

A Tutorial on How to Deploy Your Java EE Cloud Software Application to Run on an Amazon AWS Server

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April 1, 2018

Keywords and phrases: Cloud software application, amazon web services (AWS), virtual private server (VPS), virtual network computing (VNC), glassfish, MySQL, Java, EC2 instance, CentOS

TABLE OF CONTENTS

PURPOSE	3
STEP 1: Creating a Virtual Private Server using AWS	4
1.1 CREATE AN AWS ACCOUNT	4
1.2 SELECT & LAUNCH EC2 INSTANCE	6
STEP 2: Setting up Minimal CentOS Server	11
2.1 UPDATE YOUR SYSTEM.....	11
2.2 INSTALL THE LINKS WEB BROWSER.....	11
2.3 INSTALL WGET	11
2.4 INSTALL THE GNU COMPILER COLLECTION (GCC).....	11
2.5 INSTALL HTTP SERVER	11
2.6 INSTALL PHP	11
2.7 INSTALL NANO	11
2.8 INSTALL ZIP & UNZIP	11
2.9 CHANGE PASSWORDS.....	11
2.10 CREATE NEW USER	12
STEP 3: VNC Server Installation – Accessing your VPS Using a Graphical Interface for CentOS	14
3.1 INSTALL DESKTOP FOR CENTOS.....	14
3.2 INSTALL FIREFOX WEB BROWSER	14
3.3 INSTALL & CONFIGURE VNC SERVER.....	14
3.4 ACCESSING VIRTUAL PRIVATE SERVER THROUGH A VNC CLIENT.....	19
STEP 4: Install Glassfish	21
4.1 INSTALL JAVA	21
4.2 INSTALL & CONFIGURE GLASSFISH	23
4.3 ACCESS THE GLASSFISH ADMINISTRATOR CONSOLE	25
STEP 5: Install MySQL	27
5.1 INSTALL MYSQL DATABASE	27
5.2 START/STOP MYSQL DATABASE.....	27
5.3 RUN MYSQL_SECURE_INSTALLATION	27
5.4 SET MYSQL DATABASE TO START ON BOOT.....	28
5.5 ACCESS MYSQL DATABASE THROUGH THE TERMINAL.....	28
5.6 CREATING USERS IN YOUR DATABASE.....	29
5.7 CREATE AND VIEW DATABASE INFORMATION.....	29
5.8 GRANT ALL PRIVILEGES OF A DATABASE TO A USER.....	29
5.9 SHOW ALL PRIVILEGES OF A USER	30
5.10 SETTING UP A DATABASE FOR YOUR CLOUD SOFTWARE APPLICATION	30
STEP 6: Configure Glassfish with MySQL	33
6.1 DOWNLOAD MYSQL CONNECTOR/J FOR GLASSFISH	33
6.2 CREATE A NEW CONNECTION POOL ON GLASSFISH.....	34
6.3 CREATE NEW JDBC RESOURCE ON GLASSFISH.....	38
STEP 7: Allocate an Elastic(Static) IP Address for your Amazon VPS & Set up your Domain	40
7.1 ALLOCATE NEW ELASTIC IP ADDRESS.....	40
7.2 SET A DOMAIN FOR YOUR VPS.....	44
STEP 8: Sending WAR Files to your VPS	46

8.1	TRANSFER YOUR WAR FILE USING SCP	46
STEP 9:	Deploy your Cloud Software Application Using Glassfish	47
9.1	OPEN EC2 INSTANCE PORTS.....	47
9.2	OPEN VPS FIREWALL PORTS	49
9.3	DEPLOY CLOUD SOFTWARE APPLICATION	50
9.4	HIDE PORT 8080.....	52
ADDITIONAL RESOURCES		56

PURPOSE

The purpose of this tutorial is to instruct the reader how to deploy a Java EE cloud software application on an Amazon AWS server. This tutorial will cover the following learning objectives:

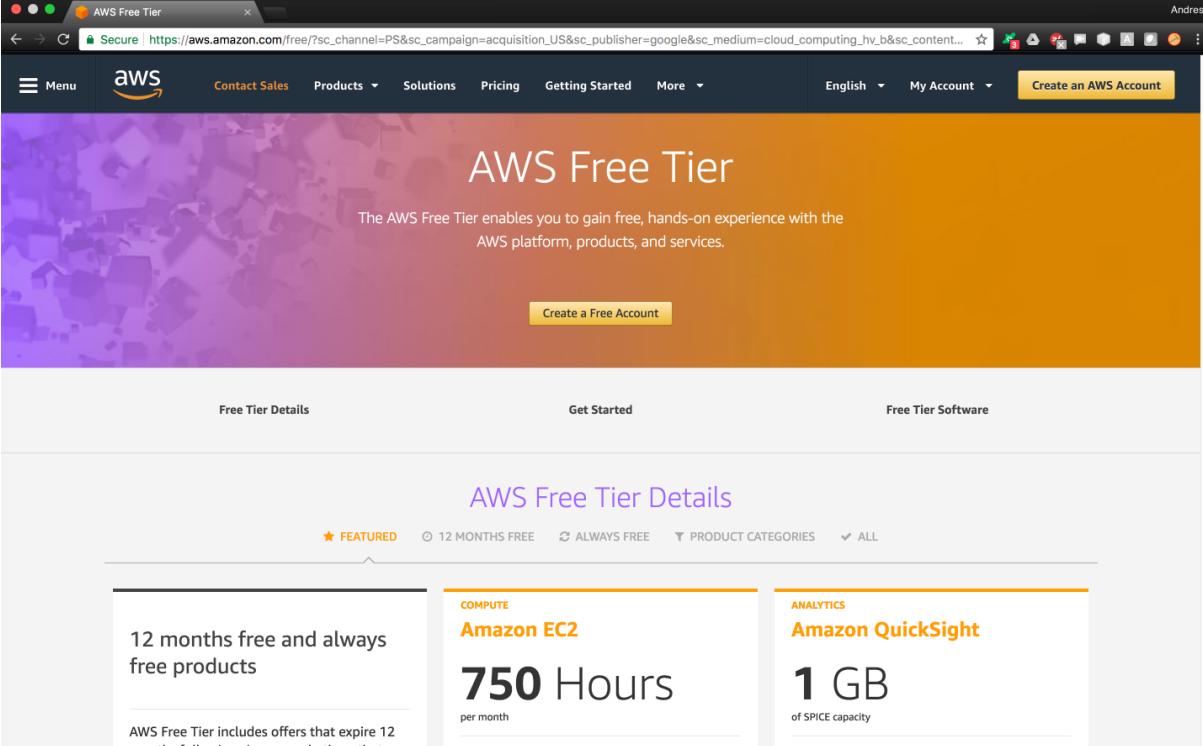
- How to create an amazon EC2 instance or virtual private server.
- How to set up a minimal version of the CentOS operating systems with the tools needed to complete this tutorial.
- How to set up Virtual Network Computing (VNC) in the virtual private server to access its graphical interface.
- How to install and configure Glassfish.
- How to copy WAR files from your local computer to your VPS.
- How to allocate an elastic(static) IP address to your VPS
- How to link your IP address to your domain.
- How to install and configure MySQL in a VPS server.
- How to configure Glassfish with MySQL.
- How to successfully deploy your cloud software application using Glassfish.

STEP 1: Creating a Virtual Private Server using AWS

We'll start the tutorial by teaching you how to properly create a virtual private server or EC2 instance using amazon web services.

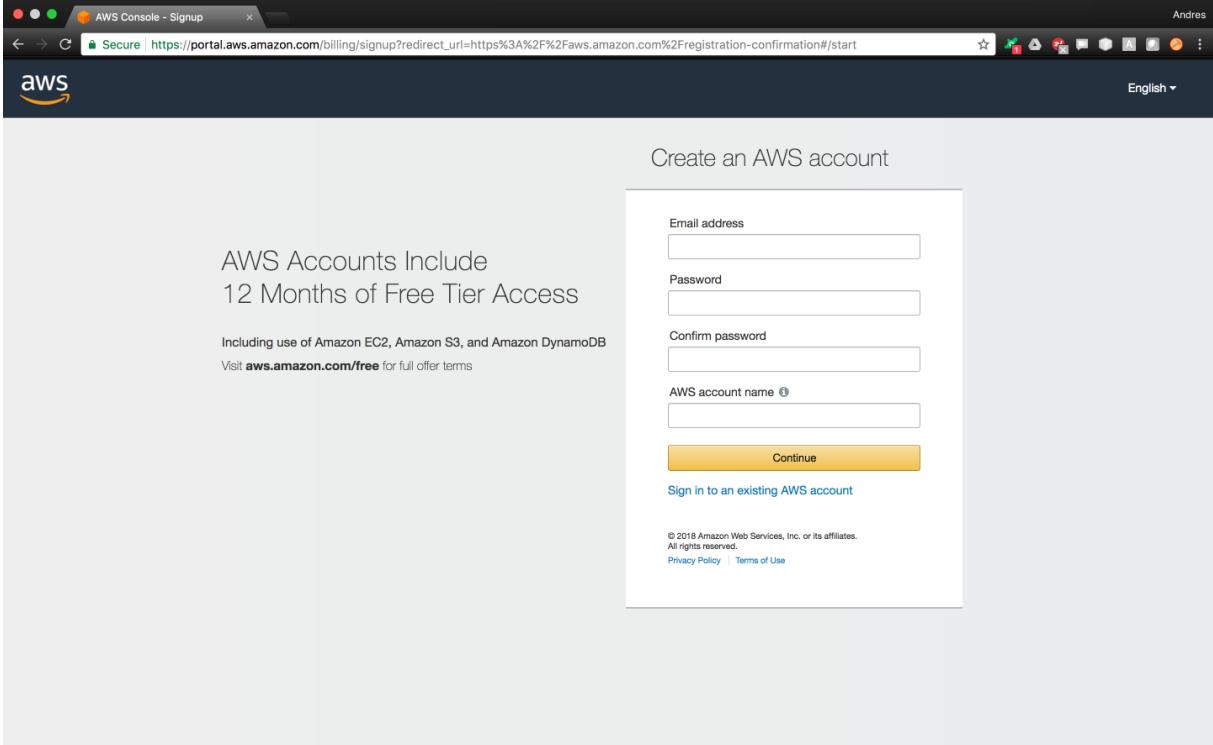
1.1 Create an AWS account

Open your browser and access amazon web services: <https://aws.amazon.com/>



The screenshot shows the AWS Free Tier landing page. At the top, there's a navigation bar with links for Menu, Contact Sales, Products, Solutions, Pricing, Getting Started, More, English, My Account, and a prominent yellow "Create an AWS Account" button. Below the navigation is a large banner with a purple-to-orange gradient background featuring the text "AWS Free Tier". A subtext below it reads: "The AWS Free Tier enables you to gain free, hands-on experience with the AWS platform, products, and services." A yellow "Create a Free Account" button is centered in the banner. Below the banner, there are three main sections: "Free Tier Details", "Get Started", and "Free Tier Software". Under "Free Tier Details", there's a heading "AWS Free Tier Details" with filters for "FEATURED", "12 MONTHS FREE", "ALWAYS FREE", "PRODUCT CATEGORIES", and "ALL". Three cards are displayed: one for "12 months free and always free products", another for "Amazon EC2" with "750 Hours" per month, and one for "Amazon QuickSight" with "1 GB" of SPICE capacity.

Proceed to create an account



The screenshot shows the 'Create an AWS account' page. At the top, it says 'AWS Accounts Include 12 Months of Free Tier Access'. Below that, it includes a note about free tier access for EC2, S3, and DynamoDB. The main form fields are 'Email address', 'Password', 'Confirm password', and 'AWS account name'. A 'Continue' button is at the bottom of the form. Below the form, there's a link to 'Sign in to an existing AWS account' and copyright information.

AWS Accounts Include
12 Months of Free Tier Access

Including use of Amazon EC2, Amazon S3, and Amazon DynamoDB
Visit aws.amazon.com/free for full offer terms

Email address

Password

Confirm password

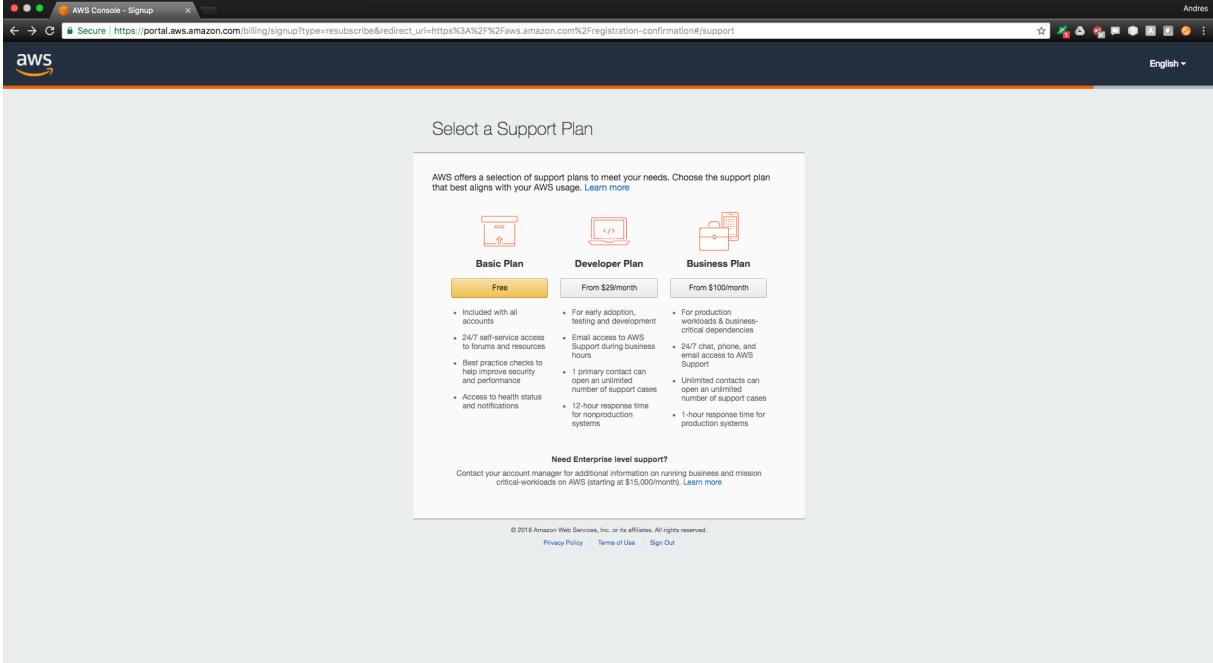
AWS account name

Continue

[Sign in to an existing AWS account](#)

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Select the basic plan (free)



The screenshot shows the 'Select a Support Plan' page. It highlights the 'Basic Plan' as 'Free'. The 'Developer Plan' starts from \$20/month, and the 'Business Plan' starts from \$100/month. Each plan has a list of included features. At the bottom, there's a section for 'Enterprise level support'.

