

# Build and Deploy Chatbots using Amazon Lex

Creating a dental chatbot with **Amazon Lex, AWS Lambda, Cognito, IAM, and S3** involves multiple AWS services that work together to manage chatbot interactions, secure authentication, storage, and permissions.

Here's a step-by-step guide to get you started.

## Step 1 : Set Up Amazon Lex for the Chatbot

### 1. **Create the Bot**:

- In the AWS Lex Console, create a new bot and give it a descriptive name (e.g., "DentalChatBot").
- Choose the preferred language and set up any additional options like voice if you need text-to-speech.

### 2. **Define Intents**:

- Intents are actions the chatbot can perform, like "ScheduleAppointment" or "GetDentalAdvice."
- For each intent, add sample **utterances** (phrases users may say) such as:
  - "I want to schedule a dental appointment"
  - "Tell me about dental hygiene"

### 3. **Set Up Slots**:

- Slots are variables or pieces of information required to fulfill the intent. For example, for scheduling an appointment, you might add slots for:
  - **Appointment Type** (root canal)
  - **Date** (`AMAZON.DATE` slot type)
  - **Time** (`AMAZON.TIME`)

### 4. **Fulfillment**:

- Set up a Lambda function (explained in Step 2) to handle backend processing and scheduling logic for the chatbot.

### 5. **Test the Bot**:

- In the Lex console, test the bot to make sure it captures intents and slots correctly.

Lex Console

us-east-1.console.aws.amazon.com/lexv2/home?region=us-east-1#bots

Services

Search

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EC2

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N. Virginia

aaraf ali

Amazon Lex

Bots

Bot templates

Networks of bots

Test workbench

Test sets

Test results

Related resources

Return to the V1 console

Descriptive Bot Builder - Provide a description in natural language to have Lex generate a bot for you using large language models.

Assisted Slot Resolution - Leverage the intelligence of large language models to resolve slot values in a user utterance when natural language understanding fails.

Sample Utterance Generation - Have Lex generate training utterances for your bot using generative AI.

AMAZON.QnAIntent: A Bedrock-powered built-in intent that uses Generative AI to fulfill FAQ requests by querying authorized knowledge content.

Generative AI Bots - Leverage large language models and your existing Bedrock knowledge bases to fulfill user requests without the need to build bots.

Bots (0) Info

Action

Create bot

Search bots

< 1 >

🔍

Name	Description	Status	Latest Version	Last updated
No bots found				

Create bot

CloudShell

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Amazon Lex

Bots

Intents

Slot types

Migration tool

Switch to the new Lex V2 console

Try the new Lex V2 Console

Build, deploy and manage your bots faster. The new console provides support for multiple languages in a bot, simplified versioning, interactive conversation flow, and other productivity tools. [Start building!](#)

Learn more.

Bots

Create

Actions

🔄 ⚙️ ?

Filter: Filter by Bot name

Name	Status	Locale	Last updated	Date
No records found.				

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Amazon Lex

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-create:

Services Search [Alt+S]

EC2 VPC S3

Amazon Lex enables any developer to build conversational chatbots quickly and easily. With Amazon Lex, no deep learning expertise is necessary—you just specify the basic conversational flow directly from the console, and then Amazon Lex manages the dialogue and dynamically adjusts the response. To get started, you can choose one of the sample bots provided below or build a new custom bot from scratch.

CREATE YOUR OWN

TRY A SAMPLE

Custom bot

BookTrip

OrderFlowers

ScheduleAppointment

Bot name

ScheduleAppointment

MakeAppointment

Intents

A particular goal that the user wants to achieve

Utterances

Spoken or typed phrases that invoke your intent

I'd like to see the dentist.

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26°C Haze 01:36 27-10-2024

Amazon Lex

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-create:

Services Search [Alt+S]

EC2 VPC S3

Language

English (US)

Sentiment analysis

☐ Yes ☒ No

IAM role

AWSServiceRoleForLexBots

Automatically created on your behalf

COPPA

Please indicate if your use of this bot is subject to the [Children's Online Privacy Protection Act \(COPPA\)](#). [Learn more](#)

☐ Yes ☒ No

Confidence score threshold

0.4 (default)

Tags

Cancel Create

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Amazon Lex console showing the configuration for the **ScheduleAppointment** bot. The bot is in the **Editor** tab, and the **MakeAppointment** intent is selected. A green notification states: "ScheduleAppointment build was successful. The build is now complete. You can now test the bot in the test window."

