

# Lab 4: AWS Security and Server Infrastructure

A demo of the basic setup of this lab is at: <https://youtu.be/GaMd8MaqBXA>

## A Outline

In previous labs we have set up a range of architectures with VMWare vSphere. This is a private cloud environment and creates infrastructure-as-a-service. Increasingly, we use the public cloud to build our information systems, and which reduces the cost in the investment in data centre costs, while providing the opportunity to quickly scale our server, network and data infrastructure. It is generally as pay-as-you-go model, and where we pay for CPU time, network bandwidth and data costs. The most popular public cloud provider is AWS (Amazon Web Services), and which provides EC2 (for compute), S3 (for data buckets), RDS (for databases) and AWS Network Firewall (for firewalls). Some of these services are outlined in Figure 1.

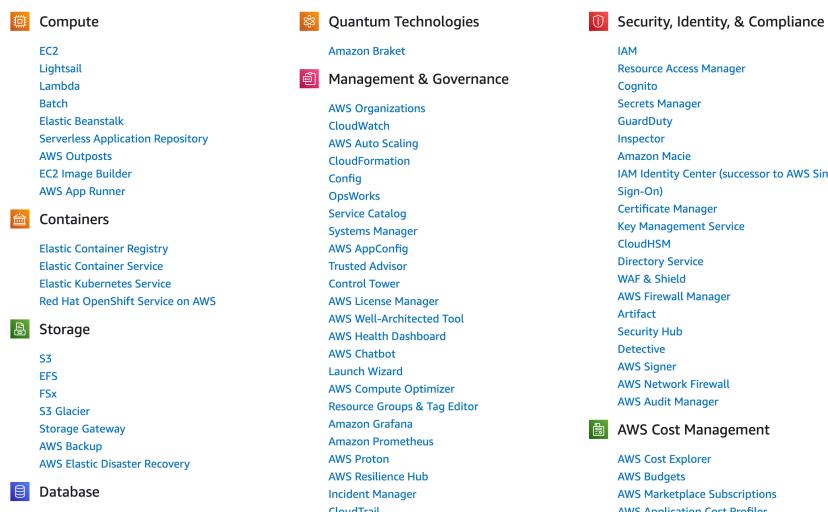


Figure 1: AWS Services

## B Enabling your lab

You should have an AWS Academy login, so go to: <https://awsacademy.instructure.com/> and log into the system and select **AWS Academy Learner Lab** (Figure 2).

AWS Academy Learner Lab - Foundation Services [28224]



This is the Edinburgh Napier University AWS Academy Learner Lab for CSN09112, and which has \$100 of credit for you to learn AWS Services. If you exceed your credit, you will lose your environment, so remember to switch your instances off when you are not using them. The lab session is four hours, but you can restart the lab again at any time. All EC2 instances will be shut off after the four hours are up. Do not end the lab, until we have finished with the module. Some resources are:

- Introduction to Cloud Computing: [here](#)
- A demo of setting up EC2 instances is [here](#).

Click [Modules](#) to start the course.

## Figure 2: AWS Academy Learner Lab

Next, select “Modules”, and then “Learner Lab - Foundational Services”, and should have the lab environment (Figure 3).

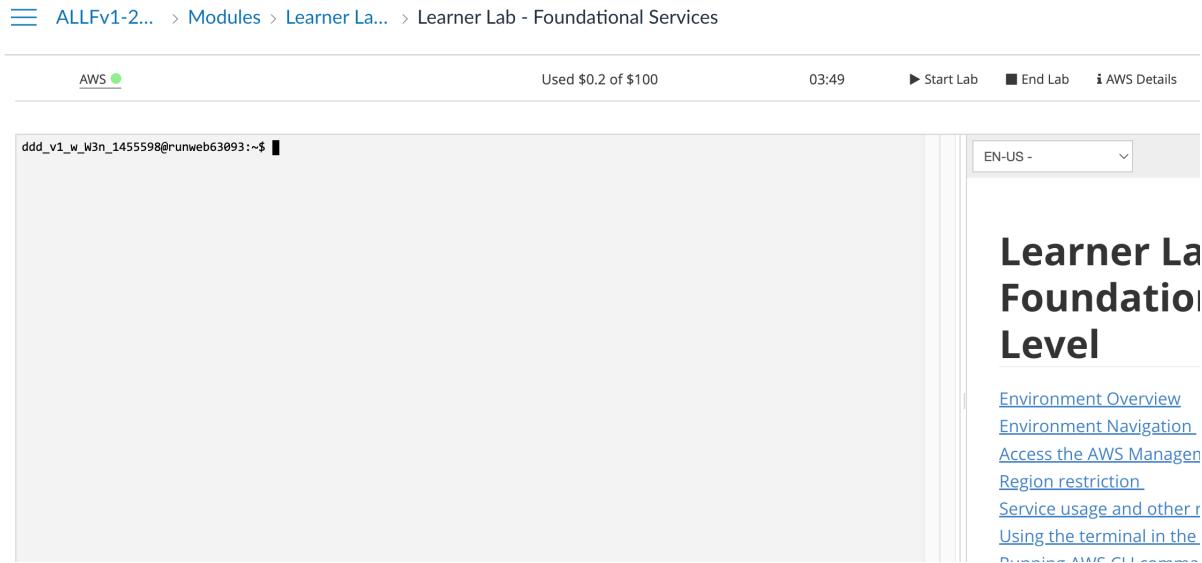


Figure 3: AWS Academy Learner Lab environment

Your unique account will have been generated, and you can access it with **aws\_access\_key\_id** and **aws\_secret\_access\_key** (from AWS details).

In the console you can interact with your AWS though the console (as you are already logged into AWS). Now, press the “Start Lab” button, and wait for the AWS light to go green. Once, green, you can click on it, and open up your AWS Management console. After this, just select EC2, and you should see your EC2 environment.