Select a Support Plan

AWS offers a selection of support plans to meet your needs. Choose the support plan that best aligns with your AWS usage. [Learn more](#)

Basic Plan **From \$20/month**

- Included with all accounts
- 24/7 self-service access to forums and resources
- Best practice checks to help improve security and performance
- Access to health status and notifications

Developer Plan **From \$100/month**

- For early adoption, testing and development
- Email access to AWS Support during business hours
- 1 primary contact can cover an unlimited number of support cases
- 12-hour response time for nonproduction systems

Business Plan **From \$100/month**

- For production workloads & business-critical dependencies
- 24/7 chat, phone, and email access to AWS Support
- Unlimited contacts can open an unlimited number of support cases
- 1-hour response time for production systems

Need Enterprise level support?
Contact your account manager for additional information on running business and mission critical-workloads on AWS (starting at \$15,000/month). [Learn more](#)

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1.2 Select & launch EC2 instance

Once the account has been created, hover on top of the ‘Services’ tab and select ‘EC2’

The screenshot shows the AWS Management Console interface. The top navigation bar includes the AWS logo, a search bar, and tabs for 'Services' and 'Resource Groups'. A user profile 'Andres' is visible on the right. The main content area is titled 'Find a service by name or feature (for example, EC2, S3 or VM, storage.)'. It displays a grid of service icons and names. The 'Compute' section is expanded, showing services like EC2, Lightsail, Lambda, and Batch. Other sections include Storage (S3, EFS, Glacier, Storage Gateway), Database (Relational Database Service, DynamoDB, ElastiCache, Amazon Redshift), Migration (AWS Migration Hub, Application Discovery Service, Database Migration Service), Developer Tools (CodeStar, CodeCommit, CodeBuild, CodeDeploy, CodePipeline, Cloud9, X-Ray), Machine Learning (Amazon SageMaker, Amazon Comprehend, AWS DeepLens, Amazon Lex, Amazon Polly, Rekognition, Amazon Transcribe, Amazon Translate), AR & VR (Amazon Sumerian), Application Integration (Step Functions, Amazon MQ, Simple Notification Service, Simple Queue Service, SWF), Analytics (Athena, EMR, CloudSearch, Elasticsearch Service, Kinesis, QuickSight, Data Pipeline, AWS Glue), Customer Engagement (Amazon Connect, Pinpoint, Simple Email Service), Business Productivity (Alexa for Business, Amazon Chime, WorkDocs, WorkMail), Media Services (Elastic Transcoder, Kinesis Video Streams, MediaConvert), Security, Identity & Compliance (IAM, Cognito, GuardDuty), and Desktop & App Streaming (WorkSpaces).

Doing this will take you to the EC2 Dashboard where you'll click on the blue button named ‘Launch Instance’

The screenshot shows the EC2 Management Console Dashboard. The left sidebar contains navigation links for EC2 Dashboard, Events, Tags, Reports, Limits, Instances (Instances, Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts), AMIs (AMIs, Bundle Tasks), Elastic Block Store (Volumes, Snapshots), Network & Security (Security Groups, Elastic IPs, Placement Groups, Key Pairs, Network Interfaces), Load Balancing (Load Balancers, Target Groups), and Auto Scaling. The main content area is titled 'Resources' and shows statistics for the US East (Ohio) region: 0 Running Instances, 0 Dedicated Hosts, 0 Volumes, 0 Key Pairs, 0 Placement Groups, 0 Elastic IPs, 0 Snapshots, 0 Load Balancers, and 1 Security Groups. A message box says 'Learn more about the latest in AWS Compute from AWS re:Invent 2017 by viewing the EC2 Videos.' Below it is a 'Create Instance' section with a 'Launch Instance' button. To the right, there are sections for 'Account Attributes' (Supported Platforms: VPC, Default VPC: vpc-f437b69c, Resource ID length management), 'Additional Information' (Getting Started Guide, Documentation, All EC2 Resources, Forums, Pricing, Contact Us), and 'AWS Marketplace' (Barracuda NextGen Firewall F-Series - PAYG, Splunk Insights for AWS Cloud Monitoring). The bottom footer includes links for Feedback, English (US), Copyright notice (© 2008 - 2016, Amazon Web Services, Inc. or its affiliates. All rights reserved.), Privacy Policy, and Terms of Use.

In the next screen we'll select 'AWS Marketplace' on the menu located to the left. And we'll search for CentOS 6 (x86_64) with updates HVM as shown in the picture. Please note that as March of 2018, the CentOS 7 offered by AWS Marketplace is unreliable so be cautious.

Step 1: Choose an Amazon Machine Image (AMI)

- AWS Marketplace**
- Community AMIs**
- Categories**
 - All Categories
 - Infrastructure Software (132)
 - Developer Tools (13)
 - Business Software (7)
- Operating System**
 - Clear Filter
 - All Windows
 - Windows 2012 (1)
 - Windows 2012 R2 (2)
 - All Linux/Unix
 - Amazon Linux (3)
 - CentOS (131)
 - Ubuntu (1)
 - Other Linux (2)
- Software Pricing Plans**

CentOS 7 (x86_64) - with Updates HVM

★★★★★ (51) | 1801_01 Previous versions | Sold by Centos.org
\$0.00/hr for software + AWS usage fees
Linux/Unix, CentOS 7 | 64-bit Amazon Machine Image (AMI) | Updated: 1/13/18

This is the Official CentOS 7 x86_64 HVM image that has been built with a minimal profile, suitable for use in HVM instance types only. The image contains just enough packages to ...
[More info](#)

CentOS 6 (x86_64) - with Updates HVM

★★★★★ (23) | 1801_01 Previous versions | Sold by Centos.org
\$0.00/hr for software + AWS usage fees
Linux/Unix, CentOS 6 | 64-bit Amazon Machine Image (AMI) | Updated: 1/13/18

This is the Official CentOS 6 x86_64 HVM image that has been built with a minimal profile. The image contains just enough packages to run within AWS, bring up an SSH Server and ...
[More info](#)

CentOS 6.5 (x86_64) - Release Media

★★★★★ (59) | 6.5 - 2013-12-01 | Sold by Centos.org
\$0.00/hr for software + AWS usage fees
Linux/Unix, CentOS 6.5 | 64-bit Amazon Machine Image (AMI) | Updated: 2/26/14

This is the Official CentOS 6.5 x86_64 image that has been built with a minimal profile. The image contains just enough packages to run within AWS, bring up an SSH Server and allow ...
[More info](#)

Select

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After selecting your desired amazon machine image, you'll choose your instance type.

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. [Learn more](#) about instance types and how they can meet your computing needs.

Filter by:	All instance types	Current generation	Show/Hide Columns				
Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)							
Note: The vendor recommends using a t2.micro instance (or larger) for the best experience with this product.							
	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
<input type="checkbox"/>	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate
<input checked="" type="checkbox"/>	General purpose	t2.micro	1	1	EBS only	-	Low to Moderate
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate
<input type="checkbox"/>	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate
<input type="checkbox"/>	General purpose	t2.large	2	8	EBS only	-	Low to Moderate
<input type="checkbox"/>	General purpose	t2.xlarge	4	16	EBS only	-	Moderate
<input type="checkbox"/>	General purpose	t2.2xlarge	8	32	EBS only	-	Moderate
<input type="checkbox"/>	General purpose	m5.large	2	8	EBS only	Yes	Up to 10 Gigabit
<input type="checkbox"/>	General purpose	m5.xlarge	4	16	EBS only	Yes	Up to 10 Gigabit

Cancel **Previous** **Review and Launch** **Next: Configure Instance Details**

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Don't forget to adjust the memory size you need, and to select a General Purpose SSD as your type of storage for increased performance.

You'll also need a public/private key pair to access your VPS through SSH. We'll name ours 'masterJediKeyPair' and proceed to download it.

And that's it! You've successfully launched your EC2 instance!

The screenshot shows the AWS EC2 Management Console with the URL <https://console.aws.amazon.com/ec2/v2/home?region=us-east-1#LaunchInstanceWizard>. The page is titled "Launch Status". It includes a "Create billing alerts" section, a "How to connect to your instances" section with a note about instance launching times, and a "Getting started with your software" section with links to usage instructions and the AWS Marketplace. A "View Instances" button is located at the bottom right. The footer contains links for Feedback, English (US), Privacy Policy, and Terms of Use.

Now click on the 'View Instances' blue button to access your EC2 console where you'll be able to manage and find all the information regarding your instances.

The screenshot shows the AWS EC2 Management Console with the URL <https://console.aws.amazon.com/ec2/v2/home?region=us-east-1#Instances;search=i-005;sort=instanceId>. The left sidebar shows navigation options like EC2 Dashboard, Events, Tags, Reports, Limits, Instances, Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, Scheduled Instances, AMIs, Bundle Tasks, Volumes, Snapshots, Security Groups, Elastic IPs, Placement Groups, Key Pairs, Network Interfaces, and Load Balancing. The main content area shows a table of instances with one row selected. The selected instance is "i-00503a6be210e30b7" with the Public DNS "ec2-107-22-132-99.compute-1.amazonaws.com". The "Description" tab is active, displaying detailed information such as Instance ID, Instance state, Instance type, Availability zone, Security groups, Scheduled events, AMI ID, Platform, IAM role, Key pair name, Public DNS (IPv4), IPv6 IPs, Private DNS, Private IPs, Secondary private IPs, VPC ID, Subnet ID, Network interfaces, Source/dest. check, T2 Unlimited, and Owner. The footer contains links for Feedback, English (US), Privacy Policy, and Terms of Use.

Before accessing your VPS however, you'll need to move the 'masterJediKeyPair.pem' file you just downloaded into the " ~/.ssh/" directory on your local machine. Then you'll modify the file's privileges to protect it against accidental overwriting by running the chmod command below:

```
user$ sudo mv masterJediKeyPair.pem ~/.ssh/  
user$ chmod 400 ~/.ssh/masterJediKeyPair.pem
```

Now you'll be able to SSH into the 'centos' default user in your VPS by running the script below. (replace the IP address in the script with yours)

```
user$ ssh -i "~/.ssh/masterJediKeyPair.pem" centos@107.22.132.99
```

```
The authenticity of host '107.22.132.99 (107.22.132.99)' can't be established.  
RSA key fingerprint is SHA256:/+06KCLXU2mk5sUlQevcwDoYX9UntppqxGcewIZ+30.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '107.22.132.99' (RSA) to the list of known hosts.
```

```
[centos@ip-172-31-81-93 ~]$ ls
```

You're in! ☺

STEP 2: Setting up Minimal CentOS Server

Notice that you just created a virtual private server with a minimal CentOS 6, which means that your server only has the most basic tools and commands provided by linux. But don't worry, we'll walk you through the steps to download everything you need for this tutorial and more. The commands below will be executed from the default 'centos' user account in your VPS which has root privileges.

2.1 Update your system

Update your system with the latest versions of your packages

```
centos$ sudo yum update kernel  
centos$ sudo yum update && yum upgrade
```

2.2 Install the links web browser

This web browser will allow you to navigate the web though the terminal

```
centos$ sudo yum install links
```

2.3 Install wget

Tool to retrieve content from web servers that you'll use to download programs into your VPS

```
centos$ sudo yum install wget
```

2.4 Install the GNU Compiler Collection (GCC)

```
centos$ sudo yum install gcc
```

2.5 Install HTTP server

```
centos$ sudo yum install httpd
```

2.6 Install PHP

```
centos$ sudo yum install php
```

2.7 Install nano

Nano is a free and lightweight text editor used in linux environments. You are free to use other text editors you like, but we recommend you to use 'nano' if you are a beginner or have low experience in linux environments

```
centos$ sudo yum install nano
```

2.8 Install zip & unzip

Tools zip & unzip will allow you to compress and decompress zipped packages later on

```
sudo yum install zip unzip -y
```

2.9 Change passwords

We can use the following password 'masterJedi' for the purposes of the tutorial.

