

AWS Cloud Modernization Capstone project

1. About the Project

My project involves creating a web-based application with both a front-end and a backend. My main focus is on developing and hosting this application entirely within the AWS Cloud environment..

2. Why AWS Cloud?

I'm using AWS to develop and modernize this application. My approach involves building the project step-by-step, first getting a simple version running, and then improving its security by adding layers of protection, and boosting its performance by using various AWS services.

3. Technologies I'm Using

For this project, I'm working with a simple web application (like a "Hello World" app). Here are the key AWS services I have used to integrate:

- **Application:** A basic web app
- **Hosting:** AWS EC2 instance with Nginx or Apache web server
- **Security Features:** IAM, KMS, CloudFront
- **High Availability & Performance Features:** Read Replicas, Auto scaling, CloudWatch

Task1:

VPC:

The screenshot displays the AWS Management Console interface for a VPC and its associated Internet Gateway. The top section, titled "Your VPCs (1/2)", shows a table with two VPCs. The second VPC, "Racha-project1-vpc", is selected. Below this, the "Resource map" for "vpc-0d604180b051cb79b / Racha-project1-vpc" is shown, illustrating the network architecture with subnets, route tables, and network connections. The bottom section, titled "Internet gateways (1/1)", shows a table with one Internet Gateway, "Racha-IGW-proj1", which is attached to the selected VPC. The "Details" tab for the Internet Gateway is expanded, showing its ID, state, VPC ID, and owner.

Name	VPC ID	State	Block Public...	IPv4 CIDR	IPv6 CIDR	DHCP option set
-	yvc-0146db2d5e738e573	Available	Off	172.31.0.0/16	-	dopt-07e68cbc37b180
Racha-project1-vpc	yvc-0d604180b051cb79b	Available	Off	10.0.0.0/16	-	dopt-07e68cbc37b180

vpc-0d604180b051cb79b / Racha-project1-vpc

Details | **Resource map** | CIDRs | Flow logs | Tags | Integrations

Resource map

- VPC**: Your AWS virtual network. Racha-project1-vpc.
- Subnets (2)**: Subnets within this VPC. us-east-1a: subnet1-project1, subnet2-project1.
- Route tables (2)**: Route network traffic to resources. public-route-prj1, rtb-025dce7fb75a839e5.
- Network connections (1)**: Connections to other networks. Racha-IGW-proj1.

Name	Internet gateway ID	State	VPC ID	Owner
Racha-IGW-proj1	igw-0b59501e0c44df849	Attached	yvc-0d604180b051cb79b Racha-proje...	4910854

igw-0b59501e0c44df849 / Racha-IGW-proj1

Details | Tags

Details

- Internet gateway ID**: igw-0b59501e0c44df849
- State**: Attached
- VPC ID**: yvc-0d604180b051cb79b | Racha-project1-vpc
- Owner**: 491085423787

EC2 Instance details:

i-022bcdaab6a2fb083 (Racha-project1-instance1)

Details	Status and alarms	Monitoring	Security	Networking	Storage	Tags
▼ Instance summary Info						
Instance ID i-022bcdaab6a2fb083	Public IPv4 address 3.94.150.54 open address		Private IPv4 addresses 10.0.1.70			
Auto-assigned IP address 3.94.150.54 [Public IP]	VPC ID vpc-0d604180b051cb79b (Racha-project1-vpc)		AWS Compute Optimizer naming Opt-in to AWS Compute Optimizer for recommendations. Learn more			
IAM Role -	Subnet ID subnet-0aca87ffb80377a6f (public-subnet1-project1)		Auto Scaling Group name -			
IMDSv2 Required	Instance ARN arn:aws:ec2:us-east-1:491085423787:instance/i-022bcdaab6a2fb083		Managed false			

Subnets:

Subnets (10) Info					Last updated 14 minutes ago	Actions
<input type="text" value="Find resources by attribute or tag"/>						
<input type="checkbox"/>	Name	Subnet ID	State	VPC		
<input type="checkbox"/>	public-subnet-prj2	subnet-0de3cd19dbe75073b	Available	vpc-00da7965a96ed33fe Racha-project2-vpc		
<input type="checkbox"/>	RDS-Pvt-subnet-4	subnet-0b3bb09fdcc97d79a	Available	vpc-0d604180b051cb79b Racha-project1-vpc		
<input type="checkbox"/>	RDS-Pvt-subnet-1	subnet-0eef7715ff376a0da	Available	vpc-0d604180b051cb79b Racha-project1-vpc		
<input type="checkbox"/>	private-subnet-prj2	subnet-0ec84d202d2e7ebad	Available	vpc-00da7965a96ed33fe Racha-project2-vpc		
<input type="checkbox"/>	public-subnet1-project1	subnet-0aca87ffb80377a6f	Available	vpc-0d604180b051cb79b Racha-project1-vpc		
<input type="checkbox"/>	RDS-Pvt-subnet-3	subnet-045abf422e4ae87f1	Available	vpc-0d604180b051cb79b Racha-project1-vpc		
<input type="checkbox"/>	RDS-Pvt-subnet-2	subnet-03e2630c55d9a47dd	Available	vpc-0d604180b051cb79b Racha-project1-vpc		

Security Groups (15) Info					Actions	Export
<input type="text" value="Find resources by attribute or tag"/>						
<input type="checkbox"/>	Name	Security group ID	Security group name	VPC ID		
<input type="checkbox"/>	-	sg-0efc87c4aa9125995	rds-ec2-2	vpc-0d604180b051cb79b		
<input type="checkbox"/>	RDS-SG1	sg-0456fd7cd0832ebed	rds-ec2-1	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-056905a7cb2ce835a	default	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-0594c299824001d73	ec2-rds-2	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-0e797bcfe8be620cc	rds-ec2-4	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-096088ff7d65b360e	rds-ec2-3	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-0344c4e19d1ef487d	rds-ec2-5	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-04620bd25137e62df	ec2-rds-5	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-032dc8efe499611c9	ec2-rds-4	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-0493ff47ce9c2b866	default	vpc-00da7965a96ed33fe		
<input type="checkbox"/>	-	sg-03a7fb9b41be5a1af	ec2-rds-3	vpc-0d604180b051cb79b		
<input type="checkbox"/>	-	sg-091cce768f7b4404c	default	vpc-0146db2d5e738e573		
<input type="checkbox"/>	-	sg-0a2392d5da6d6edd1	ec2-rds-1	vpc-0d604180b051cb79b		
<input type="checkbox"/>	project1-SG	sg-0d206c895e1c64d4c	project1-SG	vpc-0d604180b051cb79b		
<input type="checkbox"/>	Proj2-SG-peering	sg-0c0232a631c70a67e	private-SG-prj2	vpc-00da7965a96ed33fe		

Route tables:

Route tables (1/7) [Info](#)

Last updated 12 minutes ago [Refresh](#) [Actions](#) [Create route table](#)

<input checked="" type="checkbox"/>	Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
<input checked="" type="checkbox"/>	public-route-prj1	rtb-0ea1a9e980f48ea13	-	-	No	vpc-0d604180b051cb79b F
<input type="checkbox"/>	-	rtb-025dce7fb75a839e5	-	-	Yes	vpc-0d604180b051cb79b F
<input type="checkbox"/>	public-sub-RT-prj2	rtb-08399340af29d60c3	subnet-0de3cd19dbe750...	-	No	vpc-00da7965a96ed33fe F
<input type="checkbox"/>	RDS-Pvt-rt	rtb-072a38d2d9dea13b5	5 subnets	-	No	vpc-0d604180b051cb79b F
<input type="checkbox"/>	private-sub-RT-prj2	rtb-034fddd3826f99f0b	subnet-0ec84d202d2e7e...	-	No	vpc-00da7965a96ed33fe F
<input type="checkbox"/>	-	rtb-05bbcd9ec3a868beb	-	-	Yes	vpc-0146db2d5e738e573 F
<input type="checkbox"/>	-	rtb-09ccc6299635cafe1	-	-	Yes	vpc-00da7965a96ed33fe F

rtb-0ea1a9e980f48ea13 / public-route-prj1

[Details](#) | [Routes](#) | [Subnet associations](#) | [Edge associations](#) | [Route propagation](#) | [Tags](#)