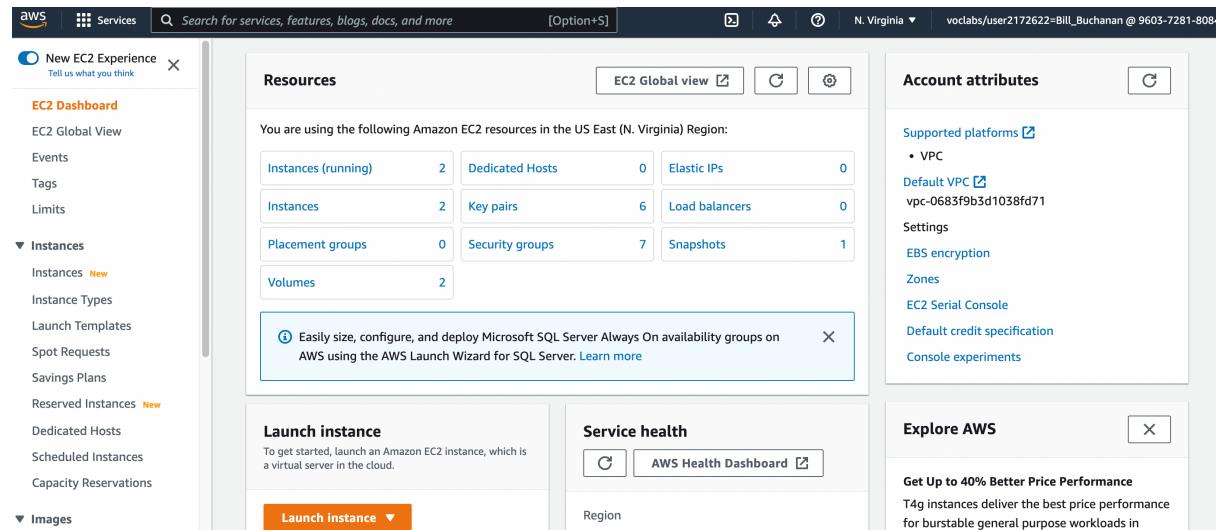
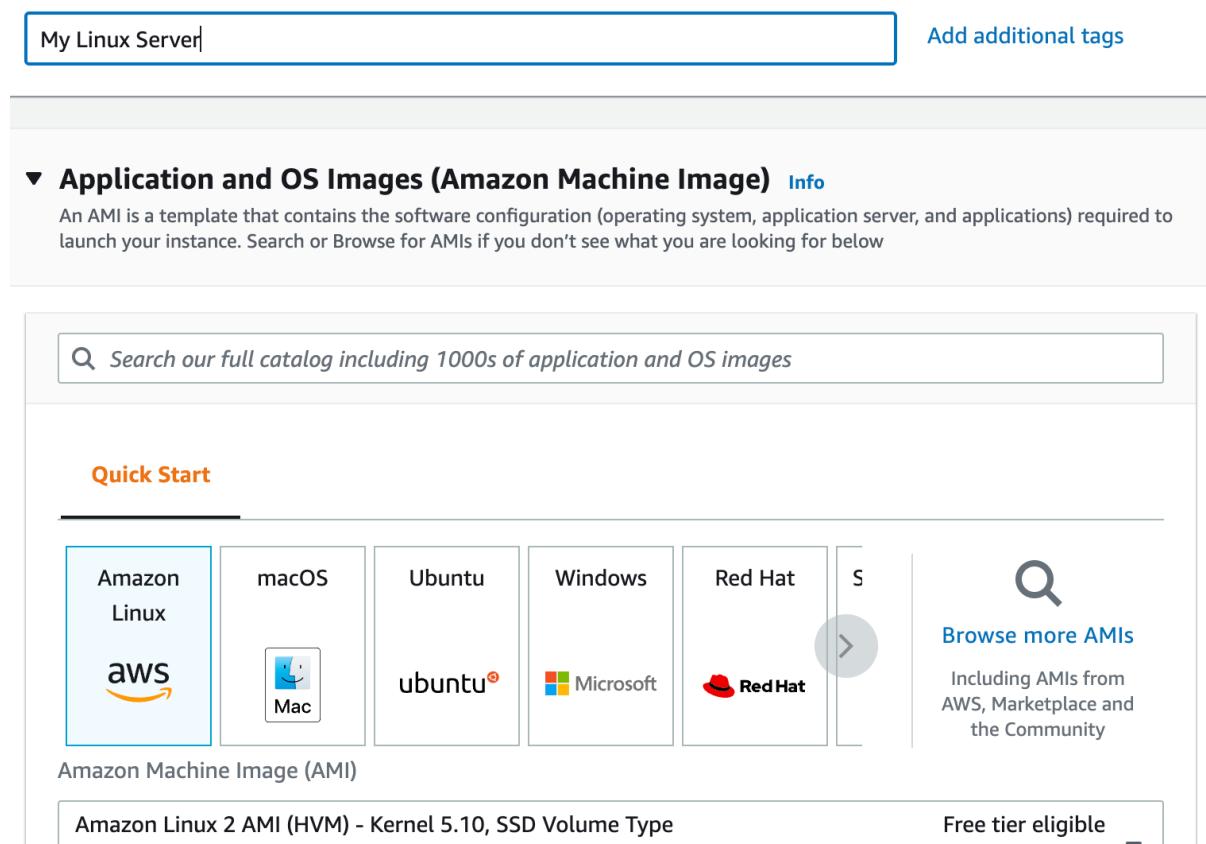


Figure 4: AWS Management Console (EC2)

## C Creating and Securing a Linux Server

We will now create a Linux Server, and which should be accessible from the Internet. For this select “Launch Instance”, and then give it a name (such as “My Linux Server”) and select the Amazon Linux instance for the AMI (Amazon Machine Instance) – as shown in Figure 5.



**Figure 5:** Creating Amazon Linux instance

Now select **t2.micro** for the instance type.

How many vCPUs will the instance have?

How much memory will it have?

How much will it cost per day to run?

If you selected, t2.medium, how much would it cost per day?

If you selected, t2.large, how much would it cost per day?

Now create a new key pair and save it to your local drive. This file contains your private key, and which you will need to connect to your instance. Accept all the other defaults.

Observe the **firewall group** that will be applied.

Which firewall ports are open on the instance?

What do you think is the main issue with this firewall setting?

How would you change it, once you have created the instance?

Observe the disk storage setting for the instance.

What type of disk will be used? [HDD/SSD]

What do you think is the advantage of using SSD?

For disk storage, what is the default size of the disk that you will create?

What is the maximum storage size for a free tier storage of the AMI instance we are creating?

### C.1 Creating the instance

Go ahead and create the instance. Then go back to the AWS Management Console, and find your instance. Wait for it to set its state to running.

Now we will connect to it. For this we need to create an SSH connection and use the private key we have generated. The public key will be stored on the instance and will authenticate our access. We do not need a username or password to access the instance, as this is often insecure. Our PEM file will give us access (or you can use Putty for the connection).

Now, we will examine the details of our instance (Figure 6). On the instance summary, determine the following:

The public IP address:

The private IP address:

The instance type:

The public IPv4 DNS:

From your local host, can you ping the public IP address? [Yes/No]

Why can't you successfully ping your instance?

Which region of the world is your instance running in?

## C.2 Enabling ICMP on firewall

Now, we will enable ICMP on the instance. First click on the Security tab of the instance summary, and then on the security group.

What is the firewall rule that is applied to the instance?

[SSH/Telnet/FTP/HTTP/HTTPPs] for [0.0.0.0/0 or 0.0.0.0/8 or 0.0.0.0/16 or 0.0.0.0/32]

What does 0.0.0.0/0 represent?

Now go ahead and add an ICMP rule for all hosts (Figure 7).

Can you now successfully ping your instance? [Yes/No]

Now, lock your ICMP rule down to just your IP address (you need to use a /32 address for this). Can you still successfully ping the instance? [Yes/No]

Ask your neighbour or one of the lab tutors to ping your instance. Can they successfully ping it? [Yes/No]

What is the advantage of applying the firewall in AWS, rather than in the instance?

The screenshot shows the AWS EC2 Instances page with the following details:

Instance summary for i-07b0512e24e263766 (MyLinuxServer)		
Instance ID	Public IPv4 address	Private IPv4 addresses
i-07b0512e24e263766 (MyLinuxServer)	52.90.3.121   <a href="#">open address</a>	172.31.16.186
IPv6 address	Instance state	Public IPv4 DNS
-	Pending	ec2-52-90-3-121.compute-1.amazonaws.com   <a href="#">open address</a>
Hostname type	Private IP DNS name (IPv4 only)	Elastic IP addresses
IP name: ip-172-31-16-186.ec2.internal	ip-172-31-16-186.ec2.internal	-
Answer private resource DNS name	Instance type	AWS Compute Optimizer finding
IPv4 (A)	t2.micro	Opt-in to AWS Compute Optimizer for recommendations.
Auto-assigned IP address	VPC ID	<a href="#">Learn more</a>
52.90.3.121 [Public IP]	vpc-0683f9b3d1038fd71	Auto Scaling Group name
IAM Role	Subnet ID	-
-	subnet-00bdb3e7927760f46	

At the bottom, the tabs are: Details (selected), Security, Networking, Storage, Status checks, Monitoring, Tags.

**Figure 6:** Details of instance

The screenshot shows the AWS Management Console interface for managing security group rules. The top navigation bar has tabs for 'Inbound rules', 'Outbound rules', and 'Tags'. Below the tabs, there's a message: 'You can now check network connectivity with Reachability Analyzer' with a 'Run Reachability Analyzer' button. The main area is titled 'Inbound rules (2)' and includes a search bar 'Filter security group rules'. A table lists the rules:

Name	Security group rule...	IP version	Type	Protocol	Port
-	sgr-0ed01ab1ba175fe5b	IPv4	SSH	TCP	22
-	sgr-04b533407d759a...	IPv4	All ICMP - IPv4	ICMP	All

**Figure 7:** Enable ICMP

### C.3 Accessing your instance

Now we will connect to our instance. For this you need SSH (such as provided by OpenSSH). This may be installed on the host you are using (such as in vSoC 2), or from Apps Anywhere. Once you have SSH, press **Connect** on the summary page, and you should then have tabs for **Connect to instance** (Figure 8). Next select the SSH client tab, and you will see the details of connecting to your instance with SSH.

The screenshot shows the 'Connect to instance' summary page for an Amazon Linux Server instance. The instance ID is listed as 'i-07b0512e24e263766 (MyLinuxServer)'. Below the instance ID, there are four tabs: 'EC2 Instance Connect', 'Session Manager', 'SSH client' (which is highlighted in orange), and 'EC2 serial console'.

- Instance ID  
 [i-07b0512e24e263766 \(MyLinuxServer\)](#)
1. Open an SSH client.
  2. Locate your private key file. The key used to launch this instance is `mynewkeypair.pem`
  3. Run this command, if necessary, to ensure your key is not publicly viewable.  
 `chmod 400 mynewkeypair.pem`
  4. Connect to your instance using its Public DNS:  
 `ec2-52-90-3-121.compute-1.amazonaws.com`

Example:

`ssh -i "mynewkeypair.pem" ec2-user@ec2-52-90-3-121.compute-1.amazonaws.com`

**Figure 8:** Connect to instance

Now find your PEM file on your local machine (from the command line), and protect it with:

`chmod 400 myfile.pem`

What protection does this put on your private key?

