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OBEROI CENTRE OF EXCELLANCE
Post Graduate Diploma In Cloud Technology**



**A
PROJECT REVIEW
ON
Deploying a 4 Tier Mailing Web Application On AWS**

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TITLE: -DEPLOYING A 4 TIER MAILING WEB APPLICATION ON AWS



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INTRODUCTION

The multi-tier application (three-tier, n-tier, and so forth.) has been a cornerstone architecture pattern for decades, and remains a popular pattern for user-facing applications. Although the language used to describe a multi-tier architecture varies, a multi-tier application generally consists of the following components:

- ❑ **Presentation tier:** Component that the user directly interacts with (for example, webpages and mobile app UIs).
- ❑ **Logic tier:** Code required to translate user actions to application functionality (for example, CRUD database operations and data processing).
- ❑ **Data tier:** Storage media (for example, databases, object stores, caches and file systems) that hold the data relevant to the application.

ABSTRACT

- ❑ Amazon Web Services (AWS) offers multiple options for provisioning infrastructure and deploying your applications. Whether your application architecture is a simple three-tier web application or a complex set of workloads, AWS offers deployment services to meet the requirements of your application and your organization.
- ❑ This whitepaper is intended for those individuals looking for an overview of the different deployment services offered by AWS. It lays out common features available in these deployment services, and articulates basic strategies for deploying and updating application stacks.

PROBLEM DEFINATION/STATEMENT

Every web developer should be familiar with the Four Tier deployment model of Development, Testing, Staging and Production. In most places, this is the “standard” for building, testing, and serving web applications, and looks like the following:

- ❑ **Development:** This is where developers make changes to code, and is usually a local, single-tenant environment (e.g. a developer’s laptop).
- ❑ **Testing:** This is an integration environment where developers merge changes to test that they work together. It may also be a Quality Assurance or UAT environment.
- ❑ **Staging:** This is where tested changes are run against Production-equivalent infrastructure and data to ensure they will work properly when released.
- ❑ **Production:** This is the live production environment.

This model has been around for a while and is often held-up as a kind of best practice for deployment architectures. It has a number of problems, however... The Four-Tier model arose from a particular historical confluence of increasing complexity in web application design, testing, and packaging, and physical constraints on computing infrastructure.

As software increased in complexity, developers started using more complex packaging methods for deploying that software.

This enabled us to start breaking down the deployment model into a series of steps that more closely matched the kinds of testing that were required for complex applications.

These steps became our actual environments. We started moving code through these tiers, with each tier professing to offer some kind of guarantee as to the increasing consistency of the data and environment, and the quality of the code.

LITERATURE REVIEW

Basically, there exists three models for cloud computing . AWS also, follows the same concept. Each model represents a singular component of the cloud computing stack. SaaS, PaaS, IaaS are three models which AWS platform, infrastructure, and software have been built based on them.

Infrastructure as a Service (IaaS):

IaaS stands for Infrastructure as a Service, includes the basic building blocks for cloud IT which provides access to the networking nodes such as host, workstations, data storage and other computing resource. IaaS also provides to the clients with the highest level of processing: networking, storage and capability of management control over application and other resources.

Platform as a Service (PaaS):

PaaS or Platforms as a service provide the capability of deploying onto the platform to the client allowing them to develop, run and administrate the service applications without underlying to the infrastructure. This can help the users to focus on the development functions and eliminate the developer's wariness related to the maintenance of the environment and resource procurement (Chang et al., 2010; AWS Inc., 2019).

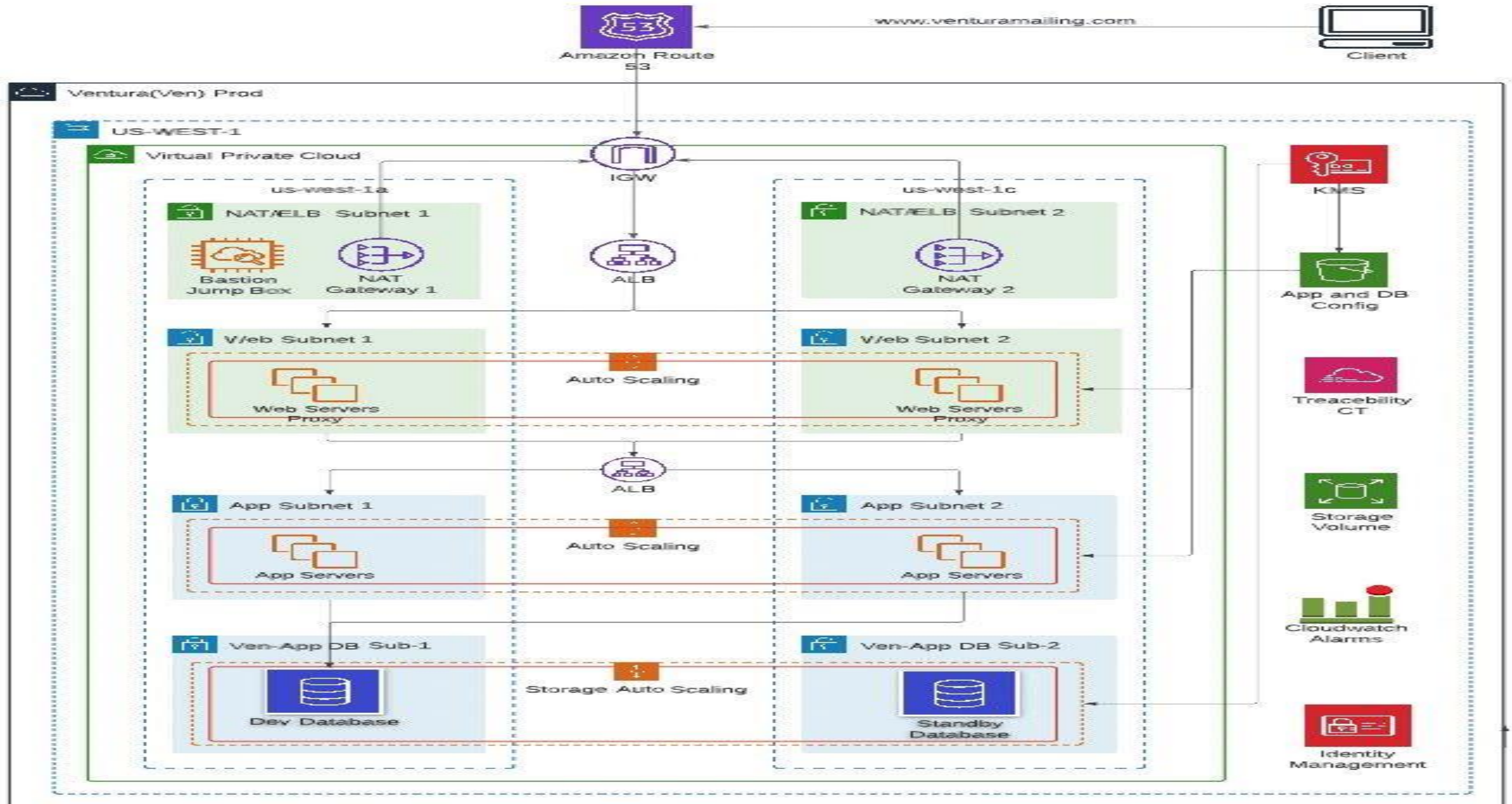
Software as a Service (SaaS):

SaaS refers to the Software as a Service, or sometimes end-user application which provides to users access to the software & applications over the Internet. It is generally run by the service providers which can eliminate thinking about the service maintaining focusing on the application layer. One of the general cases of a SaaS is using the web-based applications such as email or hosting the cloud-applications such as a basic webpage html file, etc.

SOFTWARE AND LANGUAGE USED

- ❑ **OS:-** UBUNTU 20
- ❑ **PROGRAMMING LANGUAGES:-** PHP, SHELL
- ❑ **Databases:-** Amazon Rational Database Service(Amazon RDS), Amazon Dinamo DB, Amazon Simple BD.
- ❑ **Storage:-** Amazon Simple Storage Service(S3), Amazon Glacier, Amazon Elastic Block Store(Amazon EBS), AWS Import/Export.
- ❑ Lambda, Amazon Route 53(DNS), Amazon Autoscaling, Amazon workmail, Amazon Simple Email Services, EC2, VPC, IAM(Identity and access management), Amazon API Gateway and NAT Gateway, REST API(Representational state transfer), Load Balancer(target group).

DIAGRAM



FLOWCHART

Ventura Application Architecture Network IP List – Prod

The Below Table shows the CIDR ranges and Sizes of the Production Subnets

Layer	Proposed Prod VPC/Subnet environment - VPC IP address/CIDR 10.0.0.0/16						
	Subnet Name	Type	AZs	Usage	CIDR	Total Ips	Remark
NAT/ALB	Prod-NAT-ALB-Subnet-1	Public	us-west-1a	NAT Gateway and ELB	/28	11	10.0.5.0
	Prod-NAT-ALB-Subnet-2	Public	us-west-1c	NAT Gateway and ELB	/28	11	10.0.10.0
Web	Prod-Web-Subnet-1	Public	us-west-1a	Web/Proxy Servers	/23	507	10.0.15.0
	Prod-Web-Subnet-2	Public	us-west-1c	Web/Proxy Servers	/23	507	10.0.20.0
App	Prod-App-Subnet-1	Private	us-west-1a	App/Agent Servers	/23	507	10.0.25.0
	Prod-App-Subnet-2	Private	us-west-1c	App/Agent Servers	/23	507	10.0.30.0
DB	Prod-DB-Subnet-1	Private	us-west-1a	RDS(MySQL) (Primary DB)	/28	11	10.0.35.0
	Prod-DB-Subnet-2	Private	us-west-1c	RDS(MySQL) (Secondary DB)	/28	11	10.0.40.0
Total IPs						2,072	

METHODOLOGY

STEP 1: Create The Base Networking Infrastructure For NAT/ELB, Webservers, Appservers and Database

STEP 2: Create 4 Public Route Table and 4 Private Route Tables (Because of NAT Redundancy Implementation)

STEP 3: Associate All Above Route Tables With Their Respective Subnets

STEP 4: Create and Configure IGW and NAT Gateways

STEP 5: Create Security Groups

STEP 6: Create Frontend and Backend Load Balancers

STEP 7: Create an S3 Bucket Environment To Upload The Automation and Database Configs

STEP 8: Create a Bastion Host VM For Remote Access ((SSH)) To Webservers, Appservers and MySQL Database

STEP 9: Create Webservers and Appservers Launch Templates

STEP 10: Create Webserver and Appserver Auto Scaling Groups

STEP 11: Create a Database Subnet Group and Database Instance (RDS)

STEP 12: Create a Route 53 Hosted Zone and Record For The Frontend Load Balancer Endpoint

How SES Work?

Amazon Simple Email Service (Amazon SES) lets you reach customers confidently without an on-premises Simple Mail Transfer Protocol (SMTP) system.



Why SES Work?

Amazon SES is a cloud email service provider that can integrate into any application for bulk email sending. Whether you send transactional or marketing emails, you pay only for what you use. Amazon SES also supports a variety of deployments including dedicated, shared, or owned IP addresses. Reports on sender statistics and a deliverability dashboard help businesses make every email count.

USE CASES

- ❑ **Automate transactional messages:**-Keep your customers up to date by sending automated emails, such as purchase or shipping notifications, order status updates, and policy change notices.
- ❑ **Deliver marketing emails globally:**-Tell customers around the world about products and services through newsletters, special offers, and engaging content.
- ❑ **Send timely notifications to customers:**-Send customers timely notifications about their interaction with your products and services, including daily reminders, weekly usage reports, and newsletters.
- ❑ **Send bulk email communications:**-Deliver messages—including notifications and announcements—to large groups, and track results using configuration sets.

VIDEO URL

<https://youtu.be/Xsw9Lv7Xv40>

CUSTOMERS

amazon

NETFLIX

duolingo



FUTURE SCOPE

- ❑ Future of AWS is bright. Infact it is the future of modern day computing. cloud computing, machine learning, IOT, etc are some of the domains which have a lot of offer in the near future.
- ❑ One of the most effective cloud computing environments is AWS. In the future, someone who is presently interested in beginning an AWS career will still be a very desirable option.
- ❑ The consensus currently is that during the next five to six years, there won't be any physical servers for any web applications; instead, everything will move to a particular cloud environment.
- ❑ The greatest option for selecting a cloud environment with all the necessary iconic characteristics at a reasonable price is always a career in AWS.
- ❑ The AWS organization and account structure follows the latest AWS guidance for using multiple AWS accounts.

RESULT

us-west-1.console.aws.amazon.com/vpc/home?region=us-west-1#vpcs:

aws Services Search [Alt+S] N. California Pratiksha Wankhede

VPC

VPC dashboard X

EC2 Global View New

Filter by VPC:

Select a VPC

Virtual private cloud

Your VPCs New

Subnets

Route tables

Internet gateways

Egress-only internet gateways

DHCP option sets

Elastic IPs

Managed prefix lists

Endpoints

Endpoint services

NAT gateways

Peering connections

Security

Network ACLs

Security groups

Your VPCs (1/2) Info

Filter VPCs

	Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP
<input type="checkbox"/>	-	vpc-03dc3423db3affdfb	Available	172.31.0.0/16	-	dopt-0
<input checked="" type="checkbox"/>	Prod-VPC	vpc-014acd25151a2ddc3	Available	10.0.0.0/16	-	dopt-0

vpc-014acd25151a2ddc3 / Prod-VPC

Details Resource map New CIDRs Flow logs Tags

Details

VPC ID vpc-014acd25151a2ddc3	State Available	DNS hostnames Disabled	DNS resolution Enabled
Tenancy Default	DHCP option set dopt-0c21b84ae19d44be1	Main route table rtb-0d36fb67e05f8ae74	Main network ACL acl-0b19f6074cb4132ee

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Subnets | VPC Management Console

us-west-1.console.aws.amazon.com/vpc/home?region=us-west-1#subnets:

aws

Services

Search

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VPC

N. California

Pratiksha Wankhede

VPC dashboard

EC2 Global View

Filter by VPC:

Select a VPC

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Security groups

Subnets (10)

Filter subnets

Prod-Webserver-Su...

subnet-0300359f06106762c

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.15.0/24

-

Prod-Appserver-Su...

subnet-03fe22eb7d8ad9d44

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.30.0/24

-

Prod-NAT-ALB-Sub...

subnet-0fa78d4020635511d

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.5.0/24

-

Prod-Webserver-Su...

subnet-0759a073390232e3f

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.20.0/24

-

Prod-db-Subnet-2

subnet-05e87e23728907b49

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.40.0/24

-

Prod-Appserver-Su...

subnet-0b253c84ef8e1f88a

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.25.0/24

-

Prod-NAT-ALB-Sub...

subnet-04dc924eb487def26

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.10.0/24

-

-

subnet-0810c734fdcc366d

Available

vpc-03dc3423db3affdfb

172.31.16.0/20

-

-

subnet-0c8474d2a9797ef37

Available

vpc-03dc3423db3affdfb

172.31.0.0/20

-

Prod-db-Subnet-1

subnet-0bf22601a5dc74706

Available

vpc-014acd25151a2ddc3 | Pro...

10.0.35.0/24

-

Select a subnet

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Route tables | VPC Management

us-west-1.console.aws.amazon.com/vpc/home?region=us-west-1#RouteTables:

aws

Services

Search

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VPC

Route table rtb-044cfa2e1f797f1bc | Prod-Database-RT-2 was created successfully.

VPC dashboard

EC2 Global View

Filter by VPC:

Select a VPC

Virtual private cloud

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Route tables (10)

Find resources by attribute or tag

Actions

Create route table

	Name	Route table ID	Explicit subnet associati...	Edge associations	Main	VPC
	-	rtb-09b7be9913ac17936	-	-	Yes	vpc-03dc3423db3affdfb
	-	rtb-0d36fb67e05f8ae74	-	-	Yes	vpc-014acd25151a2ddc3
	Prod-NAT-ALB-Public-RT-1	rtb-013f14213aeef721f	-	-	No	vpc-014acd25151a2ddc3
	Prod-NAT-ALB-Public-RT-2	rtb-091a26f999f29932c	-	-	No	vpc-014acd25151a2ddc3
	Prod-Webserver-RT-1	rtb-0a6d2739e9f93447f	-	-	No	vpc-014acd25151a2ddc3
	Prod-Webserver-RT-2	rtb-0eb527ef792bcfeff	-	-	No	vpc-014acd25151a2ddc3
	Prod-Appserver-RT-1	rtb-00926fd99fd9c157a	-	-	No	vpc-014acd25151a2ddc3
	Prod-Appserver-RT-2	rtb-0ef526579cbd87a7c	-	-	No	vpc-014acd25151a2ddc3
	Prod-Database-RT-1	rtb-0588967eb2b0ed29e	-	-	No	vpc-014acd25151a2ddc3
	Prod-Database-RT-2	rtb-044cfa2e1f797f1bc	-	-	No	vpc-014acd25151a2ddc3

Select a route table

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VPC Management Console

us-west-1.console.aws.amazon.com/vpc/home?region=us-west-1#SecurityGroups:

aws

Services

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VPC

VPC dashboard

EC2 Global View

Filter by VPC:

Select a VPC

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Egress-only internet gateways

DHCP option sets

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Security Groups (8)

Info

Filter security groups

	Name	Security group ID	Security group name	VPC ID	Description	Owner
	-	sg-05306f24028bcf50e	Bastion-Host-Security-...	vpc-014acd25151a2ddc3	Bastion-Host-Security-...	758045751170
	-	sg-0960843941e5d2506	Webserver-Security-G...	vpc-014acd25151a2ddc3	Webserver-Security-G...	758045751170
	-	sg-0e6470671078c65ca	Frontend-LB-Security-...	vpc-014acd25151a2ddc3	Frontend-LB-Security-...	758045751170
	-	sg-05657721da8a5f662	Database-Security-Gro...	vpc-014acd25151a2ddc3	Database-Security-Gro...	758045751170
	-	sg-0bd6438cbffb1e72e	Appserver-Security-G...	vpc-014acd25151a2ddc3	Appserver-Security-G...	758045751170
	-	sg-0c328d30af5c7b14e	default	vpc-03dc3423db3affdfb	default VPC security gr...	758045751170
	-	sg-0f18c5b787b2ed110	default	vpc-014acd25151a2ddc3	default VPC security gr...	758045751170
	-	sg-052115741b818d93b	Backend-LB-Security-...	vpc-014acd25151a2ddc3	Backend-LB-Security-...	758045751170

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Load balancers | EC2 Management Console

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

aws

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VPC

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

Auto Scaling

Auto Scaling Groups

EC2 > Load balancers

Load balancers (2)

Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

Find resources by attribute or tag

Name

DNS name

State

VPC ID

Availability Zones

Type

Date created

Prod-Frontend-LB

Prod-Frontend-LB-908496...

Active

vpc-014acd25151a2ddc3

2 Availability Zones

application

June 8, 2023 (UTC+05:30)

Prod-Backend-LB

Prod-Backend-LB-915311...

Provisioning

vpc-014acd25151a2ddc3

2 Availability Zones

application

June 8, 2023 (UTC+05:30)

0 load balancers selected

Select a load balancer above.

CloudShell

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Target groups | EC2 Management

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

aws

Services

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VPC

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

Auto Scaling

Auto Scaling Groups

EC2 > Target groups

Target groups (2) Info

Find resources by attribute or tag

Refresh

Actions

Create target group

< 1 >

Settings

<input type="checkbox"/>	Name	ARN	Port	Protocol	Target type	Load balancer
<input type="checkbox"/>	Backend-LB-HTTP-TG	arn:aws:elasticloadbalanci...	80	HTTP	Instance	Prod-Backend-LB
<input type="checkbox"/>	Frontend-LB-HTTP-TG	arn:aws:elasticloadbalanci...	80	HTTP	Instance	Prod-Frontend-LB

0 target groups selected

Select a target group above.

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S3 Management Console

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s3.console.aws.amazon.com/s3/buckets?region=us-west-1

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Services

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Global ▾

Pratiksha Wankhede ▾

VPC

Amazon S3

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Buckets

Access Points

Object Lambda Access Points

Multi-Region Access Points

Batch Operations

IAM Access Analyzer for S3

Block Public Access settings for this account

Storage Lens

Dashboards

AWS Organizations settings

Feature spotlight 3

AWS Marketplace for S3

Amazon S3 > Buckets

▶ Account snapshot

Storage lens provides visibility into storage usage and activity trends. [Learn more](#)

View Storage Lens dashboard

Buckets (1) Info

⌂

📄 Copy ARN

Empty

Delete

Create bucket

Buckets are containers for data stored in S3. [Learn more](#)

🔍 Find buckets by name

< 1 > ⚙️

	Name ▲	AWS Region ▼	Access ▼	Creation date ▼
<input type="radio"/>	prod-proxy-app-db-config	US West (N. California) us-west-1	Bucket and objects not public	June 8, 2023, 22:15:07 (UTC+05:30)

CloudShell

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REFERENCES

- ❑ Guidance for Automating Amazon VPC Routing in a Global Cloud WAN deployment.
- ❑ Guidance for Architecting SWIFT Connectivity on AWS.
- ❑ Guidance for Near Real-Time Fraud Detection Using Amazon Redshift Streaming Ingestion.
- ❑ Use the AWS Architecture icons to create architecture diagrams that communicate your design, deployment, and topology.