

CS7346 Lab 3: AWS EC2

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To support the following lab exercises, please read the following chapters in the AWS Certified Solutions Architect Study Guide.

Chapter 2

Lab: Please complete the following lab exercises in the AWS Certified Solutions Architect Study Guide. When you are done, delete all the resources that you provisioned to avoid charges.

2.1 through 2.7 (inclusive)

Environment

Laptop: MacBook Air M2 2022, macOS 13.3

Chapter 2

2.1

EXERCISE 2.1

Launch an EC2 Linux Instance and Log In Using SSH

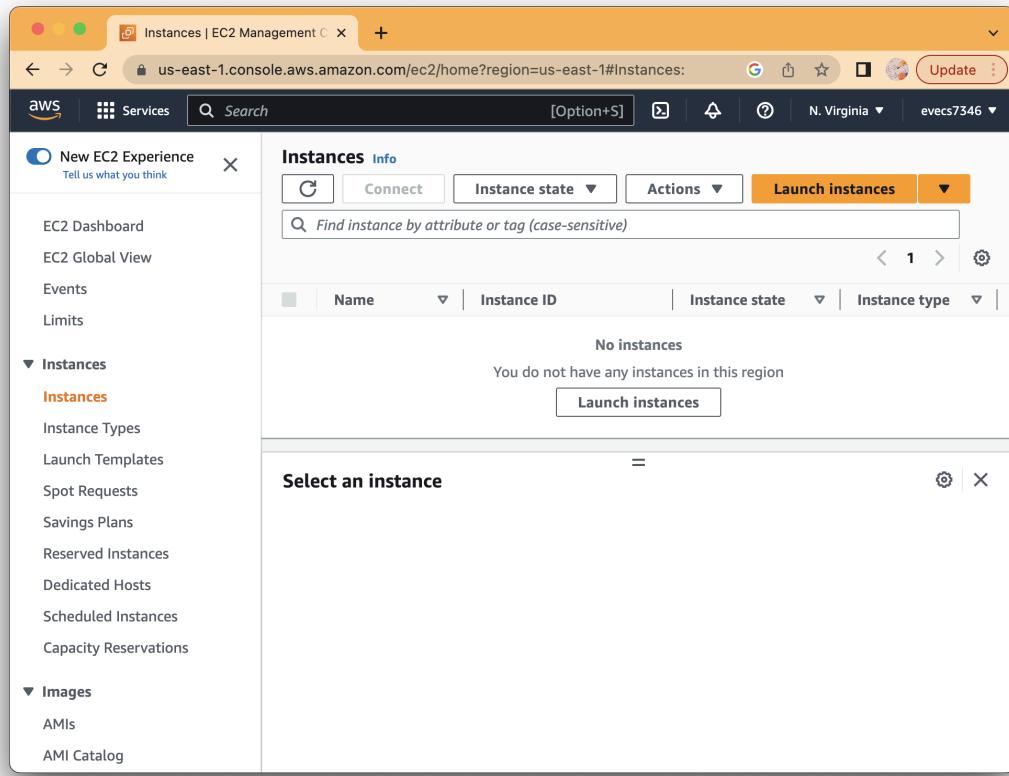
1. From the EC2 Dashboard, click to launch a new instance and select a Linux AMI and instance type. Remember, the t2.micro is FreeTier-eligible if your AWS account is still within its first year.
2. Explore the Network Settings, Configure Storage, and Advanced sections—although the default settings should work fine.
3. In the Network Settings section, make sure there's a rule permitting incoming SSH (port 22) traffic. It should be there by default. You can create your own security group or select an existing group by clicking the Edit button. Default settings will all normally work well here.

EXERCISE 2.1 (*continued*)

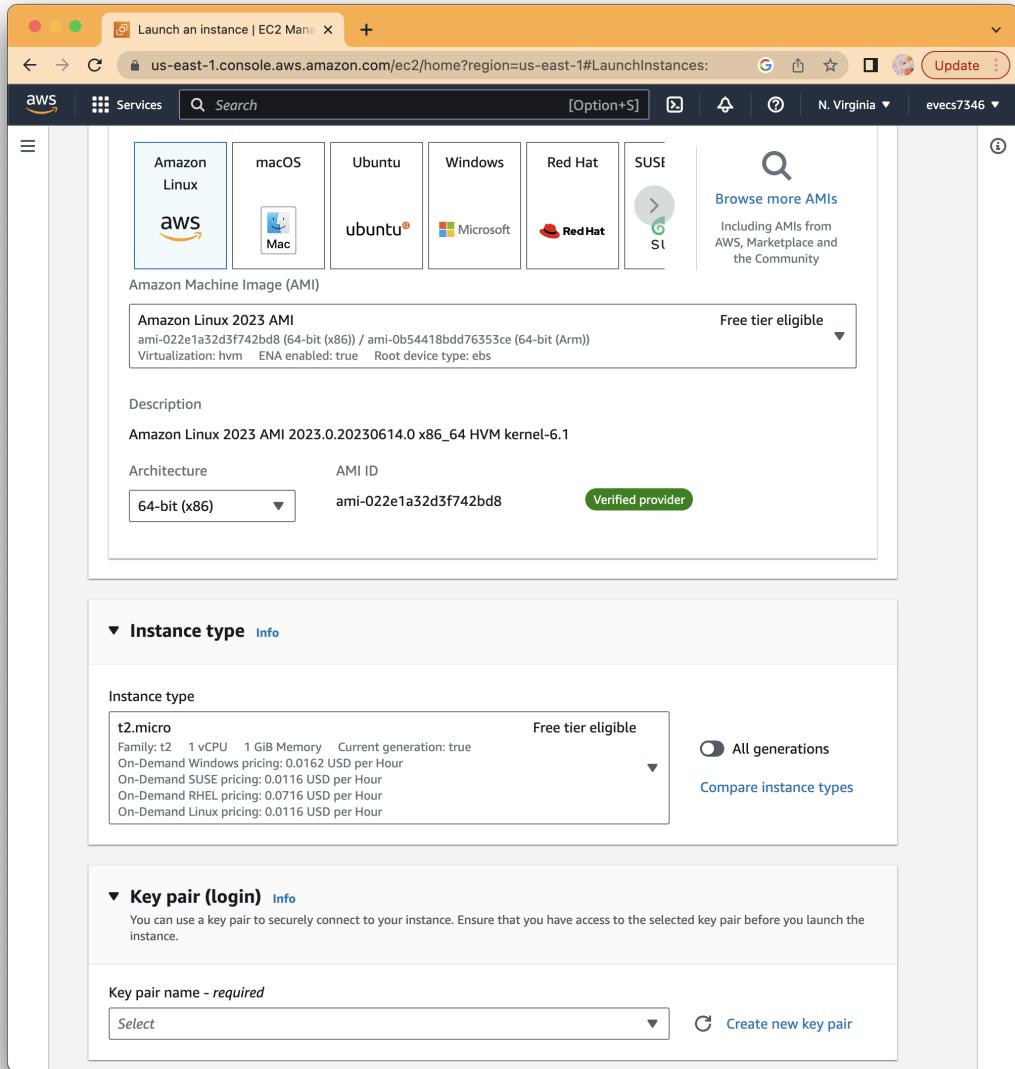
4. Before letting you launch the instance, AWS will require you to select—or create—a key pair. Follow the instructions.
5. Once the instance is launched, you can return to the Instances Dashboard to wait a minute or two until everything is running properly.
6. Click the Actions pull-down menu and select Connect for instructions on how to connect to the instance from your local machine. Note how the SSH username will vary, for instance, between Linux distributions (like Ubuntu or Amazon Linux). Then connect and take a look at your virtual cloud server.

Solution:

1.



The screenshot shows the AWS EC2 'Launch an instance' interface. At the top, there's a navigation bar with tabs for 'Launch an instance | EC2 Manager', 'Instances', and 'Launch an instance'. Below the navigation is a search bar and a 'Services' dropdown. The main content area has a breadcrumb trail: 'EC2 > Instances > Launch an instance'. The main title is 'Launch an instance' with an 'Info' link. A sub-section titled 'Name and tags' also has an 'Info' link. It contains a 'Name' field with the value 'cs7346instance' and a 'Add additional tags' button. Below this is a section for 'Application and OS Images (Amazon Machine Image)'. It includes a search bar with placeholder text 'Search our full catalog including 1000s of application and OS images'. Underneath is a 'Quick Start' section with icons for various AMIs: Amazon Linux (AWS logo), macOS (Mac logo), Ubuntu (Ubuntu logo), Windows (Microsoft logo), Red Hat (Red Hat logo), and SUSE (SUSE logo). To the right of this section is a 'Browse more AMIs' button with a magnifying glass icon. The 'Amazon Machine Image (AMI)' section shows 'Amazon Linux 2023 AMI' with the identifier 'ami-022e1a32d3f742bd8 (64-bit (x86)) / ami-0b54418bdd76353ce (64-bit (Arm))'. It indicates 'Free tier eligible' and lists 'Virtualization: hvm', 'ENA enabled: true', and 'Root device type: ebs'. Below this is a 'Description' section with the text 'Amazon Linux 2023 AMI 2023.0.20230614.0 x86_64 HVM kernel-6.1'.



2.

The screenshot shows the AWS EC2 Launch Wizard interface. The top navigation bar includes tabs for 'Launch an instance' and 'EC2 Manager'. The URL is us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances. The region is set to 'N. Virginia'.

Network settings

- Network: vpc-008d24c6794f21b94
- Subnet: No preference (Default subnet in any availability zone)
- Auto-assign public IP: Enable
- Firewall (security groups):
 - Create security group (selected)
 - Select existing security groupA security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

We'll create a new security group called 'launch-wizard-1' with the following rules:

- Allow SSH traffic from Anywhere (0.0.0.0/0)
- Allow HTTPS traffic from the internet To set up an endpoint, for example when creating a web server
- Allow HTTP traffic from the internet To set up an endpoint, for example when creating a web server

