AWS account to run the Web Hosting Service. You can skip this section if you plan to install ConPaaS over OpenNebula.

If you are new to EC2, you will need to create an account at http://aws.amazon.com/ec2/. A very good EC2 documentation can be found at http://docs.amazonwebservices.com/AWSEC2/latest/GettingStartedGuide/.

1.1 Create an EBS backed AMI on Amazon EC2

The Web Hosting Service requires the creation of an Amazon Machine Image (AMI) to contain the dependencies of it's processes. The easiest method of creating a new Elastic Block Store backed Amazon Machine Image is to start from an already existing one, customize it and save the resulting filesystem as a new AMI. The following steps explains how to setup an AMI using this methodology.

- Search the public AMIs for a Debian squeeze EBS AMI and run an instance of it. If you are going to use micro-instances then the AMI with ID ami-e0e11289 could be a good choice.
- 2. Upload the web-servers/conpaas_web_deps script to the instance:

chmod 0400 yourpublickey.pem
scp -i yourpublickey.pem web-servers/conpaas_web_deps \
 root@instancename.com:

3. Now, ssh to your instance:

ssh -i yourpublickey.pem root@your.instancename.com:

Run the conpaas_web_deps script inside the instance. This script will install all of the dependencies of the manager and agent processes as well as create the necessary directory structure. At some point the script requests to accept licenses, accept them.

- 4. Clean the filesystem by removing the conpaas_web_deps file and any other temporary files you might have created.
- 5. Go to the EC2 administration page at the AWS website, right click on the running instance and select "Create Image (EBS AMI)". AWS documentation is available at http://docs.amazonwebservices.com/AWSEC2/latest/UserGuide/index.html?Tutorial_CreateImage.html.
- 6. After the image has been fully created, you can return to the EC2 dash-board, right-click on your instance, and terminate it.

1.2 Create a Security Group

An AWS security group is an abstraction of a set of firewall rules to limit inbound traffic. The default policy of a new group is to deny all inbound traffic. Therefore, one needs to specify a whitelist of protocols and destination ports that are accessible from the outside. The Web Hosting Service uses TCP ports 80, 5555, 8080 and 9000. All three ports should be open for all running instances. AWS documentation is available at http://docs.amazonwebservices.com/AWSEC2/latest/UserGuide/index.html?using-network-security.html.

2 Creating a ConPaaS image for OpenNebula

The Web Hosting Service is capable of running over an OpenNebula installation. This section describes the process of configuring OpenNebula to run ConPaaS. You can skip this section if you plan to deploy ConPaaS over Amazon Web Services.

To create an image for OpenNebula you can execute the script web-servers/scripts/opennebula-create-new-vm-image in any 64-bit Debian or Ubuntu machine.

- Make sure your system has the following executables installed (they are usually located in /sbin or /usr/sbin, so make sure these directories are in your \$PATH): dd parted losetup kpartx mkfs.ext3 tune2fs mount debootstrap chroot umount grub-install
- 2. It is particularly important that you use Grub version 2. To install it:

```
sudo apt-get install grub2
```

- 3. Edit the first lines of the web-servers/scripts/opennebula-create-new-vm-image script, then execute it as root.
- 4. The script generates an image file called **conpaasweb.img** by default. You can now register it in OpenNebula:

```
oneimage register conpaasweb.img
```

If things go wrong

Note that if anything fails during the image file creation, the script will stop. However, it will not always reset your system to its original state. To undo everything the script has done, follow these instructions:

 The image has been mounted as a separate file system. Find the mounted directory using command df -h. The directory should be in the form of /tmp/tmp.X. 2. There may be a dev and a proc directories mounted inside it. Unmount everything using:

sudo umount /tmp/tmp.X/dev /tmp/tmp.X/proc /tmp/tmp.X

3. Find which loop device your using:

sudo losetup -a

4. Remove the device mapping:

sudo kpartx -d /dev/loopX

5. Remove the binding of the loop device:

sudo losetup -d /dev/loopX

- 6. Delete the image file
- 7. Your system should be back to its original state.

2.1 Make sure OpenNebula is properly configured

There are two main topics that you should pay attention to:

- 1. Make sure you started OpenNebula's OCCI deamon. ConPaaS relies on it to communicate with OpenNebula.
- 2. Replace the occi_templates/common.erb OCCI profile from your Open-Nebula installation with the one from misc/common.erb. This new version features a number of improvements from the standard version:
 - The match for OS TYPE:arch allows the caller to specify the architecture of the machine.
 - The graphics line allows for using vnc to connect to the VM. This is very useful for debugging purposes and is not necessary once testing is complete.

