

Cloud-based Web Application Deployment on AWS Infrastructure

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—
Cloud computing

—
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1. Introduction

This project involves deploying a cloud-based web application that follows modern **cloud-native architecture** principles. The system consists of two main components: the **backend** service and the **frontend** client. The backend performs **CRUD operations**, handles **user authentication**, manages a **database**, and supports **file/image uploads** using AWS S3. The front end consumes these backend services via **REST APIs**.

Project Requirements

- **Frontend:** Deployed a React app on **AWS Elastic Beanstalk**.
- **Backend:** Deployed a **Node.js** backend on **Amazon EC2** using Docker.
- **Database:** Used **Amazon RDS (PostgreSQL/MySQL)** or **DynamoDB**.
- **File/Image Storage:** Used **Amazon S3** to store and retrieve media assets.
- **Security:** Implemented **IAM roles, security groups**, and **HTTPS**.

7. Deployment Steps

7.1. Frontend Deployment on Elastic Beanstalk

1. **Prepare the React app:** Run `npm run build` to create the production build.
2. **Deploy to Elastic Beanstalk:** Use AWS Elastic Beanstalk CLI or AWS Console to deploy the build.

7.2. Backend Deployment on EC2

1. **Create a Docker image** for the backend.
2. **Push Docker image to Amazon ECR** (Elastic Container Registry).
3. **Launch EC2 instance** with Docker and pull the image from ECR.

7.3. Set Up DynamoDB

1. **Create a DynamoDB table** via AWS Console.
2. **Configure database access** and connect your backend to the database.

7.4. Configure S3 for File Upload

1. **Create an S3 bucket** via the AWS Console.
2. **Set up appropriate bucket policies** for public/private access.

7.5. Set Up IAM Roles and Policies

1. Create IAM roles for EC2, S3, and RDS access.
2. Attach the necessary policies to each role.

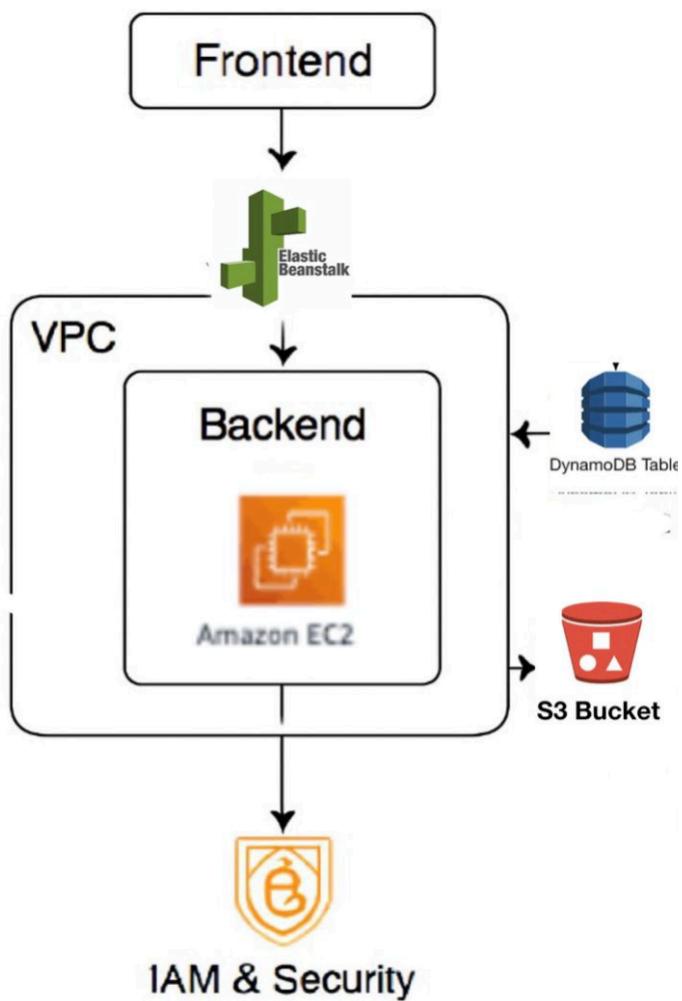
8.1. GitHub Repo Link

<https://github.com/mahamkhurram/Cloud-Project-AWS-Deploymnet-.git>

8.2. Live Demo URLs

- **Frontend (Elastic Beanstalk):** <http://cloudcomputing-env.eba-g22mshge.us-east-1.elasticbeanstalk.com/>
-
- **Backend (EC2):** <http://54.173.73.252:5000/api/posts>

8.3. Architecture diagram of AWS deployment



8.3. IAM policies screenshots

The screenshot shows the AWS IAM Role details page for 'MyEC2Role'. The role allows EC2 instances to call AWS services on behalf of the user. It was created on May 11, 2025, at 21:15 (UTC+05:00). The ARN is arn:aws:iam::218382887270:role/MyEC2Role. The instance profile ARN is arn:aws:iam::218382887270:instance-profile/MyEC2Role. The maximum session duration is 1 hour. The 'Permissions' tab is selected, showing three attached managed policies: AdministratorAccess-AWSElasticBea..., AmazonDynamoDBFullAccess, and AmazonS3FullAccess.