But please keep in mind that this is a highly unsecure password for continued use

```
centos$ sudo passwd root  
New password:  
Retype new password:  
passwd: all authentication tokens updated successfully.
```

Now it's time to change the password for the default 'centos' user account. Note that if you try to change the password directly from 'centos' account, it will ask for a password which we don't have. Instead, we'll switch users to 'root' and change the 'centos' user password from there

```
centos$ su - root
Password:
root$ sudo passwd centos
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

2.10 Create new user

We'll now create a new user 'padawan' which we'll use for everything from now on. For the purposes of this tutorial we'll use the password 'apprenticeJedi'

```
root$ adduser padawan
root$ passwd padawan
```

```
Changing password for user padawan.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

Now we will grant our 'padawan' user with root privileges by adding it to the wheel group. However, users that belong to the wheel group are not originally granted root privileges so we'll have to access the 'sudoers' file

```
root$ usermod -aG wheel padawan
root$ nano /etc/sudoers
```

Once inside, we'll proceed to uncomment the highlighted line below as shown in the picture

```
# Defaults env_keep += "HOME"

Defaults    secure_path = /sbin:/bin:/usr/sbin:/usr/bin

## Next comes the main part: which users can run what software on
## which machines (the sudoers file can be shared between multiple
## systems).
## Syntax:
##
##       user      MACHINE=COMMANDS
##
## The COMMANDS section may have other options added to it.
##
## Allow root to run any commands anywhere
root      ALL=(ALL)      ALL

## Allows members of the 'sys' group to run networking, software,
## service management apps and more.
# %sys ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE, DELEGATING, PROCESSES, LOCATE, DRIVERS

## Allows people in group wheel to run all commands
%wheel  ALL=(ALL)      ALL

## Same thing without a password
```

Your user will now have root privileges after saving the changes. As a final step, we'll test if we were successful in granting root privileges to our user. If successful, we shall see the following:

```
root$ su - padawan
padawan$ sudo ls -la /root
```

We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:

- #1) Respect the privacy of others.
- #2) Think before you type.
- #3) With great power comes great responsibility.

```
[sudo] password for padawan:
total 48
dr-xr-x---. 3 root root 4096 Mar 18 15:58 .
dr-xr-xr-x. 24 root root 4096 Mar 18 15:58 ..
-rw-r--r--. 1 root root 18 May 20 2009 .bash_logout
-rw-r--r--. 1 root root 176 May 20 2009 .bash_profile
-rw-r--r--. 1 root root 176 Sep 23 2004 .bashrc
-rw-r--r--. 1 root root 100 Sep 23 2004 .cshrc
-rw-r--r--. 1 root root 10312 Jan 8 16:16 install.log
-rw-r--r--. 1 root root 3317 Jan 8 16:15 install.log.syslog
drwx-----. 2 root root 4096 Mar 18 15:58 .ssh
-rw-r--r--. 1 root root 129 Dec 3 2004 .tcshrc
```

FYI, you can also grant root privileges uniquely to your desired user rather than the whole wheel group in the sudoers file.

STEP 3: VNC Server Installation – Accessing your VPS Using a Graphical Interface for CentOS

Up until now we can only operate our virtual private server though the terminal by connecting to it using SSH. However, we are visual creatures and in order to make our job easier, we'll set up a CentOS desktop in our VPS which we'll access using Virtual Networking Computing(VNC). Please note that connections to VNC are unencrypted, so you might want to use your VNC client in a secure network to avoid eavesdropping.

3.1 Install Desktop for CentOS

```
root$ yum groupinstall Desktop
```

3.2 Install Firefox web browser

Firefox will let you navigate the web in a more user-friendly environment than ‘links’

```
root$ yum install gnome-core xfce4 firefox
```

3.3 Install & configure VNC Server

Installing VNC server will allow you to access your VPS desktop using a VNC client remotely.

Make sure to configure the vnc server to run on startup by executing the chkconfig command

```
root$ yum install tigervnc-server
```

```
root$ yum install vnc
```

```
root$ chkconfig vncserver on
```

Now let's set a password to access VNC remotely. For the purposes of this tutorial we'll use the same password we used for the user account: ‘apprenticeJedi’

```
root$ su - padawan
```

```
padawan$ vncpasswd
```

```
Password:
```

```
Verify:
```

The next step is to configure the ‘vncservers’ file to allow connections to our user account through the default port 5901.

```
padawan$ sudo nano /etc/sysconfig/vncservers
```

Make the following changes to the file:

```
# The VNCSEVER variable is a list of display:user pairs.  
#  
# Uncomment the lines below to start a VNC server on display :2  
# as my 'myusername' (adjust this to your own). You will also  
# need to set a VNC password; run 'man vncpasswd' to see how  
# to do that.  
#  
# DO NOT RUN THIS SERVICE if your local area network is  
# untrusted! For a secure way of using VNC, see this URL:  
# https://access.redhat.com/knowledge/solutions/7027  
  
# Use "-nolisten tcp" to prevent X connections to your VNC server via TCP.  
  
# Use "-localhost" to prevent remote VNC clients connecting except when  
# doing so through a secure tunnel. See the "-via" option in the  
# `man vncviewer` manual page.  
  
VNCSEVER="1:padawan"  
VNCSEVERARGS[1]="-geometry 1024x768"
```

Now we have to make sure that we allow connections to the default VNC ports through the firewall. Otherwise, we won’t be able to establish a connection.

```
padawan$ sudo iptables -I INPUT 5 -m state --state NEW -m tcp -p tcp -m multiport --  
dports 5901:5903,6001:6003 -j ACCEPT  
  
padawan$ sudo service iptables save  
iptables: Saving firewall rules to /etc/sysconfig/iptables:[ OK ]  
  
padawan$ sudo service iptables restart  
iptables: Setting chains to policy ACCEPT: filter [ OK ]  
iptables: Flushing firewall rules: [ OK ]  
iptables: Unloading modules: [ OK ]  
iptables: Applying firewall rules: [ OK ]
```

Restart the VNC server for changes to take effect

```
padawan$ sudo service vncserver restart  
Shutting down VNC server: [ OK ]  
Starting VNC server: 1:padawan xauth: file /home/padawan/.Xauthority does not exist  
  
New 'ip-172-31-81-93:1 (padawan)' desktop is ip-172-31-81-93:1  
  
Creating default startup script /home/padawan/.vnc/xstartup  
Starting applications specified in /home/padawan/.vnc/xstartup  
Log file is /home/padawan/.vnc/ip-172-31-81-93:1.log  
[ OK ]
```

Proceed to kill the vncserver process in order to modify the configuration of our ‘xstartup’ file

```
padawan$ vncserver -kill :1  
Killing Xvnc process ID 16134
```

```
padawan$ nano /home/padawan/.vnc/xstartup
```

Now make the following changes as highlighted below

```
#!/bin/sh  
  
[ -r /etc/sysconfig/i18n ] && . /etc/sysconfig/i18n  
export LANG  
export SYSFONT  
vncconfig -iconic &  
unset SESSION_MANAGER  
unset DBUS_SESSION_BUS_ADDRESS  
OS=`uname -s`  
if [ $OS = 'Linux' ]; then  
    case "$WINDOWMANAGER" in  
        *gnome*)  
            if [ -e /etc/SuSE-release ]; then  
                PATH=$PATH:/opt/gnome/bin  
                export PATH  
            fi  
            ;;  
        esac  
    fi  
    if [ -x /etc/X11/xinit/xinitrc ]; then  
        exec /etc/X11/xinit/xinitrc  
    fi  
    if [ -f /etc/X11/xinit/xinitrc ]; then  
        exec sh /etc/X11/xinit/xinitrc  
    fi  
    [ -r $HOME/.Xresources ] && xrdb $HOME/.Xresources  
    xsetroot -solid grey  
    xterm -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &  
    #twm &  
    exec gnome-session &
```

Normally, you’d be able to access the CentOS desktop through a vnc-client by now. However, since we are using amazon web services, we need to open the vnc ports through our EC2 console as well. To do this, we’ll access our instance’s security group, and then we’ll proceed to specify the ports we want to use.

Open your EC2 Console, locate your instance, and scroll all the way to the right to find your instance's security groups. Then click on it

The screenshot shows the AWS EC2 Management Console. On the left, there's a sidebar with various navigation links like EC2 Dashboard, Instances, Images, and Security Groups. The main area displays an instance named 'Tutorial VPS' with its public DNS as 'ec2-107-22-132-99.compute-1.amazonaws.com'. The 'Description' tab is selected. On the right, under the 'Security Groups' section, it shows 'CentOS 6 -x86_64 - with Updates HVM-1801_01-AutogenByAWSMP-1.' and a note 'view inbound rules'. Below this, there are tabs for Status Checks, Monitoring, Tags, and Usage Instructions. At the bottom, there are links for Feedback, English (US), and a copyright notice.

Now that you've accessed your instance's security groups, you want to select the 'Inbound' tab and then click on 'Edit'

The screenshot shows the 'Create Security Group' page in the AWS EC2 Management Console. The sidebar on the left includes 'Instances' under the 'Security Groups' section. The main area shows a table with one row for 'sg-34bece42'. The 'Edit' button is highlighted. Below it, the 'Inbound' tab is selected in the 'Edit' section, which contains a table with columns for Type, Protocol, Port Range, Source, and Description. One rule is listed: 'SSH' on 'TCP' port '22' from '0.0.0.0/0'. At the bottom, there are links for Feedback, English (US), and a copyright notice.

At this point, we'll add a rule to allow incoming connections to the default VNC ports

The screenshot shows the AWS EC2 Management Console with the 'Edit inbound rules' dialog open. The dialog lists two rules:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop
Custom TCP Rule	TCP	5900 - 5910	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop

Below the table, a note reads: "NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created." At the bottom right are "Cancel" and "Save" buttons.

Make sure you added the rule correctly by verifying that your changes show up after saving

The screenshot shows the AWS EC2 Management Console with the 'Inbound' tab selected for the security group 'sg-34bece42'. The table shows the following rules:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	0.0.0.0/0	
Custom TCP Rule	TCP	5900 - 5910	0.0.0.0/0	

An 'Edit' button is located above the table. At the bottom right are "Cancel" and "Save" buttons.

Finally, reboot your instance for changes to take effect.

3.4 Accessing virtual private server through a VNC Client

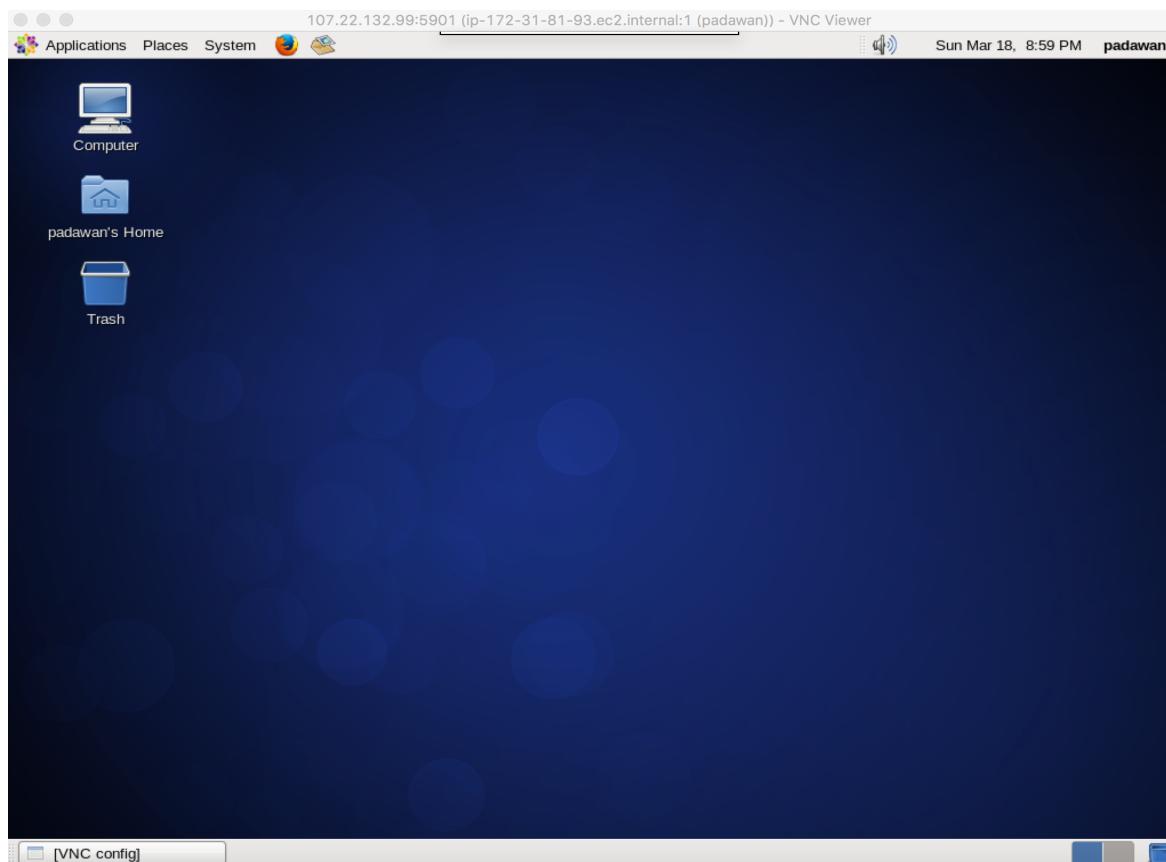
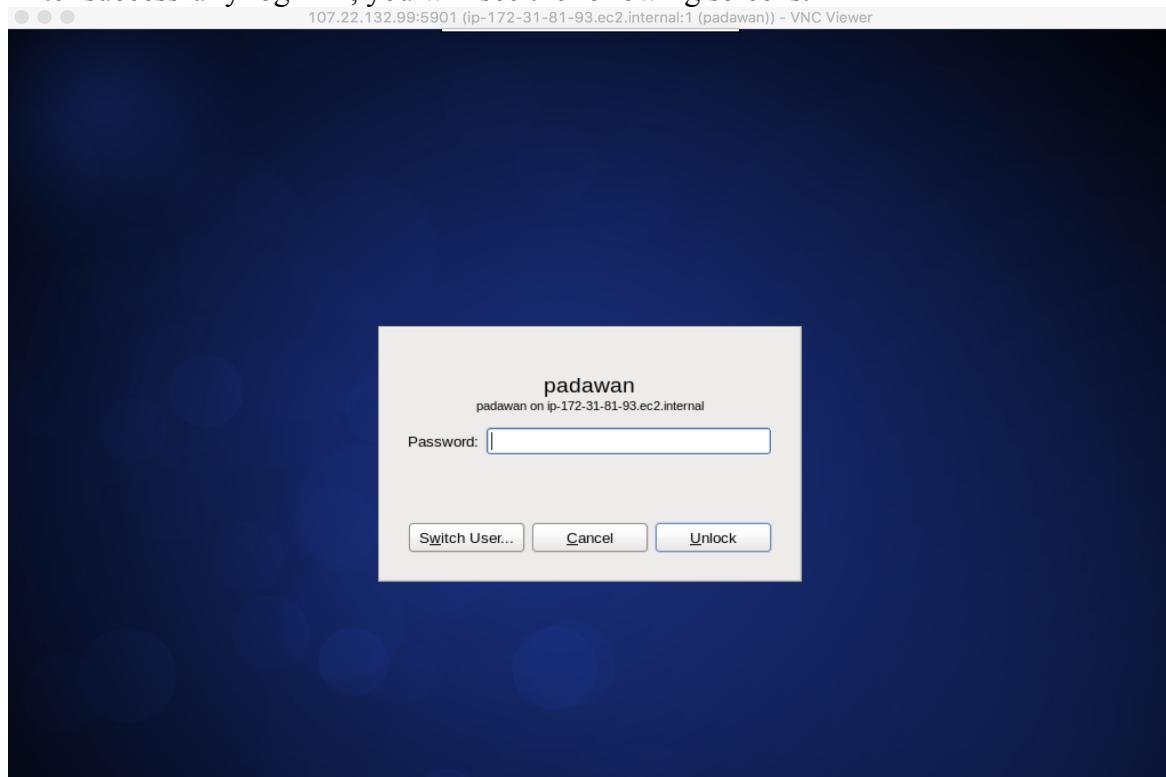
Although there are many vnc-clients available out there, we'll use a cross-platform vnc-client called 'RealVNC' in this tutorial. Visit: <https://www.realvnc.com/en/connect/download/vnc/>

