

Provision and Configure Amazon Instances (Node A & Node B)

Node A:

- Go to EC2 page on AWS console
- Click on “Launch Instance” button

Launch instance
To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

[Launch instance](#) ▼

[Migrate a server](#) ↗

Note: Your instances will launch in the US East (N. Virginia) Region

- Add “Name” - Node A

Name and tags [Info](#)

Name

- Select “Amazon Linux 2023 AMI

Amazon Linux
aws


macOS
Mac

Ubuntu
ubuntu

Windows
Microsoft

Red Hat
Red Hat

SUSE Li
SUSE


[Browse more AMIs](#)
Including AMIs from
AWS, Marketplace and
the Community

Amazon Machine Image (AMI)

Amazon Linux 2023 AMI
ami-0fff1b9a61dec8a5f (64-bit (x86), uefi-preferred) / ami-0621e09dc8263acc3 (64-bit (Arm), uefi)
Virtualization: hvm ENA enabled: true Root device type: ebs

Free tier eligible ▼


- Select or create a “Key Pair”

▼ **Key pair (login)** [Info](#)

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - *required*

▼

 [Create new key pair](#)

- Create Security Group - Select “My IP” for Allowed Traffic

▼ Network settings Info

Network | Info
vpc-02d6dc3dd5cc47a88

Subnet | Info
No preference (Default subnet in any availability zone)

Auto-assign public IP | Info
Enable

Additional charges apply when outside of free tier allowance

Firewall (security groups) | Info
A 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.

☒ Create security group ☐ Select existing security group

We'll create a new security group called 'launch-wizard-11' with the following rules:

☒ Allow SSH traffic from
Helps you connect to your instance

My IP
100.8.229.251/32

- Edit Network Security Settings

▼ Network settings Info

Edit

- Provide a Name & Description for “Security Group”

Firewall (security groups) | Info
A 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.

☒ Create security group ☐ Select existing security group

Security group name - required

car-reco-security-group

This security group will be added to all network interfaces. The name can't be edited after the security group is created. Max length is 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and _-./()#,@[]+=&:{}!\$*

Description - required | Info

Car Recognition Security Group

- Provision SSH, HTTP & HTTPS for “Inbound Security Group Rules”

| | | |
|---|--|---|
| Type Info ssh ▼ | Protocol Info TCP | Port range Info 22 |
| Source type Info My IP ▼ | Name Info Add CIDR, prefix list or security 100.8.229.251/32 ✕ | Description - optional Info e.g. SSH for admin desktop |


| | | |
|---|--|---|
| Type Info HTTP ▼ | Protocol Info TCP | Port range Info 80 |
| Source type Info My IP ▼ | Name Info Add CIDR, prefix list or security 100.8.229.251/32 ✕ | Description - optional Info e.g. SSH for admin desktop |

| | | |
|---|--|---|
| Type Info HTTPS ▼ | Protocol Info TCP | Port range Info 443 |
| Source type Info My IP ▼ | Name Info Add CIDR, prefix list or security 100.8.229.251/32 ✕ | Description - optional Info e.g. SSH for admin desktop |

- Click on “Launch Instance”

Cancel

Launch instance

 Preview code

Node B:

- Follow the same process as “Node A” (with 1 exception)
- Under “Configure Storage” - click on “Add new volume” button

▼ **Configure storage** [Info](#) Advanced

1x GiB Root volume (Not encrypted)

1x GiB EBS volume (Not encrypted) Remove

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

Add new volume

Connect to Node A and Node B via SSH

- Click on instance (Instance ID link)

| <input type="checkbox"/> | Name 🔗 ▼ | Instance ID | Instance state ▼ |
|--------------------------|--------------------------|--|------------------|
| <input type="checkbox"/> | Node A | i-047a832af1085a93b | 🟢 Running 🔍 🔍 |

- On upper right corner, click on “Connect” button

Instance summary for i-047a832af1085a93b (Node A) [Info](#) 🔄 Connect Instance state ▼ Actions ▼

Updated 1 minute ago

- Copy example “ssh” command and log into instance

Example:

📄 `ssh -i "ec2-node_a.pem" ec2-user@ec2-54-234-8-234.compute-1.amazonaws.com`

- Follow the same process to log into “Node B”

Configure security credentials for Node A & Node B

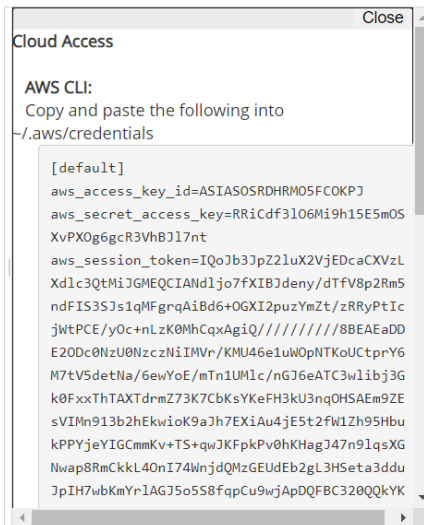
- Log into Node A & Node B and create credentials file

```
$ mkdir ~/.aws
$ cd ~/.aws
$ touch credentials
```

- In “AWS Academy Learner Lab” click on “AWS Details”

▶ Start Lab ■ End Lab 📄 AWS Details 📄 Readme 🔄 Reset

- Copy content of ~/.aws/credentials to credentials file on Node A & Node B



Install Software on Node A & Node B

- Install Java

```
// install java
sudo yum -y install java-17-amazon-corretto-devel
```

- Install Maven

```
// install maven
sudo wget http://repos.fedorapeople.org/repos/dchen/apache-maven/epel-apache-maven.repo -O /etc/yum.repos.d/epel-apache-maven.repo
sudo sed -i s/\\$releasever/6/g /etc/yum.repos.d/epel-apache-maven.repo
sudo yum install -y apache-maven
mvn --version
```

- Install Git

```
// install git
sudo yum install git -y
git config --global user.name "Aryeh Golob"
git config --global user.email ag645@njit.edu
```

Configure EBS Mount Point on Node B

- Backup “fstab” file

```
sudo cp /etc/fstab /etc/fstab.orig
```

- Create file system on EBS drive

```
sudo mkfs -t xfs /dev/xvdb
```

- Create /data directory

```
sudo mkdir /data
```

- Grant “read & write” permission to “/data” directory

```
sudo chmod -R a+rw /data
```

- Mount /data directory

```
sudo mount /dev/xvdb /data
```

- Get UUID for volume (sudo blkid)

```
[ec2-user@ip-172-31-38-216 ~]$ sudo blkid
/dev/xvda128: SEC_TYPE="msdos" UUID="A41B-D0D1" BLOCK_SIZE="512" TYPE="vfat" PARTLABEL="EFI System Partition" PARTUUID="dc8e83c2-fd31-4403-960e-484e567be164"
/dev/xvda1: LABEL="/" UUID="693eea79-11af-44b1-9c1e-01aced209966" BLOCK_SIZE="4096" TYPE="xfs" PARTLABEL="Linux" PARTUUID="8eca1f17-8f97-4b7d-9b31-ba295f584293"
/dev/xvdb: UUID="f72b10c8-564b-4bf9-8fe0-d382de8e780f" BLOCK_SIZE="512" TYPE="xfs"
```

- Set permissions on /data mount

```
sudo chmod -R a+rw /data
```

- Add volume UUID to /etc/fstab file

```
[ec2-user@ip-172-31-38-216 ~]$ sudo blkid
/dev/xvda128: SEC_TYPE="msdos" UUID="A41B-D0D1" BLOCK_SIZE="512" TYPE="vfat" PARTLABEL="EFI System Partition" PARTUUID="dc8e83c2-fd31-4403-960e-484e567be164"
/dev/xvda1: LABEL="/" UUID="693eea79-11af-44b1-9c1e-01aced209966" BLOCK_SIZE="4096" TYPE="xfs" PARTLABEL="Linux" PARTUUID="8eca1f17-8f97-4b7d-9b31-ba295f584293"
/dev/xvdb: UUID="f72b10c8-564b-4bf9-8fe0-d382de8e780f" BLOCK_SIZE="512" TYPE="xfs"
```

Clone Code From GIT Repository On Node A & Node B

- On both Node A & Node B

```
$ git clone https://github.com/qaz216/njitCloudComputing.git
```

Configure Both Node A & Node B From Config File

- Configuration file location

```
./cloud-app/src/main/resources/application.properties
```

- Config File Content

```
# application mode
#app.mode=car_recognition
app.mode=text_recognition

#bucket name
app.bucket=njit-cs-643

# sql queue info
app.queue.name=car-reco-queue.fifo
app.queue.group.id=image-processing

# processing delay for node A (car recognition)
app.car.recognition.delay=5

# result file
app.file.location=/data/result_file.txt
```

- Set Mode for Node A (Car Recognition)

```
# application mode
app.mode=car_recognition
#app.mode=text_recognition
```

- Set Mode for Node B (Text Recognition)

```
# application mode
#app.mode=car_recognition
app.mode=text_recognition
```

Compile Code On Node A & Node B

- Compile Using Maven

```
$ mvn compile
```

Run Application First on Node A then on Node B

- Use Maven to run application

```
$ mvn exec:java -Dexec.mainClass="com.njit.aryeh.RecognitionApp" -Dexec.cleanupDaemonThreads=false
```

- Verify console output for Node A

```
mode = car_recognition
running car recognition node ...
Creating queue: car-reco-queue1.fifo
image name: 1.jpg - label: car - confidence: 99.94897
image name: 2.jpg - label: car - confidence: 99.703125
image name: 4.jpg - label: car - confidence: 99.48165
image name: 5.jpg - label: car - confidence: 99.52181
image name: 6.jpg - label: car - confidence: 98.753235
image name: 7.jpg - label: car - confidence: 99.999916
sending -1
```

- Verify console output for Node B

```
mode = text_recognition
running text recognition node ...
Text detected for image: 1.jpg - text: $ BR8167 - confidence: 91.88689
Text detected for image: 1.jpg - text: $ - confidence: 93.11517
Text detected for image: 1.jpg - text: BR8167 - confidence: 90.65859
Text detected for image: 4.jpg - text: YHI9 OTZ - confidence: 99.27241
Text detected for image: 4.jpg - text: YHI9 - confidence: 99.11218
Text detected for image: 4.jpg - text: OTZ - confidence: 99.43263
Text detected for image: 7.jpg - text: Lamborghini - confidence: 97.241585
Text detected for image: 7.jpg - text: LP 610 LB - confidence: 95.650894
Text detected for image: 7.jpg - text: B0 - confidence: 76.901344
Text detected for image: 7.jpg - text: BWW - confidence: 17.247715
Text detected for image: 7.jpg - text: Lamborghini - confidence: 97.241585
Text detected for image: 7.jpg - text: LP - confidence: 99.60253
Text detected for image: 7.jpg - text: 610 LB - confidence: 91.69925
Text detected for image: 7.jpg - text: B0 - confidence: 76.901344
Text detected for image: 7.jpg - text: BWW - confidence: 17.247715
-1 received ... exiting
```

- Verify data written to file on EBS partition (/data/result_file.txt)


```
[ec2-user@ip-172-31-44-86 cloud-app]$ cat /data/result_file.txt
1.jpg - text: $ BR8167 - confidence: 91.88689
1.jpg - text: $ - confidence: 93.11517
1.jpg - text: BR8167 - confidence: 90.65859
4.jpg - text: YHI9 OTZ - confidence: 99.27241
4.jpg - text: YHI9 - confidence: 99.11218
4.jpg - text: OTZ - confidence: 99.43263
7.jpg - text: Lamborghini - confidence: 97.241585
7.jpg - text: LP 610 LB - confidence: 95.650894
7.jpg - text: B0 - confidence: 76.901344
7.jpg - text: BWW - confidence: 17.247715
7.jpg - text: Lamborghini - confidence: 97.241585
7.jpg - text: LP - confidence: 99.60253
7.jpg - text: 610 LB - confidence: 91.69925
7.jpg - text: B0 - confidence: 76.901344
7.jpg - text: BWW - confidence: 17.247715
```