Next, use the SSH connection with the name of your PEM file and with the DNS (or IP address) for your instance. For example, in the case in Figure 8, we have:

`ssh -i "mynewkeypair.pem" ec2-user@ec2-52-90-3-121.compute-1.amazonaws.com`

What is the name of the user that logs in?

An example of connecting is:

```
% ssh -i "mynewkeypair.pem" ec2-user@ec2-52-90-3-121.compute-1.amazonaws.com
The authenticity of host 'ec2-52-90-3-121.compute-1.amazonaws.com (52.90.3.121)' 
can't be established.
ED25519 key fingerprint is SHA256:/c5UOK6gprKL19xCptNQ1brb9MpYR5wEeqhD/6t+/wk.
This host key is known by the following other names/addresses:
  ~/.ssh/known_hosts:48: ec2-3-90-189-201.compute-1.amazonaws.com
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-52-90-3-121.compute-1.amazonaws.com' (ED25519) to
the list of known hosts.
Last login: Fri Sep 30 17:07:00 2022 from ec2-18-206-107-27.compute-1.amazonaws.com
[ec2-user@ip-172-31-16-186 ~]$
```

\_T| (—|\_) / Amazon Linux 2 AMI  
\_\_| \\_\_\_|\_|

https://aws.amazon.com/amazon-linux-2/  
[ec2-user@ip-172-31-16-186 ~]\$

Have you managed to connect? [Yes/No]

By using “ip addr show” or “ifconfig” in your instance, what is the private IP address of it?

Can you ping 8.8.8.8 from your instance? [Yes/No]

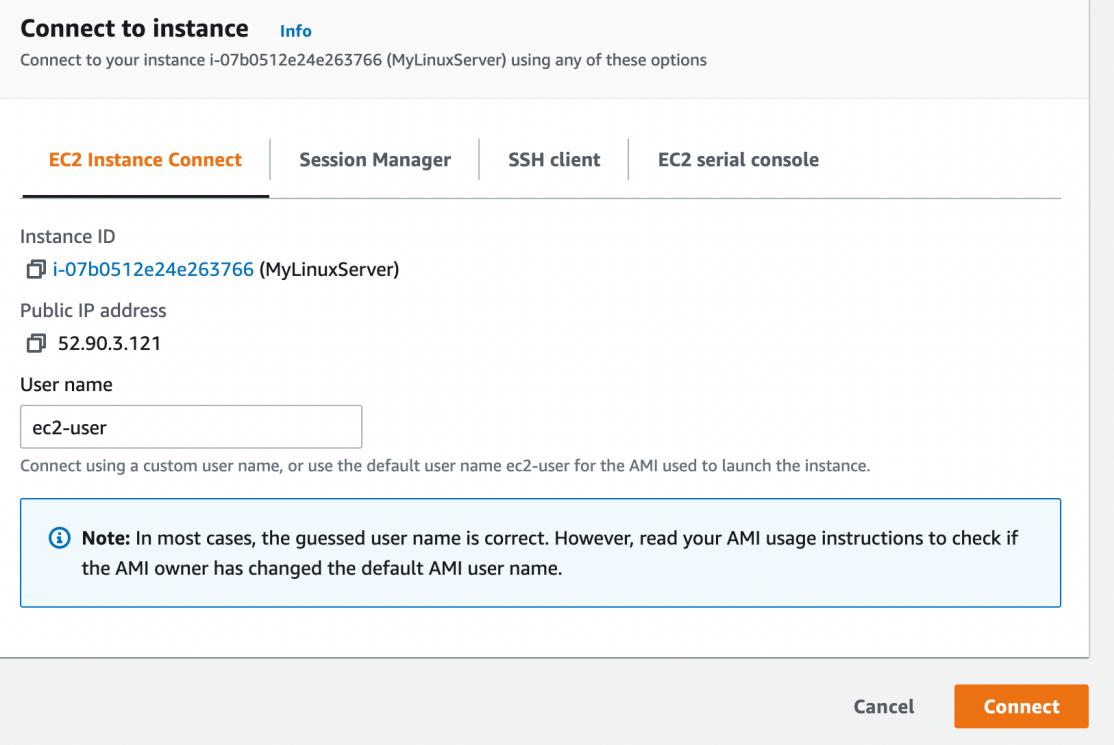
Is there a folder named .ssh? [Yes/No]

What do you think is the purpose of the file contained in .ssh?

Now create a folder in the top level named “mytestfolder”, and put a new file in there named “mytext.txt” (and put some text in this file).

Now go to the EC2 Instance Connect (Figure 8), and press on the Connect button. You should now get a console terminal in the browser.

From your console (Figure 9), verify that your file has been created. Has it been created in the instance? [Yes/No]



**Figure 9:** EC2 Instance Connect

The screenshot shows a terminal window titled 'Services' with the AWS logo. The search bar says 'Search for services, features, blogs, docs, and more' and has a keyboard shortcut '[Option+S]'. The terminal output shows a login session on an Amazon Linux 2 AMI instance. The user 'ec2-user' logs in from 'host86-131-160-187.range86-131.btcentralplus.com' at 'Sun Oct 2 11:39:05 2022'. The terminal then displays a file named 'mytext.txt' containing the word 'Test'.

```

aws | Services | Search for services, features, blogs, docs, and more [Option+S]
Last login: Sun Oct 2 11:39:05 2022 from host86-131-160-187.range86-131.btcentralplus.com
[ec2-user@ip-172-31-16-186 ~]$ cd mytestfolder/
[ec2-user@ip-172-31-16-186 mytestfolder]$ ls
mytext.txt
[ec2-user@ip-172-31-16-186 mytestfolder]$ cat mytext.txt
Test
[ec2-user@ip-172-31-16-186 mytestfolder]$ 
```

**Figure 10:** EC2 Instance Connect terminal

Now examine the running services on the instance with:

```
$ netstat -i | grep tcp
$ netstat -i | grep udp
```

Which of the main services are running:

#### C.4 Installing a Web server

Now we will install a Web server on the instance with:

```

sudo yum update -y
sudo yum install -y httpd.x86_64
sudo systemctl start httpd.service
sudo systemctl enable httpd.service

```

Next open up a browser on your computer and access your instance for Web access.

Can you connect to it? [Yes/No]

Why can't you connect to it?

Now enable a firewall rule on Port 80 and Port 443 and allow access for Web traffic (see Figure 10).

Inbound rules <a href="#">Info</a>						
Security group rule ID	Type <a href="#">Info</a>	Protocol <a href="#">Info</a>	Port range <a href="#">Info</a>	Source <a href="#">Info</a>	Description - optional <a href="#">Info</a>	
sgr-0ed01ab1ba175fe5b	SSH	TCP	22	Custom ▾	<input type="text"/> 0.0.0.0/0 <span style="color: red;">X</span>	<a href="#">Delete</a>
sgr-04b533407d759a286	All ICMP - IPv4	ICMP	All	Anywh... ▾	<input type="text"/> 0.0.0.0/0 <span style="color: red;">X</span>	Ping <a href="#">Delete</a>
-	HTTPS	TCP	443	Anywh... ▾	<input type="text"/> 0.0.0.0/0 <span style="color: red;">X</span>	All access to Web server <a href="#">Delete</a>
-	HTTP	TCP	80	Anywh... ▾	<input type="text"/> 0.0.0.0/0 <span style="color: red;">X</span>	All access to Web server <a href="#">Delete</a>

**Figure 11:** Enable HTTP and HTTPS rules

Can you now connect to your Web site? [Yes/No] (see Figure 11)

The screenshot shows a web browser window with the address bar displaying "Not Secure | 52.90.3.121". The main content area has a red header bar with the text "Test Page". Below the header, there is a message: "This page is used to test the proper operation of the Apache HTTP server after it has been installed. If you can read this page, it means that the Apache HTTP server installed at this site is working properly." There are two sections of text: "If you are a member of the general public:" and "If you are the website administrator:". The "general public" section says, "The fact that you are seeing this page indicates that the website you just visited is either experiencing problems, or is undergoing routine maintenance." It also suggests sending email to "webmaster@example.com". The "website administrator" section says, "You may now add content to the directory /var/www/html/. Note that until you do so, people visiting your website will see this page, and not your content. To prevent this page from ever being used, follow the instructions in the file /etc/httpd/conf.d/welcome.conf." It also says, "You are free to use the image below on web sites powered by the Apache HTTP Server." Below this text is the Apache logo with the text "Powered by APACHE 2.4".