The screenshot shows a web browser window with the URL <https://www.realvnc.com/en/connect/download/viewer/macos/>. The page header includes the RealVNC logo and navigation links for EN, BENEFITS, DOWNLOAD, BUY, NEWS, SUPPORT, ABOUT US, and SIGN IN. Below the header, a large heading says "Download VNC Viewer to the device to control from". A sub-instruction below it reads "Make sure you've downloaded VNC Connect to the computer you want to control." A row of icons for various platforms is shown, with "macOS" highlighted. A prominent blue "DOWNLOAD VNC VIEWER" button is centered at the bottom of the page.

Once downloaded, open the vnc-client and connect to your EC2 instance. Please make sure to access your instance by using its public IP address, and use the vnc password we chose in 3.3

The screenshot shows the RealVNC VNC Viewer application window. The title bar says "VNC Viewer". In the main area, the text "Connecting to 107.22.132.99:5901..." is displayed. On the left, there's an "Address book" sidebar with a section for "Andres's Team". A central modal dialog box titled "Authentication" is open, prompting for "VNC Server: 107.22.132.99::5901", "Username:", "Password:", and a "Remember password" checkbox. At the bottom of the dialog are "Cancel" and "OK" buttons. The background of the application shows a faint blue "VNC" logo watermark.

After successfully login-in, you will see the following screens.



STEP 4: Install Glassfish

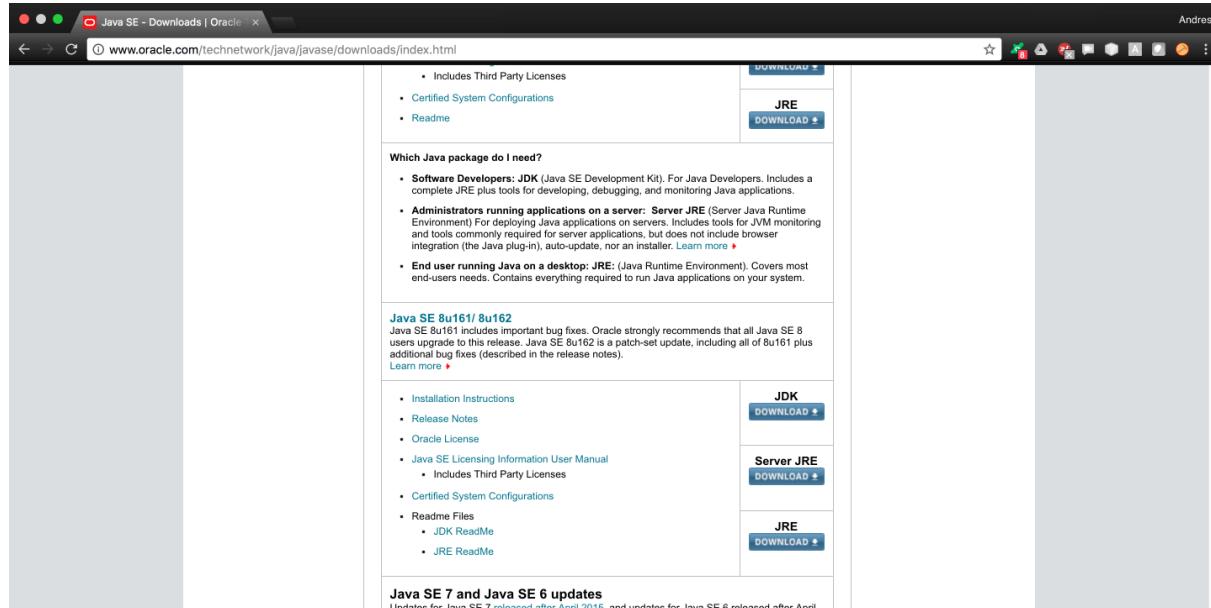
Now that we have finished setting up our VPS, we will install Glassfish to deploy our cloud software applications.

4.1 Install Java

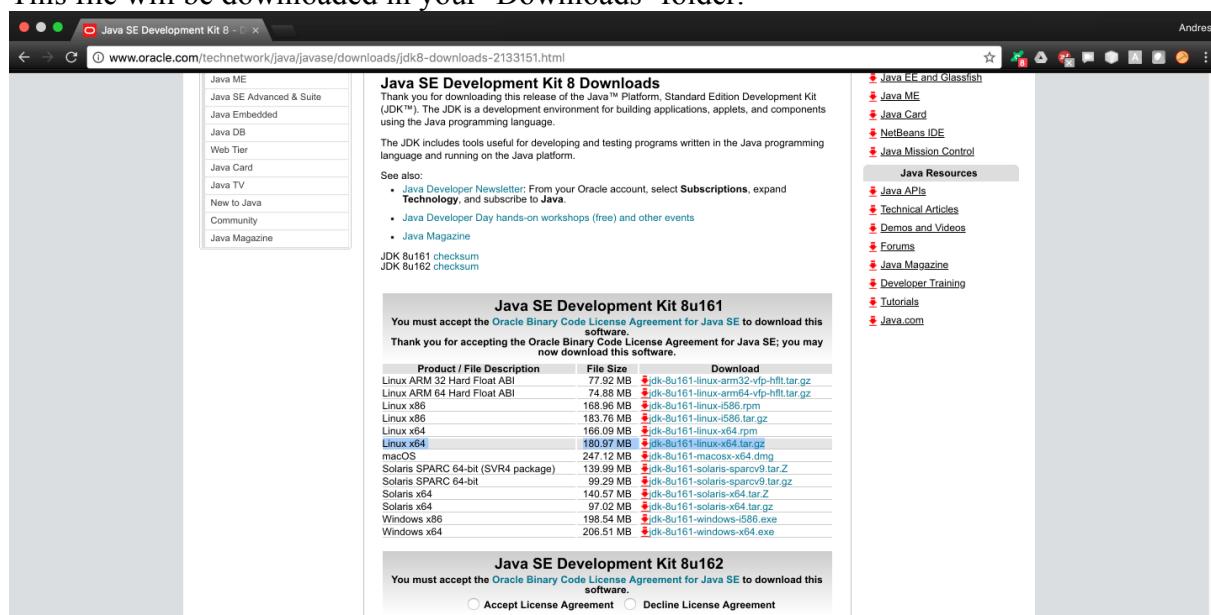
Access the following link from Firefox in your VPS:

<http://www.oracle.com/technetwork/java/javase/downloads/index.html>

Proceed to download the Java 8 JDK



Accept the license agreement, and choose the highlighted ‘Linux x64.tar.gz’ compressed file. This file will be downloaded in your ‘Downloads’ folder.



Once downloaded, we'll create the directory `/usr/java` where we will store the Java SDK. Then we'll change directory into it "`cd /usr/java`", and we'll proceed to decompress the `tar.gz` Java SDK. Make sure the SDK was stored in the right directory after it's decompressed.

```
padawan$ sudo mkdir /usr/java
padawan$ cd /usr/java
padawan$ sudo tar -xvf ~/Downloads/jdk-8u161-linux-x64.tar.gz
padawan$ ls /usr/java
jdk1.8.0_161
```

Now we'll set the location of `JAVA_HOME`, and add it to our `PATH` variable. Please note that you have to follow the steps below for both our *root* and *padawan* users.

```
padawan$ nano ~/.bash_profile
root$ nano ~/.bash_profile
```

Add the following changes to both files

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc

fi

# User specific environment and startup programs

JAVA_HOME=/usr/java/jdk1.8.0_161
export JAVA_HOME

PATH=$JAVA_HOME/bin:$PATH:$HOME/bin
export PATH
```

Finally, reboot the server and make sure that `JAVA_HOME` is set correctly

```
root$ echo $JAVA_HOME
/usr/java/jdk1.8.0_161

root$ su - padawan
padawan$ echo $JAVA_HOME
/usr/java/jdk1.8.0_161
```

4.2 Install & configure Glassfish

Access the following link from Firefox in your VPS:

<https://javaee.github.io/glassfish/>

Click on Download and locate ‘glassfish-4.1.2.zip’. Please be wary that Glassfish 4.1.1 contains a bug that won’t allow you to configure MySQL correctly.

The screenshot shows a Firefox browser window with the GlassFish GitHub project page loaded. The title bar says "GlassFish". The address bar shows "Secure | https://javaee.github.io/glassfish/". The main content area has a dark blue header with the GlassFish logo and the text "The Open Source Java EE Reference Implementation". Below this is a section titled "About" which contains a brief description of GlassFish as an open source Java EE reference implementation. To the right is a sidebar with links: Sources, Documentation, Download (which is highlighted in blue), Issue Tracker, Mailing List, Contribute, and License. At the bottom of the sidebar is a "Sponsored by ORACLE" logo. The footer of the page includes a copyright notice: "© Oracle | By contributing to this project, you are agreeing to the terms of use described [here](#)".

The screenshot shows a Firefox browser window with the "Index of http://download.oracle.com/glassfish/4.1.2/release/index.html" page loaded. The title bar says "Index of http://download.oracle.com/glassfish/4.1.2/release/index.html". The address bar shows "download.oracle.com/glassfish/4.1.2/release/index.html". The page displays a table of files available for download:

Name	Last modified	Size
Parent Directory		-
javaee7-ri-web.zip	May 24 2017	50M
javaee7-ri.zip	May 24 2017	89M
version-info-4.1.2.txt	Mar 24 2017	112
nucleus-4.1.2.zip	Mar 24 2017	20M
glassfish-4.1.2-web.zip	Mar 24 2017	58M
glassfish-4.1.2.zip	Mar 24 2017	105M

Let's unzip the glassfish file under the `/usr/share` now. If successful, a new folder called '`glassfish4`' will be created

```
padawan$ cd /usr/share
padawan$ sudo unzip ~/Downloads/glassfish-4.1.2.zip

padawan$ ls /usr/share/glassfish4/
bin  glassfish  javadb  mq  README.txt
```

We'll now change the Glassfish administrator password for obvious security reasons. Please keep in mind that the default administrator username is '`admin`'. Also note that there's no default admin password so just press enter when it asks you for it. Finally, we'll use the password '`CSD@gf-1872`' for the purposes of this tutorial.

```
padawan$ su - root

root$ /usr/share/glassfish4/bin/asadmin change-admin-password
Enter admin user name [default: admin]>admin
Enter the admin password>
Enter the new admin password>
Enter the new admin password again>
Command change-admin-password executed successfully.
```

In order to make our lives easier along the way, we'll create a script for starting, stopping, and restarting Glassfish.

```
root$ cd /etc/init.d
root$ nano glassfish
```

An empty file will open, and we'll insert the script below and then save it.