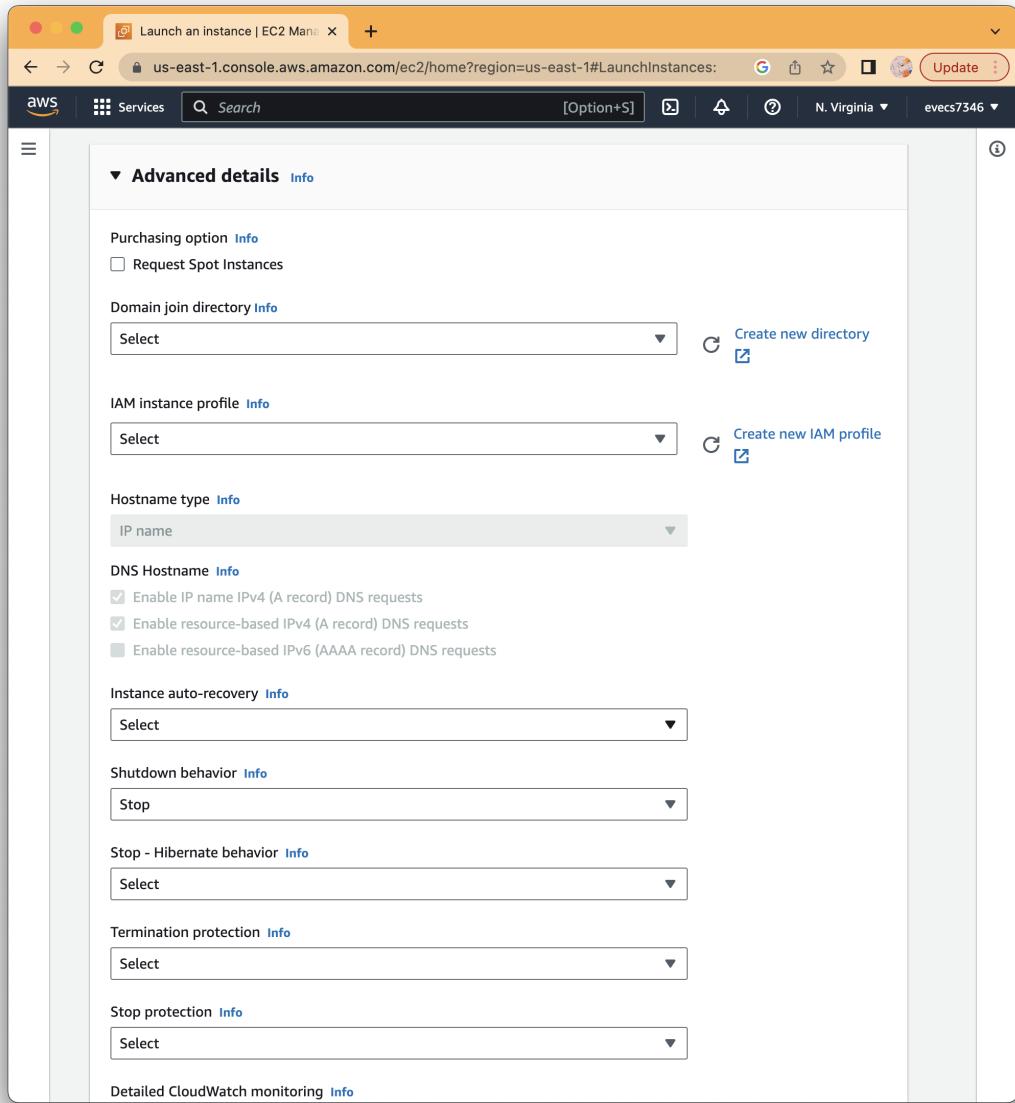
Configure storage

Advanced

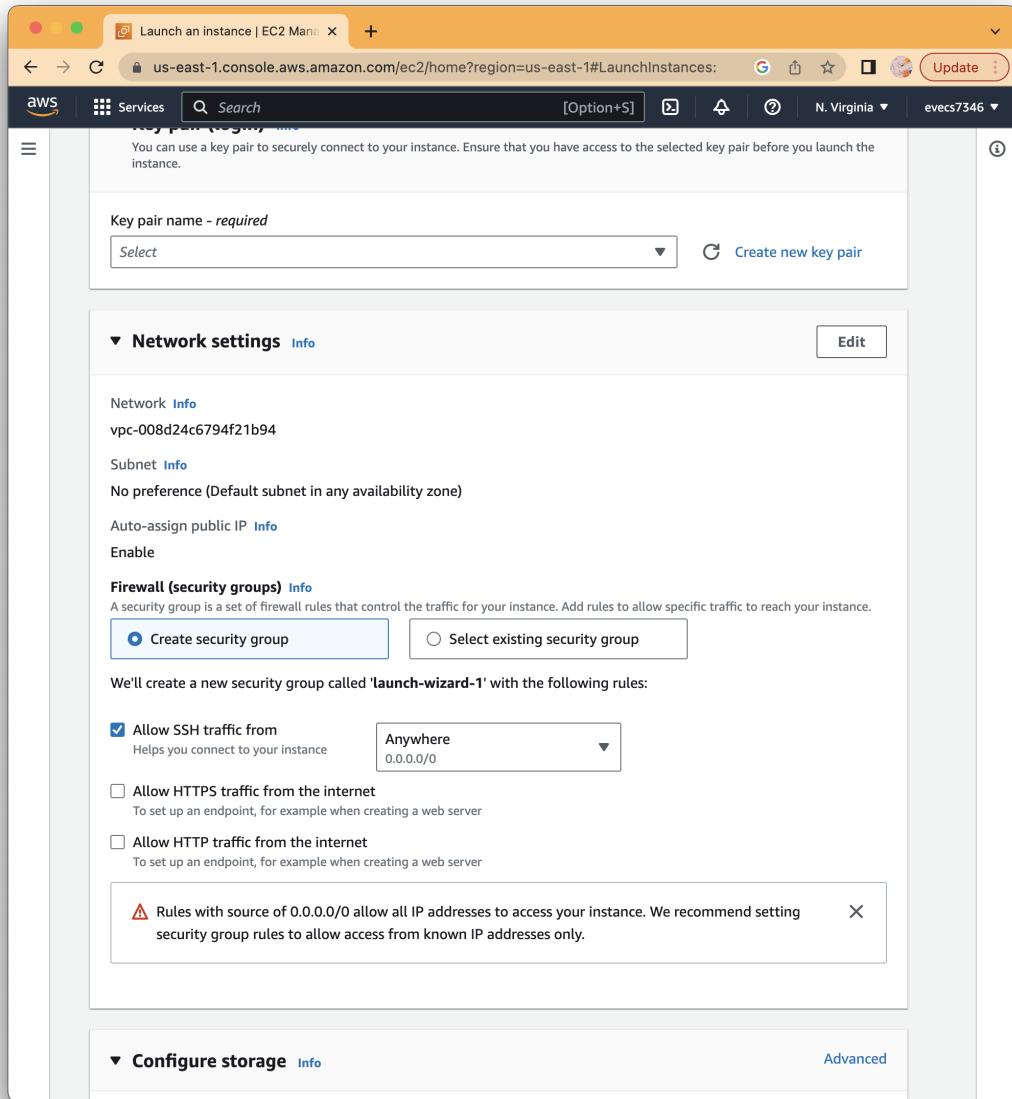
1x 8 GiB gp3 Root volume (Not encrypted)

Info Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage

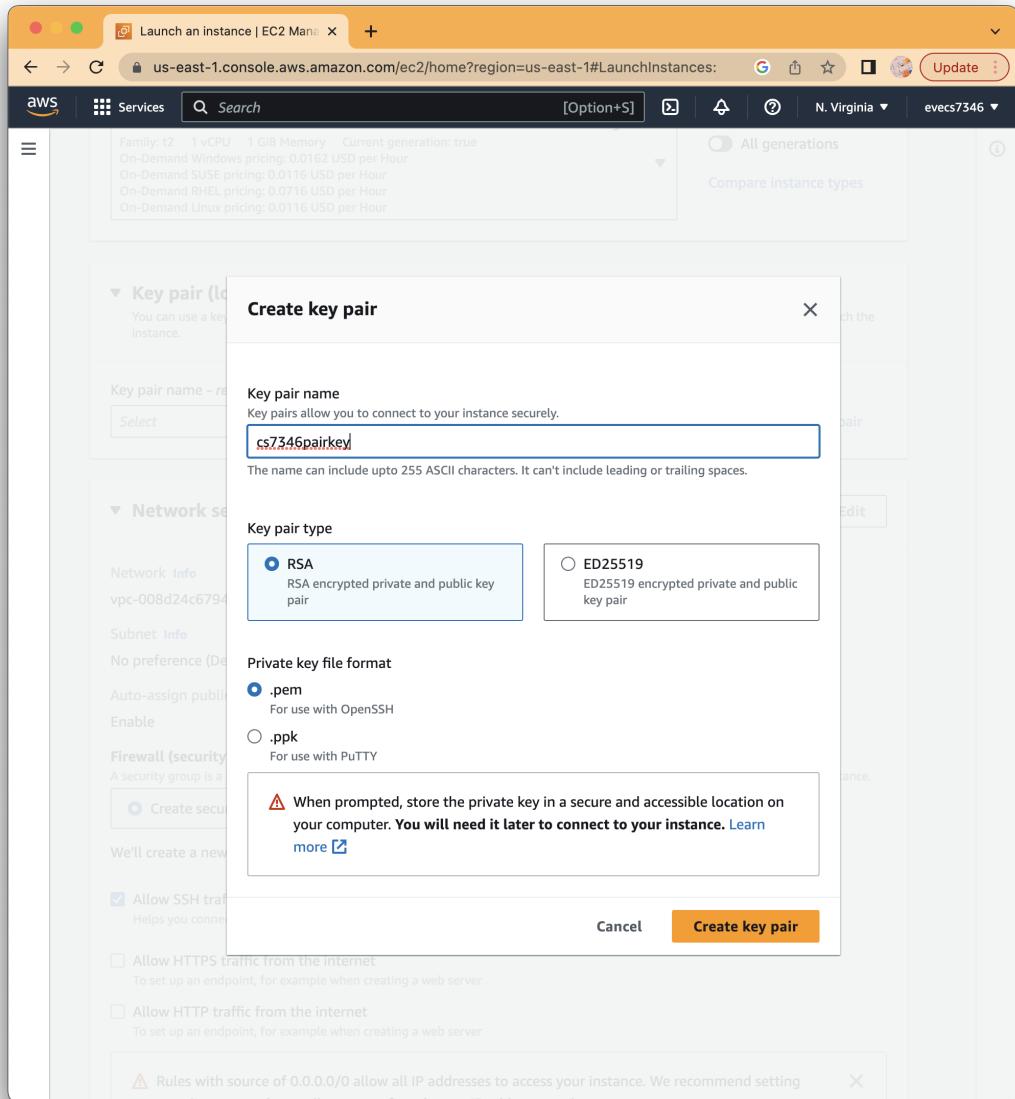
Add new volume

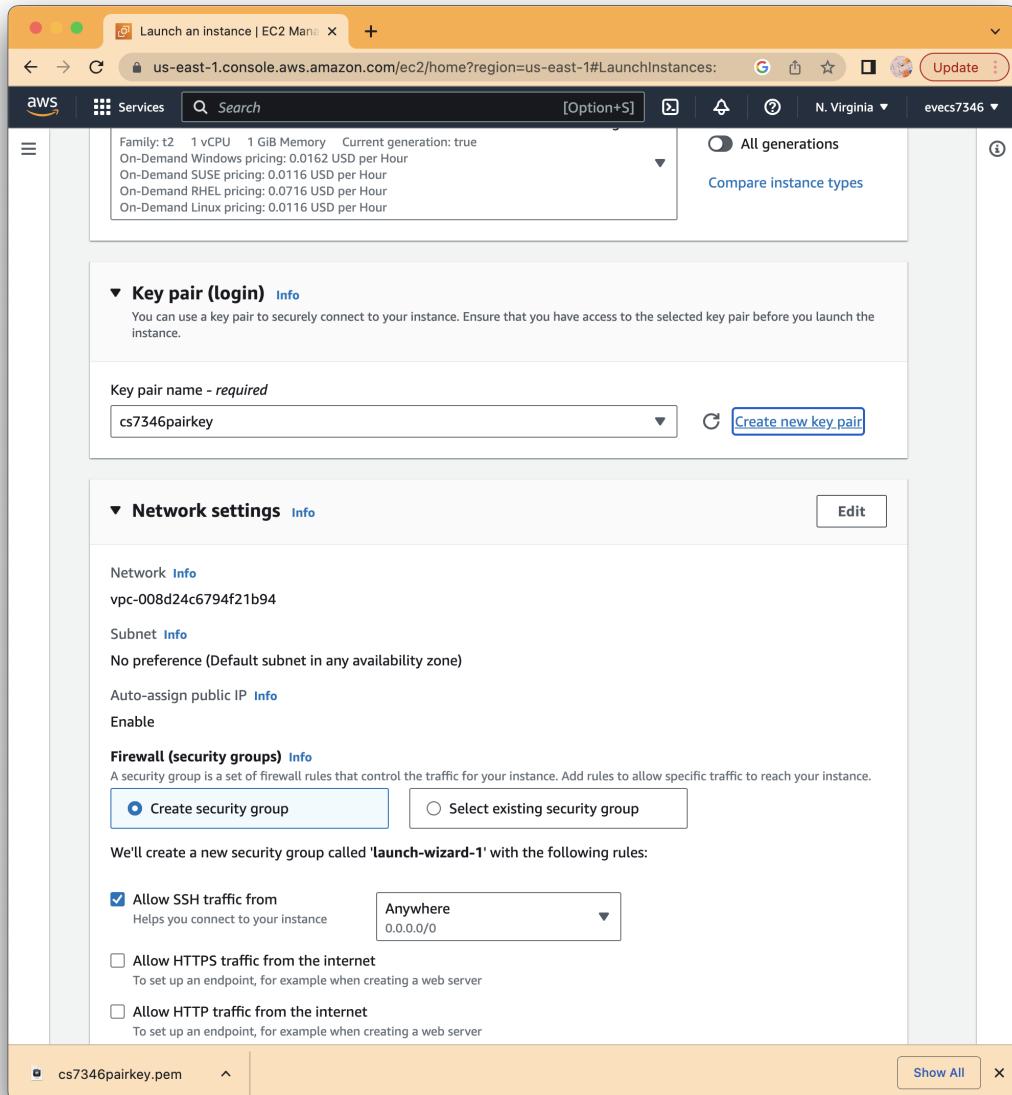


3.

