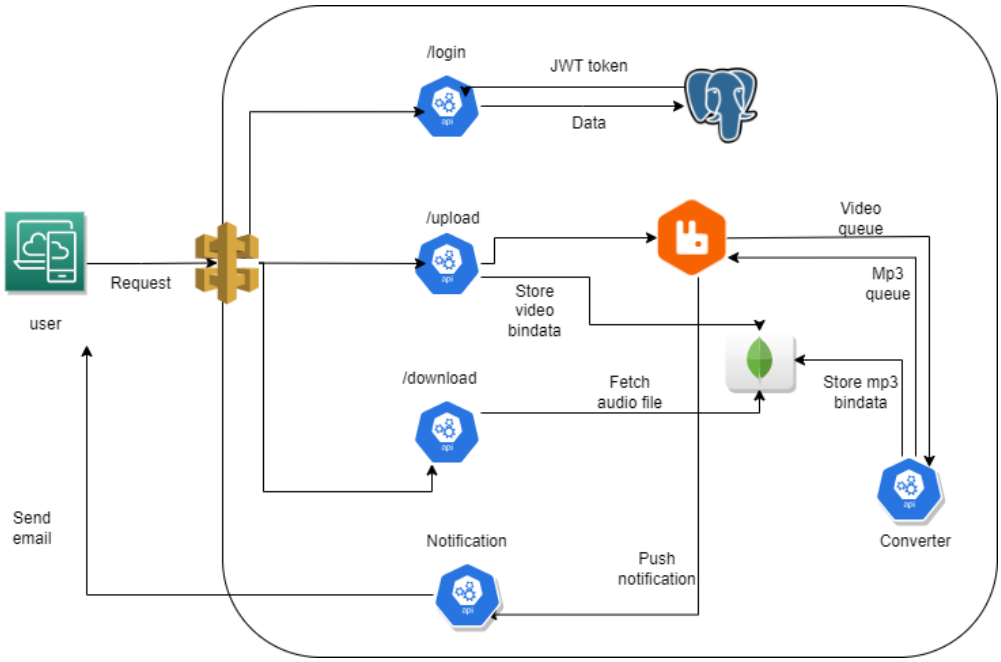
Microservices Project

Devops Project: Python Microservices video-converter Application on EKS

Converting mp4 videos to mp3 in a microservices architecture.

Architecture



Deploying a Python-based Microservice Application on AWS EKS

Introduction

This document provides a step-by-step guide for deploying a Python-based microservice application on AWS Elastic Kubernetes Service (EKS). The application comprises four major microservices: `auth-server`, `converter-module`, `database-server` (PostgreSQL and MongoDB), and `notification-server`.

Prerequisites

Before you begin, ensure that the following prerequisites are met:

1. **Create an AWS Account:** If you do not have an AWS account, create one by following the steps here.
2. **Install Helm:** Helm is a Kubernetes package manager. Install Helm by following the instructions provided here.

3. **Python:** Ensure that Python is installed on your system. You can download it from the official Python website.
4. **AWS CLI:** Install the AWS Command Line Interface (CLI) following the official installation guide.
5. **Install kubectl:** Install the latest stable version of `kubectl` on your system. You can find installation instructions here.
6. **Databases:** Set up PostgreSQL and MongoDB for your application.

High Level Flow of Application Deployment

Follow these steps to deploy your microservice application:

1. **MongoDB and PostgreSQL Setup:** Create databases and enable automatic connections to them.
2. **RabbitMQ Deployment:** Deploy RabbitMQ for message queuing, which is required for the `converter-module`.
3. **Create Queues in RabbitMQ:** Before deploying the `converter-module`, create two queues in RabbitMQ: `mp3` and `video`.
4. **Deploy Microservices:**
   - **auth-server:** Navigate to the `auth-server` manifest folder and apply the configuration.
   - **gateway-server:** Deploy the `gateway-server`.
   - **converter-module:** Deploy the `converter-module`. Make sure to provide your email and password in `converter/manifest/secret.yaml`.
   - **notification-server:** Configure email for notifications and two-factor authentication (2FA).
5. **Application Validation:** Verify the status of all components by running:

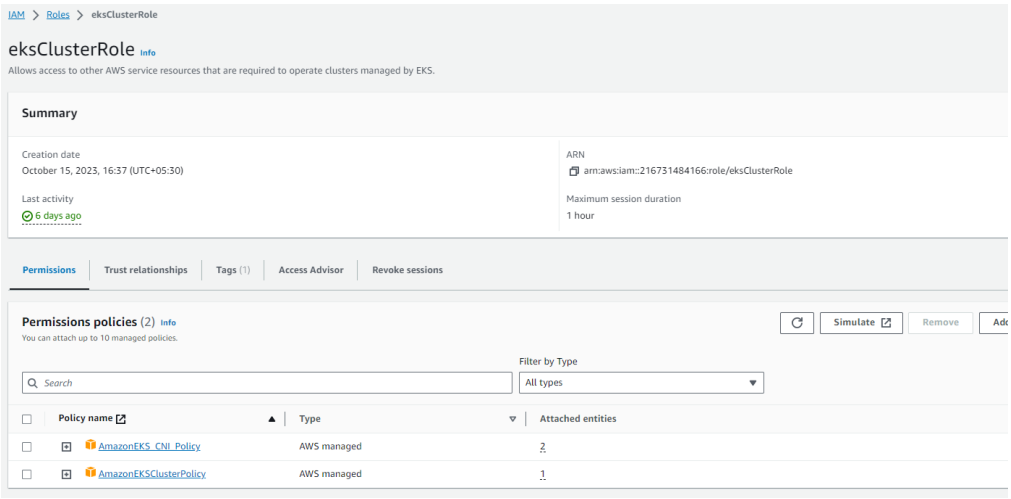
   ```
   kubectl get all
   ```

6. **Destroying the Infrastructure**

Low Level Steps

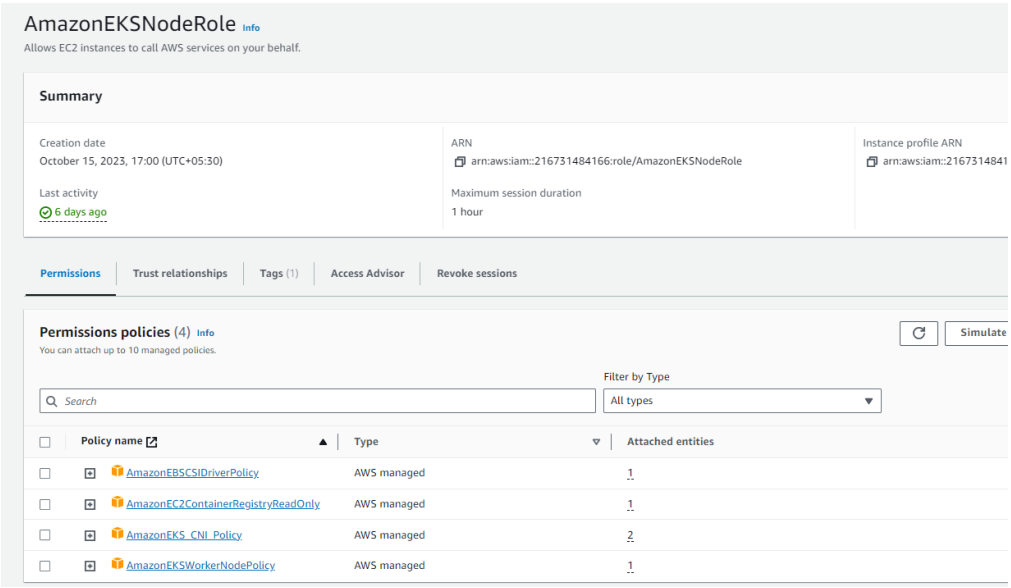
Cluster Creation

1. **Log in to AWS Console:**
   - Access the AWS Management Console with your AWS account credentials.
2. **Create eksCluster IAM Role**
   - Follow the steps mentioned in this documentation using root user
   - After creating it will look like this:



- Please attach `AmazonEKS_CNI_Policy` explicitly if it is not attached by default

1. **Create Node Role - AmazonEKSNodeRole**
    - Follow the steps mentioned in this documentation using root user
    - Please note that you do NOT need to configure any VPC CNI policy mentioned after step 5.e under Creating the Amazon EKS node IAM role
    - Simply attach the following policies to your role once you have created `AmazonEKS_CNI_Policy` , `AmazonEBSCSIDriverPolicy` , `AmazonEC2ContainerRegistryReadOnly` incase it is not attached by default
    - Your AmazonEKSNodeRole will look like this:



1. **Open EKS Dashboard:**

- Navigate to the Amazon EKS service from the AWS Console dashboard.

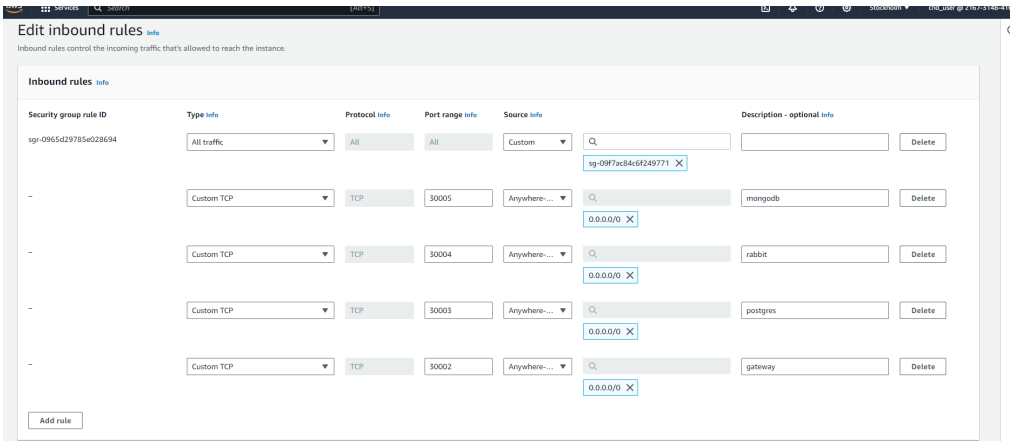
2. **Create EKS Cluster:**
   - Click "Create cluster."
   - Choose a name for your cluster.
   - Configure networking settings (VPC, subnets).
   - Choose the `eksCluster` IAM role that was created above
   - Review and create the cluster.
3. **Cluster Creation:**
   - Wait for the cluster to provision, which may take several minutes.
4. **Cluster Ready:**
   - Once the cluster status shows as "Active," you can now create node groups.

Node Group Creation

1. In the "Compute" section, click on "Add node group."
2. Choose the AMI (default), instance type (e.g., t3.medium), and the number of nodes (attach a screenshot here).
3. Click "Create node group."

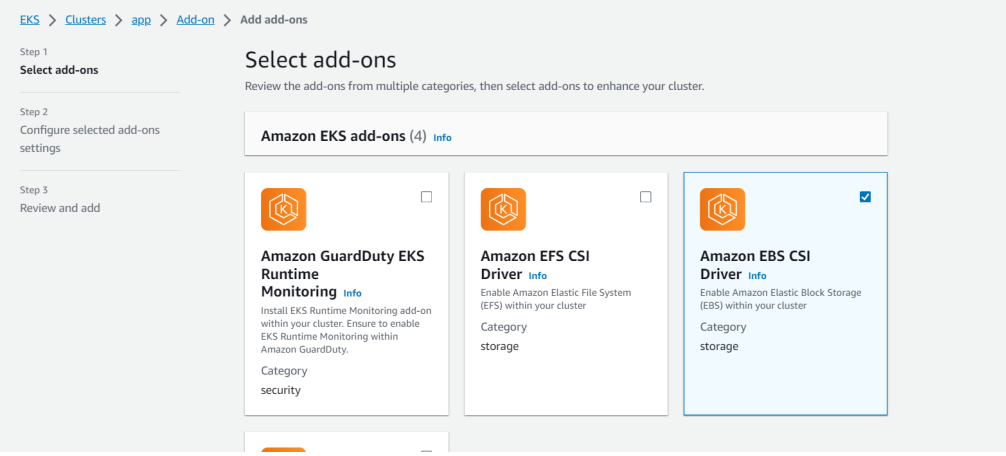
Adding inbound rules in Security Group of Nodes

NOTE: Ensure that all the necessary ports are open in the node security group.



Enable EBS CSI Addon

1. enable addon `ebs csi` this is for enabling pvcs once cluster is created



Deploying your application on EKS Cluster

1. Clone the code from this repository.
2. Set the cluster context:

```
aws eks update-kubeconfig --name <cluster_name> --region <aws_region>
```

Commands

Here are some essential Kubernetes commands for managing your deployment:

MongoDB

To install MongoDB, set the database username and password in `values.yaml`, then navigate to the MongoDB Helm chart folder and run:

```
cd Helm_charts/MongoDB
helm install mongo .
```

Connect to the MongoDB instance using:

```
mongosh mongodb://<username>:<pwd>@<nodeip>:30005/mp3s?authSource=admin
```

PostgreSQL

Set the database username and password in `values.yaml`. Install PostgreSQL from the PostgreSQL Helm chart folder and initialize it with the queries in `init.sql`. For PowerShell users:

```
cd ..
cd Postgres
helm install postgres .
```

Connect to the Postgres database and copy all the queries from the "init.sql" file.

```
psql 'postgres://<username>:<pwd>@<nodeip>:30003/authdb'
```

RabbitMQ

Deploy RabbitMQ by running:

```
helm install rabbitmq .
```

Ensure you have created two queues in RabbitMQ named `mp3` and `video`. To create queues, visit `<nodeIp>:30004` and use default username `guest` and password `guest`

NOTE: Ensure that all the necessary ports are open in the node security group.

Apply the manifest file for each microservice:

- **Auth Service:**

  ```
  cd auth-service/manifest
  kubectl apply -f .
  ```

- **Gateway Service:**

  ```
  cd gateway-service/manifest
  kubectl apply -f .
  ```

- **Converter Service:**

  ```
  cd converter-service/manifest
  kubectl apply -f .
  ```

- **Notification Service:**

  ```
  cd notification-service/manifest
  kubectl apply -f .
  ```

Application Validation

After deploying the microservices, verify the status of all components by running:

```
kubectl get all
```

Notification Configuration

For configuring email notifications and two-factor authentication (2FA), follow these steps:

1. Go to your Gmail account and click on your profile.

2. Click on "Manage Your Google Account."
3. Navigate to the "Security" tab on the left side panel.
4. Enable "2-Step Verification."
5. Search for the application-specific passwords. You will find it in the settings.
6. Click on "Other" and provide your name.
7. Click on "Generate" and copy the generated password.
8. Paste this generated password in `converter/manifest/secret.yaml` along with your email.

Run the application through the following API calls:

API Definition

- **Login Endpoint**

```
POST http://nodeIP:30002/login
```

```
curl -X POST http://nodeIP:30002/login -u <email>:<password>
```

Expected output: success!

- **Upload Endpoint**

```
POST http://nodeIP:30002/upload
```

```
 curl -X POST -F 'file=@./video.mp4' -H 'Authorization: Bearer <JWT Tok
en>' http://nodeIP:30002/upload
```

Check if you received the ID on your email.

- **Download Endpoint**

```
GET http://nodeIP:30002/download?fid=<Generated file identifier>
```

```
 curl --output video.mp3 -X GET -H 'Authorization: Bearer <JWT Token>'
"http://nodeIP:30002/download?fid=<Generated fid>"
```

Destroying the Infrastructure

To clean up the infrastructure, follow these steps:

1. **Delete the Node Group:** Delete the node group associated with your EKS cluster.

2. **Delete the EKS Cluster:** Once the nodes are deleted, you can proceed to delete the EKS cluster itself.