Policy name	Type	Attached entities
AdministratorAccess-AWSElasticBea...	AWS managed	3
AmazonDynamoDBFullAccess	AWS managed	2
AmazonS3FullAccess	AWS managed	2

The screenshot shows the AWS IAM Policies list page, displaying 1347 policies. A search bar and filter by type are present. The table lists policies such as AccessAnalyzerService..., AdministratorAccess, AdministratorAccess-A..., AdministratorAccess-A..., AIOpsAssistantPolicy, AIOpsConsoleAdminP..., AIOpsOperatorAccess, AIOpsReadOnlyAccess, AlexaForBusinessDevic..., AlexaForBusinessFullA..., AlexaForBusinessGate..., AlexaForBusinessLifes..., AlexaForBusinessNetw..., and others. Each policy entry includes its name, type, used as status, and a description.

Policy name	Type	Used as	Description
AccessAnalyzerService...	AWS managed	None	Allow Access Analyzer to analyze resou...
AdministratorAccess	AWS managed - job function	None	Provides full access to AWS services an...
AdministratorAccess-A...	AWS managed	None	Grants account administrative permis...
AdministratorAccess-A...	AWS managed	Permissions policy (2)	Grants account administrative permis...
AIOpsAssistantPolicy	AWS managed	None	Provides ReadOnly permissions requir...
AIOpsConsoleAdminP...	AWS managed	None	Grants full access to Amazon AI Opera...
AIOpsOperatorAccess	AWS managed	None	Grants access to the Amazon AI Opera...
AIOpsReadOnlyAccess	AWS managed	None	Grants ReadOnly permissions to the A...
AlexaForBusinessDevic...	AWS managed	None	Provide device setup access to AlexaFo...
AlexaForBusinessFullA...	AWS managed	None	Grants full access to AlexaForBusiness ...
AlexaForBusinessGate...	AWS managed	None	Provide gateway execution access to A...
AlexaForBusinessLifes...	AWS managed	None	Provide access to Lifesize AVS devices
AlexaForBusinessNetw...	AWS managed	None	This policy enables Alexa for Business ...

Screenshot of the AWS IAM User Details page for 'cloudapp-backend'.

Summary

ARN	arn:aws:iam::218382887270:user/cloudapp-backend	Console access	Disabled
Created	May 10, 2025, 16:46 (UTC+05:00)	Last console sign-in	-
		Access key 1	AKIATFWFCNFTFIMYM7C7 - Active Used today. 23 hours old.
		Access key 2	AKIATFWFCNFTO6OBAQEY - Active Never used. Created today.

Permissions

Permissions policies (2)

Policy name	Type	Attached via
AmazonDynamoDBFullAccess	AWS managed	Directly
AmazonS3FullAccess	AWS managed	Directly

Roles (9)

Role name	Trusted entities	Last activity
aws-elasticbeanstalk-service-role	AWS Service: elasticbeanstalk	54 minutes ago
awselatic	AWS Service: elasticbeanstalk	7 minutes ago
AWSServiceRoleForAutoScaling	AWS Service: autoscaling (Service-Linked Role)	8 minutes ago
AWSServiceRoleForRDS	AWS Service: rds (Service-Linked Role)	7 minutes ago
AWSServiceRoleForSupport	AWS Service: support (Service-Linked Role)	-
AWSServiceRoleForTrustedAdvisor	AWS Service: trustedadvisor (Service-Linked Role)	-
elasticrole2	AWS Service: ec2	-
my-new-elatsic-role	AWS Service: ec2	1 hour ago
rds-monitoring-role	AWS Service: monitoring.rds	-

Roles Anywhere

Authenticate your non AWS workloads and securely provide access to AWS services.