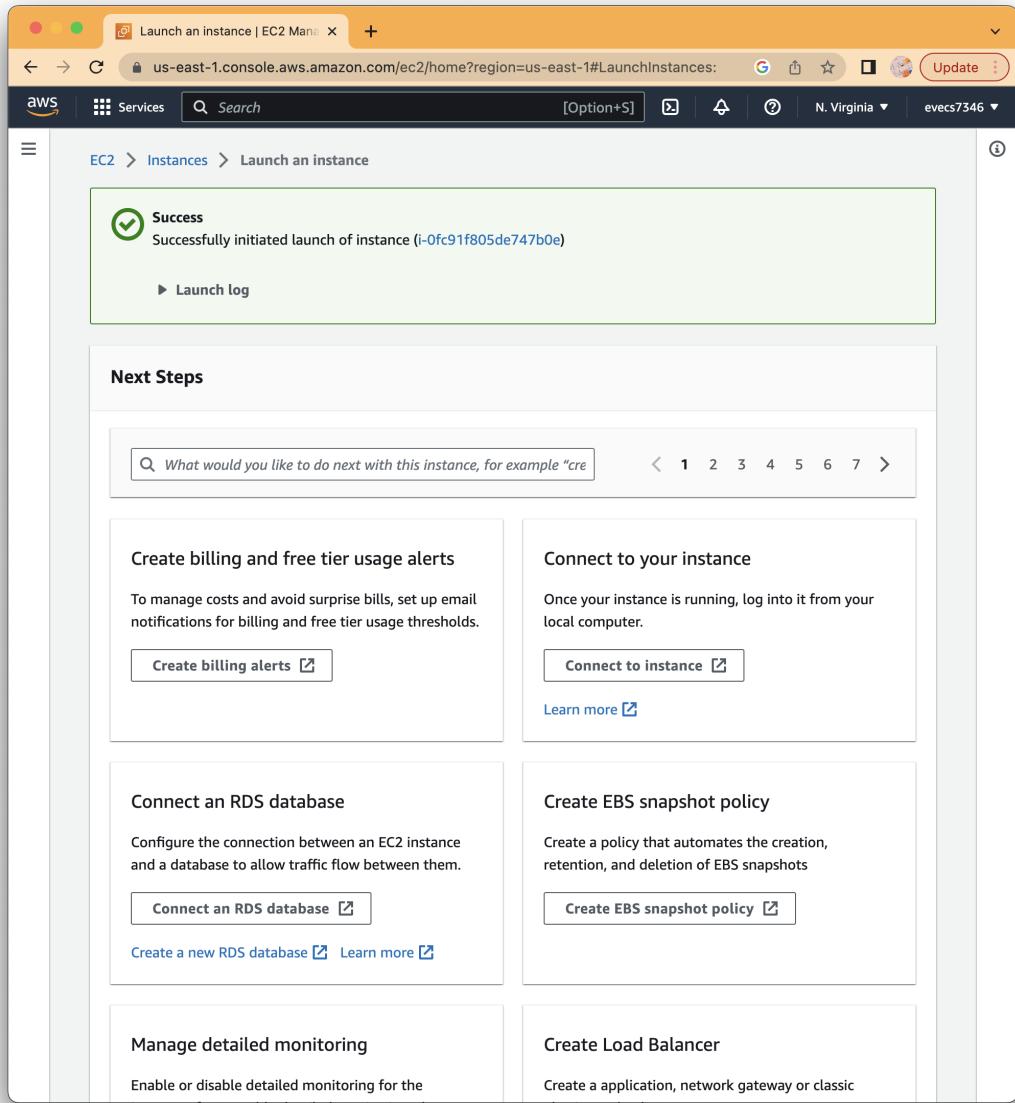


4.





5.



6.

The screenshot shows the AWS EC2 Management console with the URL us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#instances. The left sidebar is open, showing the 'Instances' section with 'Instances' selected. The main area displays a table of instances. One instance is listed: 'cs7346instance' (Instance ID: i-0fc91f805de747b0e), which is 'Running' on an 't2.micro' instance type. The status check shows '2/2 checks passed' and there are no alarms. The table includes columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, and Availability zone.

The screenshot shows the 'Connect to instance' dialog for the instance 'i-0fc91f805de747b0e'. The URL is us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#ConnectToInstance:instanceId=i-0fc91f805de747b0e. The dialog has tabs for 'EC2 Instance Connect', 'Session Manager', and 'SSH client' (which is selected). The 'SSH client' tab contains instructions for connecting via SSH, including steps to open an SSH client, locate the private key file 'cs7346pairkey.pem', run the command 'chmod 400 cs7346pairkey.pem', and connect using the Public DNS 'ec2-54-204-95-182.compute-1.amazonaws.com'. An example command is shown: `ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com`. A note at the bottom states: 'Note: In most cases, the guessed user name is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI user name.' A 'Cancel' button is at the bottom right.

```
ec2-user@ip-172-31-17-211:~
```

```
ec2-user@ip-172-31-17-211:~ (ssh) ⌘1 +
```

```
Last login: Tue Jun 27 01:51:30 on ttys004
↳ ~ cd /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 3
↳ Labs 3 ls
cs7346pairkey.pem
↳ Labs 3 ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com
The authenticity of host 'ec2-54-204-95-182.compute-1.amazonaws.com (54.204.95.182)' can't be established.
ED25519 key fingerprint is SHA256:Wyai80wSZDJLc+cSFnoTJa7JczP+NLbjlP4j57L/83E.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-54-204-95-182.compute-1.amazonaws.com' (ED25519) to the
list of known hosts.
@@@@@@@cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
@      WARNING: UNPROTECTED PRIVATE KEY FILE!          @
cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
Permissions 0644 for 'cs7346pairkey.pem' are too open.
It is required that your private key files are NOT accessible by others.
This private key will be ignored.
Load key "cs7346pairkey.pem": bad permissions
ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com: Permission denied (publickey,gssapi
-keyex,gssapi-with-mic).
↳ Labs 3 ls
cs7346pairkey.pem
↳ Labs 3 chmod 400 cs7346pairkey.pem
↳ Labs 3 ec2-54-204-95-182.compute-1.amazonaws.com
zsh: command not found: ec2-54-204-95-182.compute-1.amazonaws.com
↳ Labs 3 ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com
'          #
  \_ #####          Amazon Linux 2023
  ~~ \_\#####\
  ~~  \###|
  ~~   \#/  https://aws.amazon.com/linux/amazon-linux-2023
  ~~   V~`-'>
  ~~   /
  ~~ . .
  ~~ /  /
  /m/`|
```

2.2

EXERCISE 2.2

Assess the Free Capacity of a Running Instance and Change Its Instance Type

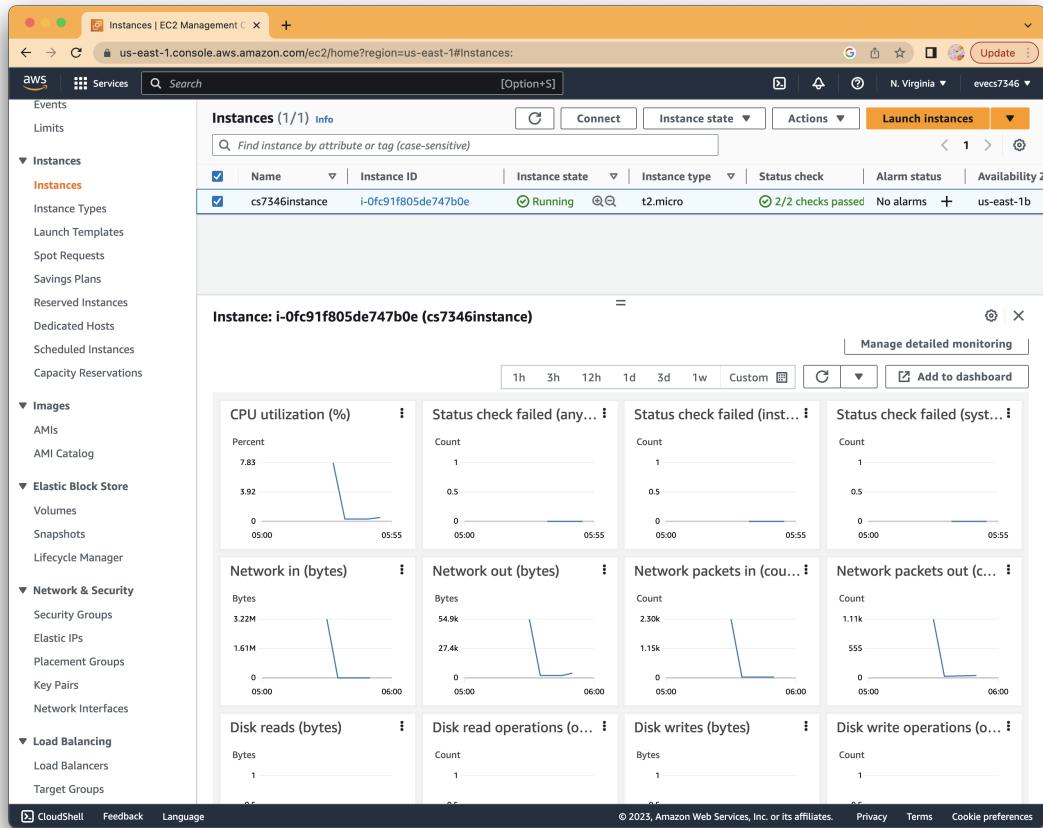
1. With an instance running, open the Instances Dashboard in the EC2 console. Select the instance you're interested in and click the Monitoring tab in the bottom half of the screen. That's a good place to see what percentage of compute and network resources you've been using over the past hours or weeks.

Now pretend that your instance is nearly maxed out and change the instance type as follows.

2. Stop the instance using the Instance State drop-down menu. (Remember, unless you're using an elastic IP address for the instance, your public IP address might be different when you start up again.)
3. From the Actions drop-down menu, click Instance Settings and then Change Instance Type (which might only appear after a minute or so or once you refresh the page). Select a new type (although remember that choosing a non-Free Tier instance type might incur costs).
4. Restart the instance and confirm that it's running properly.

Solution:

1.



2.

Screenshot of the AWS EC2 Management console showing the Instances page.

The left sidebar navigation includes:

- Events
- Limits
- Instances
 - Instances**
 - Instance Types
 - Launch Templates
 - Spot Requests
 - Savings Plans
 - Reserved Instances
 - Dedicated Hosts
 - Scheduled Instances
 - Capacity Reservations
- Images
 - AMIs
 - AMI Catalog
- Elastic Block Store
 - Volumes
 - Snapshots
 - Lifecycle Manager
- Network & Security
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Key Pairs
 - Network Interfaces
- Load Balancing
 - Load Balancers
 - Target Groups

The main content area shows the following details for one instance:

- Instances (1/1) Info**: Shows the instance name (cs7346instance), instance ID (i-0fc91f805de747b0e), and state (Running).
- Actions**: A dropdown menu with options: Stop instance (highlighted), Start instance, Reboot instance, Hibernate instance, and Terminate instance.
- Metrics**: A grid of four line charts showing system performance over time (1h, 3h, 12h, 1d, 3d, 1w, Custom).
 - CPU utilization (%): Values 7.83, 3.92, 0 at 05:00, 05:55.
 - Status check failed (any...): Count 1 at 05:00, 05:55.
 - Status check failed (inst...): Count 1 at 05:00, 05:55.
 - Status check failed (syst...): Count 1 at 05:00, 05:55.
 - Network in (bytes): Bytes 3.22M, 1.61M at 05:00, 06:00.
 - Network out (bytes): Bytes 54.9k, 27.4k at 05:00, 06:00.
 - Network packets in (cou...): Count 2.30k, 1.15k at 05:00, 06:00.
 - Network packets out (c...): Count 1.11k, 555 at 05:00, 06:00.
 - Disk reads (bytes): Bytes 1 at 05:00, 06:00.
 - Disk read operations (o...): Count 1 at 05:00, 06:00.
 - Disk writes (bytes): Bytes 1 at 05:00, 06:00.
 - Disk write operations (o...): Count 1 at 05:00, 06:00.

Page footer includes CloudShell, Feedback, Language, © 2023, Amazon Web Services, Inc. or its affiliates., Privacy, Terms, and Cookie preferences.

Screenshot of the AWS EC2 Management console showing the Instances page. A modal dialog titled "Stop instance?" is open, asking for confirmation to stop the instance "i-0fc91f805de747b0e (cs7346instance)".

The left sidebar shows the navigation menu:

- Events
- Limits
- Instances
 - Instances
 - Instance Types
 - Launch Templates
 - Spot Requests
 - Savings Plans
 - Reserved Instances
 - Dedicated Hosts
 - Scheduled Instances
 - Capacity Reservations
- Images
 - AMIs
 - AMI Catalog
- Elastic Block Store
 - Volumes
 - Snapshots
 - Lifecycle Manager
- Network & Security
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Key Pairs
 - Network Interfaces
- Load Balancing
 - Load Balancers
 - Target Groups

The main content area displays the instance details for "i-0fc91f805de747b0e (cs7346instance)". It includes a chart for CPU utilization (%) and several monitoring metrics for network and disk activity.

Screenshot of the AWS EC2 Management console showing the Instances page after the instance has been stopped. A success message "Successfully stopped i-0fc91f805de747b0e" is displayed.