```
#!/bin/bash
# description: Glassfish Start Stop Restart
# processname: glassfish
# chkconfig: 234 20 80

JAVA_HOME=/usr/java/jdk1.8.0_161
export JAVA_HOME
PATH=$JAVA_HOME/bin:$PATH
export PATH

GLASSFISH_HOME=/usr/share/glassfish4/glassfish

case $1 in
start)
sh $GLASSFISH_HOME/bin/asadmin start-domain domain1
;;
stop)
sh $GLASSFISH_HOME/bin/asadmin stop-domain domain1
;;
restart)
sh $GLASSFISH_HOME/bin/asadmin stop-domain domain1
sh $GLASSFISH_HOME/bin/asadmin start-domain domain1
;;
esac
exit 0
```

To make sure our script works correctly, we'll use chmod to make it executable and proceed to restart the Glassfish server. If successful, you should see something similar to this:

```
root$ chmod +x /etc/init.d/glassfish
root$ /etc/init.d/glassfish restart

CLI306: Warning - The server located at
/usr/share/glassfish4/glassfish/domains/domain1 is not running.
Command stop-domain executed successfully.
Waiting for domain1 to start .....
Successfully started the domain : domain1
domain Location: /usr/share/glassfish4/glassfish/domains/domain1
Log File: /usr/share/glassfish4/glassfish/domains/domain1/logs/server.log
Admin Port: 4848
Command start-domain executed successfully.
```

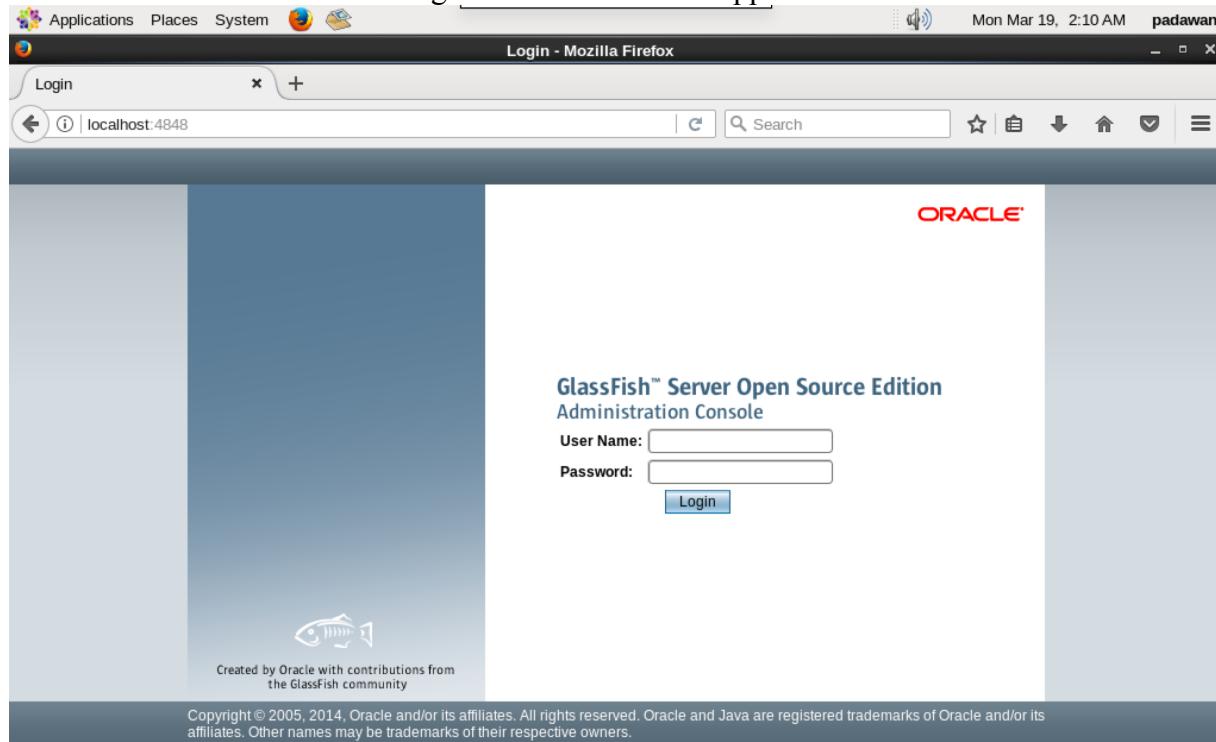
Finally, we'll set up our glassfish server to start up whenever the server boots up

```
root$ chkconfig --add /etc/init.d/glassfish
root$ chkconfig glassfish on
```

4.3 Access the Glassfish administrator console

Now that we have installed and configured Glassfish in our VPS, we'll access its admin console by opening Firefox and visiting the following url: <http://localhost:4848>

The Glassfish Admin Console Sign-In screen will then appear



After a successful sign-in you'll be redirected to the Glassfish Console Home screen

The screenshot shows the GlassFish Console Home screen in Mozilla Firefox. The URL in the address bar is `localhost:4848/common/index.jsf`. The page title is "GlassFish Console - Common Tasks - Mozilla Firefox". The header includes the GlassFish logo, application menu (Applications, Places, System), system status (Mon Mar 19, 2:11 AM, padawan), and navigation icons. The main content area is titled "GlassFish™ Server Open Source Edition" and "GlassFish Console - Common Tasks". On the left, a sidebar menu lists categories: Common Tasks, Domain, server (Admin Server), Clusters, Standalone Instances, Nodes, Applications, Lifecycle Modules, Monitoring Data, Resources (Concurrent Resources, Connectors, JDBC, JMS Resources, JNDI, JavaMail Sessions, Resource Adapter Configs), Configurations (default-config, server-config), and Update Tool. The main content area contains sections for GlassFish News, Deployment (List Deployed Applications, Deploy an Application), Administration (Change Administrator Password, List Password Aliases), Monitoring (Monitoring Data), Documentation (Open Source Edition Documentation Set, Quick Start Guide, Administration Guide, Application Development Guide, Application Deployment Guide), Update Center (Installed Components, Available Updates, Available Add-Ons), and Resources (Create New JDBC Resource, Create New JDBC Connection Pool).

STEP 5: Install MySQL

Even though we are technically able to proceed to step 7, we won't be able to use MySQL in our applications just yet. This section will cover how to install and configure MySQL in your CentOS virtual private server.

5.1 Install MySQL database

```
root$ sudo yum install mysql-server
```

5.2 Start/Stop MySQL database

```
root$ sudo /sbin/service mysqld start
root$ sudo /sbin/service mysqld stop
```

5.3 Run mysql_secure_installation

Running the command below will protect your MySQL database from common security vulnerabilities. Pay attention to highlighted lines when executing the command. For the purposes of this tutorial we'll use the following root password 'CSD@mysql-1872'

```
root$ sudo /usr/bin/mysql_secure_installation
```

NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MySQL SERVERS IN PRODUCTION USE! PLEASE READ EACH STEP CAREFULLY!

In order to log into MySQL to secure it, we'll need the current password for the root user. If you've just installed MySQL, and you haven't set the root password yet, the password will be blank, so you should just press enter here.

```
Enter current password for root (enter for none):
OK, successfully used password, moving on...
```

Setting the root password ensures that nobody can log into the MySQL root user without the proper authorisation.

```
Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
... Success!
```

By default, a MySQL installation has an anonymous user, allowing anyone to log into MySQL without having to have a user account created for them. This is intended only for testing, and to make the installation go a bit smoother. You should remove them before moving into a production environment.

```
Remove anonymous users? [Y/n] y  
... Success!
```

Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot guess at the root password from the network.

```
Disallow root login remotely? [Y/n] y  
... Success!
```

By default, MySQL comes with a database named 'test' that anyone can access. This is also intended only for testing, and should be removed before moving into a production environment.

```
Remove test database and access to it? [Y/n] y  
- Dropping test database...  
... Success!  
- Removing privileges on test database...  
... Success!
```

Reloading the privilege tables will ensure that all changes made so far will take effect immediately.

```
Reload privilege tables now? [Y/n] y  
... Success!
```

Cleaning up...

All done! If you've completed all of the above steps, your MySQL installation should now be secure.

Thanks for using MySQL!

5.4 Set MySQL database to start on boot

```
root$ sudo chkconfig mysqld on
```

5.5 Access MySQL database through the terminal

```
root$ /usr/bin/mysql -u root -p  
  
Enter password:  
Welcome to the MySQL monitor. Commands end with ; or \g.  
Your MySQL connection id is 11  
Server version: 5.1.73 Source distribution  
Copyright (c) 2000, 2013, Oracle and/or its affiliates. All rights reserved.  
Oracle is a registered trademark of Oracle Corporation and/or its  
affiliates. Other names may be trademarks of their respective  
owners.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
  
mysql>
```

5.6 Creating users in your database

The commands below will help you create users in your database

```
mysql> CREATE USER 'padawan'@'localhost' IDENTIFIED BY 'CSD@mysql-1872';
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT User, Host, Password FROM mysql.user;
+-----+-----+-----+
| User | Host | Password |
+-----+-----+-----+
| root | localhost | *B15A5314570418CCC25FCC365ED7C3AF1995DE0A |
| root | 127.0.0.1 | *B15A5314570418CCC25FCC365ED7C3AF1995DE0A |
| padawan | localhost | *B15A5314570418CCC25FCC365ED7C3AF1995DE0A |
+-----+-----+-----+
4 rows in set (0.00 sec)
```

5.7 Create and view database information

The command below will create a test database, and then show the databases in your server

```
mysql> CREATE DATABASE demodb;
Query OK, 1 row affected (0.00 sec)

mysql> SHOW DATABASES;
+-----+
| Database |
+-----+
| information_schema |
| demodb |
| mysql |
+-----+
3 rows in set (0.00 sec)
```

5.8 Grant all privileges of a database to a user

This will grant all privileges of a database to an existing user. Don't forget to flush privileges for changes to take effect

```
mysql> GRANT ALL PRIVILEGES ON demodb.* to padawan@localhost;
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)
```

5.9 Show all privileges of a user

Verify that the changes took place by showing the grants assigned to your user.

```
mysql> SHOW GRANTS FOR 'padawan'@'localhost';
+-----+
| Grants for
| padawan@localhost
| |
+-----+
| GRANT USAGE ON *.* TO 'padawan'@'localhost' IDENTIFIED BY PASSWORD
| '*B15A5314570418CCC25FCC365ED7C3AF1995DE0A' |
| GRANT ALL PRIVILEGES ON `demodb`.* TO
| 'padawan'@'localhost'
+-----+
2 rows in set (0.00 sec)
```

5.10 Setting up a Database for your cloud software application

In this step, we'll show you how to set up the database for your cloud software application within the virtual private server. We'll assume that the name of the cloud software application is '*ApartMates*' and that its database is called '*ApartmatesDB*'.

If you haven't done so, make the following directories from the *padawan* user. We'll store the SQL files in these directories later on.

```
padawan$ mkdir ~SQL
padawan$ mkdir ~SQL/ApartMates
```

If you haven't done so, make the following directory in the default *centos* user. We'll receive the transferred SQL files in this location.

```
padawan$ su - centos
centos$ mkdir mysql_files
```

Next, run the following command from your *local computer's terminal*. This will transfer your SQL scripts to your VPS under the directory we created.

```
localcomputer$ scp -i "~/.ssh/masterJediKeyPair.pem"
/Users/<your_username>/NETBEANS_PROJECTS/ApartMates/Apartmates/src/java/com/mycompan
y/sql/* centos@107.22.132.99:~/mysql_files/
```

At this point, we'll move the SQL files we just received into the corresponding cloud software application SQL folder.

```
centos$ sudo mv ~/mysql_files/* /home/padawan/SQL/ApartMates/ && sudo chown
padawan:padawan /home/padawan/
```

Once the SQL files have been moved to the appropriate location, we'll switch users to root and we'll create the corresponding database. Then, verify that the database for your cloud software application was created.

```
centos$ su - root
root$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 5.1.73 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> CREATE DATABASE ApartmatesDB;
Query OK, 1 row affected (0.00 sec)

mysql> SHOW DATABASES;
+-----+
| Database      |
+-----+
| information_schema |
| ApartmatesDB    |
| demodb         |
| mysql          |
+-----+
4 rows in set (0.00 sec)
```

Now specify the database you'll be referring to when executing the following commands. After selecting the database, you can see that there are no existing tables yet as the database was just created.

```
mysql> USE ApartmatesDB;
Database changed

mysql> SHOW TABLES;
Empty set (0.00 sec)
```

Then execute your MySQL scripts by running the command below. Run it once for each table.

```
mysql> source < ~/.../home/padawan/SQL/ApartMates/Apartment.sql;
Query OK, 0 rows affected, 1 warning (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

mysql> source < ~/.../home/padawan/SQL/ApartMates/Expenses.sql;
Query OK, 0 rows affected, 1 warning (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
```

```

mysql> source < ~/.../.../home/padawan/SQL/ApartMates/Photo.sql;
Query OK, 0 rows affected (0.01 sec)

mysql> source < ~/.../.../home/padawan/SQL/ApartMates/Roommates.sql;
Query OK, 0 rows affected, 1 warning (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

mysql> source < ~/.../.../home/padawan/SQL/ApartMates/Tasks.sql;
Query OK, 0 rows affected, 1 warning (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

```

We can verify whether the tables were created by asking MySQL to show us the tables for the selected database again.

```

mysql> SHOW TABLES;
+-----+
| Tables_in_ApartmatesDB |
+-----+
| Apartment              |
| Expense                |
| Photo                  |
| Roommate               |
| Task                   |
+-----+
5 rows in set (0.00 sec)

```

We can take it a step further, and make sure that the columns of each table were created correctly.

```

mysql> DESCRIBE Roommate;
+-----+-----+-----+-----+-----+-----+
| Field          | Type           | Null | Key | Default | Extra        |
+-----+-----+-----+-----+-----+-----+
| roommate_ID    | int(11)        | NO   | PRI | NULL    | auto_increment |
| password       | varchar(255)   | NO   |     | NULL    |               |
| first_name     | varchar(255)   | NO   |     | NULL    |               |
| last_name      | varchar(255)   | NO   |     | NULL    |               |
| email          | varchar(255)   | NO   |     | NULL    |               |
| security_question| int(11)        | NO   |     | NULL    |               |
| security_answer | varchar(255)   | NO   |     | NULL    |               |
| apartment_ID   | int(10) unsigned | YES  |     | NULL    |               |
| points         | int(10) unsigned | YES  |     | 0       |               |
+-----+-----+-----+-----+-----+-----+
9 rows in set (0.00 sec)

```

Don't forget to grant all privileges to the MySQL user you'll use if not root. For example:

```

mysql> GRANT ALL PRIVILEGES ON ApartmatesDB.* to padawan@localhost;
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)

```

STEP 6: Configure Glassfish with MySQL

Now that we have installed and configured both Glassfish and MySQL, it's time to configure our Glassfish server to communicate with our MySQL databases in order to run our cloud software applications correctly.

6.1 Download MySQL Connector/J for Glassfish

Access the following link from Firefox in your VPS:

<https://dev.mysql.com/downloads/connector/j/>

Proceed to download the highlighted zip archive at the bottom of the page.

The screenshot shows a web browser displaying the MySQL :: Download Connector/J page. The URL in the address bar is <https://dev.mysql.com/downloads/connector/j/>. The page has a blue header with links for Enterprise, Community, Yum Repository, APT Repository, SUSE Repository, Windows, Archives, MySQL.com, Documentation, and Developer Zone. On the left, there's a sidebar with links for MySQL APT Repository, MySQL SUSE Repository, MySQL Community Server, MySQL Cluster, MySQL Router, MySQL Utilities, MySQL Shell, MySQL Workbench, MySQL Connectors (which is expanded to show Connector/ODBC, Connector/Net, Connector/J, Connector/Node.js, Connector/Python, Connector/C++, Connector/C, MySQL Native Driver for PHP, and Other Downloads), and MySQL Connectors (which is also expanded). The main content area is titled "MySQL Connector/J" and describes it as the official JDBC driver for MySQL. It includes links for Online Documentation, MySQL Connector/J Installation Instructions, Documentation, MySQL Connector/J DevAPI Reference, Change History, and a note about reporting bugs. Below this is a section for "Generally Available (GA) Releases" and "Development Releases". The "Connector/J 5.1.46" section is selected. It shows two download options: "Platform Independent (Architecture Independent), Compressed TAR Archive" (mysql-connector-java-5.1.46.tar.gz) and "Platform Independent (Architecture Independent), ZIP Archive" (mysql-connector-java-5.1.46.zip). Both files are version 5.1.46, 4.2M in size, and have download links. A note at the bottom suggests using MD5 checksums and GnuPG signatures for package integrity verification. A sidebar on the right provides information about MySQL open source software licensing under the GPL License and mentions OEMs, ISVs, and VARs can purchase commercial licenses.

Now go to your Downloads folder and unzip the MySQL connector

```
padawan$ cd /home/padawan/Downloads/  
padawan$ unzip mysql-connector-java-5.1.46.zip
```

Now change directory into the unzipped folder and move the file *mysql-connector-java-5.1.46-bin.jar* into your Glassfish's lib folder

```
padawan$ cd /home/padawan/Downloads/mysql-connector-java-5.1.46  
padawan$ sudo mv mysql-connector-java-5.1.46-bin.jar  
/usr/share/glassfish4/glassfish/lib/
```

Now make sure the MySQL connector .jar file is where it's supposed to be

```
padawan$ sudo ls /usr/share/glassfish4/glassfish/lib/
appclient      dtds          javaee.jar
appserv-rt.jar  embedded      jndi-properties.jar
appclient.xml   endorsed      monitor
asadmin        gf-client.jar  mysql-connector-java-5.1.46-bin.jar
client         install       nadmin
deployment
```

nadmin.bat
package-
registration
schemas

Finally, restart your Glassfish server

```
padawan$ sudo /etc/init.d/glassfish restart
```

```
Waiting for the domain to stop .
Command stop-domain executed successfully.
Waiting for domain1 to start .....
Successfully started the domain : domain1
domain Location: /usr/share/glassfish4/glassfish/domains/domain1
Log File: /usr/share/glassfish4/glassfish/domains/domain1/logs/server.log
Admin Port: 4848
Command start-domain executed successfully.
```

6.2 Create a new connection pool on Glassfish

Open your Glassfish admin console and select *JDBC Connection Pools* at the menu on the left

The screenshot shows the GlassFish Admin Console interface in Mozilla Firefox. The URL is `localhost:4848/common/index.jsf`. The left sidebar has a tree view with nodes like Common Tasks, Domain, Clusters, Standalone Instances, Nodes, Applications, Lifecycle Modules, Monitoring Data, Resources (with JDBC, JDBC Resources, JDBC Connection Pools), JNDI, JavaMail Sessions, Resource Adapter Configs, and Configurations (with default-config and server-config). The main content area has sections for GlassFish News, Deployment (List Deployed Applications, Deploy an Application), Administration (Change Administrator Password, List Password Aliases), Monitoring (Monitoring Data), Documentation (Open Source Edition Documentation Set, Quick Start Guide, Administration Guide, Application Development Guide, Application Deployment Guide), Update Center (Installed Components, Available Updates, Available Add-Ons), and Resources (Create New JDBC Resource, Create New JDBC Connection Pool). The JDBC Connection Pools node under Resources is highlighted.

Click on ‘New’ to create a new connection pool

JDBC Connection Pools - Mozilla Firefox

localhost:4848/common/index.jsf

User: admin | Domain: domain1 | Server: localhost

GlassFish™ Server Open Source Edition

JDBC Connection Pools

To store, organize, and retrieve data, most applications use relational databases. Java EE applications access relational databases through the JDBC API. Before an application can access a database, it must get a connection.

Pools (2)

Select	Pool Name	Resource Type	Classname	Description
<input type="checkbox"/>	DerbyPool	javax.sql.DataSource	org.apache.derby.jdbc.ClientDataSource	
<input type="checkbox"/>	TimerPool	javax.sql.XADataSource	org.apache.derby.jdbc.EmbeddedXADataSource	

Proceed to fill the 1st page that pops up following the example below. Replace the ‘Pool Name’ field with your application’s own pool name

New JDBC Connection Pool (Step 1 of 2) - Mozilla Firefox

localhost:4848/common/index.jsf

User: admin | Domain: domain1 | Server: localhost

GlassFish™ Server Open Source Edition

New JDBC Connection Pool (Step 1 of 2)

Identify the general settings for the connection pool.

General Settings

* Indicates required field

Pool Name: mysql_ApartmatesDB_rootPool

Resource Type: javax.sql.DataSource

Must be specified if the datasource class implements more than 1 of the interface.

Database Driver Vendor: MySql

Introspect:

Enabled

If enabled, data source or driver implementation class names will enable introspection.

Now fill the first half of the 2nd page accordingly

The screenshot shows the GlassFish Server Open Source Edition interface. The title bar reads "New JDBC Connection Pool (Step 2 of 2) - Mozilla Firefox". The URL in the address bar is "localhost:4848/common/index.jsf". The left sidebar has a tree view with nodes like "Common Tasks", "Domain", "Clusters", "Standalone Instances", "Nodes", "Applications", "Lifecycle Modules", "Monitoring Data", "Resources", "JDBC", and "JDBC Connection Pools". The "JDBC Connection Pools" node is selected. The main content area is titled "New JDBC Connection Pool (Step 2 of 2)" and contains the following fields:

- Pool Name:** mysql_ApartmatesDB_rootPool
- Resource Type:** javax.sql.DataSource
- Database Driver Vendor:** MySQL
- Datasource Classname:** com.mysql.jdbc.jdbc2.optional.MysqlDataSource
- Driver Classname:** (empty dropdown)
- Ping:** Enabled
- Description:** (empty text input)

Buttons at the top right include "Previous", "Finish", and "Cancel". A note at the top says "Identify the general settings for the connection pool. Datasource Classname or Driver Classname must be specified for the connection pool." A small note also says "* Indicates required field".

But before clicking finish. Scroll down to the bottom of the page, and fill the following fields with their respective values as shown below:

Port: 3306

DatabaseName: ApartmatesDB

Password: CSD@mysql-1872

URL: jdbc:mysql://localhost:3306/ApartmatesDB?zeroDateTimeBehavior=convertToNull

Url: jdbc:mysql://localhost:3306/ApartmatesDB?zeroDateTimeBehavior=convertToNull

ServerName: localhost

PortNumber: 3306

User: root

If everything worked correctly, you should see the following screen with the message ‘*Ping Succeeded*’

The screenshot shows the GlassFish Server Open Source Edition administration console running in Mozilla Firefox. The title bar indicates the window is titled 'JDBC Connection Pools - Mozilla Firefox' and the date and time are 'Mon Mar 19, 1:26 PM padawan'. The URL in the address bar is 'localhost:4848/common/index.jsf'. The main content area displays the 'JDBC Connection Pools' page. A yellow banner at the top right says 'Ping Succeeded' with a green checkmark icon. Below it, a brief description states: 'To store, organize, and retrieve data, most applications use relational databases. Java EE applications access relational databases through the JDBC API. Before an application can access a database, it must get a connection.' A table titled 'Pools (3)' lists three connection pools:

Select	Pool Name	Resource Type	Classname	Description
<input type="checkbox"/>	DerbyPool	javax.sql.DataSource	org.apache.derby.jdbc.ClientDataSource	
<input type="checkbox"/>	_TimerPool	javax.sql.XADataSource	org.apache.derby.jdbc.EmbeddedXADataSource	
<input type="checkbox"/>	mysql_ApartmatesDB_rootPool	javax.sql.DataSource	com.mysql.jdbc.jdbc2.optional.MysqlDataSource	

6.3 Create new JDBC resource on Glassfish

Open your Glassfish admin console and select *JDBC Resources* at the menu on the left. Then click on ‘*New*’ to create a New JDBC resource

The screenshot shows the Glassfish Admin Console interface. The title bar reads "JDBC Resources - Mozilla Firefox". The URL in the address bar is "localhost:4848/common/index.jsf". The main content area is titled "JDBC Resources" with the sub-instruction "JDBC resources provide applications with a means to connect to a database." Below this is a table titled "Resources (2)" showing two existing JDBC resources:

Select	JNDI Name	Logical JNDI Name	Enabled	Connection Pool	Description
<input type="checkbox"/>	jdbc/_TimerPool		<input checked="" type="checkbox"/>	_TimerPool	
<input type="checkbox"/>	jdbc/_default	java:comp/DefaultDataSource	<input checked="" type="checkbox"/>	DerbyPool	

The left sidebar, titled "Tree", shows the navigation structure of the admin console, with "JDBC Resources" selected under the "JDBC" category.

Proceed to fill the page that pops up following the example below. Replace the ‘*JNDI Name*’ field with your application’s own JNDI name

The screenshot shows the "New JDBC Resource" dialog box. The title bar reads "New JDBC Resource - Mozilla Firefox". The main content area is titled "New JDBC Resource" with the instruction "Specify a unique JNDI name that identifies the JDBC resource you want to create. The name must contain only alphanumeric, underscore, dash, or dot characters." The dialog fields are as follows:

- JNDI Name:** * jdbc/ApartmatesDB
- Pool Name:** mysql_ApartmatesDB_rootPool
- Description:** (empty)
- Status:** Enabled

Below these fields is a section titled "Additional Properties (0)" with buttons for "Add Property" and "Delete Properties". A table titled "Select" lists "No items found."

The left sidebar, titled "Tree", shows the navigation structure of the admin console, with "JDBC Resources" selected under the "JDBC" category.

Finally, you should see your new JDBC resource added to the list below

The screenshot shows the GlassFish Server Open Source Edition administration console. The URL is `localhost:4848/common/index.jsf`. The left sidebar has a tree view under 'Resources' with 'JDBC' selected. The main content area is titled 'JDBC Resources' and contains a table with three rows:

Select	JNDI Name	Logical JNDI Name	Enabled	Connection Pool	Description
<input type="checkbox"/>	ApartmatesDB		<input checked="" type="checkbox"/>	mysql_ApartmatesDB_rootPool	
<input type="checkbox"/>	jdbc/_TimerPool		<input checked="" type="checkbox"/>	_TimerPool	
<input type="checkbox"/>	jdbc/_default	java:comp/DefaultDataSource	<input checked="" type="checkbox"/>	DerbyPool	

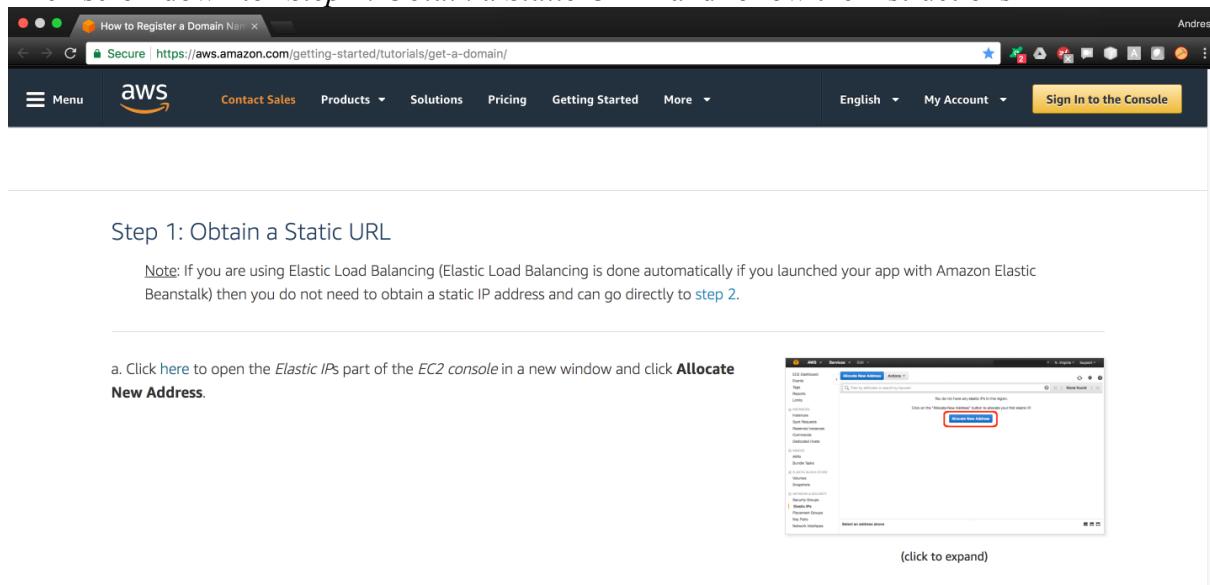
STEP 7: Allocate an Elastic(Static) IP Address for your Amazon VPS & Set up your Domain

We're almost done! But before deploying our cloud software application, we need to set an AWS elastic IP address, which just means that we'll set a static IP address to your VPS that won't change over time. Afterwards, your application will always be reachable to the same IP address.

7.1 Allocate new elastic IP address

Open your web browser and access the following AWS tutorial:
<https://aws.amazon.com/getting-started/tutorials/get-a-domain/>

Then scroll down to “*Step 1: Obtain a Static URL*” and follow the instructions



The screenshot shows a browser window with the AWS Getting Started tutorial open. The URL in the address bar is <https://aws.amazon.com/getting-started/tutorials/get-a-domain/>. The page content includes a heading "Step 1: Obtain a Static URL" and a note: "Note: If you are using Elastic Load Balancing (Elastic Load Balancing is done automatically if you launched your app with Amazon Elastic Beanstalk) then you do not need to obtain a static IP address and can go directly to step 2." Below this, there is a list item "a. Click here to open the Elastic IPs part of the EC2 console in a new window and click Allocate New Address." To the right of this text is a screenshot of the EC2 Management Console showing the "Allocate New Address" button highlighted with a red box. Below the screenshot is the caption "(click to expand)".

After following the steps you'll be presented with your new Elastic IP address



The screenshot shows the AWS EC2 Management Console with the URL <https://us-east-1.console.aws.amazon.com/ec2/v2/home?region=us-east-1#AllocateAddress:PublicIp=35.171.74.44>. The page title is "Addresses > Allocate new address". The main content area displays a success message: "New address request succeeded" and "Elastic IP 35.171.128.73". A "Close" button is at the bottom right.

You'll notice however that your Elastic IP address has not yet been associated with an EC2 instance though.

Name	Elastic IP	Allocation ID	Instance	Private IP address	Scope	Association ID	Network Interface ID
Tutorial VPS	35.171.128.73	eipalloc-53912e5a	-	-	vpc	-	-

Description

Address: 35.171.128.73

Elastic IP: 35.171.128.73
 Instance: -
 Scope: vpc
 Public DNS: -
 Network interface owner: -

Allocation ID: eipalloc-53912e5a
 Private IP address: -
 Association ID: -
 Network interface ID: -

Select the IP address above and take the action to associate it with your desired EC2 instance

Select the instance OR network interface to which you want to associate this Elastic IP address (35.171.128.73)

Resource type: Instance Network interface

Instance: i-00503a6be210e30b7

Private IP: 172.31.81.93

Reassociation: Allow Elastic IP to be reassociated if already attached

Warning
 If you associate an Elastic IP address with your instance, your current public IP address is released. [Learn more](#).

Cancel Associate

Now you'll be able to see that your IP address has been associated with your instance

The screenshot shows the AWS EC2 Management Console. On the left, the navigation menu includes 'EC2 Dashboard', 'Instances', 'Elastic IPs', and 'Load Balancing'. Under 'Elastic IPs', 'Allocation ID' is selected. The main content area displays a table with one row for 'Tutorial VPS'. The table columns are: Name, Elastic IP, Allocation ID, Instance, Private IP address, Scope, Association ID, and Network Interface ID. The details for the row are: Tutorial VPS, 35.171.128.73, eipalloc-53912e5a, i-00503a6be210e30b7, 172.31.81.93, vpc, eipassoc-2c2a3d95, eni-d0f51d51.

Address: 35.171.128.73

Description	Tags
Elastic IP: 35.171.128.73 Instance: i-00503a6be210e30b7 Scope: vpc Public DNS: ec2-35-171-128-73.compute-1.amazonaws.com Network interface owner: 731864370794	Allocation ID: eipalloc-53912e5a Private IP address: 172.31.81.93 Association ID: eipassoc-2c2a3d95 Network interface ID: eni-d0f51d51

Go to your EC2 console and you'll see the changes reflected on your instance as well

The screenshot shows the AWS EC2 Management Console. The left sidebar shows the same navigation menu as the previous screenshot. The main content area displays a table with one row for 'Tutorial VPS'. The table columns are: Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, Public DNS (IPv4), IPv4 Public IP, and IPv6 IPs. The details for the row are: i-00503a6be210e30b7, t2.micro, us-east-1c, running, 2/2 checks ..., None, ec2-35-171-128-73.compute-1.amazonaws.com, 35.171.128.73, -.

Instance: i-00503a6be210e30b7 (Tutorial VPS) Elastic IP: 35.171.128.73

Description	Status Checks	Monitoring	Tags	Usage Instructions
Instance ID: i-00503a6be210e30b7 Instance state: running Instance type: t2.micro Elastic IPs: 35.171.128.73* Availability zone: us-east-1c Security groups: CentOS 6 -x86_64- - with Updates HVM-1801_01-AutogenByAWSMP-1, view inbound rules Scheduled events: No scheduled events AMI ID: CentOS Linux 6 x86_64 HVM EBS 1801_01-74e73035-3435-48d6-88e0-89cc02ad83ee-ami-5d381c27.4 (ami-e3fd999) Platform: - IAM role: - Key pair name: masterJediKeyPair	Public DNS (IPv4): ec2-35-171-128-73.compute-1.amazonaws.com IPv4 Public IP: 35.171.128.73 IPv6 IPs: - Private DNS: ip-172-31-81-93.ec2.internal Private IPs: 172.31.81.93 Secondary private IPs: -	VPC ID: vpc-ab56fed0 Subnet ID: subnet-8597b7aa	Network interfaces: eth0 Source/dest. check: True T2 Unlimited: Disabled Owner: 731864370794	

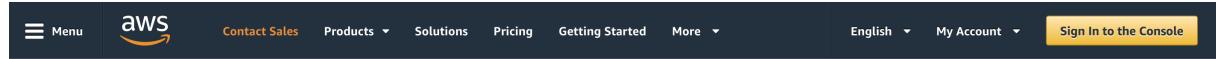
Note that you'll have to use your new Elastic IP address to SSH into your from now on
localcomputer\$ ssh -i "~/.ssh/masterJediKeyPair.pem" centos@35.171.128.73

```
The authenticity of host '35.171.128.73 (35.171.128.73)' can't be established.  
RSA key fingerprint is SHA256:/+06KCLXU2mk5sUlQevcwDoYX9UntppqxGcewIZ+30.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '35.171.128.73' (RSA) to the list of known hosts.  
Last login: Mon Mar 19 00:53:47 2018 from 71.62.158.142  
[centos@ip-172-31-81-93 ~]$
```

7.2 Set a Domain for your VPS

Open your web browser and access the following AWS tutorial:
<https://aws.amazon.com/getting-started/tutorials/get-a-domain/>

In order to set a domain for your VPS, you'll need to scroll down the page and complete steps 2 and 3.



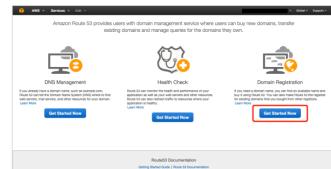
Step 2: Register a Domain Name

Now that you have an IP address associated with your instance, we will need to configure the Domain Name System (DNS) to point to this address so that people can find your website.

Note: In this example we will be acquiring a new domain name and associating it with the Elastic IP address we just created (which is attached to your instance). If you already have a domain name, or if you choose to use another domain registrar to get a domain name, please refer to their documentation on configuring DNS for your instance.

- a. Click [here](#) to open the Route 53 console in a new window (Route 53 is AWS's DNS service). You can register new domain names with Route 53 as well as manage DNS records for your domain.

Select **Get Started Now** under *Domain Registration*.



(click to expand)



Step 3: Configure DNS

Our last step is to configure the DNS so that the new domain we created in step 2 can point to the address we have for our server. This can be the static IP address (from step 1) or a fully qualified domain name (FQDN) that is automatically created if you are using Amazon Elastic Beanstalk.

- a. Open the *Hosted Zones* part of the Route 53 console by clicking [here](#). Next, **click on the domain name you created in step 2** (in this example we are using cloudexamples.com but your domain will be different).



(click to expand)

Below are Tabs to help you choose the scenario that is most applicable to you.

If you have a static IP address for your website, virtual server, or service; select **Static IP Address** below.

If you have a Fully Qualified Domain Name (FQDN) for your resource (this is common for applications launched by Elastic Beanstalk, Lambda functions, S3 static sites and more advanced deployments using Elastic Load Balancing) please select **Fully Qualified Domain Name (FQDN)** below.

Alternatively, there are many vendors that you could use to obtain your domain name from, and each vendor has its own way of linking your domain with your static IP address. For example, GoDaddy allows you to get your first domain for only \$1. If you do decide to get your domain from GoDaddy you can follow their tutorial to configure DNS:

<https://uk.godaddy.com/help/change-my-ip-address-20134>

The screenshot shows a web browser window with the URL <https://uk.godaddy.com/help/change-my-ip-address-20134>. The page is titled "Domains Help" and features a "Change my IP address" section. It provides instructions for changing the IP address of a domain's A records. The page includes social sharing icons (Facebook, Email, LinkedIn, Twitter, Google+, Pinterest) and a sidebar with related articles like "Submitting a Change of Account/Email Update Form" and "Trade a .EU domain with an account change".

STEP 8: Sending WAR Files to your VPS

After Glassfish and MySQL have been installed, and after you have configured MySQL on Glassfish, we just need to get our WAR files into our VPS to deploy them. We can easily do this by following the script below.

8.1 Transfer your WAR file using SCP

The easiest way to transfer our WAR files into our VPS and in a secure manner, is by using the linux ‘scp’ command which transfer files between hosts by using SSH.

If you haven’t done so, make the following directories from the *padawan* user. We’ll store your cloud software application’s WAR file in here

```
padawan$ mkdir /home/padawan/Netbeans_Projects  
padawan$ mkdir /home/padawan/Netbeans_Projects/ApartMates
```

If you haven’t done so, make the following directory in the default centos user. We’ll receive the transferred WAR files in this location.

```
padawan$ su - centos  
[centos@ip-172-31-81-93 ~]$ mkdir Netbeans_Projects
```

Next, run the following command from your local computer’s terminal. This will transfer your WAR files to your VPS under the directory we just created.

```
localcomputer$ scp -i ~/.ssh/masterJediKeyPair.pem  
/Users/<your_username>/NETBEANS_PROJECTS/ApartMates/Apartmates/dist/Apartmates.war  
centos@35.171.128.73:~/Netbeans_Projects/
```

At this point, we’ll move the WAR files we just received into its corresponding cloud software application folder.

```
centos$ sudo mv ~/Netbeans_Projects/Apartmates.war  
/home/padawan/Netbeans_Projects/ApartMates/ && sudo chown padawan:padawan  
/home/padawan/
```

Finally, make sure the war file has been transferred to the right location

```
padawan$ ls /home/padawan/Netbeans_Projects/ApartMates/  
Apartmates.war
```

STEP 9: Deploy your Cloud Software Application Using Glassfish

Now finally you've made it to the end of the road! It's time to deploy our cloud software application to the public internet and for it to be accessible by anyone!

9.1 Open EC2 Instance ports

If you haven't done so yet, you have to open your http, https, and the glassfish default ports to allow incoming connections to your cloud software application. This needs to be done only once.

Open your EC2 Console, locate your instance, and scroll all the way to the right to find your instance's security groups. Then click on it

The screenshot shows the AWS EC2 Management Console interface. On the left, there's a sidebar with navigation links for EC2 Dashboard, Events, Tags, Reports, Limits, Instances, AMIs, Bundle Tasks, Elastic Block Store, Network & Security, and Load Balancing. The main area displays an instance named 'Tutorial VPS' with the Elastic IP 35.171.128.73. The 'Description' tab is active, showing detailed information about the instance, including its ID (i-00503a6be210e30b7), state (running), type (t2.micro), and security group (CentOSByAWSMP-1). The 'Security Groups' section indicates that the instance is currently associated with the 'CentOSByAWSMP-1' group. At the bottom of the page, there are links for Feedback, English (US), and a footer with copyright information and links to Privacy Policy and Terms of Use.

Now that you've accessed your instance's security groups, you want to select the 'Inbound' tab and then click on 'Edit'.

The screenshot shows the AWS EC2 Management Console. On the left, there's a navigation sidebar with links like EC2 Dashboard, Instances, AMIs, and Security Groups. The Security Groups section is currently selected. The main area displays a table of security group rules for 'sg-34bece42'. The 'Inbound' tab is active. A modal window titled 'Edit' is open, showing two rows of rules:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	0.0.0.0/0	
Custom TCP Rule	TCP	5900 - 5910	0.0.0.0/0	

Add the following rules for HTTP, HTTPS, and the Glassfish Default Port

The screenshot shows the AWS EC2 Management Console. The left sidebar is identical to the previous one. The main area shows the same security group table, but now with additional rules added:

Type	Protocol	Port Range	Source	Description
HTTP	TCP	80	0.0.0.0/0	HTTP
HTTP	TCP	80	::/0	HTTP
Custom TCP Rule	TCP	8080	0.0.0.0/0	Glassfish Default ...
Custom TCP Rule	TCP	8080	::/0	Glassfish Default ...
SSH	TCP	22	0.0.0.0/0	SSH
Custom TCP Rule	TCP	5900 - 5910	0.0.0.0/0	VCN
Custom TCP Rule	TCP	443	0.0.0.0/0	HTTPS
Custom TCP Rule	TCP	443	::/0	HTTPS

Finally, reboot your instance for changes to take effect.

9.2 Open VPS firewall ports

In addition to allowing incoming connections from your EC2 console, we need to allow incoming connections from our VPS firewall.

Open your VPS terminal as the root user and run the script below to allow incoming connections to your HTTP port

```
root$ iptables -I INPUT 5 -m state --state NEW -p tcp --dport 80 -j ACCEPT  
  
root$ sudo service iptables save  
iptables: Saving firewall rules to /etc/sysconfig/iptables:[ OK ]  
  
root$ sudo service iptables restart  
iptables: Setting chains to policy ACCEPT: filter      [ OK ]  
iptables: Flushing firewall rules:                   [ OK ]  
iptables: Unloading modules:                         [ OK ]  
iptables: Applying firewall rules:                  [ OK ]
```

Now run the script below to allow incoming connections to your HTTPS port

```
root$ iptables -I INPUT 5 -m state --state NEW -p tcp --dport 443 -j ACCEPT  
  
root$ sudo service iptables save  
iptables: Saving firewall rules to /etc/sysconfig/iptables:[ OK ]  
  
root$ sudo service iptables restart  
iptables: Setting chains to policy ACCEPT: filter      [ OK ]  
iptables: Flushing firewall rules:                   [ OK ]  
iptables: Unloading modules:                         [ OK ]  
iptables: Applying firewall rules:                  [ OK ]
```

Finally, run the script below to allow incoming connections to your glassfish default port

```
root$ iptables -I INPUT 5 -m state --state NEW -p tcp --dport 8080 -j ACCEPT  
  
root$ sudo service iptables save  
iptables: Saving firewall rules to /etc/sysconfig/iptables:[ OK ]  
  
root$ sudo service iptables restart  
iptables: Setting chains to policy ACCEPT: filter      [ OK ]  
iptables: Flushing firewall rules:                   [ OK ]  
iptables: Unloading modules:                         [ OK ]  
iptables: Applying firewall rules:                  [ OK ]
```

Then reboot the server for changes to take effect

```
root$ reboot  
  
Broadcast message from centos@ip-172-31-81-93.ec2.internal  
(/dev/pts/0) at 15:34 ...  
  
The system is going down for reboot NOW!
```

9.3 Deploy cloud software application

Open your glassfish admin console and select ‘Deploy an Application’

The screenshot shows the GlassFish Server Open Source Edition Admin Console interface. The left sidebar contains a tree view of common tasks: Domain, server (Admin Server), Clusters, Standalone Instances, Nodes, Applications, Lifecycle Modules, Monitoring Data, Resources (Concurrent Resources, Connectors, JDBC), and Administration. The main content area is titled "GlassFish Console - Common Tasks". It features sections for "GlassFish News" (with a "GlassFish News" link), "Deployment" (with "List Deployed Applications" and "Deploy an Application" links), and "Documentation" (with links to the Open Source Edition Documentation Set, Quick Start Guide, Administration Guide, Application Development Guide, and Application Deployment Guide). The top status bar shows the date and time: Mon Mar 19, 3:56 PM padawan.

Locate and select your desired cloud software application war file

The screenshot shows the "Deploy Applications or Modules" dialog box. The left sidebar is identical to the previous screenshot. The main dialog has a title "Deploy Applications or Modules" and a sub-instruction: "Specify the location of the application or module to deploy. An application can be in a packaged file or specified as a directory." It includes a note: "* Indicates required field". The "Location:" section has two options: "Packaged File to Be Uploaded to the Server" (radio button is unselected) and "Local Packaged File or Directory That Is Accessible from GlassFish Server" (radio button is selected, pointing to a text input field containing "/home/padawan/Netbeans_Projects/Fitness/Fitness-Pico.war"). Below these are fields for "Type:" (set to "Web Application"), "Context Root:" (set to "Fitness-Pico"), "Application Name:" (set to "Fitness-Pico"), "Virtual Servers:" (a dropdown menu showing "server" is selected), "Status:" (checkbox checked, "Enabled"), and "Implicit CDI" (checkbox checked, "Enabled"). At the bottom right are "OK" and "Cancel" buttons.

Click ‘OK’ and that’s it! Your application will be deployed

The screenshot shows the GlassFish Administration Console interface. The left sidebar has a tree view with 'Applications' selected. The main content area is titled 'Applications' and contains a table titled 'Deployed Applications (1)'. The table has columns: Select, Name, Deployment Order, Enabled, Engines, and Action. One row is shown: Fitness-Pico, 100, checked, web, and 'Launch | Redeploy | Reload' buttons.

Select	Name	Deployment Order	Enabled	Engines	Action
<input type="checkbox"/>	Fitness-Pico	100	<input checked="" type="checkbox"/>	web	Launch Redeploy Reload

You can open your web browser and visit your software solution now! Congratulations!

The screenshot shows a web browser window with the URL '35.171.128.73:8080/Fitness-Pico/'. The page title is 'Fitness, Inc.' and the address bar shows the same URL. The content area displays a banner for 'Apple Watch and Health App' showing a hand holding a smartphone and an Apple Watch. Below the banner are social media sharing icons (Facebook, Twitter, LinkedIn, Google+). At the bottom, there's a copyright notice: 'Copyright © 2016. Fitness, Inc. All rights reserved.' and links to 'MyFitnessPal', 'Links of Interest', and 'WebMD'.

Wait! But before finishing let's go ahead and remove that ugly port 8080 number from our url

9.4 Hide Port 8080

Open your glassfish admin console and select ‘Configurations → server-config’ on the left. Then click on ‘Network Listeners’

The screenshot shows the GlassFish Admin Console interface. The title bar says "Configuration - Mozilla Firefox". The address bar shows "localhost:4848/common/index.jsf". The top menu has "Home" and "About...". The user information is "User: admin | Domain: domain1 | Server: localhost". The main title is "GlassFish™ Server Open Source Edition". On the left, there's a navigation tree:

- Resources
 - Concurrent Resources
 - Connectors
 - JDBC
 - JMS Resources
 - JNDI
 - JavaMail Sessions
 - Resource Adapter Configs
- Configurations
 - default-config
 - server-config

The "server-config" node is selected and highlighted in blue. The right panel is titled "Configuration" and contains the message "Manage configurations, and view the target server instances or clusters using the configurations." It shows the "Configuration Name: server-config" and a list of service components:

- Admin Service
- Connector Service
- EJB Container
- HTTP Service
- JVM Settings
- Java Message Service
- Logger Settings
- Monitoring
- Network Listeners
- Protocols
- Transports
- ORB

The following screen will appear and you'll notice that our Glassfish server is listening to ports 8080 and 8081

The screenshot shows the GlassFish Admin Console interface. The title bar says "Network Listeners - Mozilla Firefox". The address bar shows "localhost:4848/common/index.jsf". The top menu has "Home" and "About...". The user information is "User: admin | Domain: domain1 | Server: localhost". The main title is "GlassFish™ Server Open Source Edition". On the left, there's a navigation tree identical to the previous screenshot.

The right panel is titled "Network Listeners" and contains the message "Click New to define a new network listener. Click the name of an existing listener to modify its settings." It shows the "Configuration Name: server-config" and a table titled "Network Listeners (3)".

Select	Name	Port #	Protocol	Thread Pool	Enabled
<input type="checkbox"/>	admin-listener	4848	admin-listener	admin-thread-pool	true
<input type="checkbox"/>	http-listener-1	8080	http-listener-1	http-thread-pool	true
<input type="checkbox"/>	http-listener-2	8181	http-listener-2	http-thread-pool	true

We'll change those ports to the appropriate HTTP and HTTPS ports 80 and 443

The screenshot shows the GlassFish Server Open Source Edition administration console. The left sidebar navigation tree includes Resources, Configurations, and Network Listeners. Under Configurations, the 'server-config' node is expanded, showing sub-nodes like Admin Service, Connector Service, EJB Container, and Network Listeners. The Network Listeners node has three children: admin-listener, http-listener-1, and http-listener-2. The 'http-listener-1' node is selected. The main content area displays the 'Edit Network Listener' dialog for 'http-listener-1'. The 'General' tab is selected. A success message 'New values successfully saved.' is displayed. The configuration details are as follows:

Name:	http-listener-1
Protocol:	http-listener-1
Status:	<input checked="" type="checkbox"/> Enabled
Security:	<input type="checkbox"/> Enabled
JK Listener:	<input type="checkbox"/> Enabled
Port:	* 80
Address:	0.0.0.0
Transport:	tcp

Buttons at the bottom right include 'Save' and 'Cancel'.

This screenshot shows the same GlassFish administration interface after changes have been made. The 'http-listener-2' node in the left sidebar is now selected. The main content area displays the 'Edit Network Listener' dialog for 'http-listener-2'. The 'General' tab is selected. A success message 'New values successfully saved.' is displayed. The configuration details are as follows:

Name:	http-listener-2
Protocol:	http-listener-2
Status:	<input checked="" type="checkbox"/> Enabled
Security:	<input checked="" type="checkbox"/> Enabled
JK Listener:	<input type="checkbox"/> Enabled
Port:	* 443
Address:	0.0.0.0
Transport:	tcp

Buttons at the bottom right include 'Save' and 'Cancel'.

Your ‘*Network Listeners*’ screen should look like this after your changes

The screenshot shows the GlassFish Server Open Source Edition interface in Mozilla Firefox. The URL is `localhost:4848/common/index.jsf`. The main content area is titled “Network Listeners” and displays a table of three network listeners:

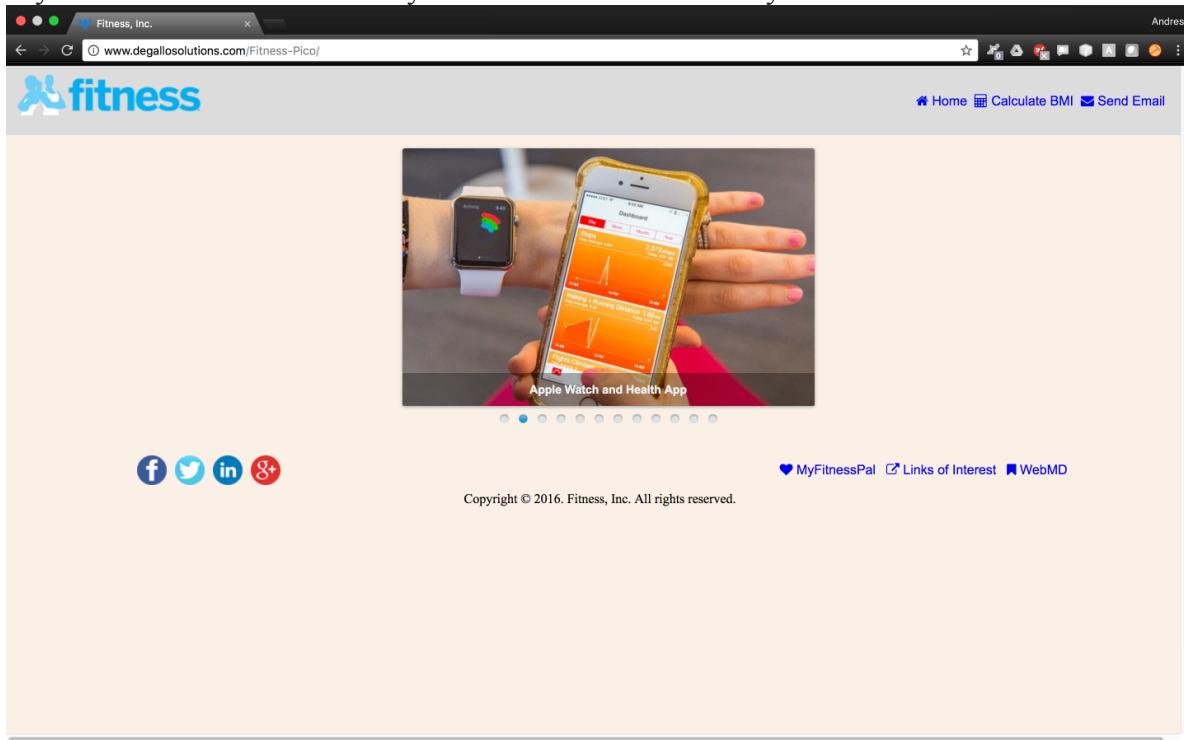
Select	Name	Port #	Protocol	Thread Pool	Enabled
<input type="checkbox"/>	admin-listener	4848	admin-listener	admin-thread-pool	true
<input type="checkbox"/>	http-listener-1	80	http-listener-1	http-thread-pool	true
<input type="checkbox"/>	http-listener-2	443	http-listener-2	http-thread-pool	true

The left sidebar navigation tree includes items such as Admin Service, Connector Service, EJB Container, HTTP Service, JVM Settings, Java Message Service, Logger Settings, Monitoring, Network Config, and Network Listeners.

Visit your cloud software application once again and omit the port 8080 number this time!

The screenshot shows a mobile browser displaying the “Fitness, Inc.” website at `35.171.128.73/Fitness-Pico/`. The page features a large banner image showing a person using an Apple Watch and the Health App on an iPhone. Below the banner, there are social media sharing icons (Facebook, Twitter, LinkedIn, Google+). At the bottom, there is a copyright notice: “Copyright © 2016. Fitness, Inc. All rights reserved.”

If you used a domain name for your software solution then your url should look like this



ADDITIONAL RESOURCES

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<https://www.realvnc.com/en/connect/download/viewer/>
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