**Figure 12:** Sample access to Web site

Now go into the /var/www folder, and create a file named “index.html”, and add:

```

<h1>Main web site</h1>
<p>Hello to you</p>

```

And then save the file.

Has it changed the welcome? [Yes/No]

## C.6 Auditing

The main logging output is in the /var/log folder. Go into this folder and observe some of the files in there. Identify the contents of the following files:

What are the likely contents of the “secure” file?

What are the likely contents of the “boot.log” file?

List the log/httpd/access\_log file. What are its contents? Can you identify your browser access? (see Figure 12). Which browser type accessed your Web server?

Now try with another browser type (such as Firefox or Chrome) and re-examine the log/httpd/access\_log file. Did it detect the new browser type?

Now access a file that does not exist in your site (such as http://AWSIP/test.htm). Now re-examine the log/httpd/access\_log file. What is the status code returned for the access?

```
e/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:11:56:24 +0000] "GET /icons/apache_pb2.gif HTTP/1.1" 200 13 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:11:56:24 +0000] "GET /favicon.ico HTTP/1.1" 404 52.90.3.121/- Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:11:58:16 +0000] "-" 408 "-" "-"
187 - - [02/Oct/2022:12:22 +0000] "GET / HTTP/1.1" 200 13 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:12:19:53 +0000] "GET / HTTP/1.1" 200 13 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:12:19:53 +0000] "GET /favicon.ico HTTP/1.1" 404 52.90.3.121/- Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:12:19:54 +0000] "GET / HTTP/1.1" 304 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
187 - - [02/Oct/2022:12:19:56 +0000] "GET / HTTP/1.1" 304 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36"
```

Figure 13: Sample list of log/httpd/access\_log

## C.7 Adding a new user

The ec2\_user can be used to connect back into the server using access authenticated with the private key. We will now create a new user named “napier”, and which can connect to the instance with SSH. For this we use adduser and passwd on the Linux instance:

```
[ec2-user@ip-172-31-16-186 ~]$ sudo adduser napier
[ec2-user@ip-172-31-16-186 ~]$ sudo passwd napier
```

```
Changing password for user napier.  
New password: <yourpass>  
Retype new password: <yourpass>  
passwd: all authentication tokens updated successfully.
```

Now we will add the new user to the login. For this, we use:

```
[ec2-user@ip-172-31-16-186 .ssh]$ sudo nano /etc/ssh/sshd_config  
Add line of (see Figure 13):  
AllowUsers ec2-user napier  
Change the following to "yes" (see Figure 14):  
PasswordAuthentication yes
```

Now restart the SSH service with:

```
[ec2-user@ip-172-31-16-186 .ssh]$ sudo systemctl restart sshd
```

Can you now connect to your instance with the new user and password:

```
ssh napier@54.209.145.85
```

Can you connect with the new user? [Yes/No]

```
#      $OpenBSD: sshd_config,v 1.100 2016/08/15 12:32:04 naddy Exp $  
AllowUsers ec2-user napier  
# This is the sshd server system-wide configuration file. See  
# sshd_config(5) for more information.  
  
# This sshd was compiled with PATH=/usr/local/bin:/usr/bin  
  
# The strategy used for options in the default sshd_config shipped with
```

Figure 14: Accessing instances

```
# To disable tunneled clear text passwords, change to no here!  
#PasswordAuthentication yes  
#PermitEmptyPasswords no  
PasswordAuthentication yes  
  
# Change to no to disable s/key passwords  
#ChallengeResponseAuthentication yes  
ChallengeResponseAuthentication no
```

Figure 15: Accessing instances

## C.8 Accessing from AWS prompt

We can also access our instance from the AWS terminal prompt. For this return to your AWS Academy console, and enter the command (Figure 15):

```
$ aws ec2 describe-instances
```

From the results, can you identify the following.

Instance type:

Public IP address:

Private IP address:

State:

```
ddd_v1_w_W3n_1455598@runweb63093:~$ aws ec2 describe-instances
{
    "Reservations": [
        {
            "Groups": [],
            "Instances": [
                {
                    "AmiLaunchIndex": 0,
                    "ImageId": "ami-026b57f3c383c2eec",
                    "InstanceId": "i-07b0512e24e263766",
                    "InstanceType": "t2.micro",
                    "KeyName": "mynewkeypair",
                    "LaunchTime": "2022-10-02T11:14:16+00:00",
                    "Monitoring": {
                        "State": "disabled"
                    },
                    "Placement": {
                        "AvailabilityZone": "us-east-1b",
                        "GroupName": "",
                        "Tenancy": "default"
                    },
                    "PrivateDnsName": "ip-172-31-16-186.ec2.internal",
                    "PrivateIpAddress": "172.31.16.186",
                    "ProductCodes": [],
                    "PublicDnsName": "ec2-52-90-3-121.compute-1.amazonaws.com",
                    "PublicIpAddress": "52.90.3.121",
                    "State": {
                        "Code": 16,
                        "Name": "running"
                    },
                    "StateTransitionReason": "",
                    "SubnetId": "subnet-00bdb3e7927760f46",
                    "VpcId": "vpc-0683f9b3d1038fd71",
                    "Architecture": "x86_64"
                }
            ]
        }
    ]
}
```

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**Figure 16:** Accessing instances

Now try we will stop our instance using an AWS EC2 command. Run the following with your instance ID (see Figure 17):

```
aws ec2 stop-instances --instance-ids [My-instance-ID]
```

From the AWS Management Console, has your instance stopped? [Yes/No]

```
ddd_v1_w_W3n_1455598@runweb62964:~$ aws ec2 stop-instances --instance-ids i-07b0512e24e263766
{
  "StoppingInstances": [
    {
      "CurrentState": {
        "Code": 64,
        "Name": "stopping"
      },
      "InstanceId": "i-07b0512e24e263766",
      "PreviousState": {
        "Code": 16,
        "Name": "running"
      }
    }
  ]
}
ddd_v1_w_W3n_1455598@runweb62964:~$ █
```

**Figure 17:** Stopping an instance

Now we will restart the instance, with:

```
aws ec2 start-instances --instance-ids [My-instance-ID]
```

Has the instance re-started? [Yes/No]

Now we will change the instance type from t3.micro to t3.small. To do this, run the following commands:

```
aws ec2 stop-instances --instance-ids [My-instance-ID]
aws ec2 wait instance-stopped --instance-ids [My-instance-ID]
aws ec2 modify-instance-attribute --instance-id [My-instance-ID] --instance-type "{\"Value\": \"t3.small\"}"
aws ec2 start-instances --instance-ids [My-instance-ID]
```

Did it change the instance type? [Yes/No]

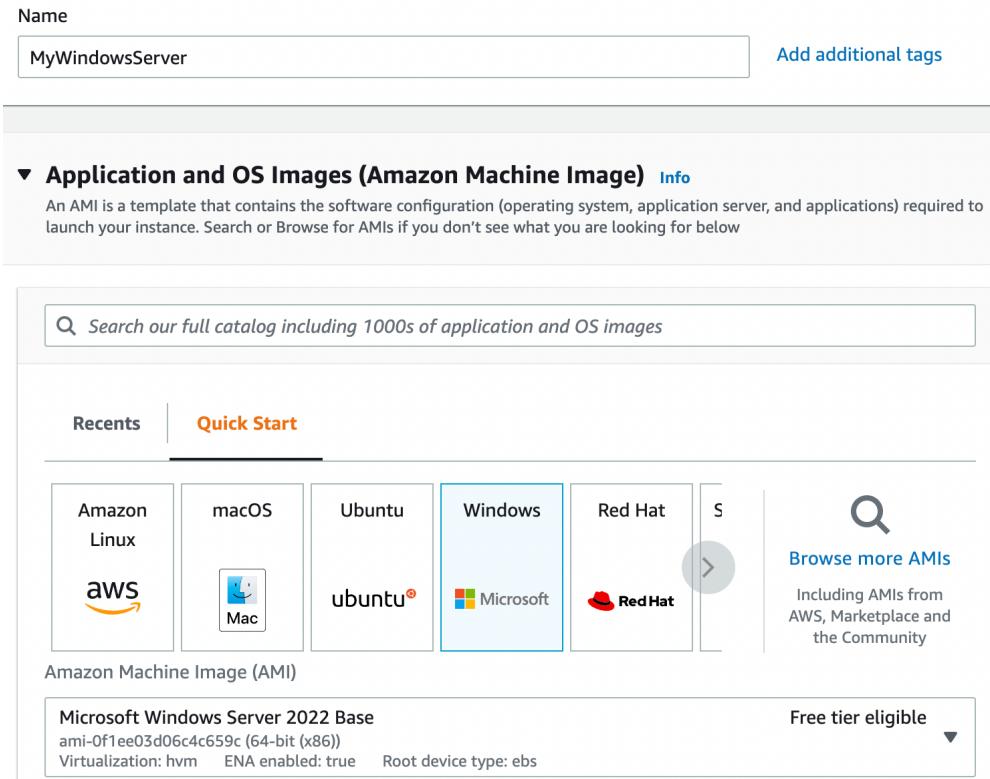
Can you still get access to your instance?

By observing the script, and investigate what t3.micro and t3.small are, can you determine what has changed about your instance?

Now, revert the instance back to t3.micro, and suspend the instance.

## D Creating and Securing a Windows 2022 Server

In this part of the lab we will create a Windows 2022 server instance with t3.micro (note, that this is very low for vCPUs and memory, so the performance may be a little lacking). First create a new instance, and give it a name, such as “MyWindowsServer” (Figure 17).



**Figure 18:** Creating Windows 2022 instance

Now select **t2.micro** for the instance type.

How many vCPUs will the instance have?

How much memory will it have?

How much will it cost per day to run?

If you selected, t2.medium, how much would it cost per day?

If you selected, t2.large, how much would it cost per day?

Now create a new key pair and save it to your local drive. This file contains your private key, and which you will need to connect to your instance. Accept all the other defaults.

Observe the firewall group that will be applied.

Which firewall ports are open on the instance?

What is the main issue with this firewall setting?

How would you change it, once you have created the instance?

Observe the disk storage setting for the instance.

What type of disk will be used? [HDD/SSD]

What is the advantage of using SSD?

For disk storage, what is the size of the disk that you will create?

What is the maximum storage size for a free tier storage of the AMI instance we are creating?

### D.1 Creating the instance

Go ahead and create the instance. Go back to the Management Console and find your instance. Wait for it to set its state to running. Now we will connect to it. For this we need to create an RDP connection, and use the private key we have generated to generate the initial password.

Now, we will examine the details of our instance (Figure 18). On the instance summary, determine the following:

The public IP address:

The private IP address:

The instance type:

The public IPv4 DNS:

From your local host, can you ping the public IP address? [Yes/No]

Why can't you successfully ping your instance?

Which region of the world is your instance running in?

### D.2 Enabling ICMP on firewall

Now we will enable ICMP on the instance. First click on the Security tab of the instance summary, and then on the security group.

What is the firewall rule that is applied to the instance?

[SSH/RDP/Telnet/FTP/HTTP/HTTPs] for [0.0.0.0/0 or 0.0.0.0/8 or 0.0.0.0/16 or 0.0.0.0/32]

What does 0.0.0.0/0 represent?

Now go ahead and add an ICMP rule for all hosts (Figure 19).

Can you now successfully ping your instance? [Yes/No]

We will not be able to ping the instance yet, as the firewall on Windows is disabling it.

Instance summary for i-07d723258364f7172 (MyWindowsServer)		
Updated less than a minute ago		
Instance ID i-07d723258364f7172 (MyWindowsServer)	Public IPv4 address 54.83.154.0   <a href="#">open address</a>	Private IPv4 addresses 172.31.85.24
IPv6 address -	Instance state <span style="color: green;">Running</span>	Public IPv4 DNS ec2-54-83-154-0.compute-1.amazonaws.com   <a href="#">open address</a>
Hostname type IP name: ip-172-31-85-24.ec2.internal	Private IP DNS name (IPv4 only) ip-172-31-85-24.ec2.internal	Elastic IP addresses -
Answer private resource DNS name IPv4 (A)	Instance type t2.micro	AWS Compute Optimizer finding <small>Opt-in to AWS Compute Optimizer for recommendations.</small> <a href="#">Learn more</a>
Auto-assigned IP address 54.83.154.0 [Public IP]	VPC ID vpc-0683f9b3d1038fd71	Auto Scaling Group name -
IAM Role -	Subnet ID subnet-07a3be17bcc59528b	
<a href="#">Details</a>   <a href="#">Security</a>   <a href="#">Networking</a>   <a href="#">Storage</a>   <a href="#">Status checks</a>   <a href="#">Monitoring</a>   <a href="#">Tags</a>		

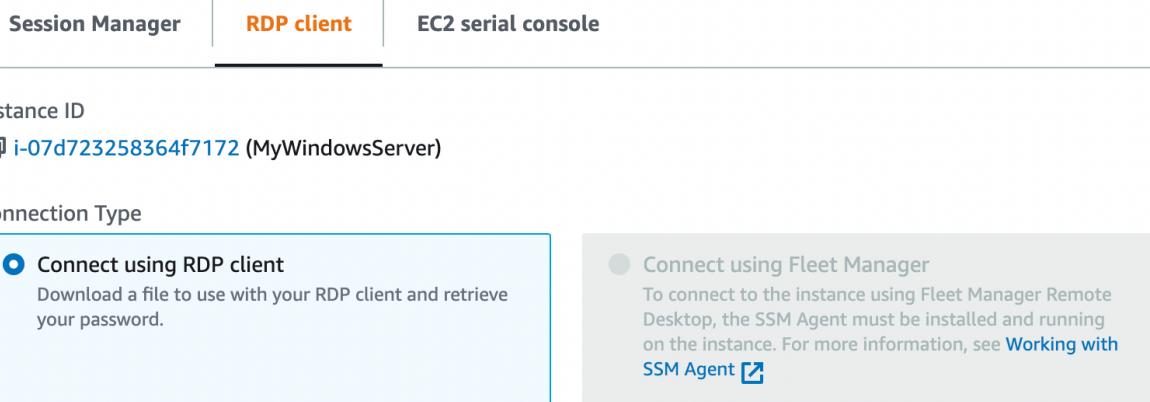
**Figure 19:** Details of instance

Inbound rules <a href="#">Info</a>						
Security group rule ID	Type <a href="#">Info</a>	Protocol <a href="#">Info</a>	Port range <a href="#">Info</a>	Source <a href="#">Info</a>	Description - optional <a href="#">Info</a>	
sgr-0101b70fb7c795a97	RDP	TCP	3389	Custom ▾	<input type="text"/> 0.0.0.0/0 <span style="color: blue;">X</span>	<span style="border: 1px solid #ccc; padding: 2px 10px;">Delete</span>
-	Custom ICMP - IPv4	All	All	Anywh... ▾	<input type="text"/> Ping All <span style="color: blue;">X</span>	<span style="border: 1px solid #ccc; padding: 2px 10px;">Delete</span>

**Figure 20:** Enable ICMP

### D.3 Accessing your instance

Now we will connect to our instance. For this you need RDP. Next Connect to instance (Figure 20). Click on “Get password” and present your PEM file, and it should reveal the password (Figure 21).



You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

[Download remote desktop file](#)

When prompted, connect to your instance using the following details:

Public DNS

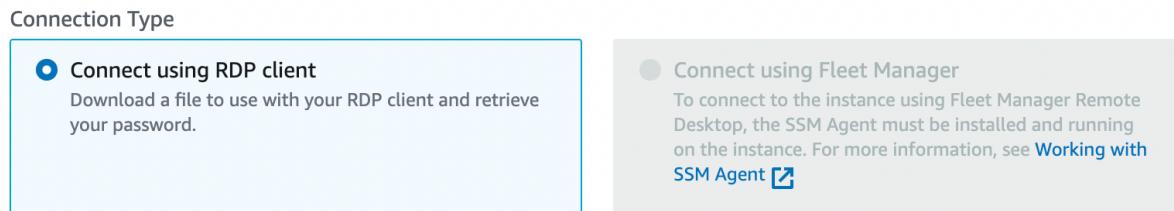
ec2-54-83-154-0.compute-1.amazonaws.com

User name

Administrator

Password [Get password](#)

**Figure 21:** Connect to instance



You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

[Download remote desktop file](#)

When prompted, connect to your instance using the following details:

Public DNS

ec2-54-83-154-0.compute-1.amazonaws.com

User name

Administrator

Password

7s8l-G?Jzzh;Lb8%KyGdmn6JwqReoRF-

**Figure 21:** Reveal password

Have you managed to connect? [Yes/No] (Figure 22)

By using “ipconfig” in your instance, what is the private IP address of it?