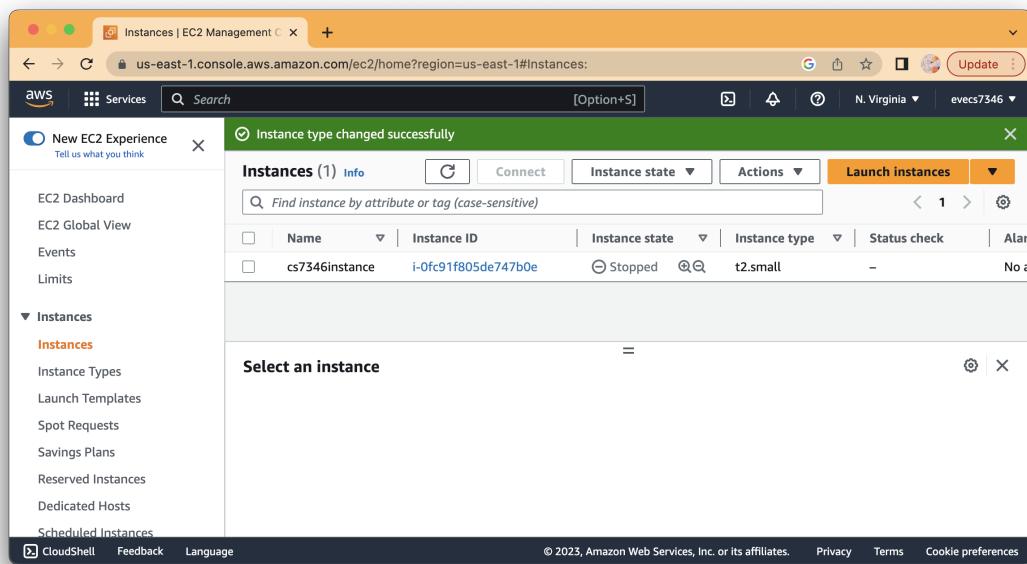
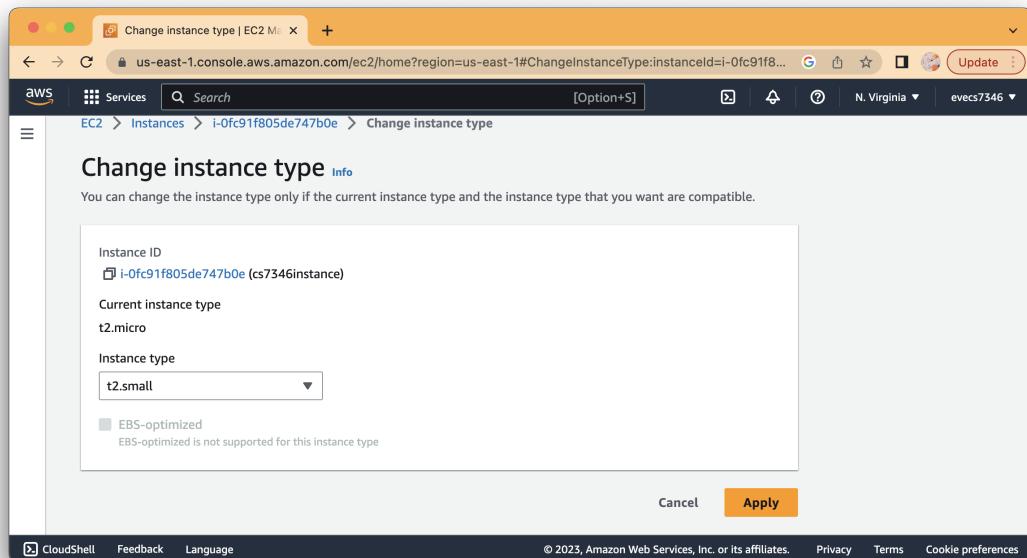
The left sidebar shows the navigation menu, identical to the previous screenshot.

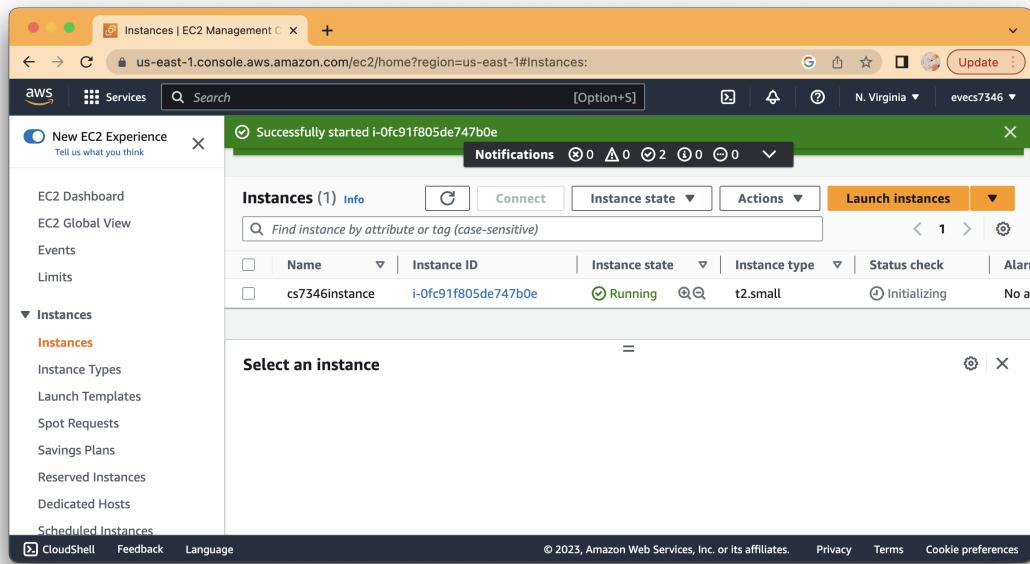
The main content area displays the instance details for "i-0fc91f805de747b0e (cs7346instance)". The instance status is now "Stopped". The monitoring metrics show a significant drop in activity, reflecting the instance being stopped.

The screenshot shows the AWS EC2 Management console with the URL <https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#Instances>. The main pane displays a single instance named 'cs7346instance' with the ID 'i-0fc91f805de747b0e'. The instance is currently stopped. The Actions menu is open, showing options like 'Launch instances', 'Connect', 'View details', 'Manage instance state', and 'Instance settings'. The 'Instance settings' section is expanded, showing tabs for 'Details', 'Security', and 'Network'. Under 'Details', there is a 'Change instance type' button. The 'Network' tab shows the private IP address '172.31.17.211'.

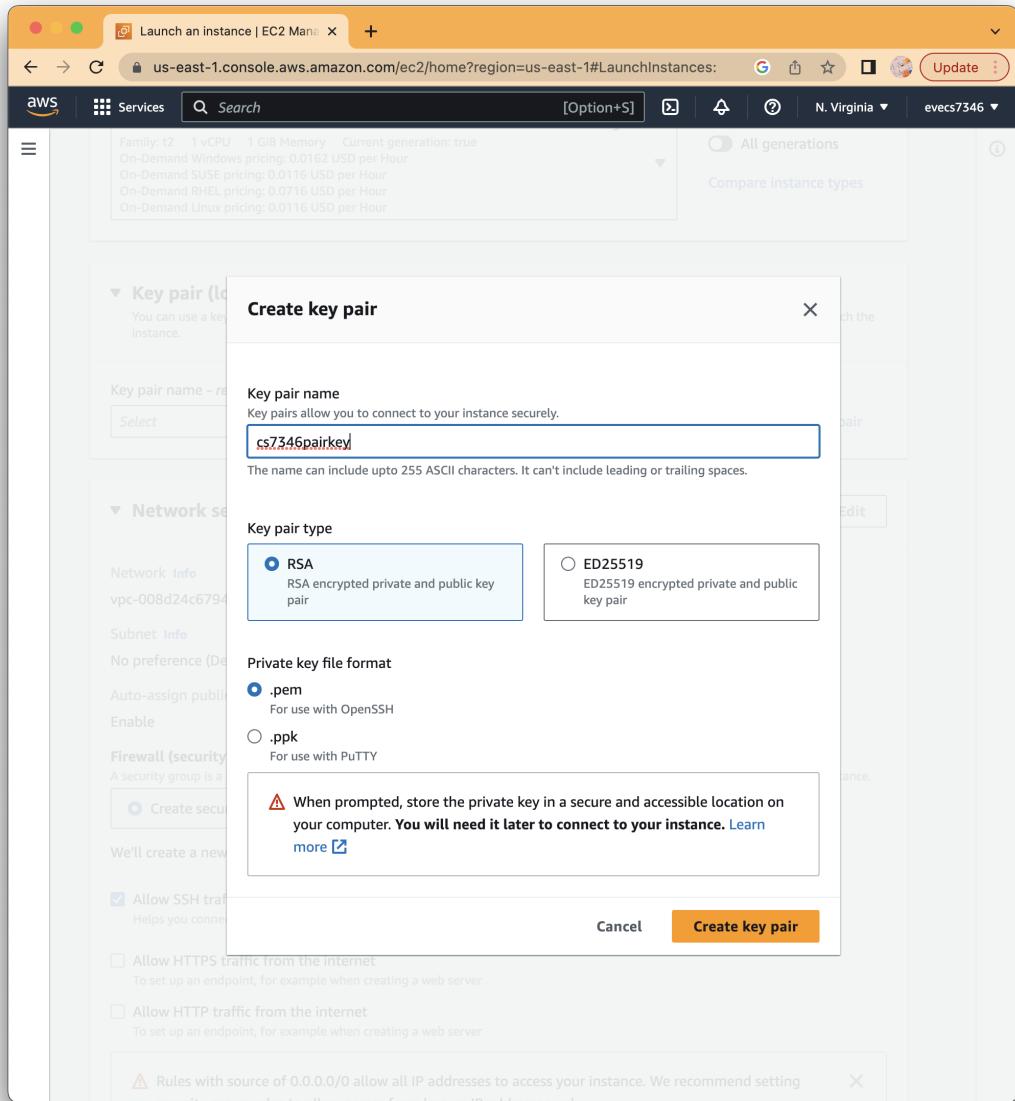
3.

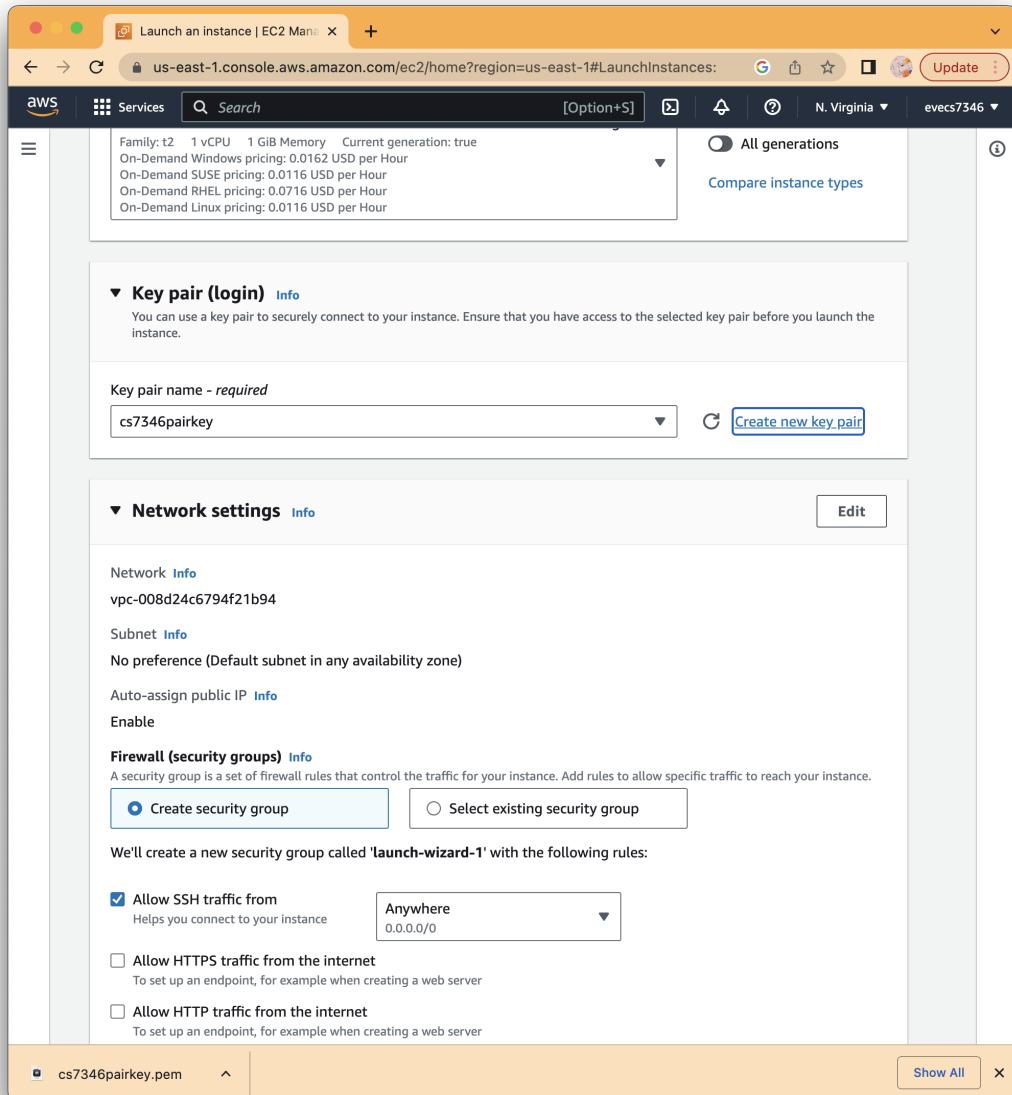
This screenshot is identical to the one above, showing the AWS EC2 Management console with the same URL and instance details. The context menu is open over the same instance ('cs7346instance'). The 'Change instance type' button in the 'Instance settings' section is highlighted with a blue box.





4.





5.

The screenshot shows the AWS EC2 Instances Launch an instance page. At the top, there is a success message: "Successfully initiated launch of instance (i-Ofc91f805de747b0e)". Below this, there is a "Launch log" link. The main area is titled "Next Steps" and contains several cards:

- Create billing and free tier usage alerts**: To manage costs and avoid surprise bills, set up email notifications for billing and free tier usage thresholds. Includes a "Create billing alerts" button.
- Connect to your instance**: Once your instance is running, log into it from your local computer. Includes a "Connect to instance" button.
- Connect an RDS database**: Configure the connection between an EC2 instance and a database to allow traffic flow between them. Includes a "Connect an RDS database" button.
- Create EBS snapshot policy**: Create a policy that automates the creation, retention, and deletion of EBS snapshots. Includes a "Create EBS snapshot policy" button.
- Manage detailed monitoring**: Enable or disable detailed monitoring for the instance. Includes a "Create Load Balancer" button.
- Create Load Balancer**: Create a application, network gateway or classic load balancer.

