

ECS Fargate Nginx Server Deployment with ALB And EFS using CodePipeline (Task 7)



Zaeem Attique Ashar
Cloud Intern

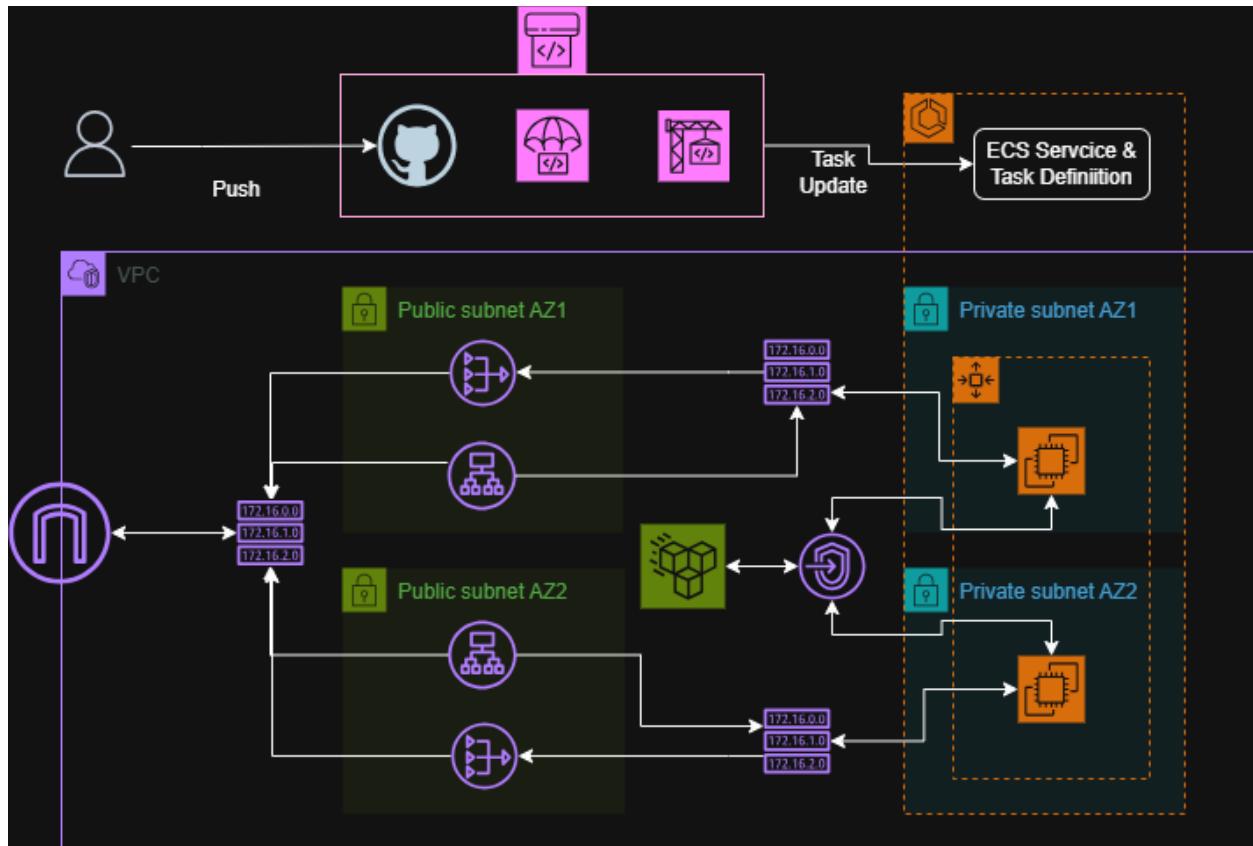
Task Description:

This task will be a guide on setting up a Node Application server with a highly available architecture on AWS ECS Cluster Spread over multiple availability zones. An internet facing Load Balancer will be set up in front of the ECS cluster to listen to traffic and balance it upon tasks. AWS EFS will be used for persistence in shared storage to prevent data loss. The application will automatically be deployed using the AWS CodePipeline.

Architecture Diagram: 2

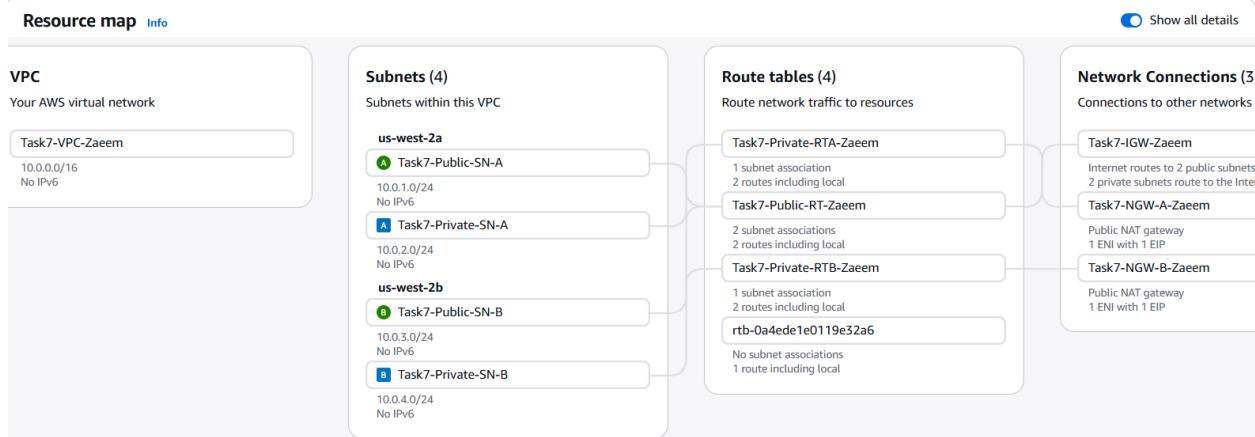
Task7.1: Create basic networking infrastructure	3
Task7.2: Create EFS File System and Mount Points	4
Task7.3: Build Docker Image and push to ECR.....	5
Task7.4: Create an ECS + EC2 Cluster and dependencies	6

Architecture Diagram:



Task7.1: Create basic networking infrastructure

- Create and configure a VPC
 - CIDR Block: 10.0.0.0/16
- Create and configure Subnets
 - Public Subnet A (us-west-2a), CIDR: 10.0.1.0/24
 - Private Subnet A (us-west-2a), CIDR: 10.0.2.0/24
 - Public Subnet B (us-west-2b), CIDR: 10.0.3.0/24
 - Private Subnet A (us-west-2a), CIDR: 10.0.4.0/24
- Create and configure NAT Gateways
 - NAT Gateway A in Public Subnet A
 - NAT Gateway B in Public Subnet B
- Create and configure Internet Gateway
 - Create and attach to the project's VPC
- Create and configure Route Tables
 - Public Route Table, Outbound rule: 0.0.0.0/0 -> IGW, attach to Public SN A&B
 - Private Route Table A, Outbound Rule: 0.0.0.0/0 -> NGW attach to Private SN A
 - Private Route Table B, Outbound Rule: 0.0.0.0/0 -> NGW attach to Private SN B



Task7.2: Create EFS File System and Mount Points

- Create File System:
 - Name: Task7-EFS-Zaeem
 - Encryption: Yes
- Create Access Points:
 - File System: Task7-EFS-Zaeem
 - Name: Task7-EFS-AP-Zaeem
 - Root Directory: /
 - POSIX UID 1000, GID 1000
 - Owner UID 1000, Owner GID: 1000
 - AP Permissions: 0755
- Create Mount Points:
 - AZ us-west-2a, Subnet Private, SG Task7-EFS-SG-Zaeem
 - AZ us-west-2b, Subnet Private, SG Task7-EFS-SG-Zaeem

Task7-EFS-Zaeem (fs-04cc00938133363d8)

Delete Attach Edit

General		Automatic backups	
Amazon resource name (ARN)	arn:aws:elasticfilesystem:us-west-2:504649076991:file-system/fs-04cc00938133363d8	Enabled	Enabled
Performance mode	General Purpose	Encrypted	745bede3-4d17-4e30-84fc-db434ebff4dd (aws/elasticfilesystem)
Throughput mode	Elastic	File system state	Available
Lifecycle management	Transition into Infrequent Access (IA): 30 day(s) since last access Transition into Archive: 90 day(s) since last access Transition into Standard: None	DNS name	fs-04cc00938133363d8.efs.us-west-2.amazonaws.com
Availability zone	Regional	Replication overwrite protection	Enabled

Metered size | Monitoring | Tags | File system policy | Access points | **Network** | Replication

Manage Copy Share

Availability zone (AZ-ID)	Mount target ID	Subnet ID	VPC ID	Mount target state	IPv4 address	IPv6 address	Network interface ID	Security groups
us-west-2a (usw2-az1)	fsmt-0ccfd81d0be3b743	subnet-0782f9eb2fa43c008	VPC-0433be6a79e22a9cd	Available	10.0.2.108	N/A	eni-0a03ace4dbb757da5	sg-0c5437c8d99adda51 (Task7-EFS-SG-Zaeem)

Task7.3: Build Docker Image and push to ECR

- Build Docker Image:
 - Got to source code directory.
 - Create DockerFile.yaml and write instructions
 - Use command to build image: `docker image -t nodejs:latest -f DockerFile.yaml`.
 - Use to tag image: `docker tag nodejs:latest <ecr uri>/zaeem/task7:latest`
 - Use command to push to ECR: `docker push <ecr uri>/zaeem/task7:latest`

```
* PS C:\Users\zaeem\Documents\Innovation Lab - Cloudelligent\Task7\node-js-sample-master> aws ecr get-login-password --region us-west-2 | docker login --username AWS --password-stdin 504649076991.dkr.ecr.us-west-2.amazonaws.com
Login Succeeded
* PS C:\Users\zaeem\Documents\Innovation Lab - Cloudelligent\Task7\node-js-sample-master> docker build -t zaeem/task7 -f .\Dockerfile.yaml .
[+] Building 1.9s (10/10) FINISHED
   => [internal] load build definition from Dockerfile.yaml
   => [internal] load metadata for docker.io/library/node:18-alpine
   => [internal] load .dockerignore
   => [internal] transfer context: 2B
   => [1/5] FROM docker.io/library/node:18-alpine@sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35cb9bc4b8ca09d9e
   => [internal] resolve docker.io/library/node:18-alpine@sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35cb9bc4b8ca09d9e
   => [internal] load build context
   => [internal] transfer context: 41.69kB
   => CACHED [2/5] WORKDIR /usr/src/app
   => CACHED [3/5] COPY package.json .
   => CACHED [4/5] RUN npm install -production
   => CACHED [5/5] COPY .
   => exporting to image
   => exporting layers
   => exporting manifest sha256:5fd261775ccb9c4c00335w6079530:64cf9668818527c9fb229c3dbffed2c
   => exporting config sha256:8baa20da511541294c8b566ca4f45c326c7bd2e1b02789fe914c30c7779d4e
   => exporting attestation manifest sha256:1fd7012cd0e05e2049395a83d3e53fc308c5e6413132da44eeffb92ae836a6
   => exporting manifest list sha256:730e95da8c2f1f547b178f1a99695da51324667e65b17c6861335f30b942ed8
   => naming to doc
   => unpacking to docker-desktop/dashboard/build/desktop-linux/desktop-
   => linux/8e81chhrzkw6bzny2bbegp6m (ctrl + click)
View build details: docker-desktop:/dashboard/build/desktop-linux/desktop_1/linux/8e81chhrzkw6bzny2bbegp6m
* PS C:\Users\zaeem\Documents\Innovation Lab - Cloudelligent\Task7\node-js-sample-master> docker tag zaeem/task7:latest 504649076991.dkr.ecr.us-west-2.amazonaws.com/zaeem/task7:latest
The push refers to repository [504649076991.dkr.ecr.us-west-2.amazonaws.com/zaeem/task7]
79b00165671: Pushed
a2ad9f246cff: Pushed
1e5a4c89ce5: Pushed
25ff2da83641: Pushed
96885a348ee2: Pushed
d71dd0e83405: Pushed
7798e84cf363: Pushed
8c0c2c8931c7: Pushed
f18232174bc9: Pushed
latest: digest: sha256:730e95da8c2f1f547b178f1a99695da51324667e6b5b17c8d81335f30b942ed8 size: 856
* PS C:\Users\zaeem\Documents\Innovation Lab - Cloudelligent\Task7\node-js-sample-master>
```

Task7.4: Create an ECS + EC2 Cluster and dependencies

- Create and Configure a Launch Template
 - Name: Task7-EC2-LT-Zaeem
 - Container instance AMI: Amazon Linux 2023
 - Instance Type: t3.micro
 - SSH Key pair: Task7-EC2
 - Subnet: Do not include
 - Availability Zone: Do not include
 - Security Group: Task7-EC2-SG-Zaeem
 - Storage Volume: 8GiB Default EBS volume

Task7-EC2-LT-Zaeem (lt-077e5c92913adb93)

The screenshot shows the 'Launch template details' page for 'Task7-EC2-LT-Zaeem'. It includes sections for 'Launch template details' (with ID lt-077e5c92913adb93), 'Default version' (version 11), and 'Owner' (SO_AdministratorAccess_00a7feb88c39771/zaeem). Below this, there are tabs for 'Details', 'Versions', and 'Template tags'. The 'Details' tab displays 'Launch template version details' for version 11 (Task7-EC2-LT-Zaeemv11). It shows settings for 'Instance details' (AMI ID ami-07b09ad3acff075f, Instance type t2.small), 'Network interfaces' (Availability Zone), and 'Advanced details' (Security group IDs sg-04aa2d576725c8bf). Buttons for 'Actions' and 'Delete template version' are at the top right.

- Create and Configure Application Load Balancer
 - Name: Task7-ALB-Zaeem
 - Scheme: Internet Facing
 - Load Balancer IP: IPv4
 - VPC: Task7-VPC-Zaeem
 - AZ and Subnets: AZ1 Public SN & AZ2 Public SN
 - Security Groups: Task7-ALB-SG-Zaeem
 - Listener Protocol HTTP, Port 80
 - Routing Action: Forward to TG
 - Register Targets: None

Task7-ALB-Zaeem

The screenshot shows the 'Listeners and rules' section of the ALB configuration for 'Task7-ALB-Zaeem'. It lists one rule: 'HTTP-5000' with a 'Forward to target group' action pointing to 'Task7-TG-Zaeem' (1 rule). Other tabs include 'Details', 'Network mapping', 'Resource map', 'Security', 'Monitoring', 'Integrations', 'Attributes', 'Capacity', and 'Tags'. Buttons for 'Actions', 'Manage rules', 'Manage listener', and 'Add listener' are at the top right.

- Create and Configure Auto Scaling Group
 - Name: Task7-ASG-Zaeem
 - Launch Template: Task7-EC2-LT-Zaeem
 - VPC: Task7-VPC-Zaeem
 - AZ: Private SN A & Private SN B
 - Load Balancer: Attach to existing
 - Attach to an Existing Target Group
 - Group Size: Desired capacity 2, min 1, max 3
 - No scaling policies

Task7-ASG-Zaeem Capacity overview

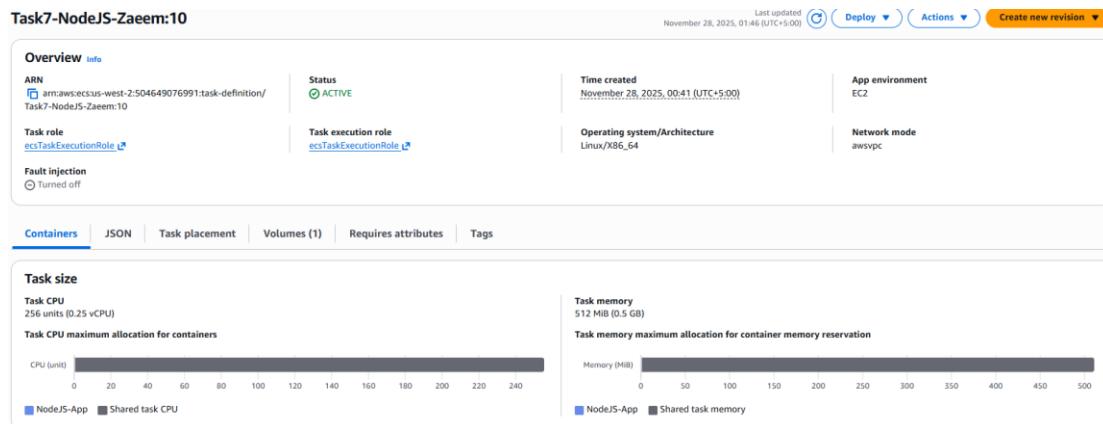
Edit															
Desired capacity 2	Scaling limits (Min - Max) 1 - 3	Desired capacity type Units (number of instances)	Status												
Date created Thu Nov 27 2025 23:46:33 GMT+0500 (Pakistan Standard Time)															
Details Integrations Automatic scaling Instance management Instance refresh Activity Monitoring Tags - moved															
Launch template <table border="1"> <tr> <td>Launch template lt-077e5c92913adb93 Task7-EC2-LT-Zaeem</td> <td>AMI ID ami-07b09ad3acff075f</td> <td>Instance type t2.small</td> <td>Owner arn:aws:s3:::504649076991:assumed-role/AWSReservedSSO_AdministratorAccess_d0a7cfec88c39771/zaeem</td> </tr> <tr> <td>Version Default</td> <td>Security groups -</td> <td>Security group IDs sg-04aa2d376725c8bf</td> <td>Create time Thu Nov 27 2025 23:33:47 GMT+0500 (Pakistan Standard Time)</td> </tr> <tr> <td>Description Task7-EC2-LT-Zaeemv11</td> <td>Storage (volumes) -</td> <td>Key pair name -</td> <td>Request Spot Instances No</td> </tr> </table> <p>View details in the launch template console</p>				Launch template lt-077e5c92913adb93 Task7-EC2-LT-Zaeem	AMI ID ami-07b09ad3acff075f	Instance type t2.small	Owner arn:aws:s3:::504649076991:assumed-role/AWSReservedSSO_AdministratorAccess_d0a7cfec88c39771/zaeem	Version Default	Security groups -	Security group IDs sg-04aa2d376725c8bf	Create time Thu Nov 27 2025 23:33:47 GMT+0500 (Pakistan Standard Time)	Description Task7-EC2-LT-Zaeemv11	Storage (volumes) -	Key pair name -	Request Spot Instances No
Launch template lt-077e5c92913adb93 Task7-EC2-LT-Zaeem	AMI ID ami-07b09ad3acff075f	Instance type t2.small	Owner arn:aws:s3:::504649076991:assumed-role/AWSReservedSSO_AdministratorAccess_d0a7cfec88c39771/zaeem												
Version Default	Security groups -	Security group IDs sg-04aa2d376725c8bf	Create time Thu Nov 27 2025 23:33:47 GMT+0500 (Pakistan Standard Time)												
Description Task7-EC2-LT-Zaeemv11	Storage (volumes) -	Key pair name -	Request Spot Instances No												
Network <table border="1"> <tr> <td>Availability Zones usw2-az1 (us-west-2a) usw2-az2 (us-west-2b)</td> <td>Subnet ID subnet-0782f9eb2fa43c008 subnet-0616b3d5b0b48b225</td> <td>Availability Zone distribution Balanced best effort</td> <td>Edit</td> </tr> </table>				Availability Zones usw2-az1 (us-west-2a) usw2-az2 (us-west-2b)	Subnet ID subnet-0782f9eb2fa43c008 subnet-0616b3d5b0b48b225	Availability Zone distribution Balanced best effort	Edit								
Availability Zones usw2-az1 (us-west-2a) usw2-az2 (us-west-2b)	Subnet ID subnet-0782f9eb2fa43c008 subnet-0616b3d5b0b48b225	Availability Zone distribution Balanced best effort	Edit												

- Create and Configure ECS Cluster
 - Name: Task7-ECS-Cluster-Zaeem
 - Infrastructure: Fargate and self-managed instances
 - Select Task7-ASG-Zaeem Auto Scaling Group

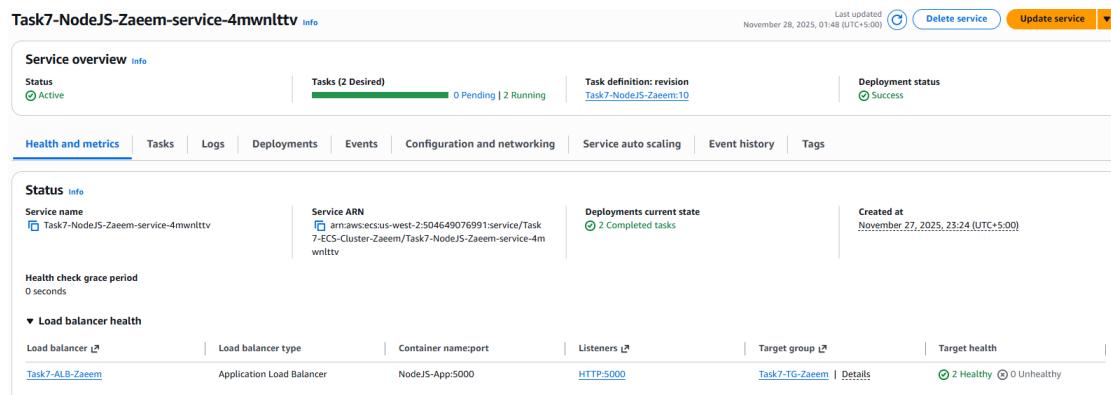
Task7-ECS-Cluster-Zaeem ASG

Last updated November 28, 2025, 01:46 (UTC+5:00) Actions Create with Express Mode																														
Cluster overview	Status Active	CloudWatch monitoring Container insights with enhanced observability	Registered container instances 2																											
Services	Draining -	Tasks	Pending -																											
Services Tasks Infrastructure Metrics Scheduled tasks Configuration Event history Tags																														
Services (1) Info <table border="1"> <tr> <td>Filter services by value</td> <td>Filter launch type Any launch type</td> <td>Filter scheduling strategy Any scheduling strategy</td> <td>Filter resource management type Any resource management type</td> <td>Last updated November 28, 2025, 01:46 (UTC+5:00)</td> <td>Manage tags</td> <td>Update</td> <td>Delete service</td> <td>Create</td> </tr> <tr> <td><input type="checkbox"/> Service name</td> <td>ARN</td> <td>Status</td> <td>Scheduling strategy</td> <td>Task definition</td> <td>Deployments and tasks</td> <td>Last</td> <td></td> <td></td> </tr> <tr> <td>Task7-NodeJS-Zaeem-service-4mwnl1tv</td> <td>arn:aws:ecs:us-west-2:5</td> <td>Active</td> <td>REPLICA</td> <td>Task7-NodeJS-Zaeem:10</td> <td>2/2 Tasks running</td> <td></td> <td></td> <td></td> </tr> </table>				Filter services by value	Filter launch type Any launch type	Filter scheduling strategy Any scheduling strategy	Filter resource management type Any resource management type	Last updated November 28, 2025, 01:46 (UTC+5:00)	Manage tags	Update	Delete service	Create	<input type="checkbox"/> Service name	ARN	Status	Scheduling strategy	Task definition	Deployments and tasks	Last			Task7-NodeJS-Zaeem-service-4mwnl1tv	arn:aws:ecs:us-west-2:5	Active	REPLICA	Task7-NodeJS-Zaeem:10	2/2 Tasks running			
Filter services by value	Filter launch type Any launch type	Filter scheduling strategy Any scheduling strategy	Filter resource management type Any resource management type	Last updated November 28, 2025, 01:46 (UTC+5:00)	Manage tags	Update	Delete service	Create																						
<input type="checkbox"/> Service name	ARN	Status	Scheduling strategy	Task definition	Deployments and tasks	Last																								
Task7-NodeJS-Zaeem-service-4mwnl1tv	arn:aws:ecs:us-west-2:5	Active	REPLICA	Task7-NodeJS-Zaeem:10	2/2 Tasks running																									

- Create a Task Definition for the ECS Cluster
 - Name: Task7-NodeJS-Zaeem
 - Infrastructure Requirements: Amazon EC2 Instances
 - OS&Arch: Linux/x64, Network Mode: bridge
 - vCPU: 1, Memory: 3GB
 - Select Task role and Task Execution Roles
 - Container 1 (essential): Name NodeJS-App, ECR Image URI, Port Mapping 3000 to 80 for accessing the nodejs application
 - Storage: Configure at task definition, Vol Type: EFS, Enter EFS ID, Enter AP ID

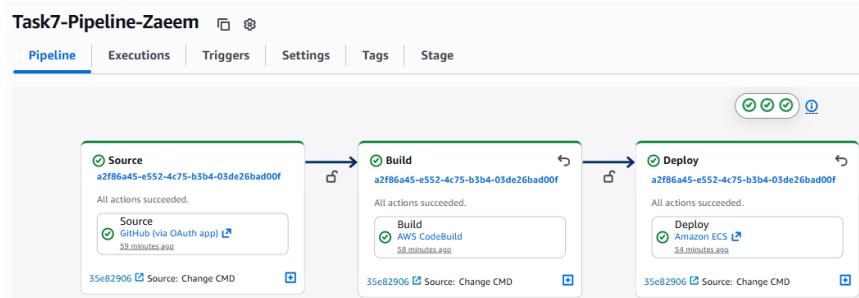


- Create ECS Service to run Task Definition:
 - Family: Task7-NodeJS-Zaeem
 - Svc Name: Task7-NodeJS-Zaeem-Service
 - Compute option: Capacity Provider Strategy, custom: base 2, weight 1
 - Scheduling Strategy: Replica
 - Desired Task: 2
 - Load Balancer: Task7-VPC-Zaeem, Type: ALB, Container: NodeJS-App, Load Balancer: Task7-ALB-Zaeem



Task7.5: Creating the CodePipeline

- Basic Pipeline Configuration:
 - Use the Build Pipeline button to create a new pipeline.
 - Category: Custom Pipeline
 - Pipeline Name: Task7-Pipeline-Zaeem
 - Execution mode: Queued
 - Service Role: Create new
- Source Stage:
 - Source Provider: GitHub (OAuth via app)
 - Connect to GitHub and allow the pipeline connection
- Build Stage:
 - Build Provider: Other (AWS CodeBuild)
 - Create a new project
 - Set Environment Variables:
 - REGION="us-west-2"
 - ACCOUNT_ID="504649076991"
 - REPO_NAME="zaeem/task7"
 - IMAGE_TAG="latest"
 - Build Type: Single Build
 - Region: United States Oregon
 - Input Artifacts: SourceArtifact
 - Place the buildspec.yml file in the root of repo
- Deploy Stage (skipping the test stage):
 - Deploy Provider: Amazon ECS
 - Region: United States (Ohio)
 - Input Artifacts: BuildArtifact
 - Place the buildspec.yml file in the root of repo
 - Cluster Name: Task7-ECS-Cluster-Zaeem
 - Service Name: Task7-NodeJS-Zaeem-Service
 - Deployment Time Out: 15 min
 - Create Pipeline



Task7.6: Verification and Testing

- Any commits to the GitHub code repository will trigger the pipeline



- The tasks deployed can be seen under the ECS Service

A screenshot of the AWS ECS Service console for 'Task7-ECS-Cluster-Zaeem'. It shows a 'Cluster overview' section with ARN 'arn:aws:ecs:us-west-2:504649076991:cluster/Task7-EC-S-Cluster-Zaeem', Status 'Active', and CloudWatch monitoring enabled. It also shows 'Registered container instances' (2) and task counts (Pending: 0, Running: 2). Below this, a 'Services' tab is selected, showing a table for 'Services (1)'. The service 'Task7-NodeJS-Zaeem-Service' has ARN 'arn:aws:ecs:us-west-2:51', Status 'Active', Scheduling strategy 'REPLICA', and Task definition 'Task7-NodeJS-Zaeem:13'. It shows 2/2 Tasks running.

- The webpage of the NodeJS application can be accessed at the DNS of the ALB

A screenshot of a web browser displaying the 'Hello World!' application. The URL is 'task7-alb-zaeem-856788729.us-west-2.elb.amazonaws.com:5000'. The page content is 'Hello World!'. The browser's address bar shows the URL, and the top navigation bar includes links like Gmail, YouTube, Maps, News, Translate, and Calculus 1 Lecture 0...'. A warning icon in the address bar indicates that the connection is not secure.

Task7.7: Problems Faced

- The resources of the containers in the task definition should be less than that of the resources set in the Launch Template for the instances otherwise the containers will not be placed and will be stuck in the pending state.
- We must specify artifacts output in the buildspec.yml file to make sure that they are saved in the S3 bucket and passed onto the Deploy Stage otherwise we get an S3 permission error which is not related to permissions at all.
- The pipeline role must have the correct policies attached to carry out all the stages.