Can you ping 8.8.8.8 from your instance? [Yes/No]

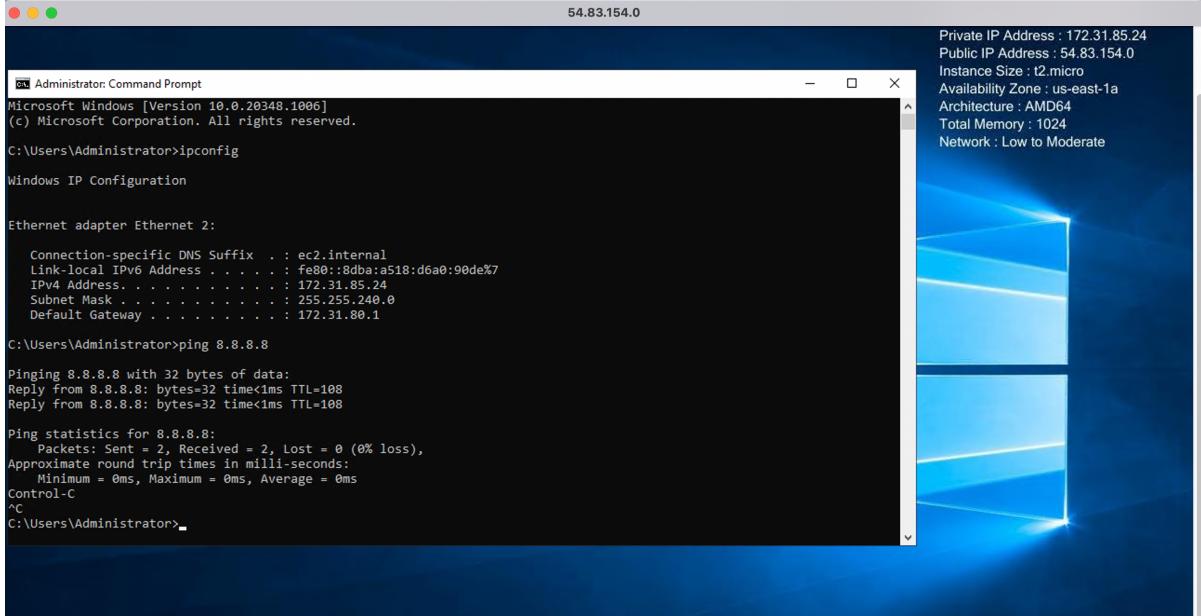


Figure 22: Windows 2022

#### D.4 Enable ICMP on instance

We have enabled the AWS firewall for ICMP. Now we will open-up ICMP in the instance. For this open-up with Advanced Windows firewall, and enable the rule for “File and Printer Sharing (ICMP-in) – as shown in Figure 23.

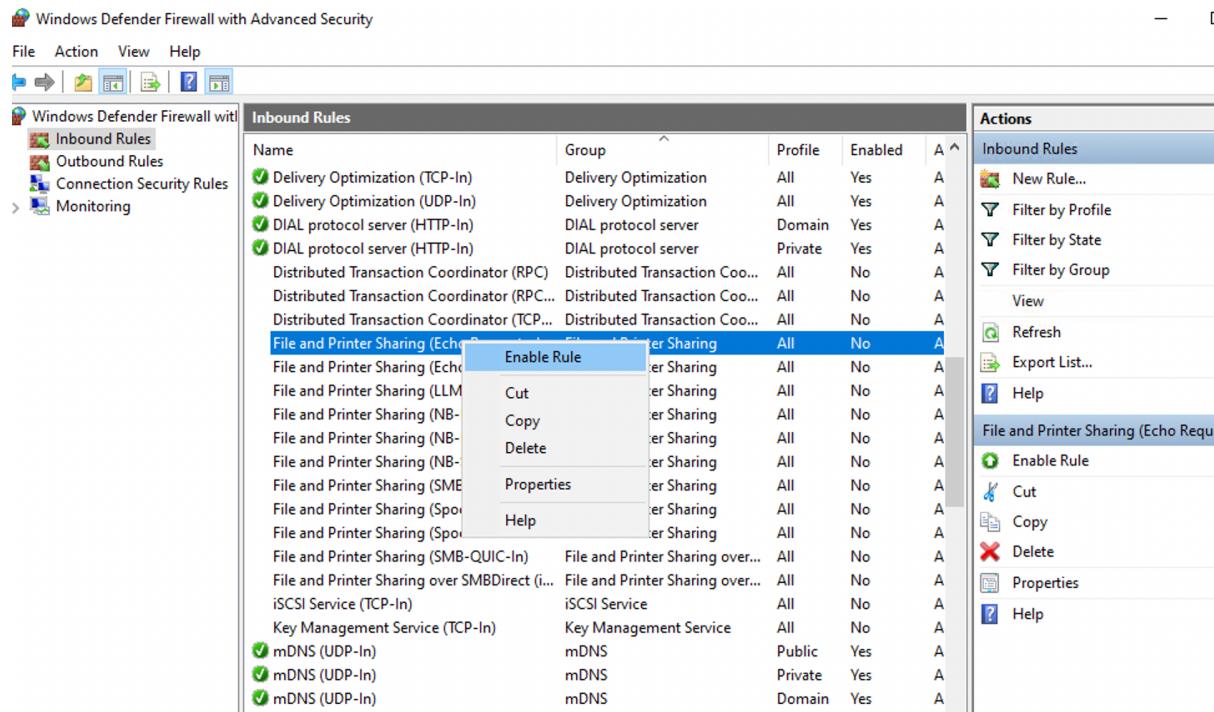


Figure 23: Enable ICMP

Can you successfully ping the instance from your instance? [Yes/No]

## D.5 Show running services

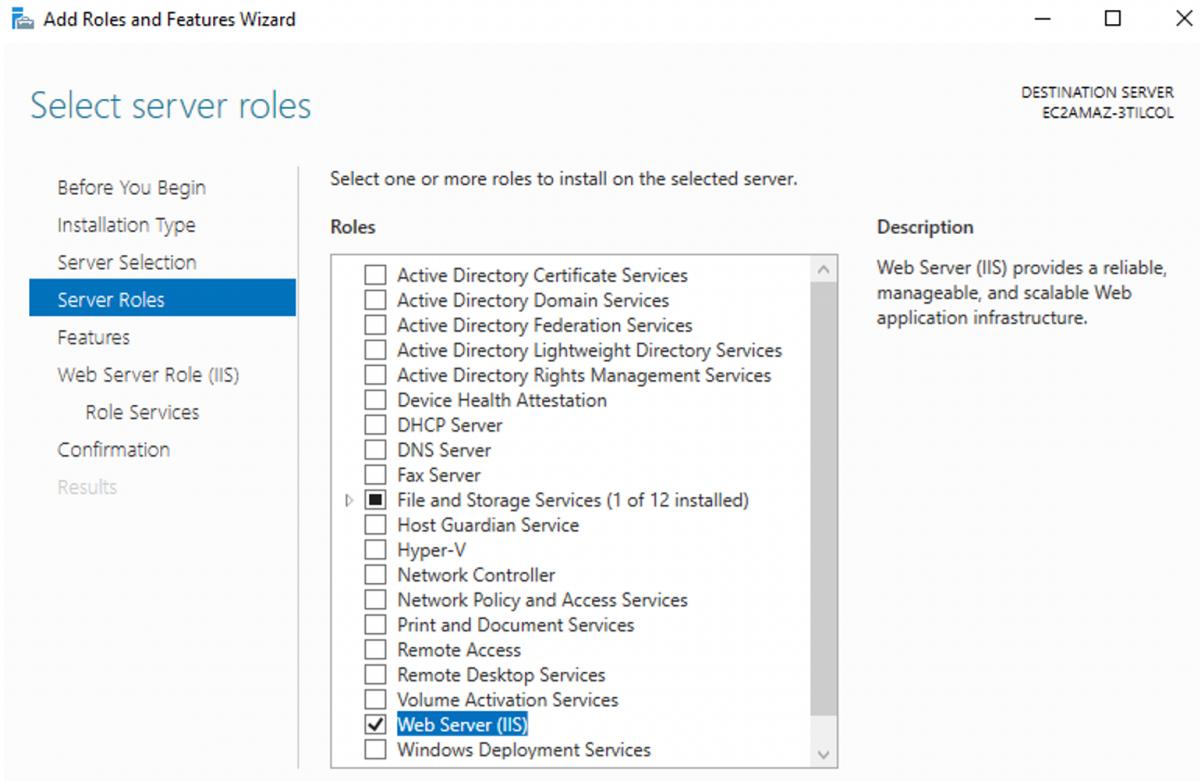
Now examine the running services on the instance with:

```
$ netstat -i | grep tcp
$ netstat -i | grep udp
```

Which of the main services are running:

## D.6 Enable Web server

Now select Server Manage, and “Add a Role” for Web Server (IIS) (Figure 24).



