

# Exercise 1

*Start up an instance on Amazon EC2 and get Apache web server running*

## Prior Knowledge

Unix Command Line Shell

## Learning Objectives

Understand about EC2 instances

Start an instance using the web interface

Configure the AWS command line

Manage instances from a command line

Understand Security Groups

## Software Requirements

(see separate document for installation of these)

- AWS CLI

## Part A: Starting an Instance from the Web Console.

1. You have been provided with an Ubuntu VM. Start that up. Please ask the TA or lecturer if you don't know how to do that.
2. The course is also providing time and resources on the Amazon AWS/EC2 cloud for the duration of the course.

3. Open up a browser window and navigate to <https://ox-clo.signin.aws.amazon.com/console>

Account:

User Name:

Password:

☐ I have an MFA Token (more info)

[Sign In](#)

[Sign-in using root account credentials](#)

Hint: make a bookmark for that URL

4. Use the userid and password that you have been given. You will need to create a new password:

AWS account **ox-clo**

IAM user name **oxclo02**

Old password

New password

Retype new password

[Confirm password change](#)

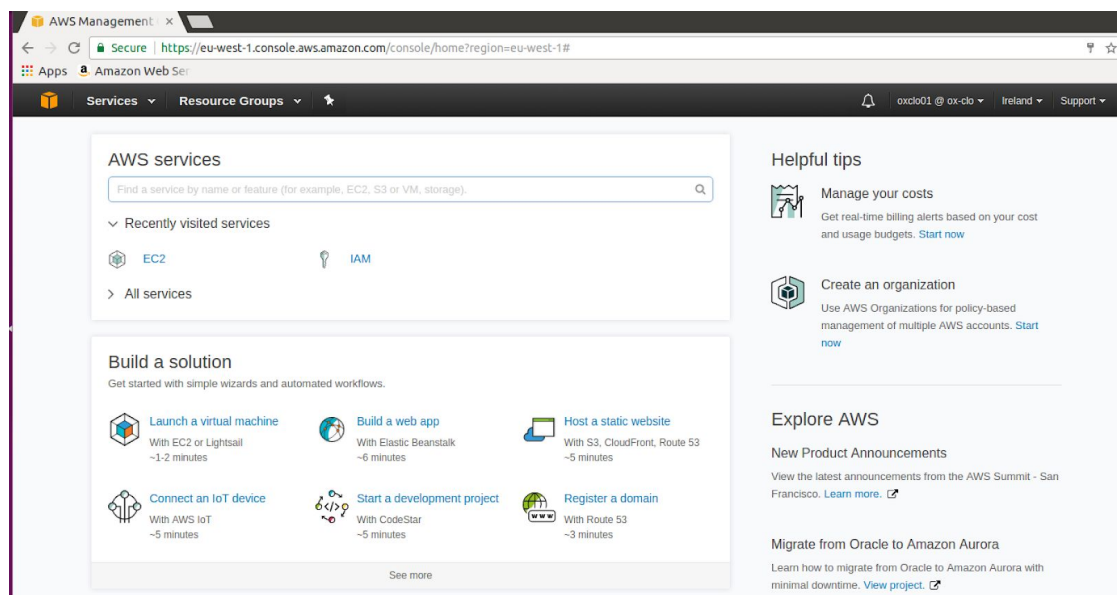
[Sign-in using root account credentials](#)

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English

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5. You should see a screen like this:



6. In the top right corner click on Oregon and change to **EU (Ireland)** (unless it is already on Ireland!)

7. Expand **All Services**:

▼ **All services**



**Compute**

EC2  
Lightsail   
ECR  
ECS  
EKS  
Lambda  
Batch  
Elastic Beanstalk  
Serverless Application Repository



**Storage**

S3  
EFS  
FSx  
S3 Glacier  
Storage Gateway  
AWS Backup



**Machine Learning**

Amazon SageMaker  
Amazon Comprehend  
AWS DeepLens  
Amazon Lex  
Machine Learning  
Amazon Polly  
Rekognition  
Amazon Transcribe  
Amazon Translate  
Amazon Personalize  
Amazon Forecast  
Amazon Textract  
AWS DeepRacer



