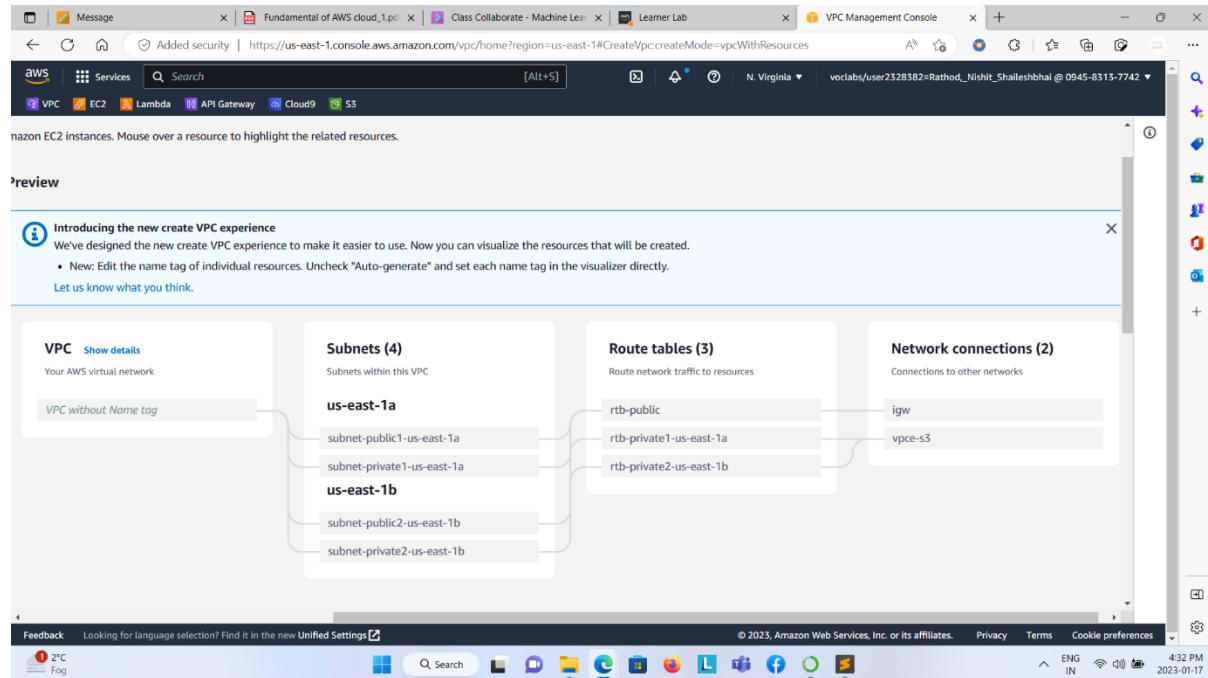


## AIGC 5003 Machine Learning Cloud Computing

### Lab One

- Create a new instance in a public subnet.
- Install boto3 python library on it.
- Query S3 bucket and running instances programmatically from the inside of that instance.

### The Architecture



### VPC

The screenshot shows the AWS VPC Management Console VPC dashboard. On the left, a sidebar navigation menu includes options like "VPC dashboard", "EC2 Global View", "Filter by VPC", "Virtual private cloud", and "Your VPCs". Under "Your VPCs", two VPCs are listed:

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR
vpc-0568fc5e8dac592b5	vpc-0568fc5e8dac592b5	Available	10.0.0.0/16	-
Do Not Delete	vpc-0889a3bb92870ab49	Available	172.31.0.0/16	-

The status bar at the bottom right shows: © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences ENG IN 434 PM 2023-01-17.

## Subnets

The screenshot shows the AWS VPC Management Console with the Subnets page open. The left sidebar shows a selected VPC named "vpc-0568fc5e8dac592b5". The main pane displays a table of four subnets:

Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR
public-2	subnet-048cd508cd49e1ceb	Available	vpc-0568fc5e8dac592b5   SM...	10.0.2.0/24	-
private-2	subnet-00e59765b7e966683	Available	vpc-0568fc5e8dac592b5   SM...	10.0.3.0/24	-
private-1	subnet-0f86713d96cc602cc	Available	vpc-0568fc5e8dac592b5   SM...	10.0.1.0/24	-
public-1	subnet-0166bf1263b97bc42	Available	vpc-0568fc5e8dac592b5   SM...	10.0.0.0/24	-

A search bar at the top right contains the query "search: vpc-0568fc5e8dac592b5". A "Create subnet" button is located in the top right corner of the main pane.

## Route Tables

The screenshot shows the AWS VPC Management Console with the Route Tables page open. The left sidebar shows the same selected VPC "vpc-0568fc5e8dac592b5". The main pane displays a table of two route tables:

Name	Route table ID	Explicit subnet associat...	Edge associations	Main	VPC
Main	rtb-0596786c4778af72e	-	-	Yes	vpc-0568fc5e8dac592b5   SM...
public-RT	rtb-0cc1cc6d02a13777c	2 subnets	-	No	vpc-0568fc5e8dac592b5   SM...

A search bar at the top right contains the query "search: vpc-0568fc5e8dac592b5". A "Create route table" button is located in the top right corner of the main pane.

## Internet Gateways

The screenshot shows the AWS VPC Management Console with the 'Internet gateways' page open. The left sidebar shows 'Your VPCs' and 'Virtual private cloud' sections. The main table lists one internet gateway:

Name	Internet gateway ID	State	VPC ID	Owner
SM-IGW	igw-0c21ce116df13a850	Attached	vpc-0568fc5e8dac592b5   SM-vpc	094583137742

The details pane for 'igw-0c21ce116df13a850 / SM-IGW' shows the following information:

Details	Tags
Internet gateway ID: igw-0c21ce116df13a850 State: Attached VPC ID: vpc-0568fc5e8dac592b5   SM-vpc Owner: 094583137742	

## EC2 Instances

The screenshot shows the AWS EC2 Instances page with three running instances listed:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IP
Lab Server	i-05985b4116f6d7e6c	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b	-
aws-cloud9-La...	i-03f3b7b5ff1acc366	Running	t2.micro	2/2 checks passed	No alarms	us-east-1f	ec2-44-21-
aws-cloud9-S...	i-07ffb891529d3a717	Running	t3.small	2/2 checks passed	No alarms	us-east-1a	ec2-35-17-

The details pane for 'i-05985b4116f6d7e6c (Lab Server)' shows the following information:

Instance ID	Public IPv4 address	Private IPv4 addresses
i-05985b4116f6d7e6c (Lab Server)	54.208.44.140 [open address]	10.0.2.52
IPv6 address		Public IPv4 DNS
Hostname type	Private IP DNS name (IPv4 only)	-
IP name: ip-10-0-2-52.ec2.internal	ip-10-0-2-52.ec2.internal	Elastic IP addresses
Answer private resource DNS name		-
IPv4 (A)		AWS Compute Optimizer finding
Auto-assigned IP address	VPC ID	Opt-in to AWS Compute Optimizer for recommendation
54.208.44.140 [Public IP]	vpc-0568fc5e8dac592b5 (SM-vpc)	S.

Screenshot of the AWS EC2 Management Console showing the Instances page. The page displays a list of running instances, including the Lab Server (i-05985b4116f6d7e6c), aws-cloud9-La... (i-03f3b7b3ff1acc366), aws-cloud9-S... (i-07ffb891529d3a717), and First Server (i-0527b374b86caaae7). The Lab Server is selected.

**Instances (1/4) Info**

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPs
Lab Server	i-05985b4116f6d7e6c	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b	-
aws-cloud9-La...	i-03f3b7b3ff1acc366	Running	t2.micro	2/2 checks passed	No alarms	us-east-1f	ec2-44-21
aws-cloud9-S...	i-07ffb891529d3a717	Running	t3.small	2/2 checks passed	No alarms	us-east-1a	ec2-35-17
First Server	i-0527b374b86caaae7	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a	-

**Instance: i-05985b4116f6d7e6c (Lab Server)**

**Networking details**

Public IPv4 address 54.208.44.140   open address	Private IPv4 addresses 10.0.2.52	VPC ID vpc-0568fc5e8dac592b5 (SM-vpc)
Public IPv4 DNS -	Private IP DNS name (IPv4 only) ip-10-0-2-52.ec2.internal	Subnet ID subnet-048cd508cd49e1ceb (public-2)
Availability zone us-east-1b	IPV6 addresses -	Carrier IP addresses (ephemeral) -
		Secondary private IPv4 addresses -
		Outpost ID -

Feedback: Looking for language selection? Find it in the new Unified Settings.

Screenshot of the AWS EC2 Management Console showing the Instances page. The page displays a list of running instances, including the Lab Server (i-05985b4116f6d7e6c), aws-cloud9-La... (i-03f3b7b3ff1acc366), aws-cloud9-S... (i-07ffb891529d3a717), and First Server (i-0527b374b86caaae7). The Lab Server is selected.

**Instances (1/4) Info**

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPs
Lab Server	i-05985b4116f6d7e6c	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b	-
aws-cloud9-La...	i-03f3b7b3ff1acc366	Running	t2.micro	2/2 checks passed	No alarms	us-east-1f	ec2-44-21
aws-cloud9-S...	i-07ffb891529d3a717	Running	t3.small	2/2 checks passed	No alarms	us-east-1a	ec2-35-17
First Server	i-0527b374b86caaae7	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a	-

**Instance: i-05985b4116f6d7e6c (Lab Server)**

**LabRole**

094583157742

Tue Jan 17 2023 15:15:55 GMT-0500 (Eastern Standard Time)

**Security groups**

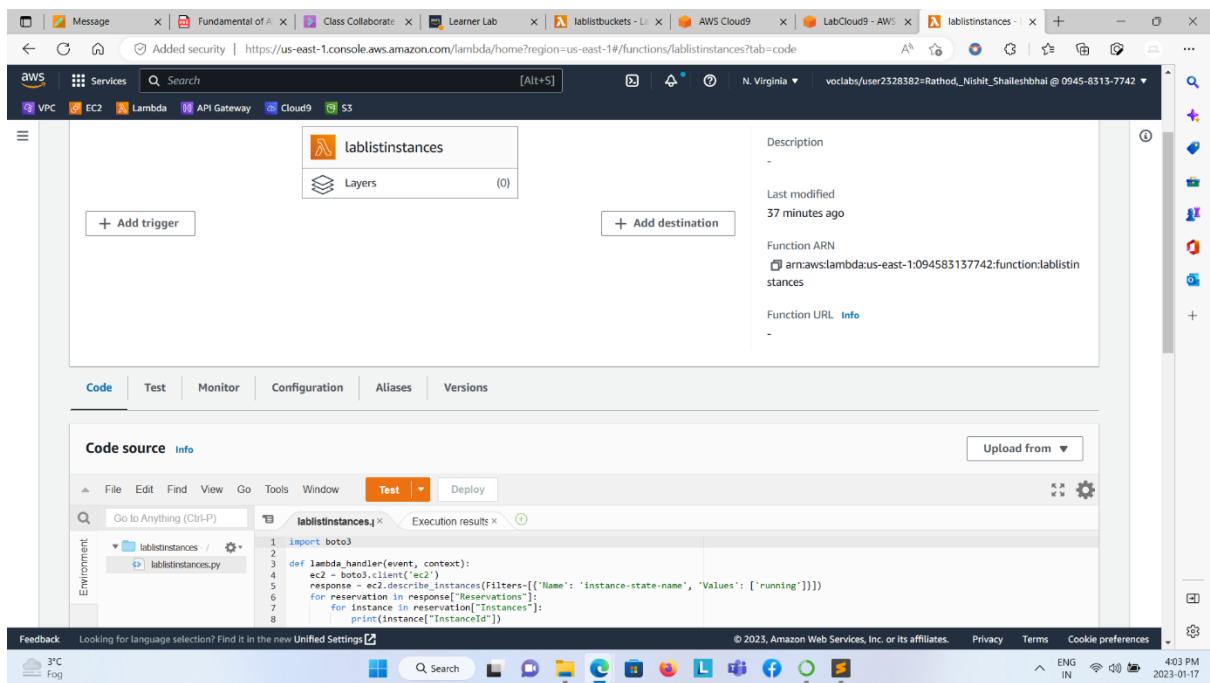
sg-01d1b09511086c3ca (launch-wizard-2)

**Inbound rules**

Filter rules	Security group rule ID	Port range	Protocol	Source	Security groups
	sra-069bc8cc82c48b539	22	TCP	0.0.0.0/0	launch-wizard-2

Feedback: Looking for language selection? Find it in the new Unified Settings.

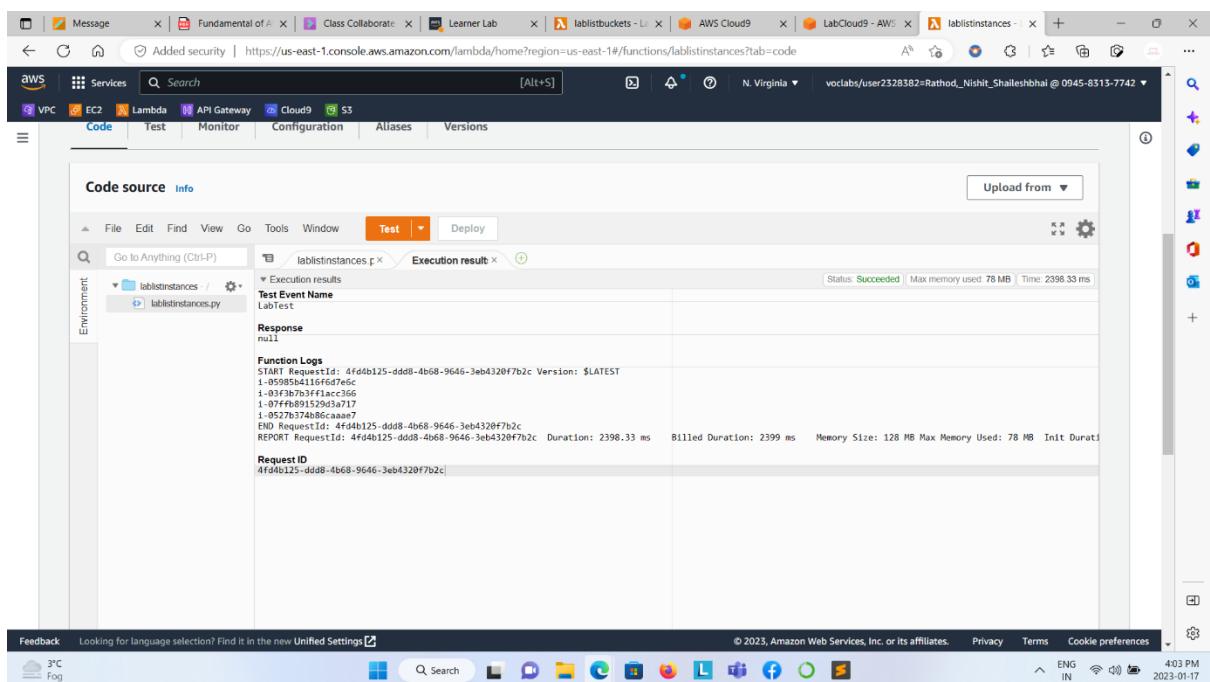
## Lambda Function: lablistinstances and lablistbuckets



The screenshot shows the AWS Lambda console interface. The top navigation bar includes tabs for Message, Fundamental of AI, Class Collaborate, Learner Lab, lablistbuckets, AWS Cloud9, LabCloud9 - AWS, lablistinstances, and another lablistinstances tab. The main area shows a Lambda function named "lablistinstances". The "Code" tab is selected, displaying the code source. The code in "lablistinstances.py" is:

```
import boto3

def lambda_handler(event, context):
    ec2 = boto3.client('ec2')
    response = ec2.describe_instances(Filters=[{'Name': 'instance-state-name', 'Values': ['running']}])
    for reservation in response['Reservations']:
        for instance in reservation['Instances']:
            print(instance["InstanceId"])
```



The screenshot shows the AWS Lambda console interface, similar to the previous one but with the "Test" tab selected. The "Execution result" pane shows the output of a test event named "LabTest". The "Response" field is empty ("null"). The "Function Logs" section contains the following log entries:

```
START RequestId: 4fd4b125-ddd8-4b68-9646-3eb4320f7b2c Version: $LATEST
1-05985b4116f6d7e6c
1-03fb3b7b3f1acc366
1-07fffb081529d3a717
1-0c5374b8cc0d127
REPORT RequestId: 4fd4b125-ddd8-4b68-9646-3eb4320f7b2c Duration: 2398.33 ms Billed Duration: 2399 ms Memory Size: 128 MB Max Memory Used: 78 MB Init Duration: 0 ms
Request ID
4fd4b125-ddd8-4b68-9646-3eb4320f7b2c
```

Screenshot of the AWS Lambda function configuration page for 'Lablistbuckets'.

**Code properties**

Package size 341.0 byte	SHA256 hash DOAy8NNxTc/mk7U+kXH21CvU2vh+1Px4wXfEz5GoM=	Last modified January 17, 2023 at 03:25 PM EST
----------------------------	---	---

**Runtime settings** [Info](#) [Edit](#)

Runtime Python 3.9	Handler <a href="#">Info</a> lablistbuckets.lambda_handler	Architecture <a href="#">Info</a> x86_64
-----------------------	---	---

**Layers** [Info](#) [Edit](#) [Add a layer](#)

Merge order	Name	Layer version	Compatible runtimes	Compatible architectures	Version ARN
There is no data to display.					



Screenshot of the AWS Lambda function configuration page for 'Lablistbuckets'.

**Code source** [Info](#) [Upload from](#)

**Code**

```
File Edit Find View Go Tools Window Test Deploy
Go to Anything (Ctrl-P)
lablistbuckets.py Execution results
1 import boto3
2
3 def lambda_handler(event, context):
4     s3 = boto3.client('s3')
5     response = s3.list_buckets()
6     for bucket in response['Buckets']:
7         print(bucket['Name'])
```

**Description**  
-

**Last modified**  
16 minutes ago

**Function ARN**  
[arn:aws:lambda:us-east-1:094583137742:function:lablistbuckets](#)

**Function URL** [Info](#)  
-



Code source [Info](#)

File Edit Find View Go Tools Window [Test](#) Deploy

Execution results

Test Event Name: LabTest2

Response: null

Function Logs

```
START RequestId: 07b54b8d-1d61-4af8-9858-5387d84bf181 Version: $LATEST
my-bucket-labmrn
my-nstickeet
sm-S3nicket
END RequestId: 07b54b8d-1d61-4af8-9858-5387d84bf181
REPORT RequestId: 07b54b8d-1d61-4af8-9858-5387d84bf181 Duration: 1656.13 ms Billed Duration: 1657 ms Memory Size: 128 MB Max Memory Used: 69 MB Init Duration: 0 ms
```

Feedback Looking for language selection? Find it in the new [Unified Settings](#)

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

ENG IN 405 PM 2023-01-17

## Created Cloud9 environment

Installing Boto3, Running ec2-instance.py, lablistbucketscloud9.py, listbuckets.py, and lablistinstances.py files by “python filename.py code”

AWS Cloud9 > Environments

Name	Cloud9 IDE	Environment type	Connection	Permission	Owner ARN
SM-Cloud9	<a href="#">Open</a>	EC2 instance	Secure Shell (SSH)	Owner	arn:aws:sts::094583137742:assumed-role/voclabs/user2328382=Rathod_Nishit_Shaileshbhai
LabCloud9	<a href="#">Open</a>	EC2 instance	Secure Shell (SSH)	Owner	arn:aws:sts::094583137742:assumed-role/voclabs/user2328382=Rathod_Nishit_Shaileshbhai

Feedback Looking for language selection? Find it in the new [Unified Settings](#)

© 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

ENG IN 422 PM 2023-01-17

```
python3 -> ip-172-31-66-2 x Immediate Javascript (br x)

veclabs:-/environment $ pip install boto3
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: boto3 in /home/ec2-user/local/lib/python3.7/site-packages (1.26.50)
Requirement already satisfied: s3transfer<0.7.0,>=0.6.0 in /home/ec2-user/local/lib/python3.7/site-packages (from boto3) (0.6.0)
Requirement already satisfied: botocore<1.30.0,>=1.29.50 in /home/ec2-user/local/lib/python3.7/site-packages (from boto3) (1.29.50)
Requirement already satisfied: jmespath<1.0.0,>=0.9.4 in /home/ec2-user/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (1.0.0)
Requirement already satisfied: s3transfer<1.27.0,>=1.25.4 in /home/ec2-user/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (1.26.13)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (2.8.2)
Requirement already satisfied: six<1.5 in /usr/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (1.16.0)
veclabs:-/environment $
```

```
1 import boto3
2 
3 # Create an EC2 client
4 ec2 = boto3.client('ec2')
5 
6 # Call the describe_instances method
7 response = ec2.describe_instances()
8 
9 # Get a list of all the instances
10 instances = response['Reservations']
11 
12 # Iterate through the list and print
13 for instance in instances:
14     instance_id = instance['Instances'][0]['InstanceId']
15     print(f'Instance ID: {instance_id}')
16 
17 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

```
1 import boto3
2 
3 # Create an S3 client
4 s3 = boto3.client('s3')
5 
6 # Call S3 to list current buckets
7 response = s3.list_buckets()
8 
9 # Get a list of all bucket names from the response
10 buckets = [bucket['Name'] for bucket in response['Buckets']]
11 
12 # Print out the bucket list
13 print(f'Bucket List: {buckets}')
14 
15 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

```
1 import boto3
2 
3 # Create an EC2 client
4 ec2 = boto3.client('ec2')
5 
6 # Call EC2 to list all running instances
7 response = ec2.describe_instances()
8 
9 # Get a list of all running instances
10 instances = [instance['InstanceId'] for instance in response['Reservations']]
11 
12 # Print out the instance ID list
13 print(f'Running Instance ID List: {instances}')
14 
15 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

```
veclabs:-/environment $ pip install boto3
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: boto3 in /home/ec2-user/local/lib/python3.7/site-packages (1.26.50)
Requirement already satisfied: s3transfer<0.7.0,>=0.6.0 in /home/ec2-user/local/lib/python3.7/site-packages (from boto3) (0.6.0)
Requirement already satisfied: botocore<1.30.0,>=1.29.50 in /home/ec2-user/local/lib/python3.7/site-packages (from boto3) (1.29.50)
Requirement already satisfied: jmespath<1.0.0,>=0.9.4 in /home/ec2-user/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (1.0.0)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (2.8.2)
Requirement already satisfied: six<1.5 in /usr/local/lib/python3.7/site-packages (from botocore<1.30.0,gt;=1.29.50->boto3) (1.16.0)
veclabs:-/environment $
```

```
1 import boto3
2 
3 # Create an EC2 client
4 ec2 = boto3.client('ec2')
5 
6 # Call the describe_instances method
7 response = ec2.describe_instances()
8 
9 # Get a list of all the instances
10 instances = response['Reservations']
11 
12 # Iterate through the list and print
13 for instance in instances:
14     instance_id = instance['Instances'][0]['InstanceId']
15     print(f'Instance ID: {instance_id}')
16 
17 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

```
1 import boto3
2 
3 # Create an S3 client
4 s3 = boto3.client('s3')
5 
6 # Call S3 to list current buckets
7 response = s3.list_buckets()
8 
9 # Get a list of all bucket names from the response
10 buckets = [bucket['Name'] for bucket in response['Buckets']]
11 
12 # Print out the bucket list
13 print(f'Bucket List: {buckets}')
14 
15 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

```
1 import boto3
2 
3 # Create an EC2 client
4 ec2 = boto3.client('ec2')
5 
6 # Call EC2 to list all running instances
7 response = ec2.describe_instances()
8 
9 # Get a list of all running instances
10 instances = [instance['InstanceId'] for instance in response['Reservations']]
11 
12 # Print out the instance ID list
13 print(f'Running Instance ID List: {instances}')
14 
15 python3 -> ip-172-31-66-2 x Immediate Javascript (br x)
```

Created buckets on Cloud9 AWS Commandline interface by “aws s3 mb s3://my-new-bucket” code.

The screenshot shows the AWS Cloud9 IDE interface with four terminal windows open:

- Terminal 1 (ec2-instance.py):** Lists EC2 instances.
- Terminal 2 (listbucketscloud9.py):** Lists S3 buckets.
- Terminal 3 (listbuckets.py):** Lists S3 buckets.
- Terminal 4 (listinstancescloud9.py):** Lists EC2 instances.

The output from Terminal 2 and Terminal 3 both show bucket lists:

```
Bucket List: ['my-bucket-labn', 'my-nrs3bucket', 'sm-nr-s3bucket']
```

The output from Terminal 4 shows instance lists:

```
Instance ID: i-01234567890abcdef, Instance Type: t2.micro, State: running
Instance ID: i-09f7b1b1ac7e6, Instance Type: t2.micro, State: running
Instance ID: i-07ff01529d5a7, Instance Type: t3.small, State: running
Instance ID: i-0527b374880caaa, Instance Type: t2.micro, State: running
```

The screenshot shows the AWS Cloud9 IDE interface with four terminal windows open:

- Terminal 1 (ec2-instance.py):** Lists EC2 instances.
- Terminal 2 (listbucketscloud9.py):** Lists S3 buckets.
- Terminal 3 (listbuckets.py):** Lists S3 buckets.
- Terminal 4 (listinstancescloud9.py):** Lists EC2 instances.

The output from Terminal 2 and Terminal 3 both show bucket lists:

```
Bucket List: ['my-bucket-labn', 'my-nrs3bucket', 'sm-nr-s3bucket']
```

The output from Terminal 4 shows instance lists:

```
Instance ID: i-01234567890abcdef, Instance Type: t2.micro, State: running
Instance ID: i-09f7b1b1ac7e6, Instance Type: t2.micro, State: running
Instance ID: i-07ff01529d5a7, Instance Type: t3.small, State: running
Instance ID: i-0527b374880caaa, Instance Type: t2.micro, State: running
```

```

1 import boto3
2 
3 # Create an S3 client
4 s3 = boto3.client('s3')
5 
6 # Call the describe_instances method
7 response = ec2.describe_instances()
8 
9 # Get a list of all the instances
10 instances = response['Reservations']
11 
12 # Iterate through the list and print
13 for instance in instances:
14     instance_id = instance['Instances'][0]['InstanceId']
15     print(f"Instance ID: {instance_id}")
16 
17 print("Instance ID: {instance_id}")

```

```

1 import boto3
2 
3 # Create an S3 client
4 s3 = boto3.client('s3')
5 
6 # Call S3 to list current buckets
7 response = s3.list_buckets()
8 
9 # Get a list of all bucket names from the response
10 bucket_names = [bucket['Name'] for bucket in response['Buckets']]
11 
12 # Print out the bucket list
13 print(f"Bucket list: {', '.join(bucket_names)}")

```

```

1 import boto3
2 
3 # Create an EC2 client
4 ec2 = boto3.client('ec2')
5 
6 # Call EC2 to list all running instances
7 response = ec2.describe_instances()
8 
9 # Get a list of all running instances
10 instances = [instance['Instances'][0] for instance in response['Reservations']]
11 
12 # Print out the instance ID list
13 print(f"Running Instance ID List: {', '.join([str(instance['InstanceId']) for instance in instances])}")

```

## S3 Bucket created and loaded Image:

Name	AWS Region	Access	Creation date
awslabonebucket	US East (N. Virginia) us-east-1	Bucket and objects not public	January 17, 2023, 16:17:34 (UTC-05:00)
my-bucket-labnr	US East (N. Virginia) us-east-1	Objects can be public	January 17, 2023, 09:23:25 (UTC-05:00)
my-nrs3bucket	US East (N. Virginia) us-east-1	Objects can be public	January 14, 2023, 16:38:08 (UTC-05:00)
sm-nr-s3bucket	US East (N. Virginia) us-east-1	Bucket and objects not public	January 14, 2023, 16:32:39 (UTC-05:00)

The screenshot shows the AWS S3 console with the URL <https://s3.console.aws.amazon.com/s3/buckets/sm-nr-s3bucket?region=us-east-1&tab=objects>. The page displays the 'sm-nr-s3bucket' bucket with one object named 'humber.png'. The object was uploaded on January 14, 2023, at 16:34:02 UTC-05:00, is 4.5 KB in size, and has a Standard storage class.

Name	Type	Last modified	Size	Storage class
humber.png	png	January 14, 2023, 16:34:02 (UTC-05:00)	4.5 KB	Standard

The screenshot shows the AWS S3 console with the URL <https://s3.console.aws.amazon.com/s3/buckets/awslabonebucket?region=us-east-1&tab=objects>. The page displays the 'awslabonebucket' bucket with one object named 'aws.png'. The object was uploaded on January 17, 2023, at 16:19:57 UTC-05:00, is 5.4 KB in size, and has a Standard storage class.

Name	Type	Last modified	Size	Storage class
aws.png	png	January 17, 2023, 16:19:57 (UTC-05:00)	5.4 KB	Standard