8.4. AWS deployment & configuration screenshots

EC2

Deployment On AWS

AWS | Search [Option+S] | United States (N. Virginia) | Maham

EC2 > Instances

Instances

EC2

- Dashboard
- EC2 Global View
- Events
- Instances**
 - Instances
 - Instance Types
 - Launch Templates
 - Spot Requests
 - Savings Plans
 - Reserved Instances
 - Dedicated Hosts
 - Capacity Reservations
- Images**
 - AMIs
 - AMI Catalog
- Elastic Block Store**
 - Volumes
 - Snapshots
 - Lifecycle Manager
- Network & Security**
 - Security Groups
 - Elastic IPs

Instances (1/4) Info

Last updated less than a minute ago

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	WebServer	i-03789e60967839895	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Crudapp-env	i-080008252b75f05b7	Running	t3.micro	3/3 checks passed	View alarms +	us-east-1a
<input checked="" type="checkbox"/>	Backend	i-085ff0860a8422df8	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Cloudcomputi...	i-06b3a77e45850f759	Running	t3.micro	3/3 checks passed	View alarms +	us-east-1a

i-085ff0860a8422df8 (Backend)

Instance ID i-085ff0860a8422df8	Public IPv4 address 35.174.80.232 open address	Private IPv4 addresses 10.0.1.238
IPv6 address -	Instance state Running	Public IPv4 DNS -
Hostname type IP name: ip-10-0-1-238.ec2.internal	Private IP DNS name (IPv4 only) ip-10-0-1-238.ec2.internal	Elastic IP addresses 35.174.80.232 [Public IP]
Answer private resource DNS name -	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations. Learn more
Auto-assigned IP address -	VPC ID vpc-0e1119a678dd5482b (my-vpc)	Auto Scaling Group name -
IAM Role MyEC2Role	Subnet ID subnet-0a28ff2dd0edd40ce (subnet-public-1)	

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AWS | Search [Option+S] | United States (N. Virginia) | Maham

EC2 > Instances

Instances

EC2

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- Images**
 - AMIs
 - AMI Catalog
- Elastic Block Store**
 - Volumes
 - Snapshots
 - Lifecycle Manager

Instances (4) Info

Last updated less than a minute ago

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	WebServer	i-03789e60967839895	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Backend	i-085ff0860a8422df8	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Cloudcomputi...	i-06b3a77e45850f759	Running	t3.micro	3/3 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Cloudcomputi...	i-05ad85f7c6bbc6273	Terminated	t3.micro	-	View alarms +	us-east-1b

Select an instance

S3

Deployment On AWS

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

Amazon S3 > Buckets > privatebucketuser

Amazon S3

- General purpose buckets**
 - Directory buckets
 - Table buckets
 - Access Grants
 - 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
 - Storage Lens groups
 - AWS Organizations settings
- Feature spotlight [11]

AWS Marketplace for S3

privatebucketuser Info

Objects | Metadata | Properties | Permissions | Metrics | Management | Access Points

Objects (5)

(C) Copy S3 URI Copy URL Download Open Delete Actions Create folder Upload

Objects are the fundamental entities stored in Amazon S3. You can use [Amazon S3 inventory](#) to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

Name	Type	Last modified	Size	Storage class
0.PNG	PNG	May 11, 2025, 05:36:58 (UTC+05:00)	36.3 KB	Standard
1.PNG	PNG	May 11, 2025, 05:08:14 (UTC+05:00)	0 B	Standard
test-file.txt	txt	May 11, 2025, 04:52:37 (UTC+05:00)	27.0 B	Standard
TEST.TXT	TXT	May 11, 2025, 04:56:13 (UTC+05:00)	0 B	Standard
testfile.txt	txt	May 11, 2025, 17:15:14 (UTC+05:00)	0 B	Standard

CloudShell Feedback [Option+S] | Search | United States (N. Virginia) | Maham

Amazon S3 > Buckets > privatebucketuser

Amazon S3

- General purpose buckets**
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- Feature spotlight [11]

AWS Marketplace for S3

Objects | Metadata | Properties | **Permissions** | Metrics | Management | Access Points

Permissions overview

Access finding
Access findings are provided by IAM external access analyzers. Learn more about [How IAM analyzer findings work](#). [View analyzer for us-east-1](#)

Block public access (bucket settings)

Block **all** public access On

Individual Block Public Access settings for this bucket

Bucket policy

The bucket policy, written in JSON, provides access to the objects stored in the bucket. Bucket policies don't apply to objects owned by other accounts. [Learn more](#)

Public access is blocked because Block Public Access settings are turned on for this bucket
To determine which settings are turned on, check your Block Public Access settings for this bucket. Learn more about [using Amazon S3 Block Public Access](#)

aws Search [Option+S] United States (N. Virginia) Maham

Amazon S3

- General purpose buckets
- Directory buckets
- Table buckets
- Access Grants
- 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
- Storage Lens groups
- AWS Organizations settings

Feature spotlight 11

▶ AWS Marketplace for S3

Account snapshot - updated every 24 hours All AWS Regions

Storage lens provides visibility into storage usage and activity trends. Metrics don't include directory buckets. [Learn more](#)

[View Storage Lens dashboard](#)

General purpose buckets | **Directory buckets**

General purpose buckets (4) Info All AWS Regions

Buckets are containers for data stored in S3.