6.

The screenshot shows the AWS EC2 Management console with the URL us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#instances. The left sidebar is open, showing the 'Instances' section with 'Instances' selected. The main area displays a table of instances. One instance is listed: 'cs7346instance' (Instance ID: i-0fc91f805de747b0e), which is 'Running' on an 't2.micro' instance type. The status check shows '2/2 checks passed' and there are no alarms. The table includes columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, and Availability zone.

The screenshot shows the 'Connect to instance' dialog for the instance 'i-0fc91f805de747b0e'. The URL is us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#ConnectToInstance:instanceId=i-0fc91f805de747b0e. The dialog has tabs for 'EC2 Instance Connect', 'Session Manager', and 'SSH client' (which is selected). The 'SSH client' tab contains instructions for connecting via SSH, including steps to open an SSH client, locate the private key file 'cs7346pairkey.pem', run the command 'chmod 400 cs7346pairkey.pem', and connect using the Public DNS 'ec2-54-204-95-182.compute-1.amazonaws.com'. An example command is provided: `ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com`. A note at the bottom states: 'Note: In most cases, the guessed user name is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI user name.'

```

>Last login: Tue Jun 27 01:51:30 on ttys004
↳ ~ cd /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 3
↳ Labs 3 ls
cs7346pairkey.pem
↳ Labs 3 ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com
The authenticity of host 'ec2-54-204-95-182.compute-1.amazonaws.com (54.204.95.182)' can't be established.
ED25519 key fingerprint is SHA256:Wyi80wSZDJLc+cSFnoTJa7JczP+NLbjLP4j57L/83E.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-54-204-95-182.compute-1.amazonaws.com' (ED25519) to the
list of known hosts.
@@@@@@@cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
@      WARNING: UNPROTECTED PRIVATE KEY FILE!           @
cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
Permissions 0644 for 'cs7346pairkey.pem' are too open.
It is required that your private key files are NOT accessible by others.
This private key will be ignored.
Load key "cs7346pairkey.pem": bad permissions
ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com: Permission denied (publickey,gssapi
-keyex,gssapi-with-mic).
↳ Labs 3 ls
cs7346pairkey.pem
↳ Labs 3 chmod 400 cs7346pairkey.pem
↳ Labs 3 ec2-54-204-95-182.compute-1.amazonaws.com
zsh: command not found: ec2-54-204-95-182.compute-1.amazonaws.com
↳ Labs 3 ssh -i "cs7346pairkey.pem" ec2-user@ec2-54-204-95-182.compute-1.amazonaws.com
'          #
  \_ #####          Amazon Linux 2023
  ~~ \#####\
  ~~ \###|
  ~~   #/|---> https://aws.amazon.com/linux/amazon-linux-2023
  ~~ . / |
  ~~ / / |
/m/ '
[ec2-user@ip-172-31-17-211 ~]$ |

```

2.3

EXERCISE 2.3

Assess Which Pricing Model Will Best Meet the Needs of a Deployment

Imagine that your application will need to run two always-on f1.2xlarge instances (which come with instance storage and won't require any EBS volumes). To meet seasonal demand, you can expect to require as many as four more instances for a total of 100 hours through the course of a single year. How should you pay for this deployment?

Bonus: Calculate your total estimated monthly and annual costs.

Solution:

<https://aws.amazon.com/ec2/instance-types/f1/>

Product Details

Name	FPGAs	vCPUs	Instance Memory (GiB)	SSD Storage (GB)	Enhanced Networking	EBS Optimized	On-Demand Price/hr*	1-yr Reserved Instance Effective Hourly*	3-yr Reserved Instance Effective Hourly*
f1.2xlarge	1	8	122	470	Yes	Yes	\$1.65	\$1.06	\$0.76
f1.4xlarge	2	16	244	940	Yes	Yes	\$3.30	\$2.12	\$1.52
f1.16xlarge	8	64	976	4 x 940	Yes	Yes	\$13.20	\$8.50	\$6.10

On-demand model 100 hours: $1.65 \times 100 \times 4 = 660 \$$

Year: 660 \$

Month: $660 \div 12 = 55 \$$

Reserved-demand model: $1.06 \times 365 \times 24 = 9285.6 \$$

Year: 9285.6 \$

Month: 773.8 \$

2.4

EXERCISE 2.4

Create and Launch an AMI Based on an Existing Instance Storage Volume

1. If necessary, launch an instance (following the instructions displayed when you click the Connect menu item at the top) and make at least some token change to the root volume. This could be something as simple as typing **touch test.txt** on a Linux instance to create an empty file.
2. Create an image from the instance's volume (you'll access the dialog box by using the Actions pull-down menu and then clicking Image And Templates in the instance's dashboard).
3. Launch an instance from the console and select the new AMI from the My AMIs tab.
4. Log into the instance and confirm that your previous change has persisted.

Solution:

- 1.

Screenshot of the AWS EC2 Management Console showing the Instances page. A single instance, 'cs7346instance' (ID: i-0fc91f805de747b0e), is listed as 'Running' on a t2.micro instance type. The page includes a sidebar with navigation links like EC2 Dashboard, EC2 Global View, Events, Limits, Instances, Images, and Elastic Block Store.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status
cs7346instance	i-0fc91f805de747b0e	Running	t2.micro	2/2 checks passed	No alarms

Instance: i-0fc91f805de747b0e (cs7346instance)

54.144.49.11 [Public IP]	vpc-008d24c6794f21b94	Opt-in to AWS Compute Optimizer for recommendations. Learn more
IAM Role	Subnet ID	Auto Scaling Group name
-	subnet-0b8f9b6de09e2792c	-
IMDSv2 Required		
Instance details		
Platform	AMI ID	Monitoring
Amazon Linux (Inferred)	ami-022e1a32d3f742bd8	disabled
Platform details	AMI name	Termination protection
Linux/UNIX	al2023-ami-2023.0.20230614.0-kernel-6.1-x86_64	Disabled
Stop protection	Launch time	AMI location
Disabled	Tue Jun 27 2023 09:30:49 GMT-0400 (Eastern Daylight Time) (8 minutes)	amazon/al2023-ami-2023.0.20230614.0-kernel-6.1-x86_64

Screenshot of the AWS EC2 Management Console showing the 'Connect to instance' page for the same instance. It provides options for connecting via EC2 Instance Connect or EC2 Instance Connect Endpoint. The instance's public IP address is listed as 54.144.49.11, and the default user name is set to 'ec2-user'.

EC2 Instance Connect

Connect to your instance i-0fc91f805de747b0e (cs7346instance) using any of these options

Connection Type

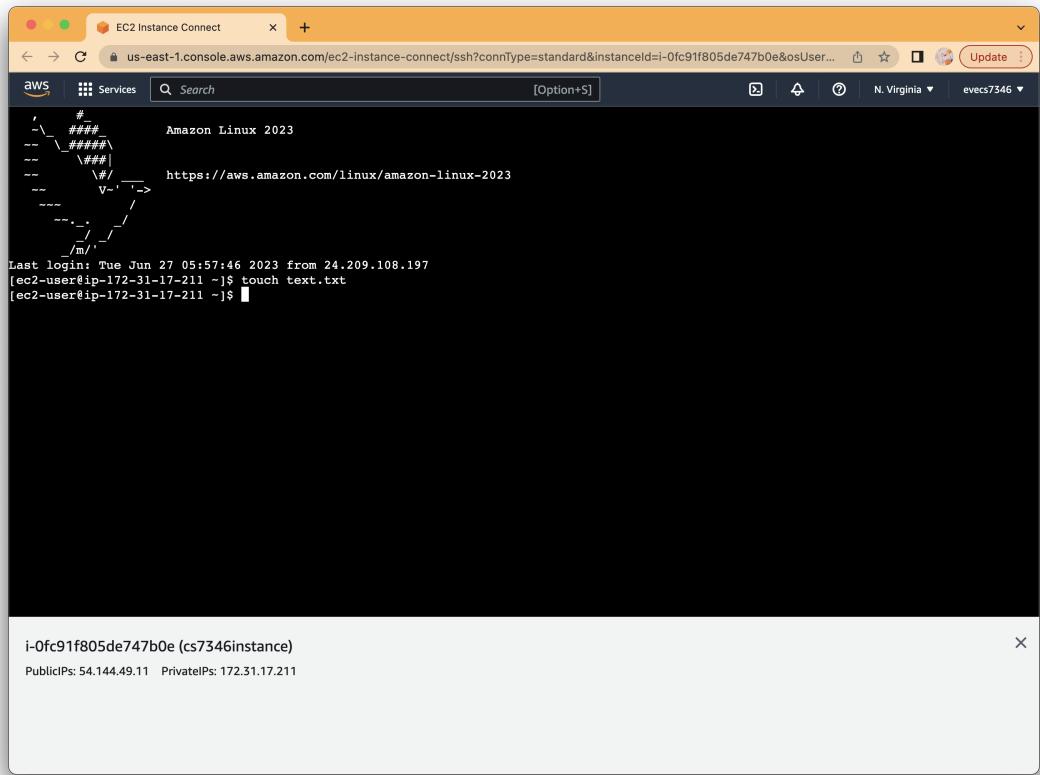
- Connect using EC2 Instance Connect
- Connect using EC2 Instance Connect Endpoint

Public IP address
54.144.49.11

User name
Enter the user name defined in the AMI used to launch the instance. If you didn't define a custom user name, use the default user name, ec2-user.
ec2-user

Note: In most cases, the default user name, ec2-user, is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI user name.

Cancel **Connect**



2.

The screenshot shows the AWS EC2 Management console with the URL us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#Instances. A message at the top indicates that an AMI is currently being created from instance `i-0fc91f805de747b0e`. The main interface displays a table of instances with one item:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status
<code>cs7346instance</code>	<code>i-0fc91f805de747b0e</code>	Running	t2.micro	2/2 checks passed	No alarms

The left sidebar shows navigation links for EC2 Dashboard, EC2 Global View, Events, Limits, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, Images (AMIs selected), and Elastic Block Store (Volumes). The bottom of the page includes CloudShell, Feedback, Language, and footer links for Privacy, Terms, and Cookie preferences.

3.

The screenshot shows the AWS EC2 Management Console with the URL us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances. The page is titled "Launch an instance".

Name and tags Info

Name: MyInstance [Add additional tags](#)

Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below.

Search our full catalog including 1000s of application and OS images

Recent AMIs | [My AMIs](#) | Quick Start

Owned by me Shared with me [Browse more AMIs](#)

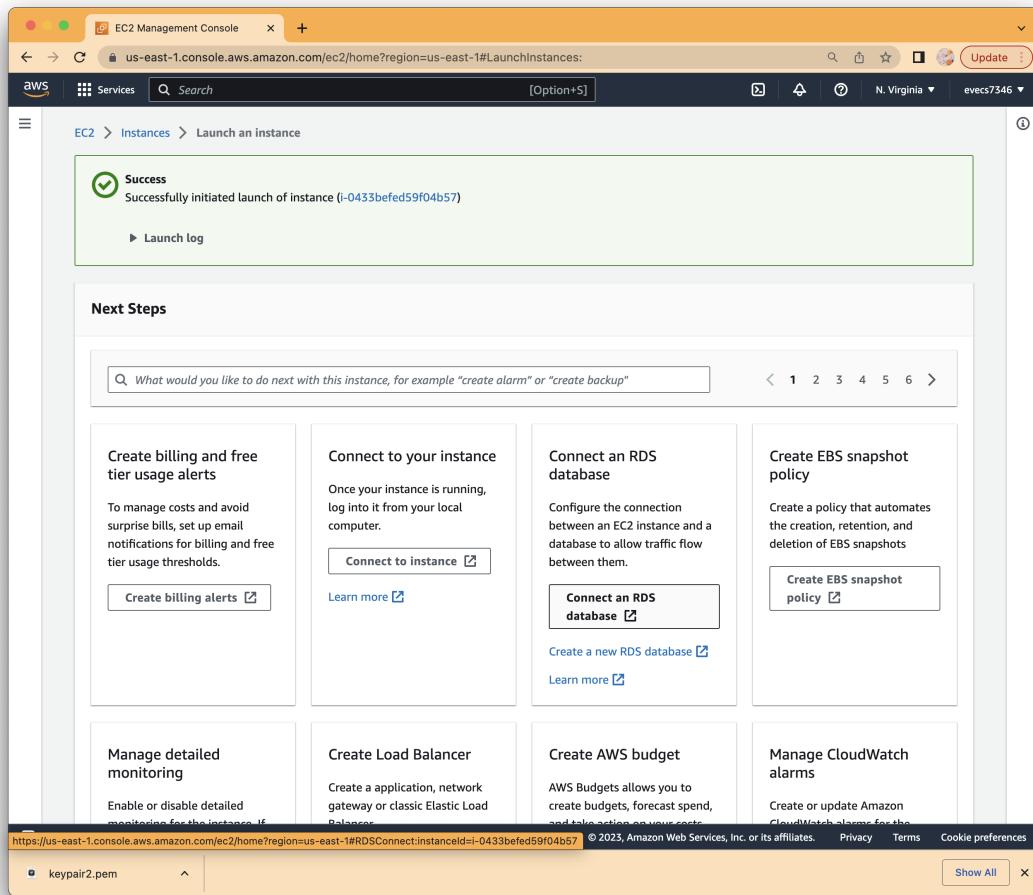
Amazon Machine Image (AMI)

newimage	ami-04a06f7cae37f75a5
2023-06-27T13:45:51.000Z	Virtualization: hvm ENA enabled: true Root device type: ebs boot mode: uefi-preferred

Description: -

Architecture: x86_64 AMI ID: ami-04a06f7cae37f75a5

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4.

Instance details | EC2 Manager

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#InstanceDetails:instanceId=i-0433befed59f04b57

New EC2 Experience Tell us what you think

EC2 > Instances > i-0433befed59f04b57

Instance summary for i-0433befed59f04b57 (MyInstance) Info

Updated less than a minute ago

C Connect Instance state Actions

Instance ID i-0433befed59f04b57 (MyInstance)	Public IPv4 address 54.225.21.210 open address	Private IPv4 addresses 172.31.25.191
IPv6 address -	Instance state Running	Public IPv4 DNS ec2-54-225-21-210.compute-1.amazonaws.com open address
Hostname type IP name: ip-172-31-25-191.ec2.internal	Private IP DNS name (IPv4 only) ip-172-31-25-191.ec2.internal	Elastic IP addresses -
Answer private resource DNS name IPv4 (A)	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations. Learn more
Auto-assigned IP address 54.225.21.210 [Public IP]	VPC ID vpc-008d24c6794f21b94	Auto Scaling Group name -
IAM Role -	Subnet ID subnet-0b8f9b6de09e2792c	
IMDSv2 Required		

Details Security Networking Storage Status checks Monitoring Tags

Instance details Info

Platform Linux/UNIX (Inferred)	AMI ID ami-04a06f7cae37f75a5	Monitoring disabled
Platform details Linux/UNIX	AMI name newimage	Termination protection Disabled
Stop protection Disabled	Launch time Tue Jun 27 2023 10:58:22 GMT-0400 (Eastern Daylight Time) (4 minutes)	AMI location 044042447389/newimage

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The screenshot shows a macOS terminal window titled "ec2-user@ip-172-31-25-191:~ (ssh)". The window has three tabs, with the first tab labeled "⌘1". The terminal content is as follows:

```
Last login: Tue Jun 27 11:04:58 on ttys004
↳ ~ cd /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 3
↳ Labs 3 chmod 400 keypair2.pem
↳ Labs 3 ssh -i "keypair2.pem" root@ec2-54-225-21-210.compute-1.amazonaws.com
Please login as the user "ec2-user" rather than the user "root".

Connection to ec2-54-225-21-210.compute-1.amazonaws.com closed.
↳ Labs 3 ssh -i "keypair2.pem" ec2-user@ec2-54-225-21-210.compute-1.amazonaws.com
          '#'
          ~\_ #####
          ~~ \_\#####\
          ~~   \|##|
          ~~     \|#/   https://aws.amazon.com/linux/amazon-linux-2023
          ~~       \|~'__->
          ~~         /
          ~~   ._./
          ~~   /_/
          /m/'

Last login: Tue Jun 27 15:07:22 2023 from 24.209.108.197
[ec2-user@ip-172-31-25-191 ~]$ |
```

2.5

EXERCISE 2.5

Create a Launch Template

In this exercise, you'll create a launch template that installs and configures a simple web server. You'll then use the launch template to manually create an instance.

1. In the EC2 Dashboard, click Launch Templates.
2. Click the Create Launch Template button.
3. Give the launch template a name such as **MyTemplate**.
4. Click inside the search field for an image and select the AMI of one of the Ubuntu Server LTS AMIs (make sure the AMI you choose uses the 64-bit x86 architecture and not 64-bit ARM).
5. For Instance Type, select t2.micro.
6. Under Network Settings, select a security group that allows inbound HTTP access. Create a new security group if necessary.
7. Expand the Advanced Details section and scroll down to the User Data field. Enter the following:

```
#!/bin/bash
apt-get update
apt-get install -y apache2
echo "Welcome to my website">> index.html
cp index.html /var/www/html
```

8. Click the Create Launch Template button.
9. Click the Launch Instance From This Template link.
10. Under Source Template Version, select 1 (Default).
11. Click the Launch Instance From Template button.
12. After the instance boots, browse to its public IP address. You should see a web page that says "Welcome to my website."
13. Terminate the instance when you're done with it.

Solution:

- 1.

The screenshot shows the AWS EC2 Management Console interface. The left sidebar contains a navigation menu with sections like EC2 Dashboard, Instances, Images, Elastic Block Store, Network & Security, and more. The main content area is divided into several panels:

- Resources**: Shows a summary of running instances (2), auto scaling groups (0), dedicated hosts (0), elastic IPs (0), instances (2), key pairs (2), load balancers (0), placement groups (0), security groups (3), snapshots (1), and volumes (2).
- Account attributes**: Lists supported platforms (VPC), default VPC (vpc-008d24c6794f21b94), settings, EBS encryption, zones, EC2 Serial Console, default credit specification, and console experiments.
- Explore AWS**: Features a callout for launching Microsoft SQL Server Always On availability groups, followed by sections on service health (AWS Health Dashboard, Region: US East (N. Virginia), Status: This service is operating normally), scheduled events, and zones.

The URL in the browser bar is <https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchTemplates>.

2.

The screenshot shows the AWS EC2 Launch Templates page. The left sidebar has a 'New EC2 Experience' section with a 'Tell us what you think' link. Below it are sections for EC2 Dashboard, EC2 Global View, Events, Limits, Instances (with 'Launch Templates' selected), Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, Images (AMIs, AMI Catalog), Elastic Block Store (Volumes, Snapshots, Lifecycle Manager), Network & Security (Security Groups, Elastic IPs, Placement Groups, Key Pairs, Network Interface), CloudShell, Feedback, and Language. The main content area has a dark header 'EC2 launch templates' and sub-section 'Streamline, simplify and standardize instance launches'. It includes a paragraph about using launch templates for automation and permission enforcement, followed by a 'New launch template' button and a 'Create launch template' button. Below this are sections for 'Benefits and features' (Streamline provisioning, Simplify permissions, Governance), 'Documentation' (Documentation, API reference), and footer links for © 2023, Amazon Web Services, Inc. or its affiliates., Privacy, Terms, and Cookie preferences.

3.

Create launch template | EC2

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateTemplate:

Services Search [Option+S] Update N. Virginia evecs7346

EC2 > Launch templates > Create launch template

Create launch template

Creating a launch template allows you to create a saved instance configuration that can be reused, shared and launched at a later time. Templates can have multiple versions.

Launch template name and description

Launch template name - required
Mytemplate
Must be unique to this account. Max 128 chars. No spaces or special characters like '&', '*', '@'.

Template version description
A prod webserver for MyApp
Max 255 chars

Auto Scaling guidance Info
Select this if you intend to use this template with EC2 Auto Scaling
 Provide guidance to help me set up a template that I can use with EC2 Auto Scaling

▶ Template tags
▶ Source template

Launch template contents
Specify the details of your launch template below. Leaving a field blank will result in the field not being included in the launch template.

▼ Application and OS Images (Amazon Machine Image) Info
An AMI is a template that contains the software configuration (operating system, application server, and applications) required to

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4.

Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

ubuntu

Quickstart AMIs (9)
My AMIs (0)
AWS Marketplace AMIs (2034)
Community AMIs (500)

Refine results

Clear all filters

Free tier only [Info](#)

OS category

All Linux/Unix

All Windows

Architecture

64-bit (Arm)

ubuntu (9 filtered, 9 unfiltered)

ubuntu Ubuntu Server 22.04 LTS (HVM), SSD Volume Type
ami-053b0d53c279acc90 (64-bit (x86)) / ami-0a0c8eebcdd6dcbb0 (64-bit (Arm))
Ubuntu Server 22.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>). Platform: ubuntu Root device type: ebs Virtualization: hvm ENA enabled: Yes

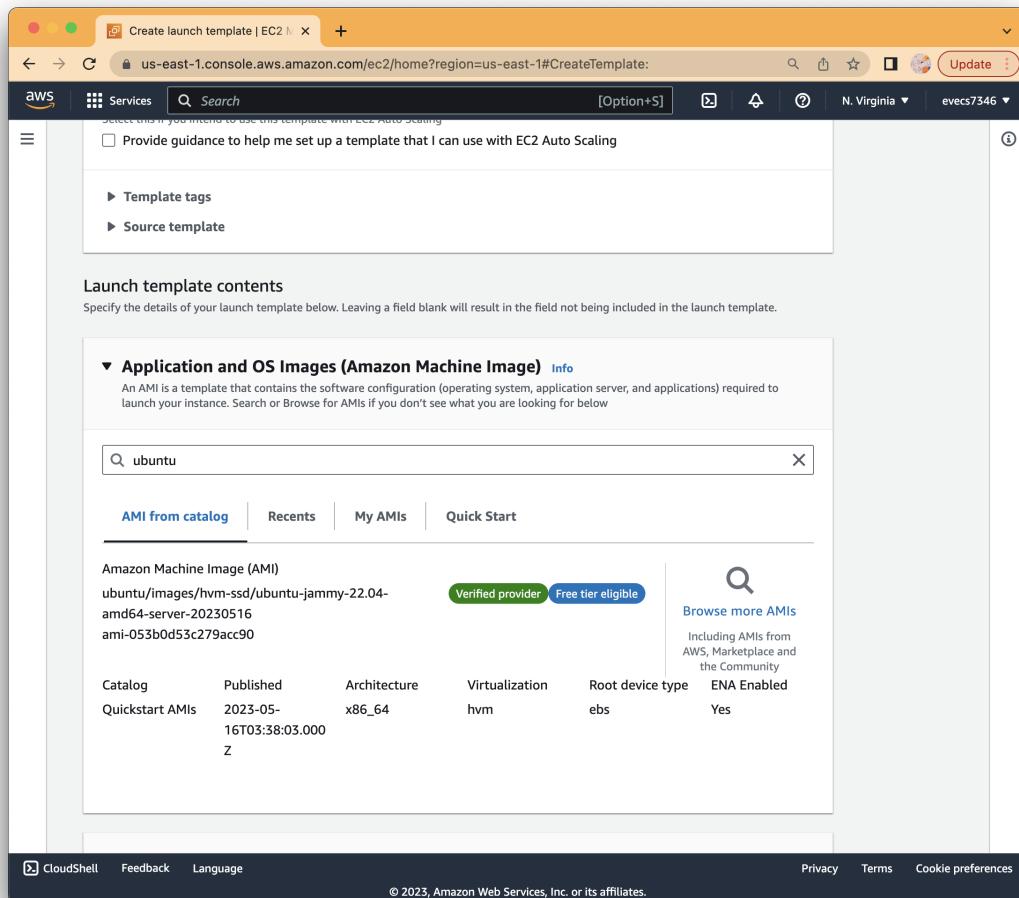
ubuntu Ubuntu Server 20.04 LTS (HVM), SSD Volume Type
ami-0261755bcb8c4a84 (64-bit (x86)) / ami-097d5b19d4f1a7d1b (64-bit (Arm))
Ubuntu Server 20.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical

Select Select

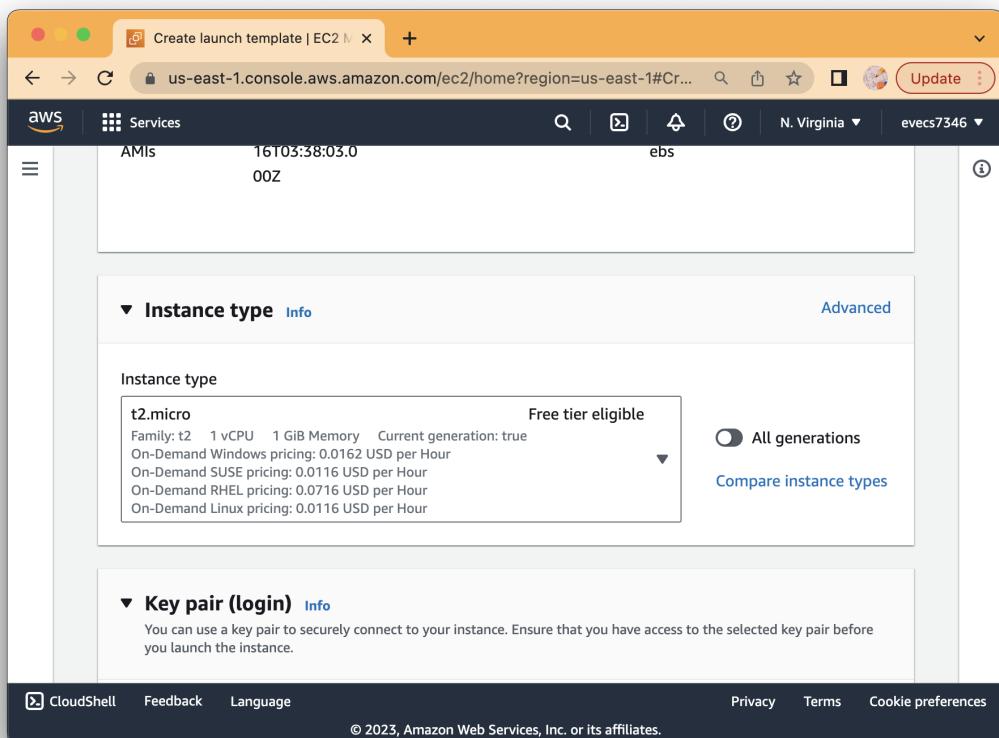
CloudShell Feedback Language

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5.