3 Setup ConPaaS's Frontend

The ConPaaS frontend is a web application that allows users to manager their ConPaaS services. Users can create, configure and terminate services through it. This section describes the process of setting up a ConPaaS frontend.

To setup your frontend, you will need a PHP-enabled web server and a MySQL database. The easiest way to install them is:

apt-get install libapache2-mod-php5 php5-curl php5-mysql \
 mysql-server

3.1 Create a MySQL Database

The ConPaaS frontend uses a MySQL database to store data about users and their services. The script located in frontend/scripts/frontend-db.sql creates a new user DB_USER with password DB_PASSWD and a database DB_NAME. It grants all access permissions to user DB_USER on the new database. Finally, it creates the database schema. You must update the first four lines to change DB_USER, DB_PASSWD and DB_NAME to reasonable values.

Install a MysQL database if you don't have one already. You can now create the database schema using this command, replacing ADMIN and ADMINPASSWORD with the MySQL administrator's name and password:

```
mysql -u ADMIN -p < frontend-db.sql
```

You will be prompted for the administrator's password, then the database schema will be created automatically.

3.2 Configure the Front-end

The ConPaaS Front-end code is a collection of PHP scripts. It can run on any PHP-enabled Web server. We recommend using Apache with the mod_php module. The following instructions detail the configuration of the frontend once you have a working PHP-enabled Web server.

- 1. Copy all files from the frontend/conf directory to a location <u>outside</u> of the Web server's document root. This directory contains sensitive configuration parameters which must not be accessible by external users. A good location could be for example /etc/conpaas. Note that files in this directory must be readable by the Web server (in Debian and Ubuntu distributions the Web server runs under username www-data).
 - Edit each of these files to setup the required configuration parameters. Each variable should be described in the config file itself. If you are installing ConPaaS on EC2 you do not need to edit file opennebula.ini. If you are installing ConPaaS on OpenNebula you do not need to edit file aws.ini.
- 2. Place the PHP code found in directory frontend/www at the document root of the frontend web server such that the file named __init__.php is directly underneath it.
- 3. Edit the CONF_DIR variable in __init__.php such that it points to the configuration directory path chosen in step 1.
- 4. (Only if you are installing ConPaaS from the svn repository) Download the AWS sdk for PHP from http://aws.amazon.com/sdkforphp/. Extract the sdk directory and rename it to aws-sdk. Place it under the lib directory of the front-end source code such that lib/aws-sdk/ contains a file named config-sample.inc.php (among others).

- 5. Inside the web document's root, copy lib/aws-sdk/config-sample.inc.php to lib/aws-sdk/config.inc.php and fill in AWS_KEY, AWS_SECRET_KEY, AWS_ACCOUNT_ID and AWS_CANONICAL_ID as instructed in the file's documentation.
- 6. (Only if you are installing ConPaaS from the svn repository) Make sure that the Web server's document directory contains a subdirectory named code and containing the following files: agent-start, agent-stop, ConPaaSWeb.tar.gz, ec2-agent-user-data and manager-start. These files contain the entire implementation of the Web hosting service. They are downloaded by newly created VM instances upon startup.

Files ec2-manager-user-data and opennebula-user-data must be placed in the frontend's configuration directory, and edited with configuration information.

At this point, your front-end should be working!

4 Miscellaneous

4.1 The credit system

The frontend is designed to maintain accounting of resources used by each user. When a new user is created, (s)he receives a number of credits as specified in the "main.ini" configuration file. Later on, one credit is substracted each time a VM is executed for (a fraction of) one hour. The administrator can change the number of credits by directly editing the frontend's database.

4.2 Application sandboxing

The default ConPaaS configuration creates strong snadboxing so that applications cannot open sockets, access the file system, execute commands, etc. This makes the platform relatively secure against malicious applications. On the other hand, it strongly restricts the actions that ConPaaS applications can do. To reduce these security measures to a more usable level, you need to edit two files:

- To change restrictions applied to PHP applications, edit file web-servers/etc/fpm.tmpl to change the list of disable_functions. Do not forget to recreate a file ConPaaSWeb.tar.gz out of the entire web-servers directory, and to copy it at the URL specified in file frontend/conf/manager-user-data.
- To change restrictions applied to Java applications, edit file "web-servers/etc/tomcat-catalina.policy". Do not forget to recreate a file ConPaaSWeb.tar.gz out of the entire "web-servers" directory, and to copy it at the URL specified in file "frontend/conf/manager-user-data".