**Analytics**

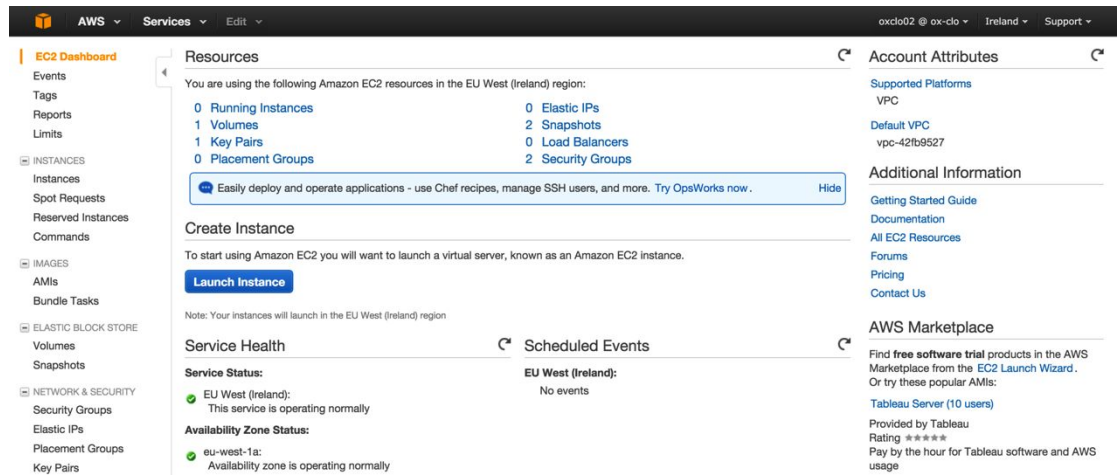
Athena  
EMR

8. Now click on the link EC2

9. Please note:

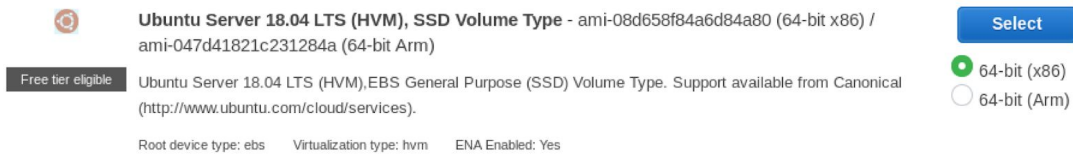
*You will be working in a shared environment with other students on the course (unless you have chosen to use your own Amazon account). As a result, we will need to be very careful not to interfere with other students' instances, volumes, etc. Therefore please be careful to **tag and name** your resources clearly so that you can identify them. (Instructions on how to do that will follow!).*

As a result, the screen below will differ depending on who has done different parts of this exercise.



10. Click on the blue button: Launch Instance

11. Choose “Ubuntu Server 18.04 LTS (HVM), SSD Volume Type”



12. Choose the instance type **t2.micro**.

13. Click **Next: Configure Instance Details**

**Next: Configure Instance Details**

14. Click **Next: Add Storage**

15.

Click **Next: Add Tags**

16. In the Tag Instance screen, give your instance a Name.

Make the *Key* be **Name**

Make the *Value* the same as your userid.

#### Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.

A copy of a tag can be applied to volumes, instances or both.

Tags will be applied to all instances and volumes. [Learn more](#) about tagging your Amazon EC2 resources.

Key (127 characters maximum)	Value (255 characters maximum)	Instances ⓘ	Volumes ⓘ
Name	oxclo01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

[Add another tag](#) (Up to 50 tags maximum)

17. Now click: **Next: Configure Security Group**

18. Change the name of the security group to your userid.

#### Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group  
☐ Select an existing security group

Security group name:   
Description:

Type ⓘ	Protocol ⓘ	Port Range ⓘ	Source ⓘ	Description ⓘ
SSH	TCP	22	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop

[Add Rule](#)

19.