**Figure 24:** Enable Web Server

Now open a browser on the instance, and access <http://localhost>

Can you connect to the IIS Web server? [Yes/No] (see Figure 25)

Now open up your AWS firewall for Port 80 (Figure 25).

Inbound rules <a href="#">Info</a>						
Security group rule ID	Type <a href="#">Info</a>	Protocol <a href="#">Info</a>	Port range <a href="#">Info</a>	Source <a href="#">Info</a>	Description - optional <a href="#">Info</a>	
sgr-088cf5bfd7b0741f4	All ICMP - IPv4	ICMP	All	Custom ▾	<input type="text" value="0.0.0.0"/> X	<input type="button" value="Ping All"/>
sgr-0101b70fb7c795a97	RDP	TCP	3389	Custom ▾	<input type="text" value="0.0.0.0"/> X	<input type="button" value="Delete"/>
-	HTTP	TCP	80	Anywh... ▾	<input type="text" value="0.0.0.0"/> X	<input type="button" value="Web"/>

**Figure 25:** Enable HTTP

Now open a browser on the instance, and access [http://\[IP of AWS\]](http://[IP of AWS])

Can you connect to the IIS Web server? [Yes/No] (Figure 27)

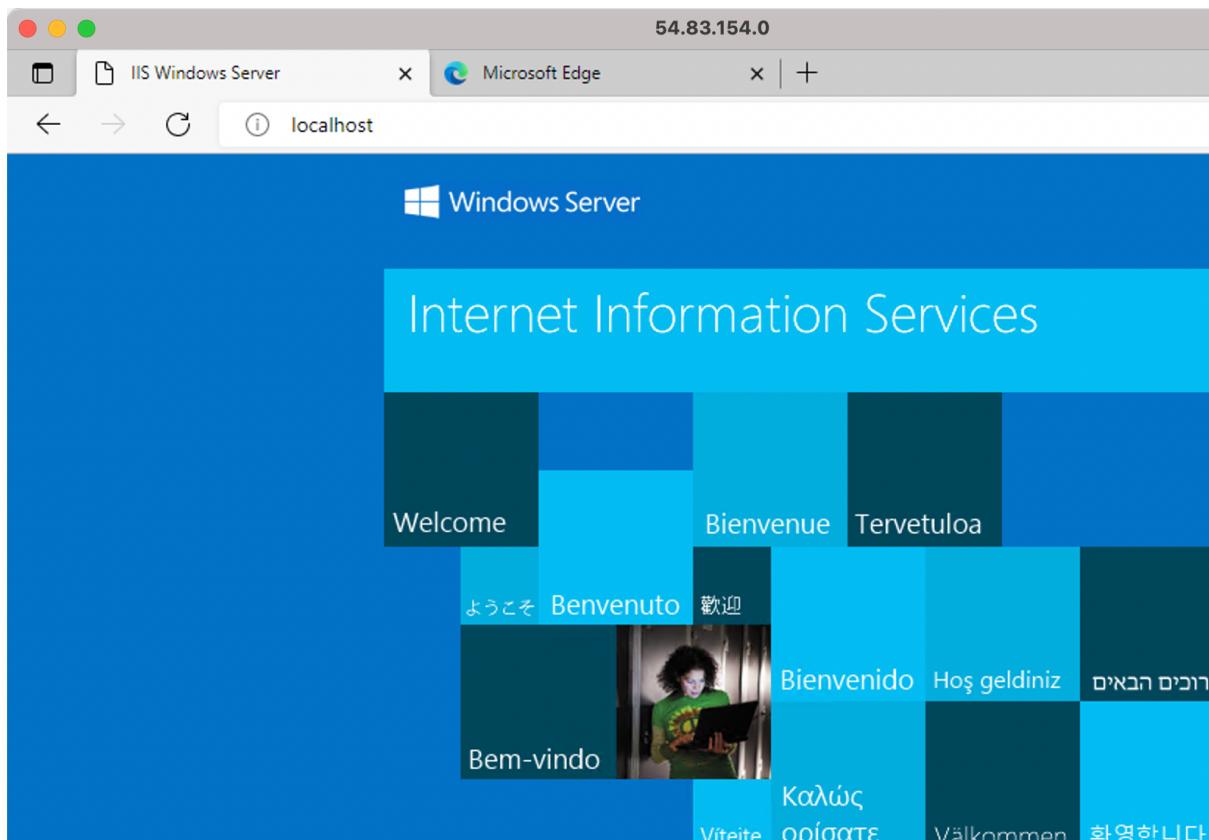


Figure 26: Local host

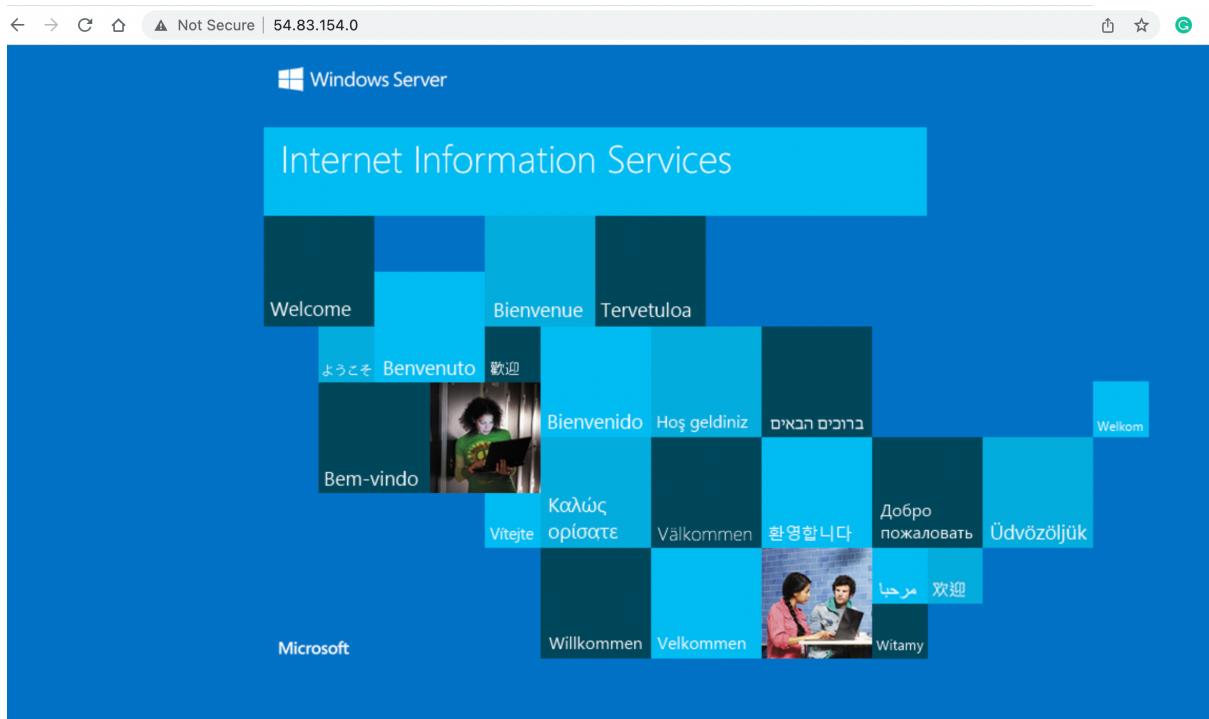


Figure 27: Remote access

Now go into the /inetpub/www folder, and create a file named “iisstart.html”, and add:

```
<h1>Main web site</h1>
```

```
<p>Hello to you</p>
```

And then save the file.

Has it changed the welcome? [Yes/No]

## D.7 Auditing

The main logging output is in the “C:\inetpub\logs\LogFiles\W3SVC1” folder. Identify the contents of the following files:

Go into the “C:\inetpub\logs\LogFiles\W3SVC1” folder, and list the file in there. What are its contents? Can you identify your browser access? Which browser type accessed your Web server?