Name	AWS Region	IAM Access Analyzer	Creation date
clouddapp-files	US East (N. Virginia) us-east-1	View analyzer for us-east-1	May 10, 2025, 16:54:32 (UTC+05:00)
elasticbeanstalk-us-east-1-218382887270	US East (N. Virginia) us-east-1	View analyzer for us-east-1	May 11, 2025, 19:23:29 (UTC+05:00)
privatebucketuser	US East (N. Virginia) us-east-1	View analyzer for us-east-1	May 10, 2025, 22:59:37 (UTC+05:00)
publicbucketuser	US East (N. Virginia) us-east-1	View analyzer for us-east-1	May 10, 2025, 22:57:57 (UTC+05:00)

Copy ARN Empty Delete Create bucket

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DynamoDB

aws Search [Option+S] United States (N. Virginia) Maham

DynamoDB

Dashboard

Tables

- Explore items
- PartiQL editor
- Backups
- Exports to S3
- Imports from S3
- Integrations [New](#)
- Reserved capacity
- Settings

DAX

- Clusters
- Subnet groups
- Parameter groups
- Events

Share your feedback on Amazon DynamoDB Your feedback is an important part of helping us provide a better customer experience. Take this short survey to let us know how we're doing. Share feedback

Amazon DynamoDB reduces prices for on-demand throughput by 50% and global tables by up to 67%. To learn more, see [What's New post](#) and visit the [DynamoDB pricing page](#).

Tables (3) Info

Name	Status	Partition key	Sort key	Indexes	Replication Regions	Deletion protection	Favorite
Post	Active	PostID (N)	-	0	0	Off	On
posts	Active	postid (S)	-	0	0	Off	On
users	Active	uid (S)	-	1	0	Off	On

Actions Delete Create table

Beanstalk

Deployment On AWS

Environment successfully launched.

X

Instance traffic and scaling [Info](#)

Edit

Customize the capacity and scaling for your environment's instances. Select security groups to control instance traffic. Configure the software that runs on your environment's instances by setting platform-specific options.

Instances

Root volume type
gp2

Instance size
12

IMDSv1
Deactivated

EC2 Security Groups

sg-0b79c4d811b805c0b, sg-0e755487f0349d1b7

Capacity

Environment type
Single instance

Fleet composition
On-Demand instance

On-demand base
0

On-demand above base
0

Capacity rebalancing
Deactivated

Scaling cooldown
360

Processor type
x86_64

Instance types
t3.micro, t3.small

AMI ID
ami-0f466a1a46085b81e

Updates, monitoring, and logging [Info](#)

Edit

Define when and how Elastic Beanstalk deploys changes to your environment. Manage your application's monitoring and logging settings, instances, and other environment resources.

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us-east-1.console.aws.amazon.com/elasticbeanstalk/home?region=us-east-1#/environment/configuration?environmentId=e-fbxqbkaja

Elastic Beanstalk > Environments > Cloudcomputing-env > Configuration

Environment successfully launched.

Configuration [Info](#)

Cancel Review changes Apply changes

Service access [Info](#)

Configure the service role and EC2 instance profile that Elastic Beanstalk uses to manage your environment. Choose an EC2 key pair to securely log in to your EC2 instances.

Service role: arn:aws:iam::218382887270:role/service-role/awselastic

EC2 instance profile: my-new-elastics-role

Networking and database [Info](#)

Configure VPC settings, and subnets for your environment's EC2 instances and load balancer. Set up an Amazon RDS database that's integrated with your environment.

Network

VPC: vpc-0e1119a678dd5482b	Public IP address: false	Instance subnets: subnet-0a28ff2dd0edd40ce
----------------------------	--------------------------	--

Instance traffic and scaling [Info](#)

Customize the capacity and scaling for your environment's instances. Select security groups to control instance traffic. Configure the software that runs on your environment's instances by setting platform-specific options.

Instances

Root volume type	Instance size	IMDSv1
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Beanstalk

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configurations

ent: Cloudcomputing-

environment []
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urino

Environment successfully launched.

Domain Cloudcomputing-env.eba-g22mshge.us-east-1.elasticbeanstalk.com []	Application name cloudcomputing	Running version crudapp	Platform state Supported
---	---	-----------------------------------	------------------------------------

Events Health Logs Monitoring Alarms Managed updates Tags

Events (12) Info

Time	Type	Details
May 11, 2025 21:09:35 (UTC+5)	INFO	Requested environment info from each instance.
May 11, 2025 21:09:33 (UTC+5)	INFO	requestEnvironmentInfo is starting.
May 11, 2025 20:30:39 (UTC+5)	INFO	Launched environment: Cloudcomputing-env. However, there were issues during launch. See event log for details.

Deployment On AWS