Details

Route table ID
[rtb-0ea1a9e980f48ea13](#)

VPC
[vpc-0d604180b051cb79b | Racha-](#)

Main
☐ No

Owner ID
[491085423787](#)

Explicit subnet associations
-

Edge associations
-

RDS Database:

aws [Alt+S]

[RDS](#) > [Databases](#) > tutorial-rachadb-instance

Successfully set up a connection between tutorial-rachadb-instance and EC2 instance i-06022d0798abc1167 [?](#)

Notifications ☐ 0 ☐ 0 ☐ 2 ☐ 0 ☐ 0 ☐ 0

tutorial-rachadb-instance

[Refresh](#) [Modify](#) [Actions](#)

Summary

DB identifier
tutorial-rachadb-instance

CPU
 43.50%

Status
Backing-up

Class
db.t3.micro

Role
Instance

Current activity
0 Connections

Engine
MariaDB

Region & AZ
us-east-1a

Recommendations

Connectivity & security

Monitoring

Logs & events

Configuration

Maintenance & backups

Data migrations - new

Tags

Recommendations

Connectivity & security

Endpoint & port

Endpoint
[tutorial-rachadb-instance.covgeou26dk0.us-east-1.rds.amazonaws.com](#)

Port
3306

Networking

Availability Zone
us-east-1a

VPC
[Racha-project1-vpc \(vpc-0d604180b051cb79b\)](#)

Security

VPC security groups
[rds-ec2-5 \(sg-0344c4e19d1ef487d\)](#)
Active

Publicly accessible
No

Webserver Output :

Sample page

NAME

ADDRESS

Add Data

ID

NAME

ADDRESS

Task3:

Peering connections b/w 2 VPC's:

Peering connections (1/1) [Info](#)

Name

Peering connection ID

Status

Requester VPC

Accepter VPC

vpc-racha-peering1

pcx-09177958ba57c93aa

Active

vpc-0d604180b051cb79b / Racha...

vpc-00da7965a96ed33fe / Rac...

pcx-09177958ba57c93aa / vpc-racha-peering1

Details

DNS

Route tables

Tags

Details

Requester owner ID

491085423787

Peering connection ID

pcx-09177958ba57c93aa

Status

Active

Expiration time

-

Accepter owner ID

491085423787

Requester VPC

vpc-0d604180b051cb79b / Racha-project1-vpc

Requester CIDRs

10.0.0.0/16

Requester Region

N. Virginia (us-east-1)

VPC Peering connection ARN

arn:aws:ec2:us-east-1:491085423787:vpc-peering-connection/pcx-09177958ba57c93aa

Accepter VPC

vpc-00da7965a96ed33fe / Racha-project2-vpc

Accepter CIDRs

11.0.0.0/18

Accepter Region

N. Virginia (us-east-1)

Resource map

CIDRs

Flow logs

Tags

Integrations

Resource map [Info](#)

VPC [Show details](#)

Your AWS virtual network

Racha-project2-vpc

Subnets (2)

Subnets within this VPC

us-east-1a

public-subnet-prj2

private-subnet-prj2

Route tables (3)

Route network traffic to resources

public-sub-RT-prj2

private-sub-RT-prj2

rtb-09ccc6299635cafe1

VPC dashboard

EC2 Global View

Filter by VPC

Your VPCs (1/3)