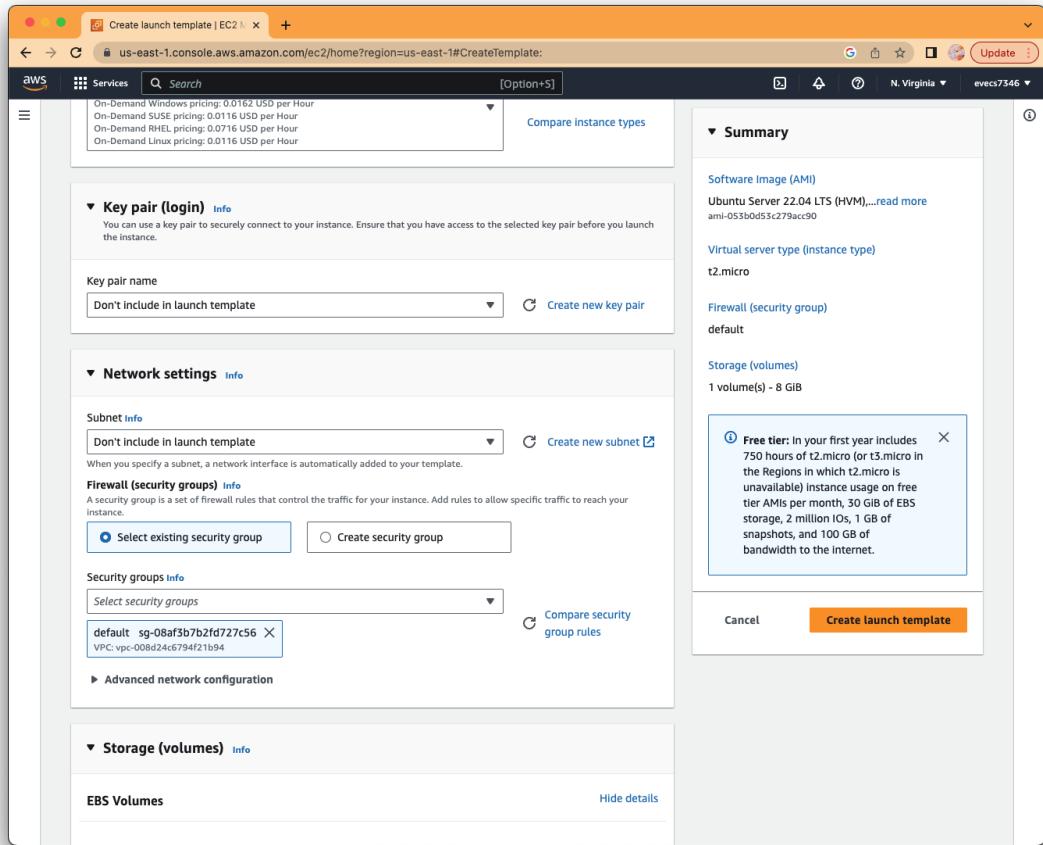
6.

The screenshot shows the AWS EC2 'Create launch template' interface. On the left, a sidebar lists various EC2 services: EC2 Dashboard, EC2 Global View, Events, Limits, Instances (with sub-options like Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations), Images (AMIs, AMI Catalog), Elastic Block Store (Volumes, Snapshots, Lifecycle Manager), Network & Security (Security Groups, Elastic IPs, Placement Groups, Key Pairs, Network Interfaces), CloudShell, Feedback, and Language.

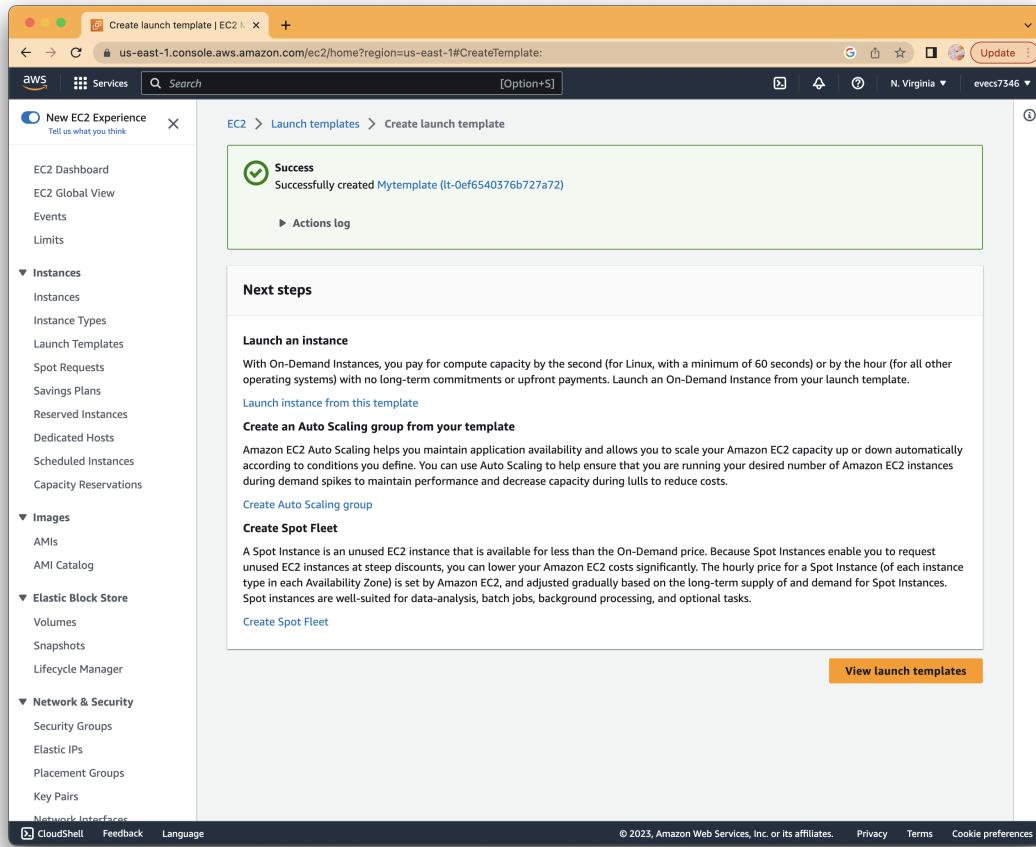
The main panel is titled 'Network settings'. It includes sections for 'Subnet Info' (set to 'Don't include in launch template'), 'Firewall (security groups) Info' (with options to 'Select existing security group' or 'Create security group', the latter being selected and named 'MyWebServerGroup'), and 'VPC - required Info' (set to 'vpc-008d24c6794f21b94').

The 'Inbound Security Group Rules' section contains one rule: 'Security group rule 1 (TCP, 80, 0.0.0.0/0)'. This rule has 'Type' set to 'Custom TCP', 'Protocol' set to 'TCP', and 'Port range' set to '80'. The 'Source type' is 'Anywhere'. A note below the rule states: '⚠️ Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.' An 'Add security group rule' button is at the bottom of this section.

7.



8.



9.

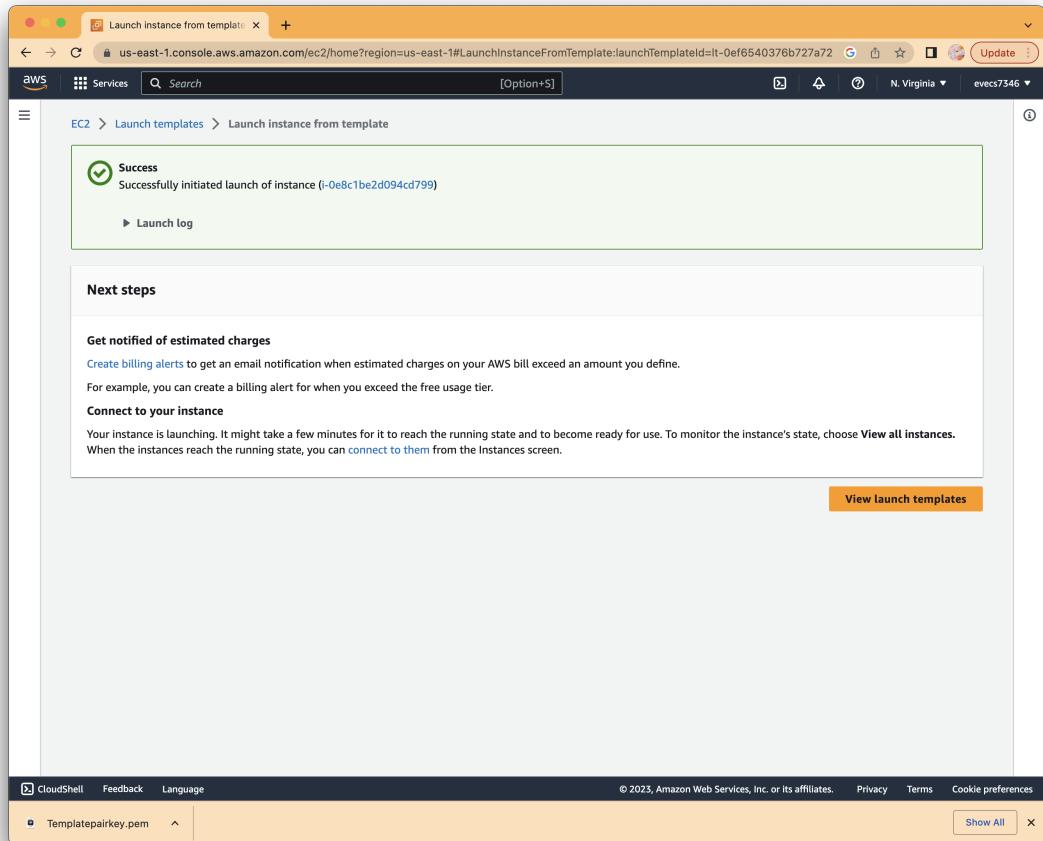
The screenshot shows the AWS EC2 Management Console with the URL us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchTemplateDetails:launchTemplateId=lt-0ef6540376b727a72. The page displays the details for a launch template named 'Mytemplate' (ID: lt-0ef6540376b727a72). The 'Actions' menu is open, with 'Launch instance from template' highlighted. Other options include 'Delete template', 'Modify template (Create new version)', 'Delete template version', 'Set default version', 'Manage tags', 'Create Spot Fleet', and 'Create Auto Scaling group'. The 'Launch template details' section shows the launch template ID, name, and default version. The 'Launch template version details' section shows the default version, which includes the AMI ID (ami-053b0d53c279acc90), instance type (t2.micro), security groups (sg-0ade381abc8c8b710), and availability zone. The 'Details' tab is selected in the navigation bar.

10.

The screenshot shows the AWS EC2 'Launch instance from template' wizard. The top navigation bar includes tabs for 'Launch instance from template', 'Launch instances', and 'Launch templates'. The main content area is titled 'Launch instance from template' and contains the following sections:

- Choose a launch template**:
 - Source template**: Mytemplate (ID: lt-0ef6540376b727a72)
 - Source template version**: 1 (Default)
- Instance details**:
 - Application and OS Images (Amazon Machine Image)**: Info
 - A message states: "Your instance details are listed below. Any fields that are not specified as part of the configuration below will use the template or default values for those fields. Ensure that you have permissions to override these parameters or your instance launch will fail."
 - A search bar: "Search our full catalog including 1000s of application and OS images".
 - Navigation tabs: AMI from catalog, Recents, My AMIs, Quick Start.
 - Amazon Machine Image (AMI) details:
 - ubuntu/images/hvm-ssd/ubuntu-jammy-22.04-
 - amd64-server-20230516
 - ami-053b0d53c279acc90
 - Buttons: Verified provider, Free tier eligible.
 - A callout box: "Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million I/Os, 1 GB of snapshots, and 100 GB of bandwidth to the internet." (with a close button).
- Summary**:
 - Number of instances: 1
 - Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ...read more (ami-053b0d53c279acc90)
 - Virtual server type (instance type): t2.micro
 - Firewall (security group): MyWebServerGroup
 - Storage (volumes): 1 volume(s) - 8 GiB
- Action buttons: Cancel, Launch instance (highlighted in orange), Review commands.

11.



A screenshot of a terminal window titled "ubuntu@ip-172-31-94-208: /var/www/html". The window shows a single line of code:

```
<html>
  <body>
    Welcome to my website
  </body>
</html>
```

The cursor is at the end of the line, and the command ":wq!" is typed in the bottom right corner of the terminal window.

12.

Screenshot of the AWS EC2 Management console showing the Instances page.