*Hint: There is a security warning about the security rule. The default rule allows Secure Shell (SSH) access from any IP address. If you know your company or personal internet connection comes from a specific IP address you can improve security by restricting to that.*

*Note this is NOT the IP address you get by looking at the local machine's configuration, but the publicly visible IP address that the Amazon cloud sees from you. You can see what your IP is by typing "what's my IP" into Google.*

*However, I am not sure if the Oxford network sends messages from different IPs or the same and therefore we will leave this as-is despite the warning.*

## Click **Review and Launch**

You should see something very like this:

The screenshot shows the 'Review and Launch' page in the AWS Management Console. It displays details for an Ubuntu Server 14.04 LTS (HVM) AMI. The instance type is t2.micro, with 1 vCPU and 1 GiB of memory. The security group is oxclo02, which allows SSH access from 0.0.0.0/0. The instance is tagged with the key 'Name' and value 'oxclo02'. At the bottom, there are buttons for 'Cancel', 'Previous', and 'Launch'.

AMI Details [Edit AMI](#)

Free tier eligible

Ubuntu Server 14.04 LTS (HVM), SSD Volume Type - ami-47a23a30

Ubuntu Server 14.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).  
Root Device Type: ebs Virtualization type: hvm

Instance Type [Edit instance type](#)

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t2.micro	Variable	1	1	EBS only	-	Low to Moderate

Security Groups [Edit security groups](#)

Security group name: oxclo02  
Description: launch-wizard-1 created 2015-11-16T09:27:30.852+00:00

Type	Protocol	Port Range	Source
SSH	TCP	22	0.0.0.0/0

Instance Details [Edit instance details](#)

Storage [Edit storage](#)

Tags [Edit tags](#)

Key	Value
Name	oxclo02

[Cancel](#) [Previous](#) [Launch](#)

## 20. Click **Launch**

21. You will be prompted with a new window to decide on the correct key pair to secure this instance with. Since this is the first time you are using EC2, you need to create a key pair. Change the dropdown box to **Create a new key pair**.

The dialog box titled 'Select an existing key pair or create a new key pair' provides instructions on key pairs. It includes a dropdown menu set to 'Create a new key pair'. The 'Key pair name' field contains 'oxclo02'. A 'Download Key Pair' button is visible. A message box states: 'You have to download the private key file (\*.pem file) before you can continue. Store it in a secure and accessible location. You will not be able to download the file again after it's created.' At the bottom are 'Cancel' and 'Launch Instances' buttons.

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Create a new key pair

Key pair name: oxclo02

Download Key Pair

You have to download the **private key file** (\*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

[Cancel](#) [Launch Instances](#)

22. Change the name of the key pair to your userid.

23. Click **Download Key Pair**. This will save a file to your ~/Downloads directory.

24.

## Click **Launch Instances**

You should see something like:

### Launch Status

#### ✓ Your instances are now launching

The following instance launches have been initiated: [i-a475401d](#) [View launch log](#)

#### Get notified of estimated charges

Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

### How to connect to your instances

Your instances are launching, and it may take a few minutes until they are in the **running** state, when they will be ready for you to use. Usage hours on your new instances will start immediately when you start or terminate your instances.

Click **View Instances** to monitor your instances' status. Once your instances are in the **running** state, you can **connect** to them from the Instances screen. [Find out](#) how to connect to your instances.

#### Here are some helpful resources to get you started

- [How to connect to your Linux instance](#)
- [Amazon EC2: User Guide](#)
- [Learn about AWS Free Usage Tier](#)
- [Amazon EC2: Discussion Forum](#)

25. Click on the blue instance ID link (e.g. **i-a475401d** in the screenshot above)

You will see a dashboard like:

The screenshot shows the AWS Management Console interface for a specific EC2 instance. At the top, there are buttons for 'Launch Instance', 'Connect', and 'Actions'. Below this is a search bar and a table of instances. The instance 'i-0fa3d4032833ea933' is highlighted. The instance details panel shows the following information:

Instance: i-0fa3d4032833ea933		Public DNS: ec2-54-154-120-147.eu-west-1.compute.amazonaws.com	
<b>Description</b>			
Instance ID	i-0fa3d4032833ea933	Public DNS (IPv4)	ec2-54-154-120-147.eu-west-1.compute.amazonaws.com
Instance state	pending	IPv4 Public IP	54.154.120.147
Instance type	t2.micro	IPv6 IPs	-

26. Make sure you are running the Ubuntu VM, and start a fresh terminal window (Ctrl-Alt-T, or find Terminal graphically)

27. Check if there is already a `~/keys` directory.

**If not**, then make a directory to store your private key:

```
mkdir ~/keys
```

28. Copy your private key to the new directory:

```
cp ~/Downloads/oxclo*.pem ~/keys/
```




29. Before you can use the key you need to change the permissions on it.

Type:

```
chmod 400 ~/keys/oxclo*.pem
```



30. Check to see if the status checks on your instance are now complete.  
Refresh the browser window:

Instance State	Status Checks	Alarm Status	Public DNS	Public IP
 running	 2/2 checks ...	None	 ec2-52-30-233-95.eu-w...	52.30.233.95

31. Copy the Public IP Address from the browser window (e.g. 52.30.233.95 in my case)
32. Try to SSH into the machine. Replace your key file name and the IP address below!

```
ssh -i ~/keys/oxclonn.pem ubuntu@ww.xx.yy.zz
```

33. As this is the first time you are accessing this host, the key on the server side is not known. You should see something like:

```
The authenticity of host '52.30.233.95 (52.30.233.95)' can't be established.  
ECDSA key fingerprint is SHA256:7GhOakN9Pj3vWAegV0uYhPVI9qqVEe9RINM0wcutO1E.  
Are you sure you want to continue connecting (yes/no)?
```

Type **yes** and hit Enter.

You will see something like:

```
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.4.0-1020-aws x86_64)

* Documentation: https://help.ubuntu.com
* Management:   https://landscape.canonical.com
* Support:      https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>",
See "man sudo_root" for details.
```

34.



**Congratulations – you have a cloud instance running.**

## **PART B – Running a Web Server**

35. In the SSH shell type:

```
sudo apt update
```

```
Hit http://eu-west-1.ec2.archive.ubuntu.com trusty/universe Translation-en
Ign http://eu-west-1.ec2.archive.ubuntu.com trusty/main Translation-en_US
Ign http://eu-west-1.ec2.archive.ubuntu.com trusty/universe Translation-en_US
Fetched 10.3 MB in 3s (2,713 kB/s)
Reading package lists... Done
```

You will see a lot of log, e.g.:

36. Now type:

```
sudo apt install apache2
```

37. You will see:

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  apache2-bin apache2-data libapr1 libaprutil1 libaprutil1-dbd-sqlite3
  libaprutil1-ldap ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine apache2-suexec-custom apache2-utils
  openssl-blacklist
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data libapr1 libaprutil1 libaprutil1-dbd-sqlite3
  libaprutil1-ldap ssl-cert
0 upgraded, 8 newly installed, 0 to remove and 130 not upgraded.
Need to get 1,285 kB of archives.
After this operation, 5,348 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

38. Hit Enter (same as Y). The log should look like:

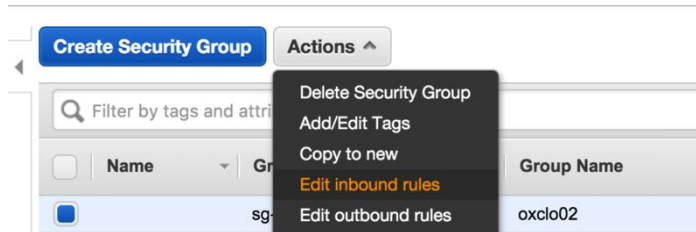
```
Enabling conf serve-cgi-bin.
Enabling site 000-default.
* Starting web server apache2
Setting up ssl-cert (1.0.33) ...
Processing triggers for libc-bin (2.19-0ubuntu6.6) ...
Processing triggers for ureadahead (0.100.0-16) ...
Processing triggers for ufw (0.34-rc-0ubuntu2) ...
```

39. Check locally if it is running:

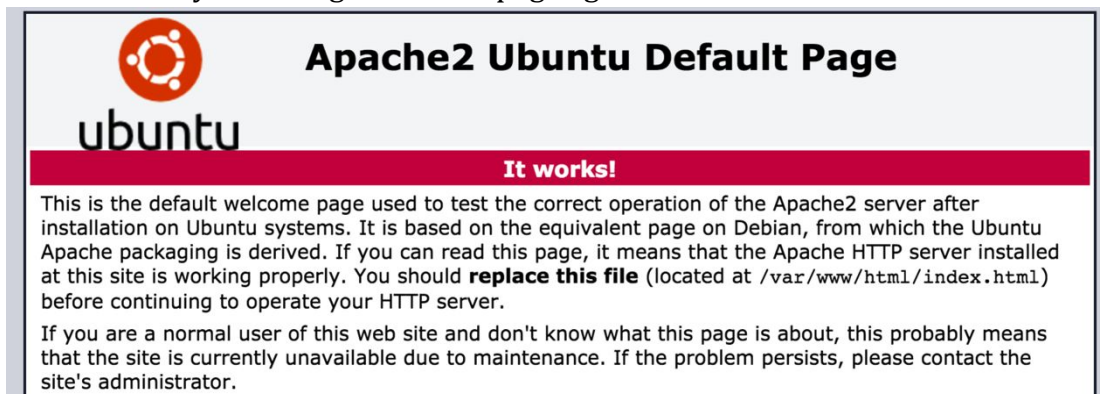
a. curl <http://localhost>

b. You should see a lot of HTML scroll by.

40. Now try browsing the server from your local machine. Find the Public IP address or Public DNS name and use that in a browser window.
41. It will timeout because we have not enabled port 80 (www) to be accessed. Go back to the EC2 dashboard, and choose **Security Groups** from the left hand menu.
42. Find the group that you created that uses your userid as the Group Name, select it, and then choose **Actions -> Edit Inbound rules**



43. Click **Add Rule**
44. Click on the drop down box that says "Custom TCP Rule" and change it to HTTP.
45. Click **Save**.
46. Now try browsing to the webpage again. You should see:



47. Congratulations!

## PART C – Using the AWS Command Line

48. The AWS Command Line (AWS CLI) is available as part of the Python PIP installed code. PIP is a package manager for Python.
49. In a fresh Ubuntu Terminal Window (*make sure you are not doing this on your cloud server by mistake!*)

a. Type:

```
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in  
/usr/local/lib/python2.7/dist-packages (from  
botocore==1.5.80->awscli) (0.9.3)  
Requirement already satisfied: pyasn1>=0.1.3 in  
/usr/local/lib/python2.7/dist-packages (from  
rsa<=3.5.0,>=3.1.2->awscli) (0.2.3)  
Requirement already satisfied: six>=1.5 in  
/usr/local/lib/python2.7/dist-packages (from  
python-dateutil<3.0.0,>=2.1->botocore==1.5.80->awscli)  
(1.10.0)
```

```
sudo pip install awscli
```

You should see log ending like:

This is because the it is already installed. Otherwise you will see:

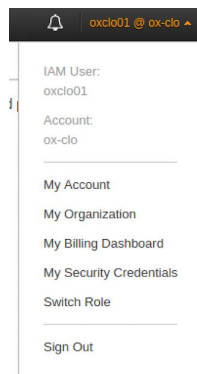
```
changing mode of /usr/local/bin/rst2s5.py to 755
changing mode of /usr/local/bin/rst2xetex.py to 755
changing mode of /usr/local/bin/rst2man.py to 755
changing mode of /usr/local/bin/rst2html.py to 755
Successfully installed awscli docutils botocore rsa jmespath python-dateutil pyasn1
Cleaning up...
```

50. Now you can configure the AWS command line with your credentials

51. First we need to create an Access Key and Secret Key for you. I could have printed one out for you, but that would be difficult to type in, so let's go create one in the AWS Console.

52. Go to the AWS Console

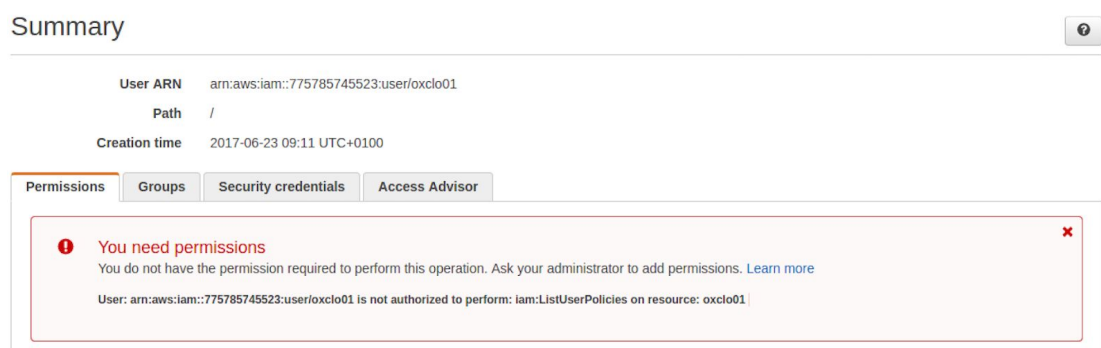
53. In the top right corner, click on your username, then choose **My Security Credentials:**



54. In the left hand menu choose **Users**

55. Click on your own userid

56. You should see something like



Scroll until you find: **Create Access Key**. Click on it. You will see:

Create access key

✓ Success

This is the **only** time that the secret access keys can be viewed or downloaded. You cannot recover them later. However, you can create new access keys at any time.

Download .csv file

Access key ID	Secret access key
AKIAIR34DT2HFSW73RQQ	***** Show

Close

57. Click **Download .csv file** and then **Save**

58. You can also click Show and then copy and paste these two token identifiers into a new text file

Create access key

✓ Success

This is the **only** time that the secret access keys can be viewed or downloaded. You cannot recover them later. However, you can create new access keys at any time.

Download .csv file

Access key ID	Secret access key
AKIAITJOR7ZIBCVCD5PA	GreasluQ9j3PzFD6uJ+HNACnfZimwOUyRo92RIP Hide

Close

***59. You need to make a note of these credentials or download them, because the secret key will not be available again.***

60. Now we can use these keys to configure the AWS CLI. Back in the terminal window where you installed the AWS CLI, type:

**aws configure**

- When prompted  
AWS Access Key ID [None]:

Type the Access Key ID from the text file or CSV (cut and paste)

- b. Do the same for the Secret Access Key.
- c. For the region choose Ireland: **eu-west-1**
- d. For the output format, type **json**

*Hint: You now have three credentials for AWS:*

- *Your userid/password*
- *An Access Key/Secret Key for controlling EC2/AWS through command line, third-party tools and apps, and any Web Service APIs*
- *An SSH Private Key pair for accessing the actual instances that you startup.*

61.

Now let's use the CLI to terminate your instance.

62. From the console (we could get this from the CLI too, but its complex to describe) copy the instance id of your running instance.

63. Now use the AWS CLI to terminate:

Replacing the instance ID with your own, type:

```
aws ec2 terminate-instances --instance-ids i-0b735618d9e69b35b
```

64. You should see log like:

```
aws ec2 terminate-instances --instance-ids i-0fa3d4032833ea933
{
  "TerminatingInstances": [
    {
      "InstanceId": "i-0fa3d4032833ea933",
      "CurrentState": {
        "Code": 32,
        "Name": "shutting-down"
      },
      "PreviousState": {
        "Code": 16,
        "Name": "running"
      }
    }
  ]
}
```

65. Your SSH session to the server will die, and the web site will no longer be running.

66. Congratulations! You have completed all three parts of this Lab.