Last updated 18 minutes ago

Actions Create VPC

Name	VPC ID	State	Block Public...	IPv4 CIDR	IPv6 CIDR
-	vpc-0146db2d5e738e573	Available	Off	172.31.0.0/16	-
Racha-project1-vpc	vpc-0d604180b051cb79b	Available	Off	10.0.0.0/16	-
<input checked="" type="checkbox"/> Racha-project2-vpc	vpc-00da7965a96ed33fe	Available	Off	11.0.0.0/18	-

vpc-00da7965a96ed33fe / Racha-project2-vpc

Details Resource map CIDRs Flow logs Tags Integrations

Details

VPC ID
vpc-00da7965a96ed33fe

DNS resolution
Enabled

Main network ACL

State
✔ Available

Tenancy
default

Default VPC

Block Public Access
Off

DHCP option set
dopt-07e68cbc37b18059a

IPv4 CIDR

DNS hostnames
Enabled

Main route table
rtb-09ccc6299635cafe1

IPv6 pool

```
[ec2-user@ip-10-0-1-30 ~]$  
[ec2-user@ip-10-0-1-30 ~]$ ping 11.0.2.81  
PING 11.0.2.81 (11.0.2.81) 56(84) bytes of data.  
64 bytes from 11.0.2.81: icmp_seq=1 ttl=127 time=0.709 ms  
64 bytes from 11.0.2.81: icmp_seq=2 ttl=127 time=0.721 ms  
64 bytes from 11.0.2.81: icmp_seq=3 ttl=127 time=0.774 ms  
64 bytes from 11.0.2.81: icmp_seq=4 ttl=127 time=1.52 ms  
64 bytes from 11.0.2.81: icmp_seq=5 ttl=127 time=0.858 ms  
^C  
--- 11.0.2.81 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4130ms  
rtt min/avg/max/mdev = 0.709/0.915/1.515/0.304 ms
```

Task4:

Auto scaling details:

EC2 > Auto Scaling groups > racha-prj1-ASG

Auto Scaling group updated successfully

racha-prj1-ASG

racha-prj1-ASG Capacity overview

arn:aws:autoscaling:us-east-1:491085423787:autoScalingGroup:8ec17ced-b5b6-4ee9-9377-c754807359fc:autoScalingGroupName/racha-prj1-ASG

Desired capacity	Scaling limits (Min - Max)	Desired capacity type
1	1 - 1	Units (number of instances)

Date created

Fri Mar 14 2025 18:05:10 GMT+0530 (India Standard Time)

Details

Integrations - new

Automatic scaling

Instance management

Instance refresh

Activity

Monitor

Launch template

Launch template

lt-0304932a972c220d2

prj1template

Version

Default

AMI ID

ami-0f2766d500ec3eef3

Instance type

-

Security groups

-

Security group IDs

sg-0d206c895e1c64d4c

Load balancers (1/1)

Actions ▾

Create load balancer

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

Q Filter load balancers

< 1 >

<input checked="" type="checkbox"/>	Name	DNS name	State	VPC ID	Availability Zones	Type	Date cre
<input checked="" type="checkbox"/>	racha-prj1-ASG-1	racha-prj1-ASG-1-9115444...	Provisioning..	vpc-0d604180b051cb79b	2 Availability Zones	application	March 1

Load balancer: racha-prj1-ASG-1

< Details

Listeners and rules

Network mapping

Resource map

Security

Monitoring

Integrations

Attributes

Capac >

Details

Load balancer type

Application

Scheme

Internet-facing

Status

Provisioning

Hosted zone

Z35SXDOTRQ7X7K

VPC

[vpc-0d604180b051cb79b](#)

Availability Zones

[subnet-0b3bb09fdcc97d79a](#) us-east-1b (use1-az2)
[subnet-0aca87ffb80377a6f](#) us-east-1a (use1-az1)

Load balancer IP address type

IPv4

Date created

March 14, 2025, 18:08 (UTC+05:30)

Target groups (1/1) Info

Actions ▾

Create target group

Q Filter target groups

< 1 >

<input checked="" type="checkbox"/>	Name	ARN	Port	Protocol	Target type	Load balancer	VPC ID
<input checked="" type="checkbox"/>	racha-prj1-ASG-1	arn:aws:elasticloadbalancin...	80	HTTP	Instance	racha-prj1-ASG-1	vpc-0d6

Target group: racha-prj1-ASG-1

Details

Targets

Monitoring

Health checks

Attributes

Tags

Details

arn:aws:elasticloadbalancing:us-east-1:491085423787:targetgroup/racha-prj1-ASG-1/a24d2795317eb6e1

Target type

Instance

IP address type

IPv4

Protocol : Port

HTTP: 80

Load balancer

[racha-prj1-ASG-1](#)

Protocol version

HTTP1

VPC

[vpc-0d604180b051cb79b](#)

Task5:
Read Replica of RDS Database:

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

RDS > Databases > tutorial-rachadb-instance > readreplica-1

Filter by databases

DB identifier	Status	Role	Engine	Region	Size	Recommendations	CPU	Current...
tutorial-rachadb-instance	Available	Primary	MariaDB	us-east-1a	db.t3.micro		2.55%	1 Conn
readreplica-1	Modify...	Replica	MariaDB	us-east-1b	db.t3.micro		17.88%	0 Conn

Connectivity & security | Monitoring | Logs & events | Configuration | Maintenance & backups | Data migrations - new | Tags | Recommendations

Connectivity & security

Endpoint & port

Endpoint
readreplica-1.covgeou26dk0.us-east-1.rds.amazonaws.com

Port
3306

Networking

Availability Zone
us-east-1b

VPC
Racha-project1-vpc (vpc-0d604180b051cb79b)

Subnet group
rds-ec2-db-subnet-group-1

Subnets
subnet-0ee8cf558ed64850e
subnet-03e2630c55d9a47dd
subnet-045abf422e4ae87f1

Security

VPC security groups
rds-ec2-5 (sg-0344c4e19d1ef487d)
Active

Publicly accessible
No

Certificate authority Info
rds-ca-rsa2048-g1

Certificate authority date
May 26, 2061, 05:04 (UTC+05:30)

DB instance certificate expiration date

Task6: Encrypt the data on DB layer and S3 using KMS(Key Management Service)

aws Search United States (N. Virginia) Rana

Amazon S3 > Buckets > racha-s3-kms > happy face.jpg

happy face.jpg Info

Copy S3 URI | Download | Open | Object actions

Properties | Permissions | Versions

Object overview

Owner
ranagon9

AWS Region
US East (N. Virginia) us-east-1

Last modified
March 14, 2025, 19:06:46 (UTC+05:30)

Size
18.5 KB

Type
jpg

Key
happy face.jpg

S3 URI
s3://racha-s3-kms/happy face.jpg

Amazon Resource Name (ARN)
arn:aws:s3:::racha-s3-kms/happy face.jpg

Entity tag (Etag)
f31ccb7cc586b8a03f3cc85e34154953

Object URL
https://racha-s3-kms.s3.us-east-1.amazonaws.com/happy+face.jpg

is XML file does not appear to have any style information associated with it. The document tree is shown below.

```
Error>
<Code>AccessDenied</Code>
<Message>Access Denied</Message>
<RequestId>0ZBA3RGFM2YSK4Z6</RequestId>
<HostId>rtNMUTFJrR1A6q1y0Thgf2MhPGW4czwYJY/An8HodaN57A32/dT2HUMspwDUSM8vBW2+qifalwOQ2l67/ZFoLg==</HostId>
/Error>
```

User2 has Admin access

Policy Name	Actions
 AmazonS3FullAccess	Show Policy Detach Policy Simulate Policy
BucketAllPolicy	Show Policy Detach Policy Simulate Policy
Inline Policies	

Task9: Access application using Cloudfront DNS

Cloudfront Distributions:

CloudFront > Distributions > E21Y09I9SF9K66

E21Y09I9SF9K66

[General](#) | [Origins](#) | [Behaviors](#) | [Error pages](#) | [Geographic restrictions](#) | [Invalidations](#) | [Tags](#)

Details

Distribution domain name

ARN

is XML file does not appear to have any style information associated with it. The document tree is shown below.

```
Error>
<Code>AccessDenied</Code>
<Message>Access Denied</Message>
<RequestId>0ZBA3RGFM2YSK4Z6</RequestId>
<HostId>rtNMUTFJrR1A6q1y0Thgf2MhPGW4czwYJY/An8HodaN57A32/dT2HUMspwDUSM8vBW2+qifalwOQ2l67/ZFoLg==</HostId>
/Error>
```

Webpage output:

