Module Introduction

Deploy your first app server

Web Server

Objective

Do your first app server backend deployment in AWS!

Background

Cloud

Buzz word that everyone uses, but is a very simple concept. In very simple terms,

- Cloud is a bunch of hardware resources like storage or compute that someone maintains for you.
- Eg: Apple maintains your photos in iCloud instead of your harddisk, AWS provides you with a server (think desktop computer) to host your website instead of doing it from a machine at your house.
- https://youtu.be/QJncFirhjPg

AWS

Amazon Web Services (AWS) is one of the most popular cloud service providers out in the market. They provide different kinds of services for companies and individuals. https://youtu.be/a9__D53WsUs

Some of the popular offerings from AWS are:

- Virtual machines (EC2)
  - VM - in simple terms, computers with some configuration; eg: 2cpu, 16GB RAM, 20 GB hard disk

- Storage (S3)
- Load Balancers (ELB)

You'll be using **AWS EC2 virtual machines** in this Byte.

Docker

Docker is a containerization technology - you can think of them as tiny VMs. You don't have to know the details of docker for this Byte. But feel free to dig deeper if you are curious - find our bytes
Docker-1(https://learn.crio.do/home/me/ME_DOCKER1) and
Docker-2(https://learn.crio.do/home/me/ME_DOCKER2)

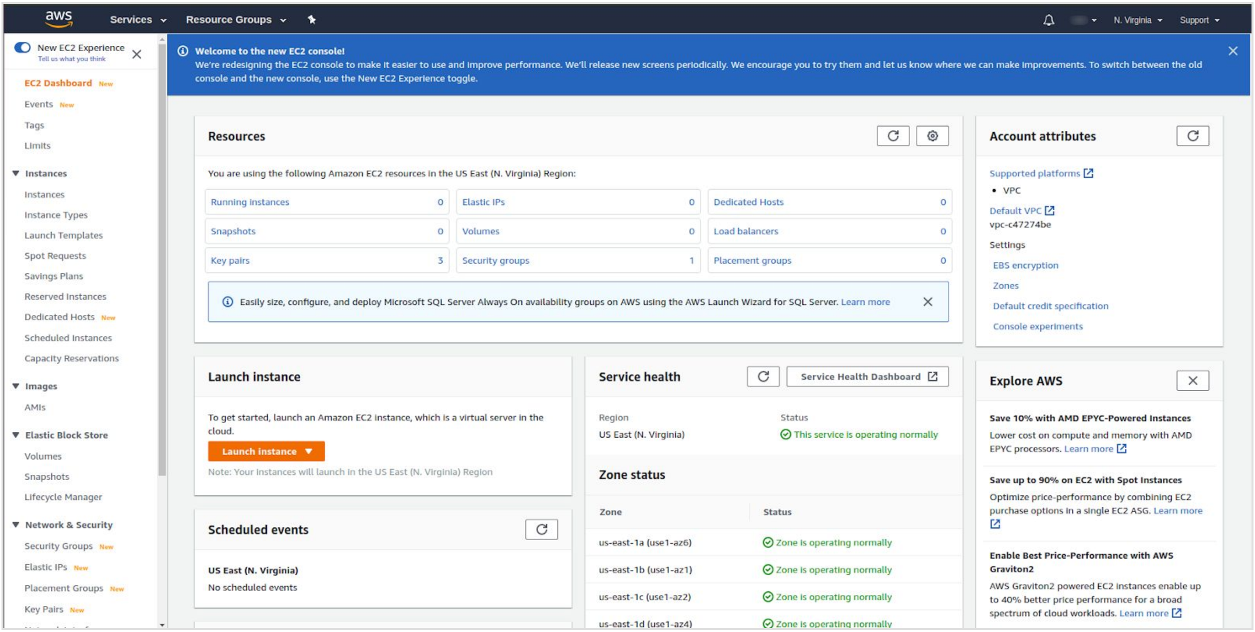
Primary goals

1. Launch your first virtual server in AWS
2. Deploy the app backend server
3. Connect mobile app to the app backend server

Create an EC2 instance

Elastic Compute Cloud (EC2) is the IaaS(Infrastructure as a Service) offering from AWS - you can rent out servers with customizable memory, storage and bandwidth. These servers can then be used for purposes hosting your applications, which is exactly what we're going to do.

Step 1. Click on the search bar. Search for EC2. After clicking you will see a EC2 dashboard. Click on the launch instance button.



Welcome to the new EC2 console!
We're redesigning the EC2 console to make it easier to use and improve performance. We'll release new screens periodically. We encourage you to try them and let us know where we can make improvements. To switch between the old console and the new console, use the New EC2 Experience toggle.

Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) Region:

Running instances	0	Elastic IPs	0	Dedicated Hosts	0
Snapshots	0	Volumes	0	Load balancers	0
Key pairs	3	Security groups	1	Placement groups	0

Easily size, configure, and deploy Microsoft SQL Server Always On availability groups on AWS using the AWS Launch Wizard for SQL Server. Learn more

Account attributes

Supported platforms
- VPC

Default VPC
vpc-c47274be

Settings
EBS encryption
Zones
Default credit specification
Console experiments

Launch instance

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

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

Scheduled events

US East (N. Virginia)
No scheduled events

Service health

Region	Status
US East (N. Virginia)	This service is operating normally

Zone status

Zone	Status
us-east-1a (use1-az6)	Zone is operating normally
us-east-1b (use1-az1)	Zone is operating normally
us-east-1c (use1-az2)	Zone is operating normally
us-east-1d (use1-az4)	Zone is operating normally

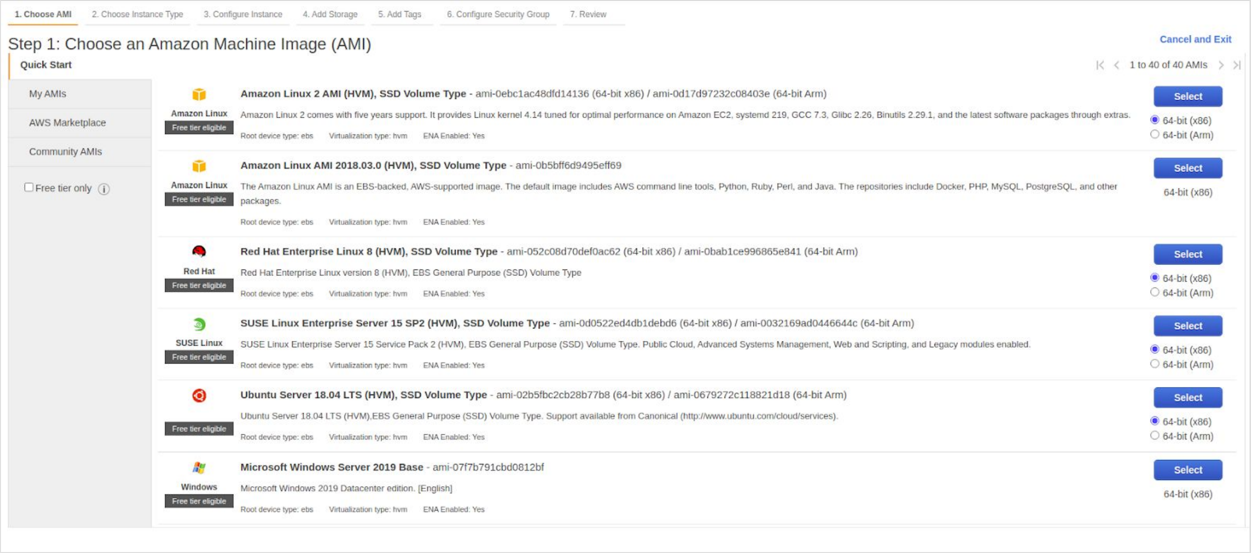
Explore AWS

Save 10% with AMD EPYC-Powered Instances
Lower cost on compute and memory with AMD EPYC processors. Learn more

Save up to 90% on EC2 with Spot Instances
Optimize price-performance by combining EC2 purchase options in a single EC2 ASG. Learn more

Enable Best Price-Performance with AWS Graviton2
AWS Graviton2 powered EC2 instances enable up to 40% better price performance for a broad spectrum of cloud workloads. Learn more

Step 2. Select **Ubuntu 18 64 bit (x86)**. - this reflects the OS configuration of the server you'd be renting. ***Note: that if you select any other distribution, the instructions/user-name to login etc will be different.***



Step 1: Choose an Amazon Machine Image (AMI)

Amazon Linux — Free tier eligible
Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0ebc1ac48dfd14136 (64-bit x86) / ami-0d17d97232c08403e (64-bit Arm)
Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras.
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
● 64-bit (x86) ○ 64-bit (Arm)

Amazon Linux — Free tier eligible
Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-0b5bff6d9495eff69
The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
64-bit (x86)

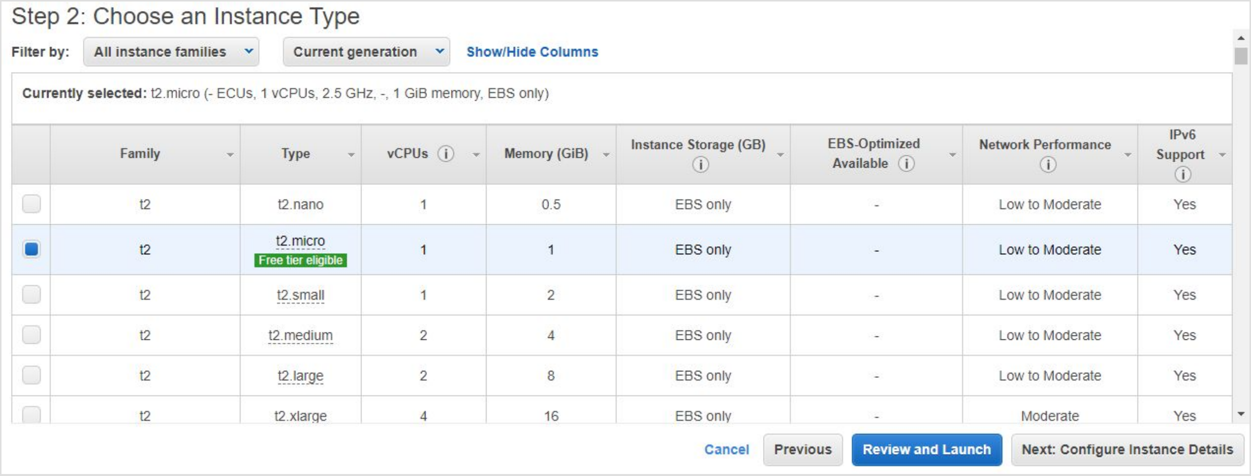
Red Hat — Free tier eligible
Red Hat Enterprise Linux 8 (HVM), SSD Volume Type - ami-052c08d70def0ac62 (64-bit x86) / ami-0bab1ce996865e841 (64-bit Arm)
Red Hat Enterprise Linux version 8 (HVM), EBS General Purpose (SSD) Volume Type
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
● 64-bit (x86) ○ 64-bit (Arm)

SUSE Linux — Free tier eligible
SUSE Linux Enterprise Server 15 SP2 (HVM), SSD Volume Type - ami-0d0522ed4db1debd6 (64-bit x86) / ami-0032169ad0446644c (64-bit Arm)
SUSE Linux Enterprise Server 15 Service Pack 2 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
● 64-bit (x86) ○ 64-bit (Arm)

Free tier eligible
Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-02b5fbc2cb28b77b8 (64-bit x86) / ami-0679272c118821d18 (64-bit Arm)
Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (http://www.ubuntu.com/cloud/services).
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
● 64-bit (x86) ○ 64-bit (Arm)

Windows — Free tier eligible
Microsoft Windows Server 2019 Base - ami-07f7b791cbd0812bf
Microsoft Windows 2019 Datacenter edition. [English]
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes
64-bit (x86)

Step 3. Click on t2 micro (Free Tier) with 1 GiB memory. This reflects the storage setting. Make sure you select the free one - you'll be charged otherwise. Click Next Configure Instance Details.

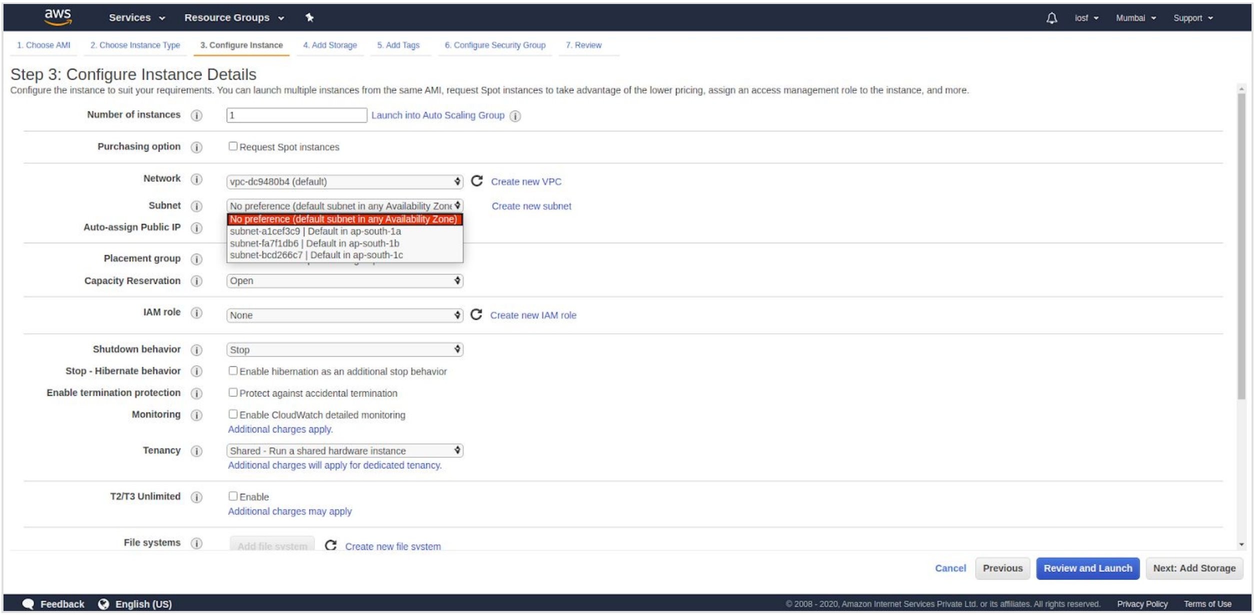


Step 2: Choose an Instance Type

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, -, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
□	t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
■	t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
□	t2	t2.small	1	2	EBS only	-	Low to Moderate	Yes
□	t2	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
□	t2	t2.large	2	8	EBS only	-	Low to Moderate	Yes
□	t2	t2.xlarge	4	16	EBS only	-	Moderate	Yes

Step 4. Choose the number of instances as 1 and click default subnet in any available zone. Move to the next step, Click on Add storage.

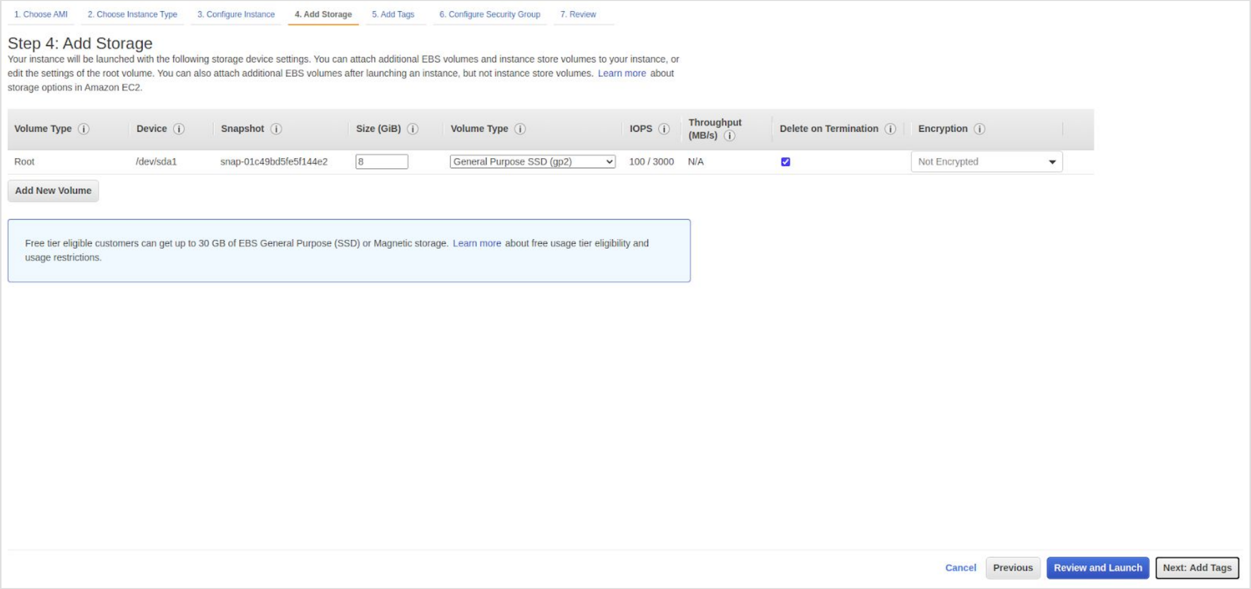


Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances	1 Launch into Auto Scaling Group
Purchasing option	□ Request Spot instances
Network	vpc-dc9480b4 (default) Create new VPC
Subnet	No preference (default subnet in any Availability Zone Create new subnet No preference (default subnet in any Availability Zone) subnet-a1cef3c9 | Default in ap-south-1a subnet-fa7f1db6 | Default in ap-south-1b subnet-bcd266c7 | Default in ap-south-1c
Auto-assign Public IP	
Placement group	
Capacity Reservation	Open
IAM role	None Create new IAM role
Shutdown behavior	Stop
Stop - Hibernate behavior	□ Enable hibernation as an additional stop behavior
Enable termination protection	□ Protect against accidental termination
Monitoring	□ Enable CloudWatch detailed monitoring Additional charges apply.
Tenancy	Shared - Run a shared hardware instance Additional charges will apply for dedicated tenancy.
T2/T3 Unlimited	□ Enable Additional charges may apply
File systems	Add file system Create new file system

Step 5. Leave this at default. Click on Add tags.



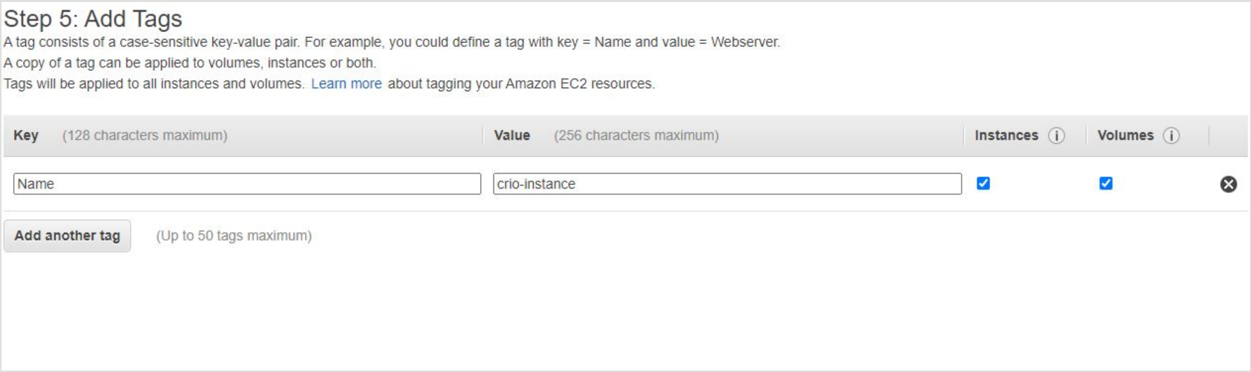
Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encryption
Root	/dev/sda1	snap-01c49bd5fe5f144e2	8	General Purpose SSD (gp2)	100 / 3000	N/A	☑	Not Encrypted

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

Step 6. Write Name in the Key and write anything in the value and that value will be your Instance name. Click on configure security group.

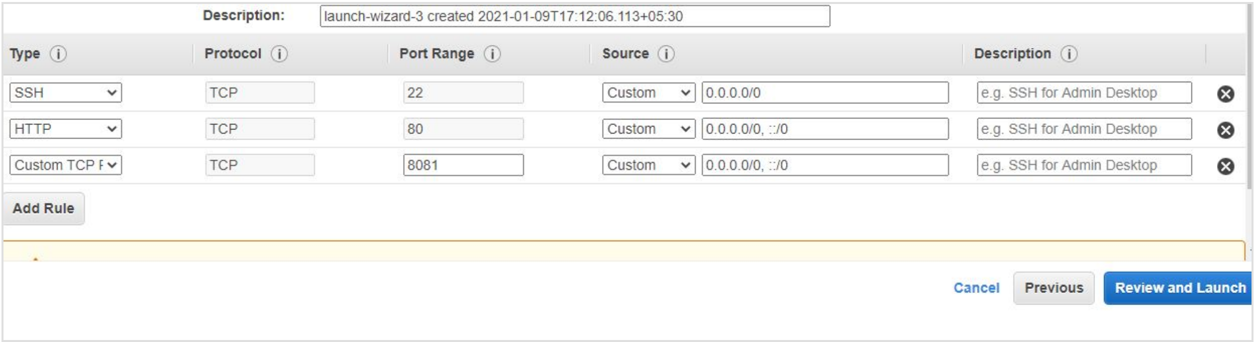


Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.
A copy of a tag can be applied to volumes, instances or both.
Tags will be applied to all instances and volumes. Learn more about tagging your Amazon EC2 resources.

Key (128 characters maximum)	Value (256 characters maximum)	Instances	Volumes
Name	crio-instance	☑	☑

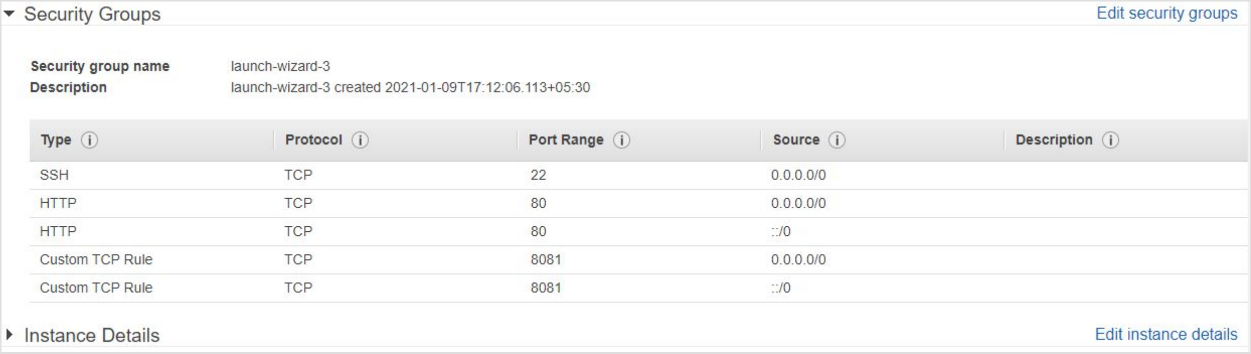
Step 7. There should be three open ports, with the configurations as shown - Confirm that you fill them exactly like they're given here



Description: launch-wizard-3 created 2021-01-09T17:12:06.113+05:30

Type	Protocol	Port Range	Source		Description
SSH	TCP	22	Custom	0.0.0.0/0	e.g. SSH for Admin Desktop
HTTP	TCP	80	Custom	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop
Custom TCP F	TCP	8081	Custom	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop

Click on review and launch. You should see something like this

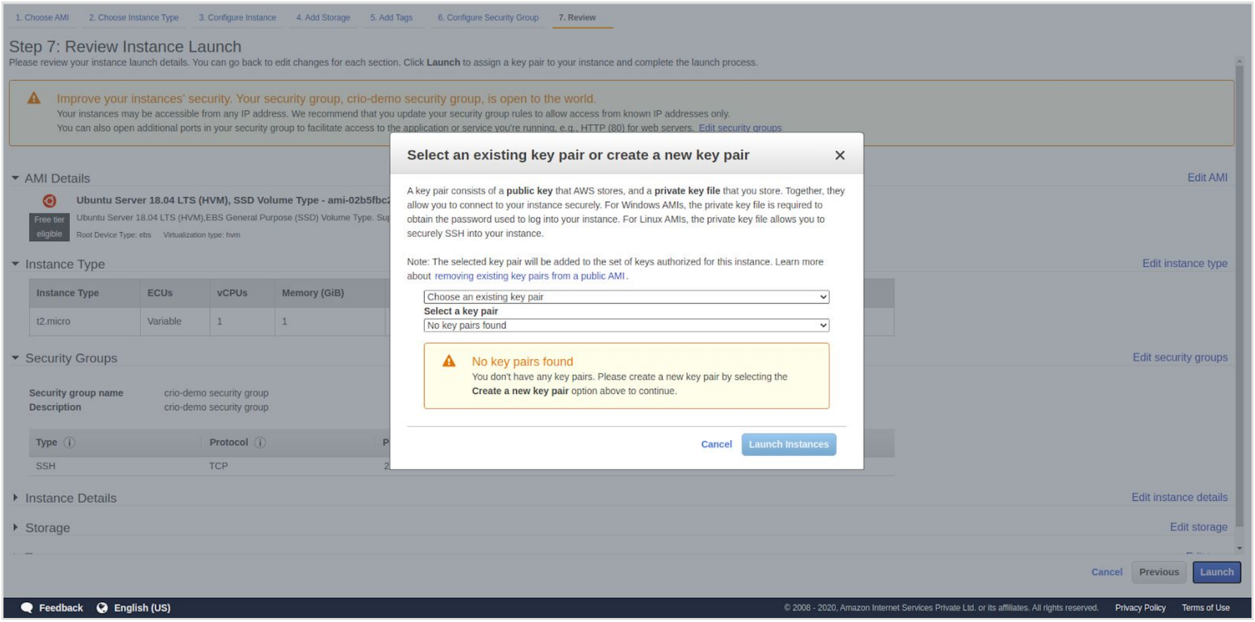


Security group name launch-wizard-3
Description launch-wizard-3 created 2021-01-09T17:12:06.113+05:30

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	0.0.0.0/0	
HTTP	TCP	80	0.0.0.0/0	
HTTP	TCP	80	::/0	
Custom TCP Rule	TCP	8081	0.0.0.0/0	
Custom TCP Rule	TCP	8081	::/0	

Step 8. Click on **Create a new key pair**. Give a key-pair name, download it in a place you'd remember. The PEM(Privacy Enhanced Mail) file is your credentials for you to be able to access your instance.

After that click on launch and wait for a few minutes to launch our instance.



Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

Improve your instances' security. Your security group, crio-demo security group, is open to the world.

Your instances may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only.

You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. Edit security groups

Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-02b5fbc2

Free tier eligible

Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Sup

Root Device Type: ebs Virtualization type: hvm

Instance Type	ECUs	vCPUs	Memory (GiB)
t2.micro	Variable	1	1

Security group name crio-demo security group
Description crio-demo security group

Type	Protocol	P
SSH	TCP	2

Select an existing key pair or create a new key pair

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

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

Choose an existing key pair

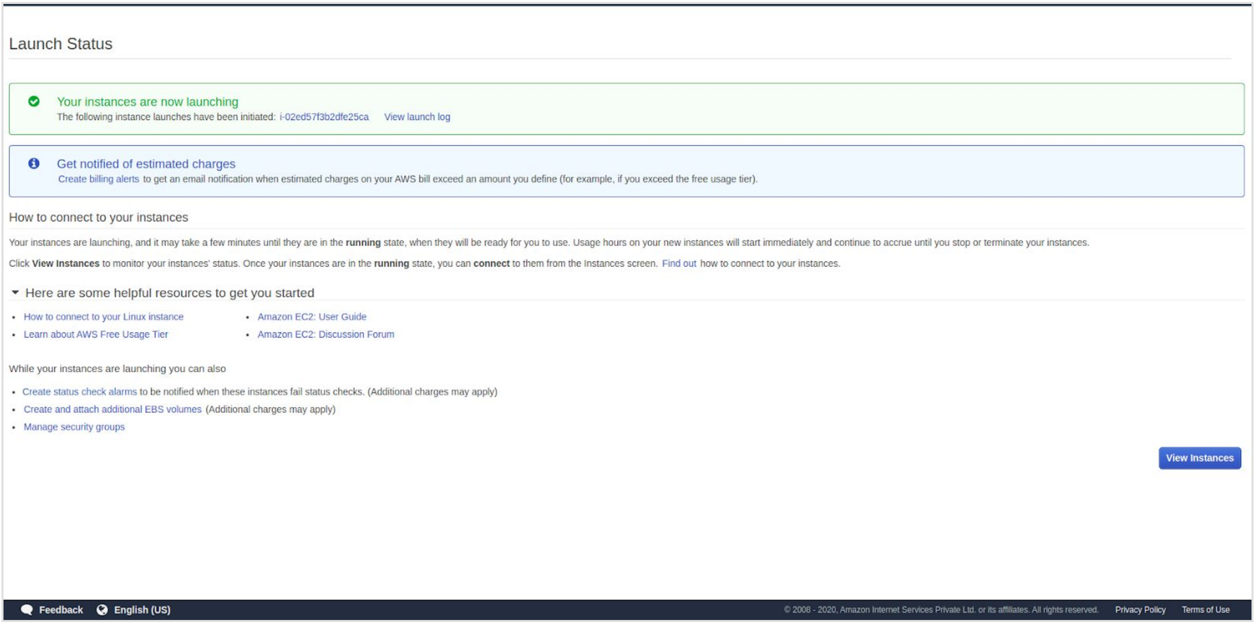
Select a key pair

No key pairs found

No key pairs found

You don't have any key pairs. Please create a new key pair by selecting the **Create a new key pair** option above to continue.

Step 9. After launching, you will see a screen like this. Click on **View Instances** to go to the Instances window.



Launch Status

Your instances are now launching
The following instance launches have been initiated: i-02ed57f3b2dfe25ca View launch log

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

How to connect to your instances

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

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

▾ Here are some helpful resources to get you started

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

While your instances are launching you can also

- Create status check alarms to be notified when these instances fail status checks. (Additional charges may apply)
- Create and attach additional EBS volumes (Additional charges may apply)
- Manage security groups

View Instances
Feedback
English (US)
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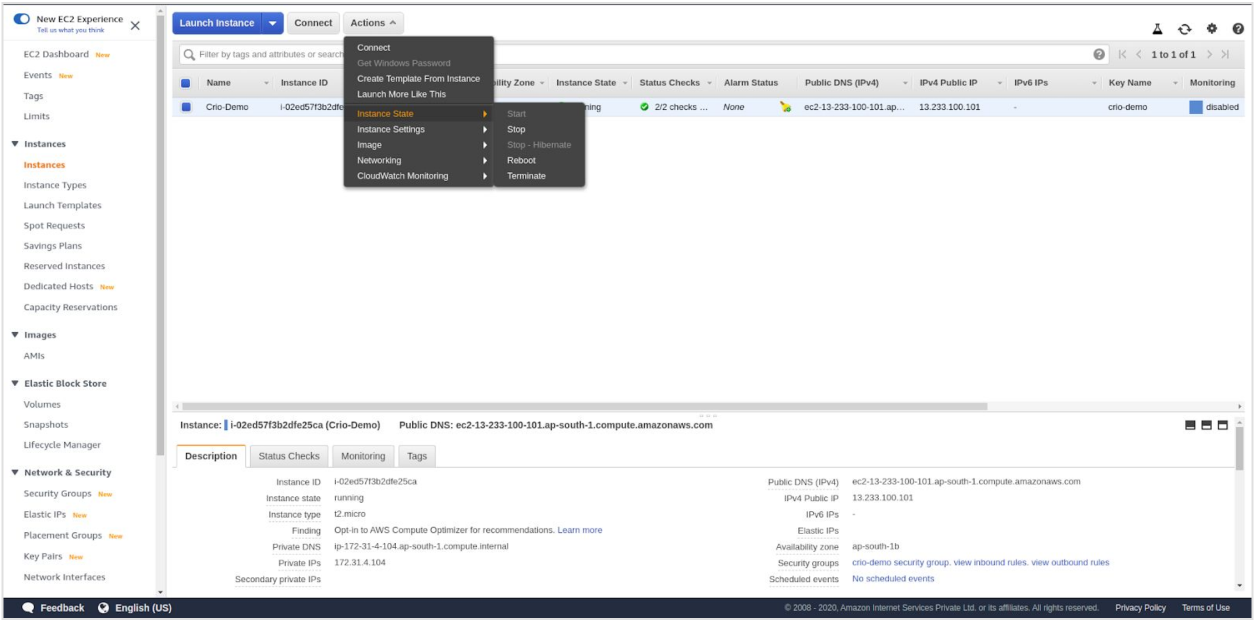
Privacy Policy
Terms of Use

Step 10. If you want to stop/terminate/reboot your instance, you can do it anytime from the console.



Name	Instance ID	...ility Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP	IPv6 IPs	Key Name	Monitoring
Crio-Demo	i-02ed57f3b2dfe...		...ning	✓ 2/2 checks ...	None	ec2-13-233-100-101.ap...	13.233.100.101	-	crio-demo	disabled

Instance: i-02ed57f3b2dfe25ca (Crio-Demo) **Public DNS:** ec2-13-233-100-101.ap-south-1.compute.amazonaws.com

Instance ID	i-02ed57f3b2dfe25ca	Public DNS (IPv4)	ec2-13-233-100-101.ap-south-1.compute.amazonaws.com
Instance state	running	IPv4 Public IP	13.233.100.101
Instance type	t2.micro	IPv6 IPs	-
Finding	Opt-in to AWS Compute Optimizer for recommendations. Learn more	Elastic IPs	
Private DNS	ip-172-31-4-104.ap-south-1.compute.internal	Availability zone	ap-south-1b
Private IPs	172.31.4.104	Security groups	crio-demo security group. view inbound rules. view outbound rules
Secondary private IPs		Scheduled events	No scheduled events

Note

Never forget to stop your instance when you're going off, to avoid unexpected costs. You can always restart it.

Curious Cats

- Explore the different categories of EC2 instances, about what they offer - this will help you when you aim to deploy an application commercially.
- In the Step 3 above, you must have seen ‘EBS only’ in the Instance Storage column. Check out what is EBS.

References

- EC2 Instance states

SSH into your instance

(**For Windows users only**, before we go ahead, we need PuTTY - a terminal program to be able to SSH. Setup PuTTY from here - https://www.putty.org/)

SSH(Secure Socket Shell) is a network protocol that allows you to sign in to your servers from a remote computer. You might have seen SSH referred to on GitHub - "Clone using HTTPS or SSH". Here, we use SSH to securely log in to the server, using the pem file we have.

```
# Usually downloads go to ~/Downloads/

chmod 400 <path-to-your-pem-file>

ssh -i "crio-demo.pem" ubuntu@<your-ec2-url>

# Example

ssh -i "~/Downloads/crio-demo.pem"
ubuntu@ec2-13-233-100-101.ap-south-1.compute.amazonaws.com
```

Note that you can either write the absolute path to the pem file, or cd to the folder where the pem file lives. You'll find your EC2 URL under the heading 'Public IPv4 DNS'

If successful, you'll now be logged on to your server - one that's sitting a few thousand miles away - sweet, eh?

References

- What is SSH
- SSH into AWS instance
- Converting private key from .pem to .ppk format for Putty (Windows)

Deploying app backend server

You will be deploying the app backend for QEats app - which is a Swiggy/UberEats like food-ordering app. Once you start the backend server, you can connect to it from your app anywhere in the world and have some fun.

1. Installing Docker

APT is a packet manager in Linux. The following instructions are similar to installing an EXE file in windows or an app in Android.

Type the following instructions the AWS instance terminal -

```
sudo apt-get update

sudo apt-get install wget

wget -qO- https://get.docker.com/ | sh

sudo usermod -aG docker $USER

sudo service docker start

newgrp docker
```

2. Install telnet

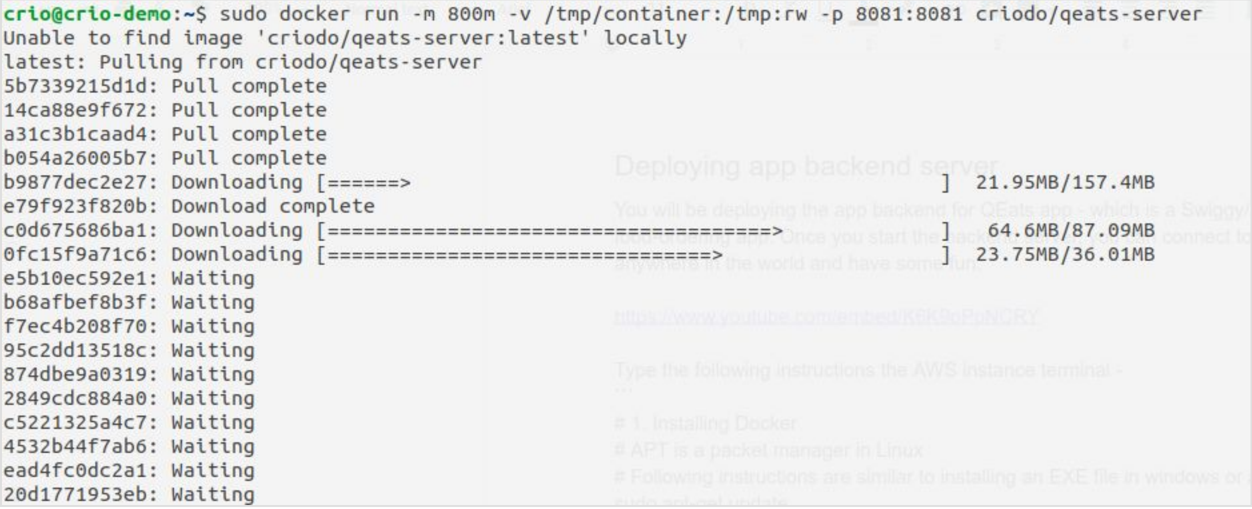
```
sudo apt install -y telnet
```

3. Run the docker container for QEats app server.

You are exposing your server on port 8081 - so make sure your firewall rules allow incoming
connections on this port.

```
sudo docker run -d -m 800m -v /var/log:/var/log:rw -p 8081:8081
criodo/qeats-server
```

The moment you run the above command, you will start seeing something like:



```
crio@crio-demo:~$ sudo docker run -m 800m -v /tmp/container:/tmp:rw -p 8081:8081 criodo/qeats-server
Unable to find image 'criodo/qeats-server:latest' locally
latest: Pulling from criodo/qeats-server
5b7339215d1d: Pull complete
14ca88e9f672: Pull complete
a31c3b1caad4: Pull complete
b054a26005b7: Pull complete
b9877dec2e27: Downloading [======>                                            ]  21.95MB/157.4MB
e79f923f820b: Download complete
c0d675686ba1: Downloading [=====================================>             ]   64.6MB/87.09MB
0fc15f9a71c6: Downloading [================================>                  ]  23.75MB/36.01MB
e5b10ec592e1: Waiting
b68afbef8b3f: Waiting
f7ec4b208f70: Waiting
95c2dd13518c: Waiting
874dbe9a0319: Waiting
2849cdc884a0: Waiting
c5221325a4c7: Waiting
4532b44f7ab6: Waiting
ead4fc0dc2a1: Waiting
20d1771953eb: Waiting
```

It will take a few minutes as it is downloading all the necessary images from Docker Hub - a public repository of docker images. Think of Docker Hub as an App store for docker images. For the purposes of this Byte, you don't have to understand all the docker instructions, but feel free to refer to the reference material if you like to learn more :)

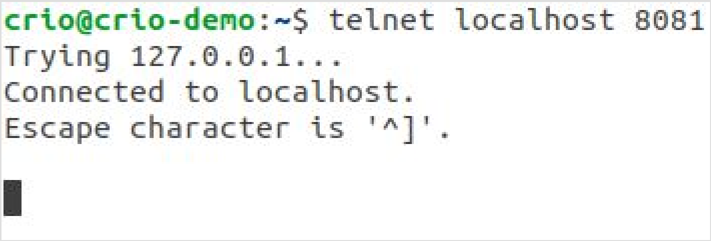
Once download finishes, your server will start serving data on port 8081!

4. When you go to the next milestone and try connecting your app to this server, or when your friend connects to this server, you can always check the logs on your server with the following commands.

```
# If you want to see the logs as they come in;

tail -f /var/log/qeats-server.log


# (or) Just print the logs

cat /var/log/qeats-server.log
```

Checkpoint

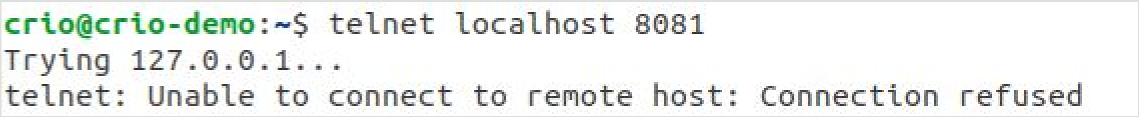
Type `telnet localhost 8081` from the same AWS instance and you should see the following output if everything worked fine -



```
crio@crio-demo:~$ telnet localhost 8081
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
```

You can press `Ctrl + ]` and then type quit to return back to terminal.

If there are any issues in starting your server, you will see this:



```
crio@crio-demo:~$ telnet localhost 8081
Trying 127.0.0.1...
telnet: Unable to connect to remote host: Connection refused
```

In that case, you might have to retry the instructions.

To logout of the server, type

```
logout
```

References

- Crio’s Docker Byte(https://learn.crio.do/home/me/ME_DOCKER1)
- Getting started with Docker

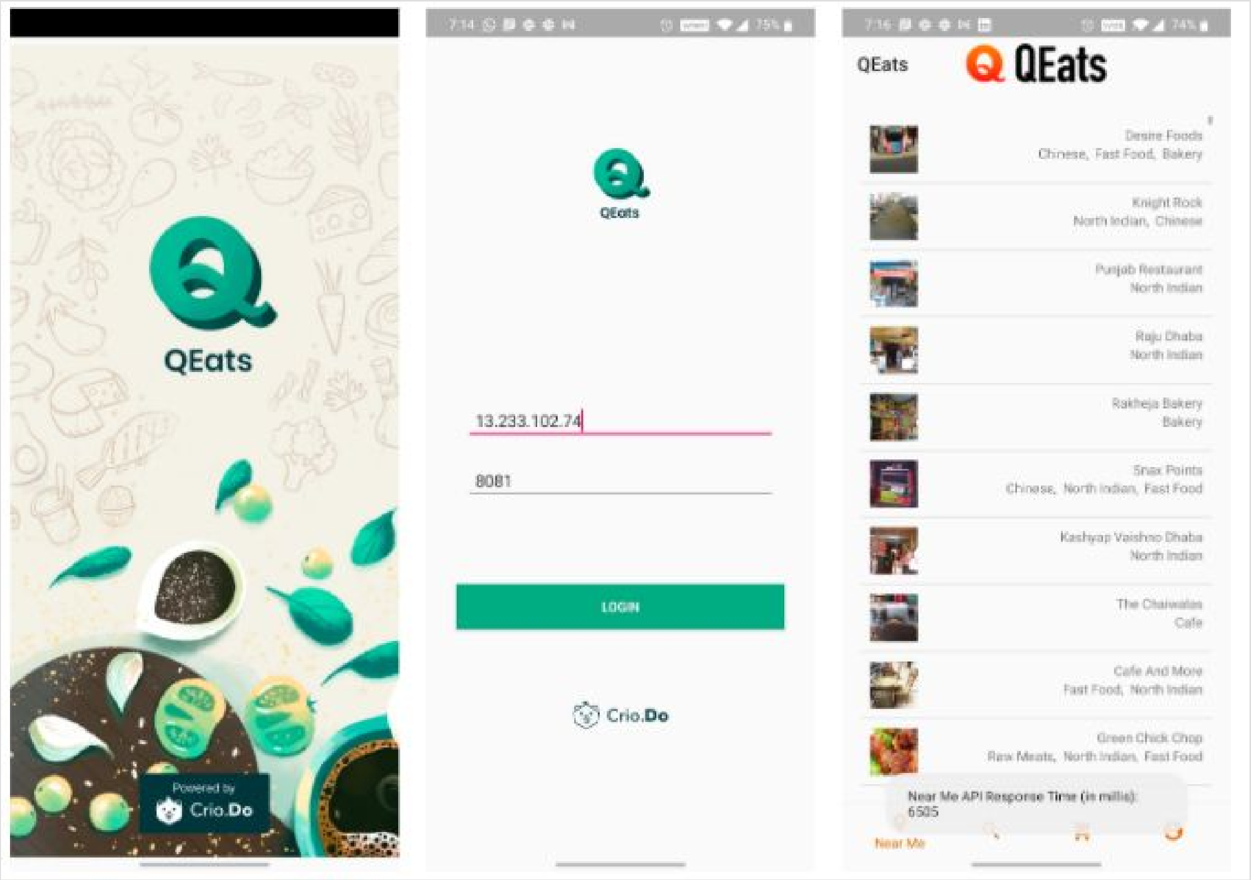
Curious Cats

- Telnet sounds something out of a Terminator movie, no? Find out what it is here.
- What is the difference between stopping and terminating an instance?
- Checkout what `sudo` and `wget` mean.

Connect the QEats Android app with your server

Download the QEats Android App (APK) https://bit.ly/qeats-app-crio onto your phone and install it. If you don’t have an Android phone, you can use an online Android emulator as shown in the next section.

The login screen of the QEats app looks like this.



13.233.102.74

8081

Desire Foods
Chinese, Fast Food, Bakery

Knight Rock
North Indian, Chinese

Punjab Restaurant
North Indian

Raju Dhaba
North Indian

Rakheja Bakery
Bakery

Snax Points
Chinese, North Indian, Fast Food

Kashyap Vaishno Dhaba
North Indian

The Chaiwalas
Cafe

Cafe And More
Fast Food, North Indian

Green Chick Chop
Raw Meats, North Indian, Fast Food

Near Me API Response Time (in millis):
6505

Enter the following details to connect to the QEats backend server:

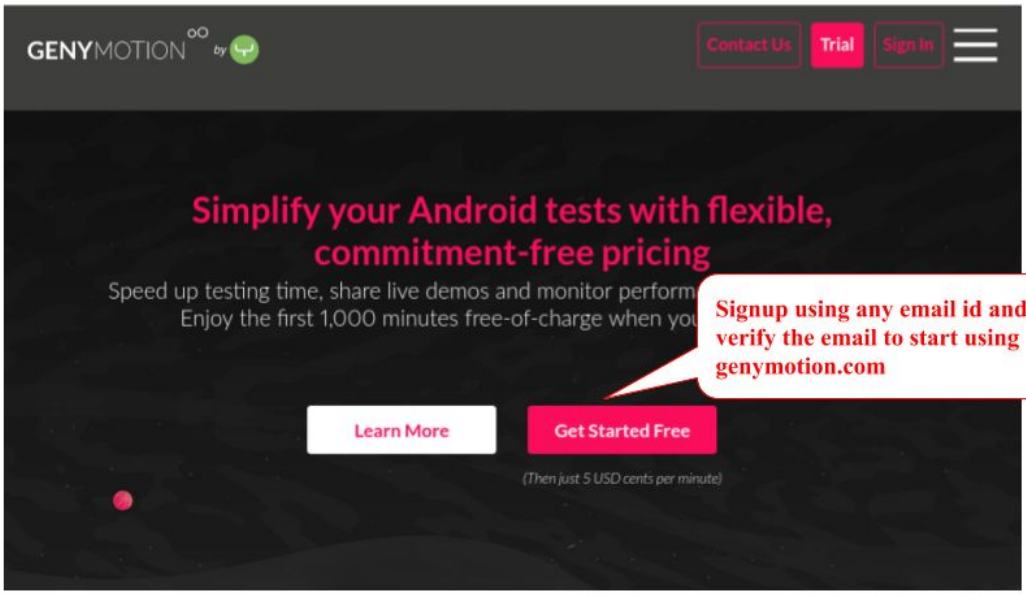
- IP Address: AWS instance public ip
- Port number: 8081

You will start seeing restaurants - you can start playing around with search, placing orders etc from the app.

Running QEats app on Emulator

Go to https://www.genymotion.com/

Step 1: Sign-up for GenyMotion Trial



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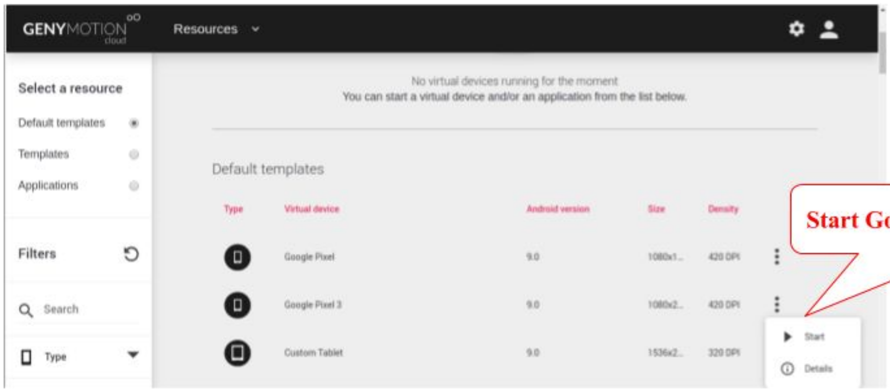
(Then just 5 USD cents per minute)

Signup using any email id and verify the email to start using genymotion.com

Step 2: Start Emulator

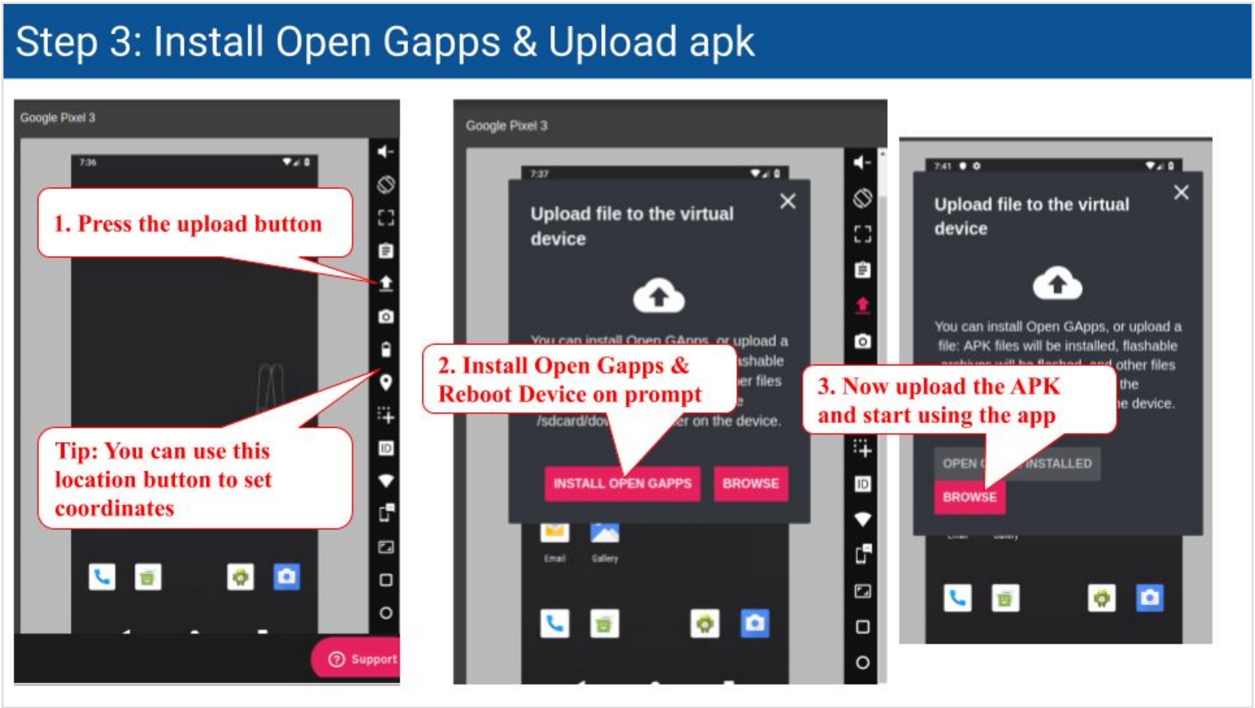


No virtual devices running for the moment
You can start a virtual device and/or an application from the list below.

Default templates

Type	Virtual device	Android version	Size	Density
	Google Pixel	9.0	1080x1...	420 DPI
	Google Pixel 3	9.0	1080x2...	420 DPI
	Custom Tablet	9.0	1536x2...	320 DPI

Start Google Pixel 3 Emulator



Step 3: Install Open Gapps & Upload apk

1. Press the upload button

Tip: You can use this location button to set coordinates

2. Install Open Gapps & Reboot Device on prompt

3. Now upload the APK and start using the app

Google Pixel 3
Google Pixel 3
Upload file to the virtual device
You can install Open GApps, or upload a file: APK files will be installed, flashable archives will be flashed, and other files
/sdcard/do… on the device.
INSTALL OPEN GAPPS
BROWSE
Upload file to the virtual device
You can install Open GApps, or upload a file: APK files will be installed, flashable archives will be flashed, and other files
the device.
OPEN
INSTALLED
BROWSE
Email
Gallery
Support

Takeaways

You have successfully deployed your first app server on AWS EC2 instance using Docker.

Congratulations! You can ask your friends to install the QEats app from this link (https://bit.ly/qeats-app-crio) and connect with your server. Boast away!

Note

Make sure to terminate the instance once you play around with it!

Curious Cats

- Mattermost is a Slack / Microsoft Teams like application - do you want to try hosting it yourself? Try it out with your new found power - https://docs.mattermost.com/install/docker-local-machine.html#ubuntu

Once you host it on the server, you can connect to it through browser and Android / iOS apps available in Playstore. Note that you may have to change firewall settings to allow port 8065

Interview Corner

- What is EC2?
- What is an AMI(Amazon Machine Image)?
- What are some different types of instances that AWS offers? What do they differ in?
- How do you connect to a remote machine?
- What is SSH?
- What is Docker?