LOMBA KOMPETENSI SISWA (LKS)
SEKOLAH MENENGAH KEJURUAN
TINGKAT PROVINSI JAWA BARAT
TAHUN 2024

INFORMASI DAN KISI-KISI

Bidang Lomba

CLOUD COMPUTING

PEMERINTAH DAERAH PROVINSI JAWA BARAT

DINAS PENDIDIKAN

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LOMBA KOMPETENSI SISWA (LKS)
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NASKAH SOAL
***(Terbuka / Tertutup)**

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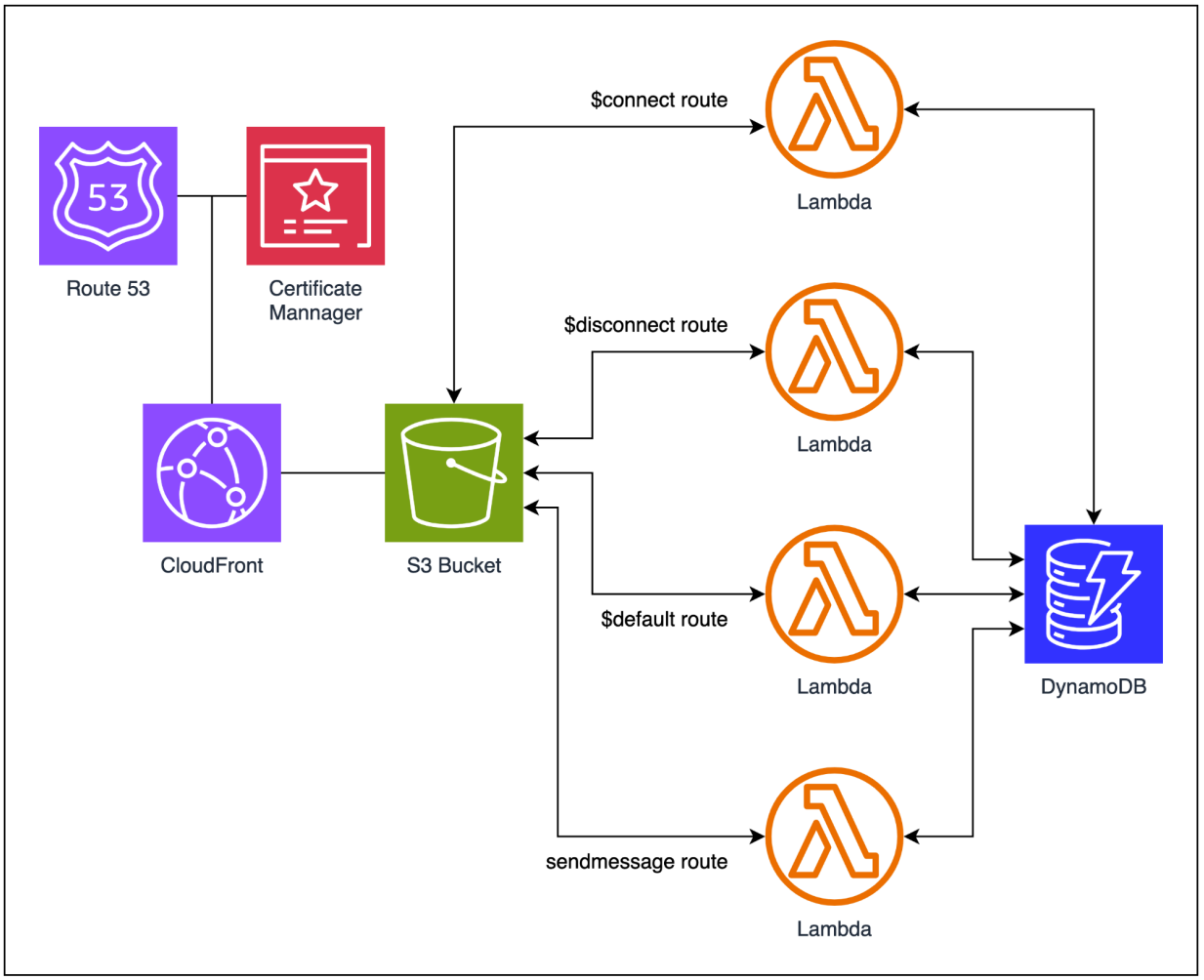
1. Overview

Amazon API Gateway WebSocket is a fully managed service that enables real-time two-way communication between clients and servers over the WebSocket protocol. It allows developers to build interactive, event-driven applications, such as chat applications, gaming platforms, and IoT solutions, without managing the underlying infrastructure. With features like built-in authorization, message routing, and scaling capabilities, AWS API Gateway WebSocket simplifies the development process, offering low-latency, bi-directional communication at any scale. By integrating with other AWS services like AWS Lambda or Amazon DynamoDB, developers can create powerful serverless architectures to handle various use cases efficiently. Additionally, API Gateway WebSocket provides detailed monitoring and logging capabilities, enabling developers to gain insights into their WebSocket APIs' performance and troubleshoot any issues effectively.

2. General Rules

1. Failure to comply with the rules will result in immediate disquali□cation.
2. You have 4 hours to finish the tasks.
3. You may use AWS Console and AWS CLI to deploy the solutions. You may not use SAM, CloudFormation or CDK.
4. Between and after the event, you may not access your account. Any activity on AWS during this period is not allowed.
5. During the event, multiple login is not permitted.
6. If you have any questions, do not hesitate to ask.

3. Architecture



1. A website should be hosted on S3 Website Hosting
2. Through provided website user can connect to chat server and chat with other users
3. When connecting, the server will store the connection id in DynamoDB table
4. When disconnecting, the server will remove the connection id from table
5. When user send messages the server will send the messages to other users based on their respective connection id

4. Information

1. This solution must be deployed in ap-southeast-1 region

2. Any deployment outside the designated region will result in major point reduction.
3. Make sure you register your Certificate in the us-east-1 region.

5. Task

5.1 Create DynamoDB Table

Create DynamoDB Table with following configuration

- Name : `lks-jabar-2024-connection`
- Partition key :
    - Name : `connectionId`
    - Type : `String`
- Sort Key : leave empty
- Table settings : choose `Customize Settings`
- Table class : `DynamoDB Standard`
- Read/write capacity settings : `On-demand`
- Tags :
    - Key : LKS-CC-2024
    - Value : lks-chat-table

5.2 Create Lambda Functions

5.2.1 Connect Handler

This lambda will be used to connect to chat server

1. Create Lambda Function with following configuration
    - Option : `Author from scratch`
    - Function name : `api-ws-connect-handler`
    - Runtime : `Node.js 16.x`
    - Architecture : `x86_64`
2. Open created Lambda Function
3. Upload `connect-handler.zip` as code for created Lambda Function
4. Go to **Configuration** tab and open **Tags** panel, add tag :
    - Key : LKS-CC-2024
    - Value : lks-chat-connect-handler

5. Go to **Configuration** tab and open **Environment variables** panel, add environment variable :
    - Key : `table`
    - Value : `lks-jabar-2024-connection`
6. Go to **Configuration** tab and open **Permission** panel
7. Open execution role and do the following :
    - Add new policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "Statement1",
      "Effect": "Allow",
      "Action": [
        "dynamodb:BatchWriteItem",
        "dynamodb:PutItem",
        "dynamodb:DescribeTable",
        "dynamodb:DeleteItem",
        "dynamodb:UpdateItem"
      ],
      "Resource": "[arn_of_lks-jabar-2024-connection_table]"
    }
  ]
}
```

    - Save policy with name `api-ws-connect-handler-db-policy`

5.2.2 Disconnect Handler

This lambda will be used to disconnect from chat server

1. Create Lambda Function with following configuration
    - Option : `Author from scratch`
    - Function name : `api-ws-disconnect-handler`
    - Runtime : `Node.js 16.x`
    - Architecture : `x86_64`
2. Open created Lambda Function
3. Upload `disconnect-handler.zip` as code for created Lambda Function
4. Go to **Configuration** tab and open **Tags** panel, add tag :
    - Key : LKS-CC-2024
    - Value : lks-chat-disconnect-handler
5. Go to **Configuration** tab and open **Environment variables** panel, add environment variable :

- Key : `table`
- Value : `lks-jabar-2024-connection`

6. Go to **Configuration** tab and open **Permission** panel
7. Open execution role and do the following :
   - Add new policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "Statement1",
      "Effect": "Allow",
      "Action": [
        "dynamodb:BatchWriteItem",
        "dynamodb:PutItem",
        "dynamodb:DescribeTable",
        "dynamodb:DeleteItem",
        "dynamodb:UpdateItem"
      ],
      "Resource": "[arn_of_lks-jabar-2024-connection_table]"
    }
  ]
}
```

   - Save policy with name `api-ws-disconnect-handler-db-policy`

5.2.3 Sendmessage Handler

This lambda will be used to send message to chat server

1. Create Lambda Function with following configuration
   - Option : `Author from scratch`
   - Function name : `api-ws-sendmessage-handler`
   - Runtime : `Node.js 16.x`
   - Architecture : `x86_64`
2. Open created Lambda Function
3. Upload `sendmessage-handler.zip` as code for created Lambda Function
4. Go to **Configuration** tab and open **Tags** panel, add tag :
   - Key : LKS-CC-2024
   - Value : lks-chat-sendmessage-handler
5. Go to **Configuration** tab and open **Environment variables** panel, add environment variable :
   - Key : `table`
   - Value : `lks-jabar-2024-connection`
6. Go to **Configuration** tab and open **Permission** panel

7. Open execution role and do the following
    - Add new policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "Statement1",
      "Effect": "Allow",
      "Action": [
        "dynamodb:BatchGetItem",
        "dynamodb:GetRecords",
        "dynamodb:GetShardIterator",
        "dynamodb:Query",
        "dynamodb:GetItem",
        "dynamodb:Scan",
        "dynamodb:ConditionCheckItem",
        "dynamodb:DescribeTable"
      ],
      "Resource": "[arn_of_lks-jabar-2024-connection_table]"
    },
    {
      "Sid": "Statement2",
      "Effect": "Allow",
      "Action": "execute-api:ManageConnections",
      "Resource":
"arn:aws:execute-api:[region]:[account-id]:*/*/POST/@connections/*"
    }
  ]
}
```

    - Save policy with name `api-ws-sendmessage-handler-db-policy`

5.2.4 Default Handler

1. Create Lambda Function with following configuration
    - Option : `Author from scratch`
    - Function name : `api-ws-default-handler`
    - Runtime : `Node.js 16.x`
    - Architecture : `x86_64`
2. Open created Lambda Function
3. Upload `default-handler.zip` as code for created Lambda Function.
4. Go to **Configuration** tab and open **Tags** panel, add tag :
    - Key : LKS-CC-2024
    - Value : lks-chat-default-handler
5. Go to **Configuration** tab and open **Permission** panel
6. Open execution role and do the following :

- Add new policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "Statement1",
      "Effect": "Allow",
      "Action": "execute-api:ManageConnections",
      "Resource":
"arn:aws:execute-api:[region]:[account-id]:*/*/POST/@connections/*"
    },
    {
      "Sid": "Statement2",
      "Effect": "Allow",
      "Action": "execute-api:ManageConnections",
      "Resource":
"arn:aws:execute-api:[region]:[account-id]:*/*/GET/@connections/*"
    }
  ]
}
```

- Save policy with name `api-ws-default-handler-db-policy`

5.3 Create WebSocket API

1. Open API Gateway Console.
2. Choose **Create API**. Then for **WebSocket API**, choose **Build**.
3. For **API name**, enter `ws-chat-app`.
4. For **Route selection expression**, enter `request.body.action`.
5. Choose Next.
6. For **Predefined routes**, choose **Add $connect**, **Add $disconnect**, and **Add $default**.
7. For **Custom routes**, choose **Add custom route**. For **Route key**, enter `sendmessage`
8. Choose **Next**.
9. Under **Attach integrations**
    - Integration for **$connect**
        - Integration type : `Lambda`
        - AWS Region : your region
        - Lambda function : **Connect Handler** lambda you created previously
    - Integration for **$disconnect**
        - Integration type : `Lambda`
        - AWS Region : your region
        - Lambda function : **Disconnect Handler** lambda you created previously
    - Integration for **$default**

        - Integration type : `Lambda`
        - AWS Region : your region
        - Lambda function : **Default Handler** lambda you created previously
    - Integration for **sendmessage**
        - Integration type : `Lambda`
        - AWS Region : your region
        - Lambda function : **Sendmessage Handler** lambda you created previously
10. Choose **Next**.
11. Under **Stages**
    - Stage name : `production`
12. Choose **Next**.
13. Review your new WebSocket API.
14. Choose **Create and deploy**.
15. Open WebSocket API you have created on previous steps.
16. Select **API Settings** menu on left menu
17. Under **Tags**, add tag :
    - Key : LKS-CC-2024
    - Value : lks-chat-websocket-api
18. Select **Stages** menu on left menu.
19. On **Stages** select **production**.
20. Note down **WebSocket URL** value.

5.4 Create S3 Website Hosting

5.4.1 Create S3 Bucket

1. Open S3 Console
2. Choose **Create Bucket**.
3. For **Bucket name**, enter `ws-chat-web-[account_id]`
4. Under **Object Ownership** :
    - Choose ACLs enabled.
    - Under **Object ownership**, choose **Bucket owner preferred**.
5. Under **Block Public Access settings for this bucket** :
    - Uncheck **Block *all* public access**.
    - Check ***I acknowledge that the current settings might result in this bucket and the objects within becoming public.***
6. Under **Tags**, add tag :
    - Key : LKS-CC-2024

    - Value : lks-chat-ws-chat-bucket
7. Choose **Create Bucket**.

5.4.2 Enabling website hosting

1. Open S3 bucket you have created previously.
2. Choose **Properties** tab.
3. Under **Static website hosting**, choose **Edit**.
4. Under **Static website hosting**, choose **Enable**.
5. Under **Hosting type**, choose **Host a static website**.
6. In **Index document**, enter `index.html`.
7. Choose **Save changes**.

5.4.3 Uploading website to S3 bucket

1. Download `web.zip` and extract it on your computer.
2. Open S3 bucket you have created previously.
3. Choose **Upload**.
4. Under **Upload** :
    - Add extracted files into files list
    - Under **Permission** / **Access control list (ACL)**, choose **Grant public-read access**
    - Check ***I understand the risk of granting public-read access to the specified objects***.
5. Choose **Upload**.

5.4.4 Testing your website

1. Open S3 bucket you have created previously.
2. Choose **Properties** tab.
3. Under **Static website hosting** copy your website URL.
4. Open URL in browser.
5. You should see something like th

5.5 Create distribution

5.5.1 Create Cloudfront distribution

1. Open Cloudfront Console.
2. Choose **Create Distribution**.
3. Under **Origin**
    - For **Origin domain**, enter domain part of your S3 Website URL.
    - For **HTTP Port**, enter `80`
    - For **Name**, enter `ws-chat-distribution`
4. Under **Default cache behavior**
    - For Viewer protocol policy, choose **Redirect HTTP to HTTPS**
5. For **Web Application Firewall**, choose **Do not enable protections**.
6. Under **Settings**
    - For **Alternate domain name**, choose **Add item** and enter a custom domain name that matches with your registered domain name. If you registered the domain name `example.com`, enter `chat.example.com` as a custom domain name.
    - For **Custom SSL Certificate**, choose a certificate from AWS Certificate Manager created for your registered domain.
7. Choose **Create distribution**
8. Open you created distribution and go to **Tags** tab
9. Add tag :
    - Key : LKS-CC-2024
    - Value : lks-chat-ws-chat-distribution

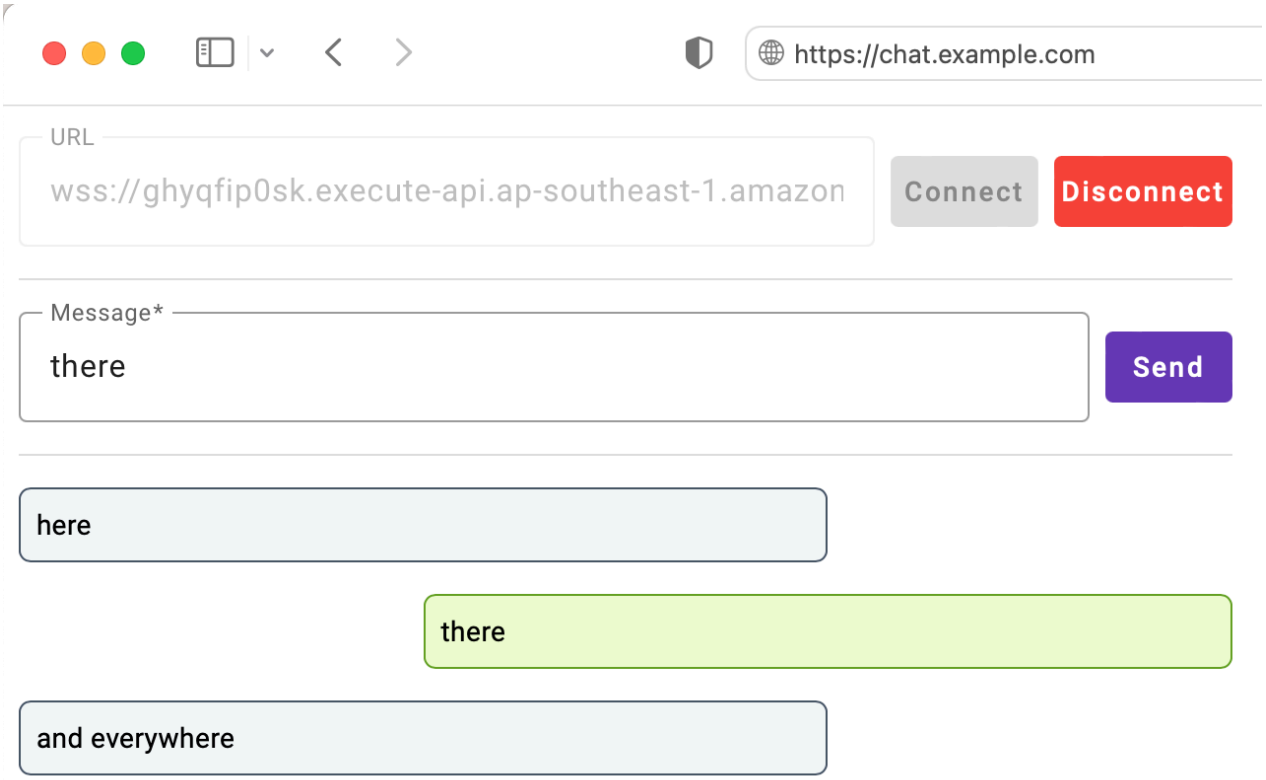
5.5.2 Create DNS Record

1. Open Route 53 Console.
2. Open hosted zone for your registered domain.
3. Choose **Create record**, add new record with following configuration :
    - Record name : `chat`.
    - Record type : `CNAME`.
    - Value : domain name of your **Cloudfront distribution**
    - TTL : 300

5.6 Chat using your hosted website

1. Copy the alternate domain of your Cloudfront distribution and use it as your website URL.
2. Open your website URL in two or more browser tabs/windows.

3. Try to communicate between those tabs/windows :
    - For **URL**, enter your **WebSocket URL**.
    - Click **Connect**.
    - Enter your message and click Send



6. Reference

- DynamoDB
- Lambda
- API Gateway
- Simple Storage Service (S3)
- CloudFront
- Route 53