Now try with another browser type, and re-examine the log/httpd/access\_log file. Did it detect the new browser type?

Now access a file that does not exist in your site (such as http://AWSIP/test.htm). Now re-examine the file. What is the status code returned for the access?

## D.8 Changing Administrator password

We can change the Administrator password, with something like:

```
net user administrator mynewpassword$$7k1
```

## E Python Access

Your unique account will have been generated, and you can access it with **aws\_access\_key\_id** and **aws\_secret\_access\_key** (from AWS details). You will also find that your console has been setup with the details already setup for you. For this, there is a hidden folder named **.aws**, and there is a file named **credentials** in there:

```
ddd_v1_w_W3n_1455598@runweb63277:~$ ls -al
drwxrwx--- 5 ddd_v1_w_W3n_1455598 apache          6144 Oct  2 10:13 .
drwxrwx--- 5 ddd_v1_w_W3n_1455598 apache          6144 Sep 29 10:32 ..
dr-xr-xr-x  2 ddd_v1_w_W3n_1455598 apache          6144 Sep 29 12:08 .aws
-rw-rw-r--  1 ddd_v1_w_W3n_1455598 apache          51 Sep 29 10:32 .gitconfig
drwxr-x--- 2 ddd_v1_w_W3n_1455598 apache          6144 Sep 29 12:08 .ssh
-rw-r--r--  1 root           root            3851 Oct  4 02:44 .termrc
dr-xr-xr-x  2 root           root            6144 Sep 29 10:32 .voc
ddd_v1_w_W3n_1455598@runweb63277:~/ .aws$ cd .aws
ddd_v1_w_W3n_1455598@runweb63277:~/ .aws$ ls -al
dr-xr-xr-x  2 ddd_v1_w_W3n_1455598 apache 6144 Sep 29 12:08 .
drwxrwx--- 5 ddd_v1_w_W3n_1455598 apache 6144 Oct  2 10:13 ..
-r--r--r--  1 ddd_v1_w_W3n_1455598 apache 29 Oct  4 00:19 config
-r--r--r--  1 ddd_v1_w_W3n_1455598 apache 501 Oct  4 00:19 credentials
ddd_v1_w_W3n_1455598@runweb63277:~/ .aws$ cat credentials
```

List the contents of the credentials file, and verify that it contains the same credentials as from the AWS details button.

Are they the same? [Yes/No]

Now create a Python file which will show your instances in the terminal window (such as 1.py):

```
import boto3
ec2 = boto3.client('ec2', region_name='us-east-1')
ec2.describe_instances()
```

The screenshot shows the AWS Cloud9 interface. At the top, it says "AWS" with a green dot, "Used \$0.6 of \$100", "01:13", and a "Start L" button. Below this is a terminal window titled "GNU nano 2.5.3" with the file name "File: 1.py". The code in the terminal is:

```
import boto3
ec2 = boto3.client('ec2', region_name='us-east-1')
print(ec2.describe_instances())
```

At the bottom of the terminal window, there are various nano editor key bindings:

- [ Read 4 lines ]
- ^G Get Help    ^O Write Out    ^W Where Is    ^K Cut Text    ^J Justify    ^C Cur Pos    ^Y Prev Page    M-\ First Line
- ^X Exit    ^R Read File    ^\ Replace    ^U Uncut Text    ^T To Linter    ^A Go To Line    ^V Next Page    M-/ Last Line

**Figure 28:** Python file creation

Save the file, and then run the file with Python3 and prove that it shows your instances (see Figure 29).

The screenshot shows the AWS Cloud9 interface with the same header as Figure 28. Below the terminal window, the output of running the script is shown:

```
ddd_v1_w_W3n_1455598@runweb63277:~$ python3 1.py
[{"Reservations": [{"Groups": [], "Instances": [{"AmiLaunchIndex": 0, "ImageId": "ami-0f1ee03d06c4c659c", "InstanceId": "i-07d723258364f7172", "InstanceType": "t2.micro", "KeyName": "mynewkeypair", "LaunchTime": datetime.datetime(2022, 10, 4, 7, 19, 13, tzinfo=tzutc()), "Monitoring": {"State": "disabled"}, "Placement": {"AvailabilityZone": "us-east-1a", "GroupName": "", "Tenancy": "default"}, "Platform": "windows", "PrivateDnsName": "ip-172-31-85-24.ec2.internal", "PrivateIpAddress": "172.31.85.24", "ProductCodes": [], "PublicDnsName": "", "State": {"Code": 80, "Name": "stopped"}, "StateTransitionReason": "User initiated (2022-10-04 08:19:39 GMT)", "SubnetId": "subnet-07a3be17bcc59528b", "VpcId": "vpc-0683f9b3d1038fd71", "Architecture": "x86_64", "BlockDeviceMappings": [{"DeviceName": "/dev/sda1", "Ebs": {"AttachTime": datetime.datetime(2022, 10, 2, 17, 31, 2, tzinfo=tzutc()), "DeleteOnTermination": True, "Status": "attached", "VolumeId": "vol-0b6340bf864d2e1fa"}]}, "ClientToken": "", "EbsOptimized": False, "EnaSupport": True, "Hypervisor": "xen", "NetworkInterfaces": [{"Attachment": {"AttachmentId": "eni-attach-01696c8e6cc7e8c52", "DeleteOnTermination": True, "DeviceIndex": 0, "Status": "attached", "NetworkCardIndex": 0}, "Description": "", "Groups": [{"GroupName": "launch-wizard-7", "GroupId": "sg-010232483d4c11a2b"}], "InterfaceId": "eni-0eca02977e47f82a9", "OwnerId": "960372818084", "PrivateDnsName": "ip-172-31-85-24.ec2.internal", "PrivateIpAddress": "172.31.85.24", "PrivateIpAddresses": [{"Primary": True, "PrivateDnsName": "ip-172-31-85-24.ec2.internal", "PrivateIpAddress": "172.31.85.24"}], "SourceDestCheck": True, "Status": "in-use", "SubnetId": "subnet-07a3be17bcc59528b", "VpcId": "vpc-0683f9b3d1038fd71", "InterfaceType": "interface"}, "RootDeviceName": "/dev/sda1", "RootDeviceType": "ebs", "SecurityGroups": [{"GroupName": "launch-wizard-7", "GroupId": "sg-010232483d4c11a2b"}], "SourceDestCheck": True, "StateReason": {"Code": "Client.UserInitiatedShutdown", "Message": "Client.UserInitiatedShutdown: User initiated shutdown"}, "Tags": [{"Key": "Name", "Value": "MyWindowsServer"}], "VirtualizationType": "hvm", "CpuOptions": {"CoreCount": 1, "ThreadsPerCore": 1}, "CapacityReservationSpecification": {"CapacityReservationPreference": "open"}, "HibernationOptions": {"Configured": False}, "MetadataOptions": {"State": "applied", "HttpTokens": "optional", "HttpPutResponseHopLimit": 1, "HttpEndpoint": "enabled"}, "EnclaveOptions": {"Enabled": False}, "OwnerId": "960372818084", "ReservationId": "r-01711ca50d7fdc07d"}, {"GroupSet": [{"Instances": [{"AmiLaunchIndex": 0, "ImageId": "ami-026b57f3c383c2eeb", "InstanceId": "i-07bae12a2a263766", "Insta...}]}]}
```

**Figure 29:** Running the Python3 file

Does the Python3 program show your instances? [Yes/No]

Now we will stop one of our instances. For this, get an instance name, and add it to the following file:

```
import boto3
ec2 = boto3.client('ec2', region_name='us-east-1')
ec2.stop_instances(InstanceIds=["i-07b0512e24xxxxxx"])
```

Now run the Python file, and prove that it has stopped your instance.

Does the Python3 program stop your instance? [Yes/No]

Now we will restart one of our instances. For this, get an instance name, and add it to the following file:

```
import boto3
ec2 = boto3.client('ec2', region_name='us-east-1')
ec2.start_instances(InstanceIds=["i-07b0512e24xxxxxx"])
```

Now run the Python file, and prove that it has stopped your instance.

Does the Python3 program start your instance? [Yes/No]

Finally, write a Python3 program which will start both of your instances, and another one to stop them both.

Do you Python3 programs work? [Yes/No]

You can also use the AWS prompt. Now try to start and stop your instances with:

```
aws ec2 stop-instances --instance-ids i-07b0512e24xxxxxx
```

and

```
aws ec2 start-instances --instance-ids i-07b0512e24xxxxxx
```

Do these command line programs work? [Yes/No]