The left sidebar navigation includes:

- EC2 Dashboard
- EC2 Global View
- Events
- Limits
- Instances
 - Instances
 - Instance Types
 - Launch Templates
 - Spot Requests
 - Savings Plans
 - Reserved Instances
 - Dedicated Hosts
 - Scheduled Instances
 - Capacity Reservations
- Images
 - AMIs
 - AMI Catalog
- Elastic Block Store
 - Volumes
 - Snapshots
 - Lifecycle Manager
- Network & Security
 - Security Groups
 - Elastic IPs
 - Placement Groups
- CloudShell
- Feedback
- Language

The main content area displays the "Instances (3) Info" table:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Z
cs7346instance	i-0fc91f805de747b0e	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b
MyInstance	i-0433befed59f04b57	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b
-	i-0e8c1be2d094cd799	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a

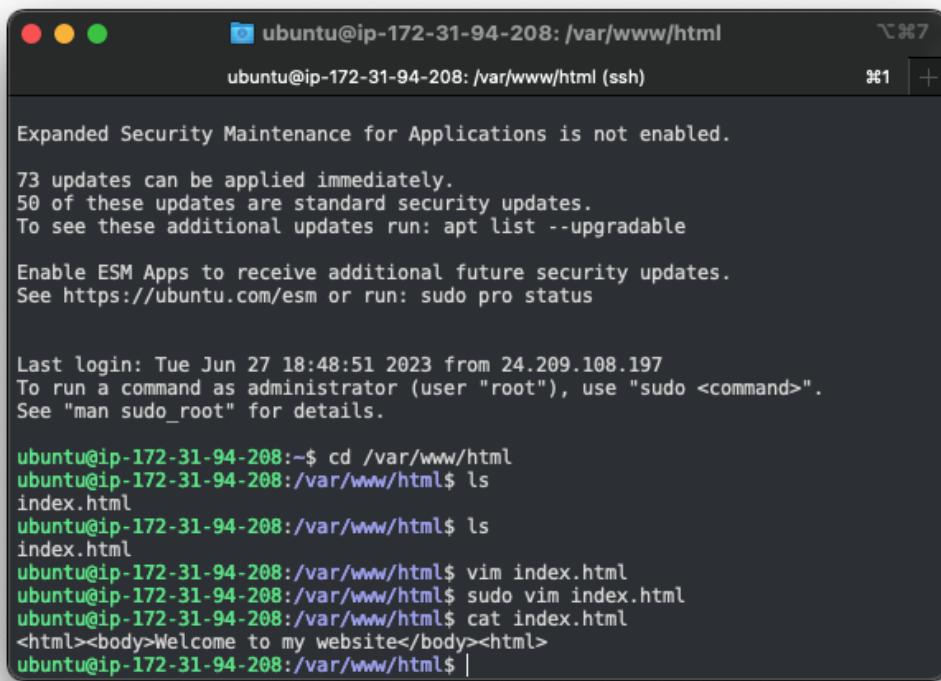
A modal dialog titled "Select an instance" is open at the bottom of the page.

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The screenshot shows the 'Edit user data' interface in the AWS Management Console. The instance ID is i-0e8c1be2d094cd799. The current user data is displayed in a code editor-like area:

```
#!/bin/bash
apt-get update
apt-get install -y apache2
echo "Welcome to my website"> index.html
cp index.html /var/www/html
```

A 'Copy user data' button is available. Below it, under 'New user data', there are two options: 'Modify user data as text' (selected) and 'Modify user data by importing a file'. The 'text' input field contains the same code as the current user data. A checkbox 'Input is already base64-encoded' is present. At the bottom are 'Cancel' and 'Save' buttons.



A screenshot of a macOS terminal window titled "ubuntu@ip-172-31-94-208: /var/www/html". The window shows an SSH session to an Ubuntu system. The terminal content includes:

```
Expanded Security Maintenance for Applications is not enabled.  
73 updates can be applied immediately.  
50 of these updates are standard security updates.  
To see these additional updates run: apt list --upgradable  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
Last login: Tue Jun 27 18:48:51 2023 from 24.209.108.197  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ip-172-31-94-208:~$ cd /var/www/html  
ubuntu@ip-172-31-94-208:/var/www/html$ ls  
index.html  
ubuntu@ip-172-31-94-208:/var/www/html$ vim index.html  
ubuntu@ip-172-31-94-208:/var/www/html$ sudo vim index.html  
ubuntu@ip-172-31-94-208:/var/www/html$ cat index.html  
<html><body>Welcome to my website</body></html>  
ubuntu@ip-172-31-94-208:/var/www/html$ |
```

```

ubuntu@ip-172-31-94-208: /var/www/html
ubuntu@ip-172-31-94-208: /var/www/html (ssh) ❶ | + ❷
↳ - cd Downloads
↳ [Downloads] ssh -i "yes.pem" ubuntu@ec2-44-201-215-179.compute-1.amazonaws.com
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.19.0-1025-aws x86_64)

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

System information as of Tue Jun 27 19:57:51 UTC 2023

System load: 0.0 Processes: 124
Usage of /: 23.4% of 7.57GB Users logged in: 2
Memory usage: 30% IPv4 address for eth0: 172.31.94.208
Swap usage: 0%

Expanded Security Maintenance for Applications is not enabled.

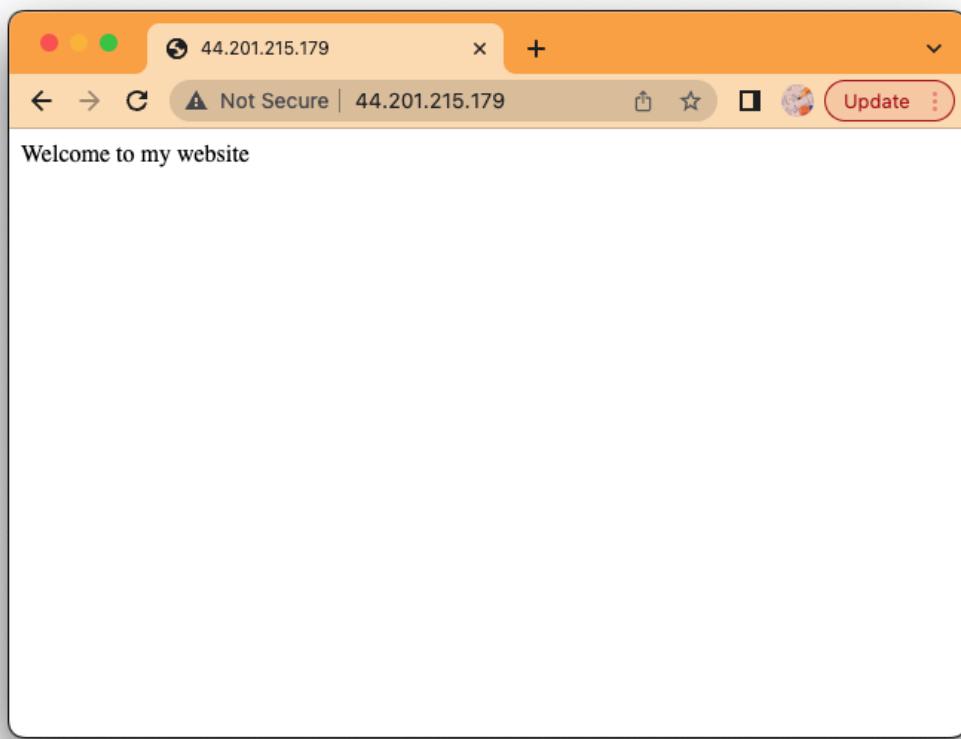
73 updates can be applied immediately.
50 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Tue Jun 27 19:17:19 2023 from 24.209.108.197
ubuntu@ip-172-31-94-208:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Fetched 218 kB in 1s (324 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-94-208:~$ sudo apt-get install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
apache2 is already the newest version (2.4.52-1ubuntu4.5).
0 upgraded, 0 newly installed, 0 to remove and 69 not upgraded.
ubuntu@ip-172-31-94-208:~$ cd /var/www/html
ubuntu@ip-172-31-94-208:/var/www/html$ sudo systemctl start apache2.service
ubuntu@ip-172-31-94-208:/var/www/html$ sudo systemctl status apache2.service
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor prese
   Active: active (running) since Tue 2023-06-27 19:47:15 UTC; 12min ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 3664 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SU
 Main PID: 3669 (apache2)
   Tasks: 55 (limit: 1141)
   Memory: 5.1M
      CPU: 67ms
     CGroup: /system.slice/apache2.service
             └─3669 /usr/sbin/apache2 -k start
                 ├─3670 /usr/sbin/apache2 -k start
                 ├─3671 /usr/sbin/apache2 -k start
                 └─3672 /usr/sbin/apache2 -k start

Jun 27 19:47:15 ip-172-31-94-208 systemd[1]: Stopped The Apache HTTP Server.
Jun 27 19:47:15 ip-172-31-94-208 systemd[1]: Starting The Apache HTTP Server...
Jun 27 19:47:15 ip-172-31-94-208 systemd[1]: Started The Apache HTTP Server.
[lines 1-17/17 (END)...skipping...

```



13.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
cs7346instance	i-0fc91f805de747b0e	Shutting-down	t2.micro	2/2 checks passed	No alarms	us-east-1b
Myinstance	i-0433befed59f04b57	Shutting-down	t2.micro	2/2 checks passed	No alarms	us-east-1b
yes	i-0d49abce5483b6ac7	Shutting-down	t2.micro	2/2 checks passed	No alarms	us-east-1a
-	i-0c07ef506762314e4	Shutting-down	t2.micro	2/2 checks passed	No alarms	us-east-1a

2.6

EXERCISE 2.6

Install the AWS CLI and Use It to Launch an EC2 Instance

Need help? Learn how to install the AWS CLI for your OS here:

<http://docs.aws.amazon.com/cli/latest/userguide/getting-started-install.html>

Refer to the previous AWS CLI example for help launching your instance. (Hint: You will need to fill in some xxxx placeholders with actual resource IDs.)

Solution:

```

eve@Eves-Air:~ ~ (-zsh)
Last login: Tue Jun 27 15:57:40 on ttys000
↳ - curl "https://awscli.amazonaws.com/AWSCLIV2.pkg" -o "AWSCLIV2.pkg"
sudo installer -pkg AWSCLIV2.pkg -target /
    % Total    % Received % Xferd  Average Speed   Time   Time     Time Current
          Dload  Upload Total Spent   Left Speed
100 35.4M  100 35.4M    0     0  25.3M      0 0:00:01  0:00:01 --:--:-- 25.4M
Password:
Sorry, try again.
Password:
installer: Package name is AWS Command Line Interface
installer: Upgrading at base path /
installer: The upgrade was successful.
↳ - sudo installer -pkg ./AWSCLIV2.pkg -target /
installer: Package name is AWS Command Line Interface
installer: Upgrading at base path /
installer: The upgrade was successful.
↳ - which aws
/usr/local/bin/aws
↳ - aws --verison
usage: aws [options] <command> <subcommand> [<subcommand> ...] [parameters]
To see help text, you can run:
aws help
aws <command> help
aws <command> <subcommand> help
aws: error: the following arguments are required: command
↳ - aws --version
aws-cli/2.12.3 Python/3.11.4 Darwin/22.5.0 exe/x86_64 prompt/off
↳ - |

```

2.7

EXERCISE 2.7

Clean Up Unused EC2 Resources

Since you've probably been launching resources while experimenting with AWS, you'll want to make sure you haven't accidentally left anything running that could cost you money. So, take a good look through the console and kill off what shouldn't still be alive. Here are some things to consider:

- Remember to check any other AWS regions where you might have done some work—only a single region's resources will show up in the console at a time.
- Some resources can't be deleted because they're in use by other resources. A snapshot used by a private AMI is one example. You'll need to shut those down in the right order.
- When you're logged into your AWS root account, you can check out your Billing and Cost Management dashboard in the console (<http://console.aws.amazon.com/billing>). This dashboard will show you whether, taking into account your current resource usage, you stand to run up a bill in the current month.

Solution:

The screenshot shows the AWS Billing Management Console dashboard. The left sidebar is titled "Billing" and contains the following sections:

- Home**
- Billing**
 - Bills
 - Payments
 - Credits
 - Purchase orders
 - Cost & usage reports
 - Cost categories
 - Cost allocation tags
 - Free tier
 - Billing Conductor
- Cost Management**
 - Cost explorer
 - Budgets
 - Budgets reports
 - Savings Plans
- Preferences**
 - Billing preferences
 - Payment preferences
 - Consolidated billing
 - Tax settings
- Permissions**
 - Affected policies

The main content area is titled "AWS Billing Dashboard" and displays the following information:

AWS summary

Current month's total forecast USD 0.08	Current MTD balance USD 0.07	Prior month for the same period with trend No data to display
Total number of active services 7	Total number of active AWS accounts 1	Total number of active AWS Regions 3

Highest cost

Service name Relational Database Service	Trend compared to prior month No data to display	Current MTD balance USD 0.07	Prior month for the same period No data to display
--	---	--	---

Cost trend by top five services

No data	There is no data to display.
---------	------------------------------

At the bottom of the dashboard, there are links for CloudShell, Feedback, Language, and a footer with copyright information: © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences.