

Mini Project: Application Load Balancer Deployment

Introduction

This project demonstrates the deployment and configuration of an **Application Load Balancer (ALB)** in AWS. An ALB distributes incoming HTTP/HTTPS traffic across multiple EC2 instances, enabling higher availability, fault tolerance, and scalability of web applications. Unlike the Classic Load Balancer, ALB operates at the application layer (Layer 7), allowing advanced routing features such as path-based routing, host-based routing, and SSL termination. It continuously performs health checks to ensure only healthy instances receive traffic.

Prerequisites

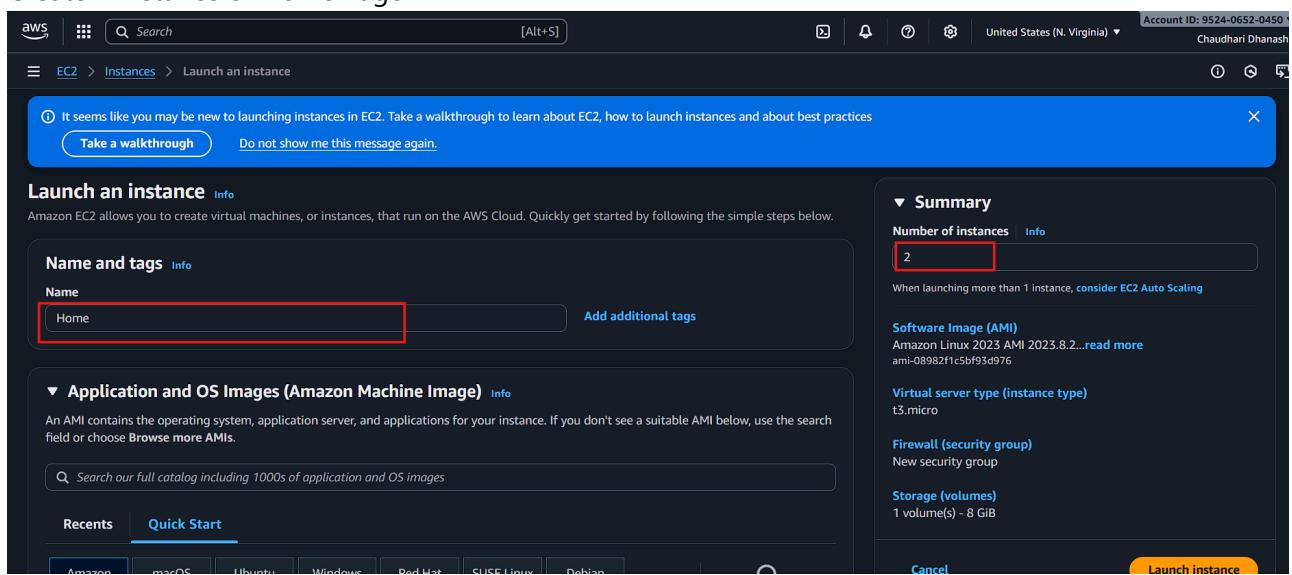
AWS Account with access to EC2, ALB, and IAM services

- Multiple running EC2 instances in the same VPC and region
- Security Groups configured to allow:
 - Inbound HTTP (80) / HTTPS (443) traffic
 - Inbound SSH (22) traffic (optional)
- Web Server Installed (e.g., Apache/Nginx) on each instance
- IAM Permissions to create and manage ALBs.

Steps to Setup Application Load Balancer.

Step 1: Launch Instances

1. Create 2 Instance of Home Page



The screenshot shows the AWS EC2 'Launch an instance' interface. In the 'User data - optional' section, a script is pasted into the text area:

```
#!/bin/bash
yum update -y
yum install httpd -y
systemctl start httpd
systemctl enable httpd
echo "<h1>Hello World from $(hostname -f)</h1>" > /var/www/html/index.html
```

The 'Summary' section on the right shows the following configuration:

- Number of instances:** 2
- Software Image (AMI):** Amazon Linux 2023 AMI 2023.8.2... (ami-08982f1c5bf93d976)
- Virtual server type (instance type):** t3.micro
- Firewall (security group):** launch-wizard-1
- Storage (volumes):** 1 volume(s) - 8 GiB

At the bottom right are 'Cancel', 'Launch instance', and 'Preview code' buttons.

2. Create 2 Instance of Laptop Page

The screenshot shows the 'Launch an instance' interface. In the 'Name and tags' section, the 'Name' field contains 'Laptop'. In the 'Application and OS Images (Amazon Machine Image)' section, the 'Quick Start' tab is selected, showing recent AMIs like Amazon Linux, macOS, Ubuntu, Windows, Red Hat, SUSE Linux, and Debian.

The 'Summary' section on the right shows the following configuration:

- Number of instances:** 2
- Software Image (AMI):** Amazon Linux 2023 AMI 2023.8.2... (ami-08982f1c5bf93d976)
- Virtual server type (instance type):** t3.micro
- Firewall (security group):** New security group
- Storage (volumes):** 1 volume(s) - 8 GiB

At the bottom right are 'Cancel', 'Launch instance', and 'Preview code' buttons.

The screenshot shows the 'Launch an instance' interface. In the 'User data - optional' section, a different script is pasted into the text area:

```
#!/bin/bash
yum update -y
yum install -y httpd
systemctl start httpd
systemctl enable httpd
sudo mkdir /var/www/html/laptop
echo "<h1>This is laptop page $(hostname -f)</h1>" > /var/www/html/laptop/index.html
```

The 'Summary' section on the right shows the following configuration:

- Number of instances:** 2
- Software Image (AMI):** Amazon Linux 2023 AMI 2023.8.2... (ami-08982f1c5bf93d976)
- Virtual server type (instance type):** t3.micro
- Firewall (security group):** launch-wizard-1
- Storage (volumes):** 1 volume(s) - 8 GiB

At the bottom right are 'Cancel', 'Launch instance', and 'Preview code' buttons.

3. Create 2 Instance of Mobile Page

Name and tags

Name: Mobile

Application and OS Images (Amazon Machine Image)

Recent AMIs: Amazon Linux, macOS, Ubuntu, Windows, Red Hat, SUSE Linux, Debian

User data - optional:

```
#!/bin/bash
yum update -y
yum install -y httpd
systemctl start httpd
systemctl enable httpd
sudo mkdir /var/www/html/mobile
echo "<h1>This is mobile page ${hostname -f}</h1>" >
/var/www/html/mobile/index.html
```

Summary

Number of instances: 2

Software Image (AMI): Amazon Linux 2023 AMI 2023.8.2...[read more](#)

Virtual server type (instance type): t3.micro

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 8 GiB

Launch instance

Step 2: Create an Application Load Balancer

1. Go to Load Balancer

Load balancers

No load balancers

You don't have any load balancers in us-east-1

Create load balancer

Create load balancer

2. Select Application Load Balancer

Application Load Balancer Info

Choose an Application Load Balancer when you need a flexible feature set for your applications with HTTP and HTTPS traffic. Operating at the request level, Application Load Balancers provide advanced routing and visibility features targeted at application architectures, including microservices and serverless functions.

Network Load Balancer Info

Choose a Network Load Balancer when you need ultra-high performance, TLS offloading at scale, centralized certificate deployment, support for UDP, and static IP addresses for your applications. Operating at the connection level, Network Load Balancers are capable of handling millions of requests per second.

Gateway Load Balancer Info

Choose a Gateway Load Balancer when you need to deploy and manage a fleet of third-party virtual appliances that support GENEVE. These appliances enable you to improve security, compliance, and policy controls.

[Create](#)

3. Name the Application Load Balancer

Create Application Load Balancer

The Application Load Balancer distributes incoming HTTP and HTTPS traffic across multiple targets such as Amazon EC2 instances, microservices, and containers, based on request attributes. When a connection request is received, it evaluates the listener rules in priority order to determine which rule to apply, and if applicable, it selects a target from the target group for the rule action.

How Application Load Balancers work

Basic configuration

Load balancer name
Name must be unique within your AWS account and can't be changed after the load balancer is created.

A maximum of 32 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Scheme | **Info**
Scheme can't be changed after the load balancer is created.

Internet-facing

- Serves internet-facing traffic.
- Has public IP addresses.
- DNS name resolves to public IPs.
- Requires a public subnet.

Internal

- Serves internal traffic.
- Has private IP addresses.
- DNS name resolves to private IPs.
- Compatible with the IPv4 and Dualstack IP address types.

4. Select all Availability Zones.

Availability Zones and subnets | **Info**

Select at least two Availability Zones and a subnet for each zone. A load balancer node will be placed in each selected zone and will automatically scale in response to traffic. The load balancer routes traffic to targets in the selected Availability Zones only.

us-east-1a (use1-az6)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-0074946e1e6cb0a0a
IPv4 subnet CIDR: 172.31.52.0/20

us-east-1b (use1-az1)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-0a0a2f906dbf510a7
IPv4 subnet CIDR: 172.31.0.0/20

us-east-1c (use1-az2)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-012df3ca55b1eabb
IPv4 subnet CIDR: 172.31.80.0/20

us-east-1d (use1-az4)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-067179291e79afecf

5. Manage Security Group

The screenshot shows the AWS Security Groups page. A red box highlights the 'Security groups' section, which contains a list box with one item: 'launch-wizard-1'. Below the list box is a small row of text: 'sg-069b296ef9b04f7c0 VPC: vpc-0d81f010b0ccfe3d1'.

6. Create Target Group 1 (Home).

- Click on Create target group

The screenshot shows the 'Listeners and routing' configuration for an Application Load Balancer. Under the 'Listener HTTP:80' section, the 'Protocol' is set to 'HTTP' and the 'Port' is set to '80'. The 'Default action' dropdown is set to 'Forward to' and has a placeholder 'Select a target group'. A red box highlights this dropdown. Below it is a 'Create target group' button. The 'Listener tags - optional' section is visible, along with 'Add listener tag' and 'Add listener' buttons.

- Select instance

The screenshot shows the 'Specify group details' step of creating a target group. It's Step 1 of 2. The 'Basic configuration' section is shown, with the 'Choose a target type' dropdown set to 'Instances'. A red box highlights the 'Instances' option, which is described as supporting load balancing to instances within a specific VPC and facilitating the use of Amazon EC2 Auto Scaling. Other options like 'IP addresses' and 'Lambda function' are also listed.

- Give name to target group(home-TG)

The screenshot shows the 'Create target group' configuration page. The 'Target group name' field is filled with 'home- TG', which is highlighted by a red box. Below it, a note says 'A maximum of 52 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.' The 'Protocol' is set to 'HTTP' and the 'Port' is set to '80'. The 'Port number where targets receive traffic. Can be overridden for individual targets during registration.' note is visible.

- Insert health check path

Health checks

The associated load balancer periodically sends requests, per the settings below, to the registered targets to test their status.

Health check protocol

HTTP

Health check path

Use the default path of "/" to perform health checks on the root, or specify a custom path if preferred.

/

Up to 1024 characters allowed.

▶ Advanced health check settings

- Select home instance and click on include as pending below

EC2 > Target groups > Create target group

Step 1: Specify group details

Step 2: Register targets

Register targets

This is an optional step to create a target group. However, to ensure that your load balancer routes traffic to this target group you must register your targets.

Available instances (2/6)

Instance ID	Name	State	Security groups	Zone
i-05f6bd7a908a505cf	Mobile	Running	launch-wizard-1	us-east-1d
i-0cd9f3682307b56d	Mobile	Running	launch-wizard-1	us-east-1d
i-02b99f5ecc0c66218	Laptop	Running	launch-wizard-1	us-east-1d
i-06eb9e997f51be034	Laptop	Running	launch-wizard-1	us-east-1d
<input checked="" type="checkbox"/> i-0d5d60fda76c04c67	Home	Running	launch-wizard-1	us-east-1d
<input checked="" type="checkbox"/> i-0e8f4b7a73827d6a7	Home	Running	launch-wizard-1	us-east-1d

2 selected

- Click on create target group

EC2 > Target groups > Create target group

80

1-65535 (separate multiple ports with commas)

Include as pending below

2 selections are now pending below. Include more or register targets when ready.

Review targets

Targets (2)

Instance ID	Name	Port	State	Security groups	Zone	Private IPv4 address	Subnet ID
i-0d5d60fda76c04c67	Home	80	Running	launch-wizard-1	us-east-1d	172.31.31.109	subnet-067179291e79afecf
i-0e8f4b7a73827d6a7	Home	80	Running	launch-wizard-1	us-east-1d	172.31.27.218	subnet-067179291e79afecf

2 pending

Cancel Previous Create target group

7. Create Target Group 2 (Laptop).

- Give name to target group(laptop-TG)

Target group name

Laptop-TG

A maximum of 32 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Protocol

Protocol for load balancer-to-target communication. Can't be modified after creation.

HTTP

Port

Port number where targets receive traffic. Can be overridden for individual targets during registration.

80

1-65535

IP address type

Only targets with the indicated IP address type can be registered to this target group.

IPv4

Each instance has a default network interface (eth0) that is assigned the primary private IPv4 address. The instance's primary

- Insert health check path

Health checks

The associated load balancer periodically sends requests, per the settings below, to the registered targets to test their status.

Health check protocol

HTTP

Health check path

Use the default path of "/" to perform health checks on the root, or specify a custom path if preferred.

/laptop/

Up to 1024 characters allowed.

► Advanced health check settings

- Click on create target group

80

1-65535 (separate multiple ports with commas)

Include as pending below

2 selections are now pending below. Include more or register targets when ready.

Review targets

Targets (2)

Instance ID	Name	Port	State	Security groups	Zone	Private IPv4 address	Subnet ID
i-02b99f5ec0c662f8	Laptop	80	Running	launch-wizard-1	us-east-1d	172.31.21.37	subnet-067179291e79afecf
i-06eb9e997f51be034	Laptop	80	Running	launch-wizard-1	us-east-1d	172.31.19.132	subnet-067179291e79afecf

2 pending

Cancel Previous Create target group

8. Create Target Group 3 (Mobile).

- Give name to target group(Mobile-TG)

Target group name

Mobile-TG

A maximum of 32 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Protocol

Protocol for load balancer-to-target communication. Can't be modified after creation.

HTTP

Port

Port number where targets receive traffic. Can be overridden for individual targets during registration.

80

1-65535

- Insert health check path

Health checks

The associated load balancer periodically sends requests, per the settings below, to the registered targets to test their status.

Health check protocol

HTTP ▾

Health check path

Use the default path of "/" to perform health checks on the root, or specify a custom path if preferred.

/mobile/

Up to 1024 characters allowed.

► Advanced health check settings

- Click on create target group

aws | Search [Alt+S] | United States (N. Virginia) | Account ID: 9524-0652-0450 | Chaudhuri Dhanash

☰ EC2 > Target groups > Create target group

80
1-65535 (separate multiple ports with commas)

Include as pending below

2 selections are now pending below. Include more or register targets when ready.

Review targets

Targets (2)

Filter targets Show only pending Remove all pending

Instance ID	Name	Port	State	Security groups	Zone	Private IPv4 address	Subnet ID
i-0cdd9f3682307b56d	Mobile	80	Running	launch-wizard-1	us-east-1d	172.31.24.137	subnet-067179291e79afecf
i-05f6bd7a908a505cf	Mobile	80	Running	launch-wizard-1	us-east-1d	172.31.16.46	subnet-067179291e79afecf

2 pending

Cancel Previous Create target group

9. Add Default action (Home-TG)

aws | Search [Alt+S] | United States (N. Virginia)

☰ EC2 > Load balancers > Create Application Load Balancer

▼ Listener HTTP:81

Protocol	Port	Default action	Info
HTTP	81 1-65535	Forward to Select a target group	Info

Create target

Laptop-TG Target type: Instance, IPv4 HTTP

Mobile-TG Target type: Instance, IPv4 HTTP

home-TG Target type: Instance home-TG HTTP

Add listener tag

Add listener

You can add up to 48 more listeners.

10. Add Listener Rules

- Go to Rule and add Laptop Rule

The screenshot shows the AWS Lambda@Edge rule configuration interface. The top navigation bar includes the AWS logo, a search bar, and account information (Account ID: 9524-0652-0450, United States (N. Virginia), Chaudhuri Dhanashri). The main page title is "Add rule".

Name and tags: The "Name" field contains "laptop-rule" (highlighted with a red box). The "Add additional tags" button is visible.

Conditions (1 value): The condition path is set to "/laptop/*" (highlighted with a red box). The "Path condition value" section indicates a case-sensitive match against "/laptop/*". A note states: "Valid characters are a-z, A-Z, 0-9 and special characters. Path must be 1-128 characters." The "Add OR condition value" button is present.

Actions: The "Routing action" section has "Forward to target groups" selected (radio button highlighted with a red box). Other options include "Redirect to URL" and "Return fixed response".

Forward to target group: A target group named "Laptop-TG" is selected (highlighted with a red box). The "Weight" is set to 1 (highlighted with a red box) and the "Percent" is 100%. The "HTTP" dropdown is set to "HTTP".

Target group stickiness: The "Turn on target group stickiness" checkbox is unchecked.

Buttons: The "Cancel" and "Next" buttons are at the bottom right of the form.

- Go to Rule and add Mobile Rule

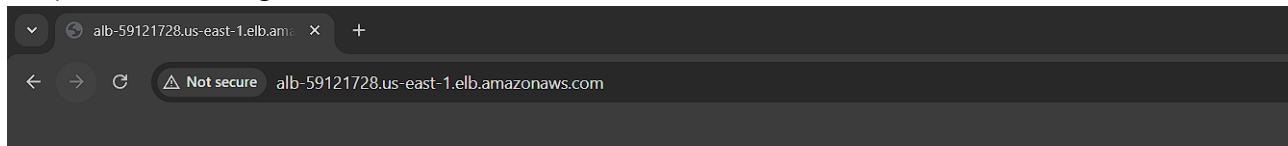
The screenshot shows the 'Name and tags' section where the name 'Mobile-rule' is entered. Below it, the 'Conditions (1 value)' section is shown, containing a path condition with the value '/mobile/*'. The path condition value is described as case sensitive and must be between 1-128 characters, with valid characters being a-z, A-Z, 0-9, and special characters.

11. Copy the DNS Command

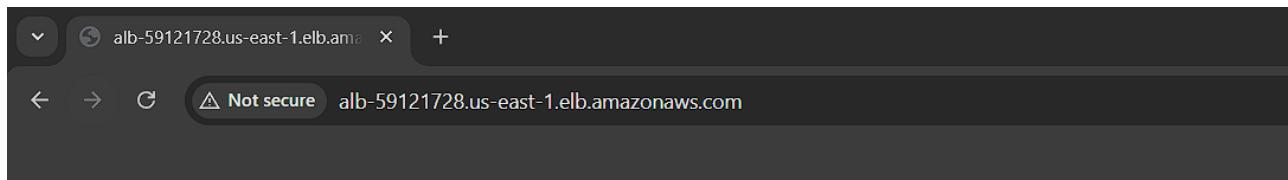
The screenshot shows the AWS EC2 Load Balancers console. It lists one load balancer named 'ALB' which is active and application-type Internet-facing. The 'DNS name info' section at the bottom right is highlighted with a red box, showing the DNS name 'ALB-787691554.us-east-1.elb.amazonaws.com (A Record)'.

Step 3: Testing the ALB

1. Output for Home Page

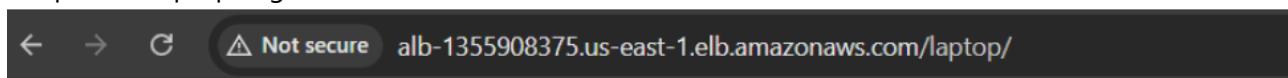


This is home page ip-172-31-26-70.ec2.internal



This is home page ip-172-31-31-116.ec2.internal

2. Output for Laptop Page

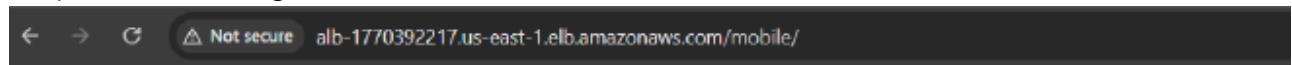


this is laptop page ip-172-31-27-238.ec2.internal



this is laptop page ip-172-31-24-241.ec2.internal

3. Output for Mobile Page



this is mobile page ip-172-31-20-81.ec2.internal



this is mobile page ip-172-31-22-198.ec2.internal

Summary

This mini project demonstrates the deployment and configuration of an AWS Application Load Balancer (ALB) to efficiently distribute incoming web traffic across three EC2 instances. By using a user-data script during instance launch, each server automatically runs a web server and serves unique content, allowing easy verification of traffic distribution.