**Slots:**

Priority	RequiredName	Slot type	Version	Prompt	Settings
1.	Appointment	Appoin...	1	What type of appoi	⚙️ ✖️
2.	Date	AMAZ...	Built-in	When should I sch	⚙️ ✖️
3.	Time	AMAZ...	Built-in	At what time shoul	⚙️ ✖️

**Confirmation prompt:**

**Fulfillment:**

☐ AWS Lambda function ☒ Return parameters to client

**Response:**

Amazon Lex console showing the **Test bot (Latest)** window. The bot is ready for testing. The chat history shows a conversation where the user asks for an appointment, and the bot responds with a confirmation.

**Chat history:**

10 pm

22:00 is available, should I go ahead and book your appointment?

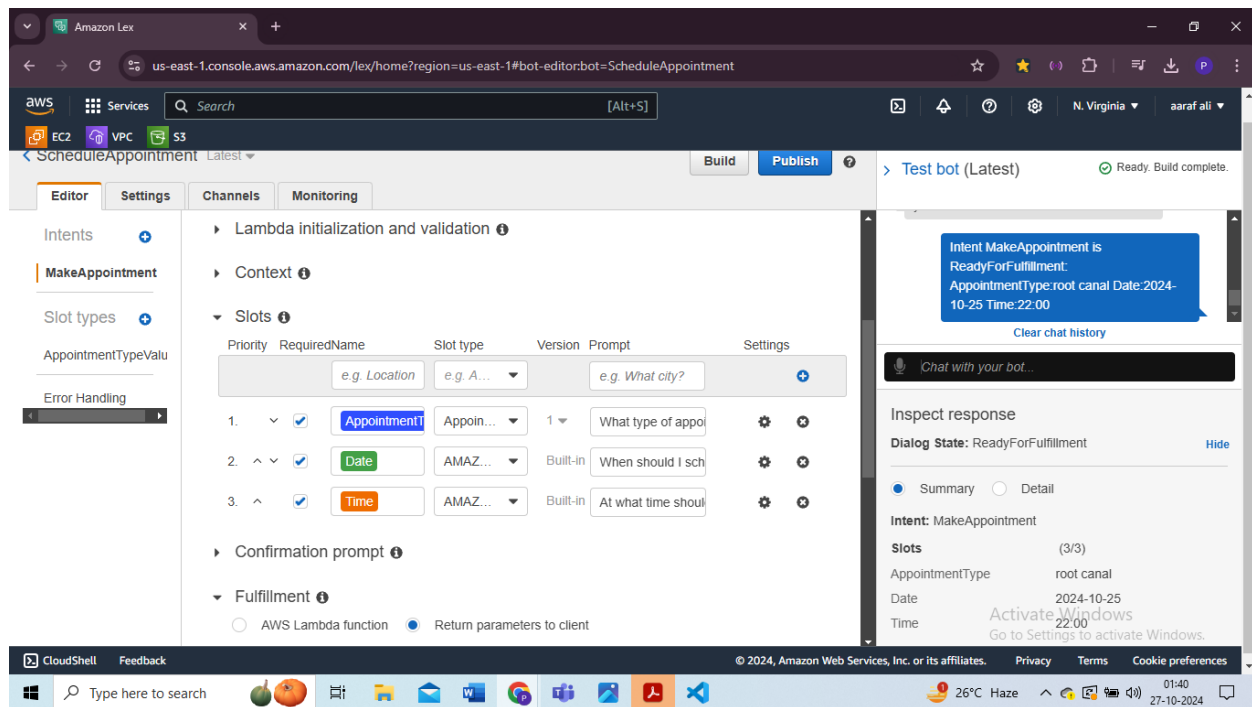
**Inspect response:**

Dialog State: ConfirmIntent

Intent: MakeAppointment

Slots (3/3):

- AppointmentType: root canal
- Date: 2024-10-25
- Time: 22:00



## Step 2 : Create the Lambda Function for Intent Fulfillment

### 1. \*\*Create a Lambda Function\*\*:

- In the AWS Lambda console, create a new function using Python as the runtime.
- Name it something like `MyChatBot`.

### 2. \*\*Assign IAM Permissions\*\*:

- Attach an IAM role to this function that allows it to interact with Lex, S3, and other AWS resources as needed.

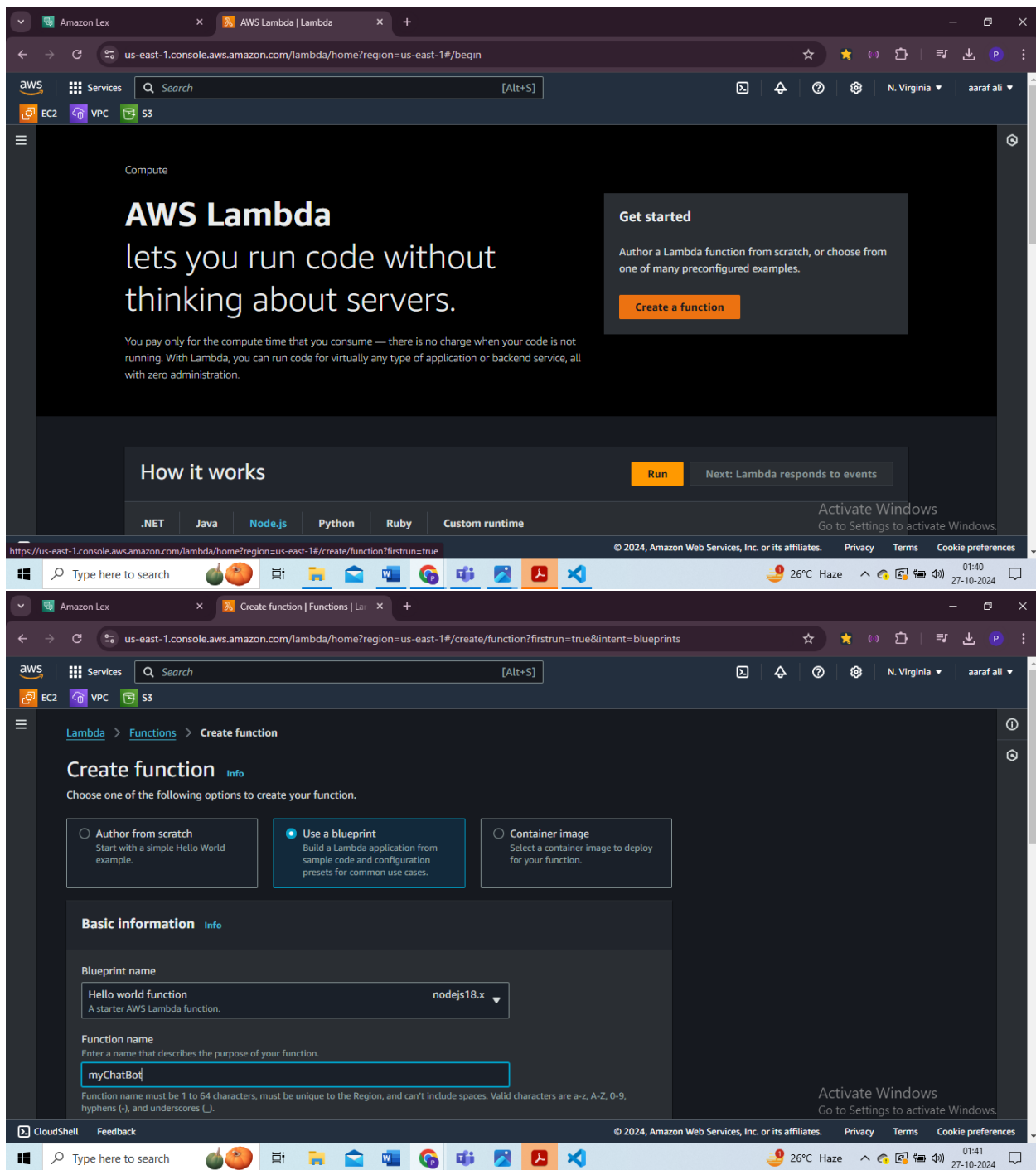
### 3. \*\*Write the Lambda Function Code\*\*:

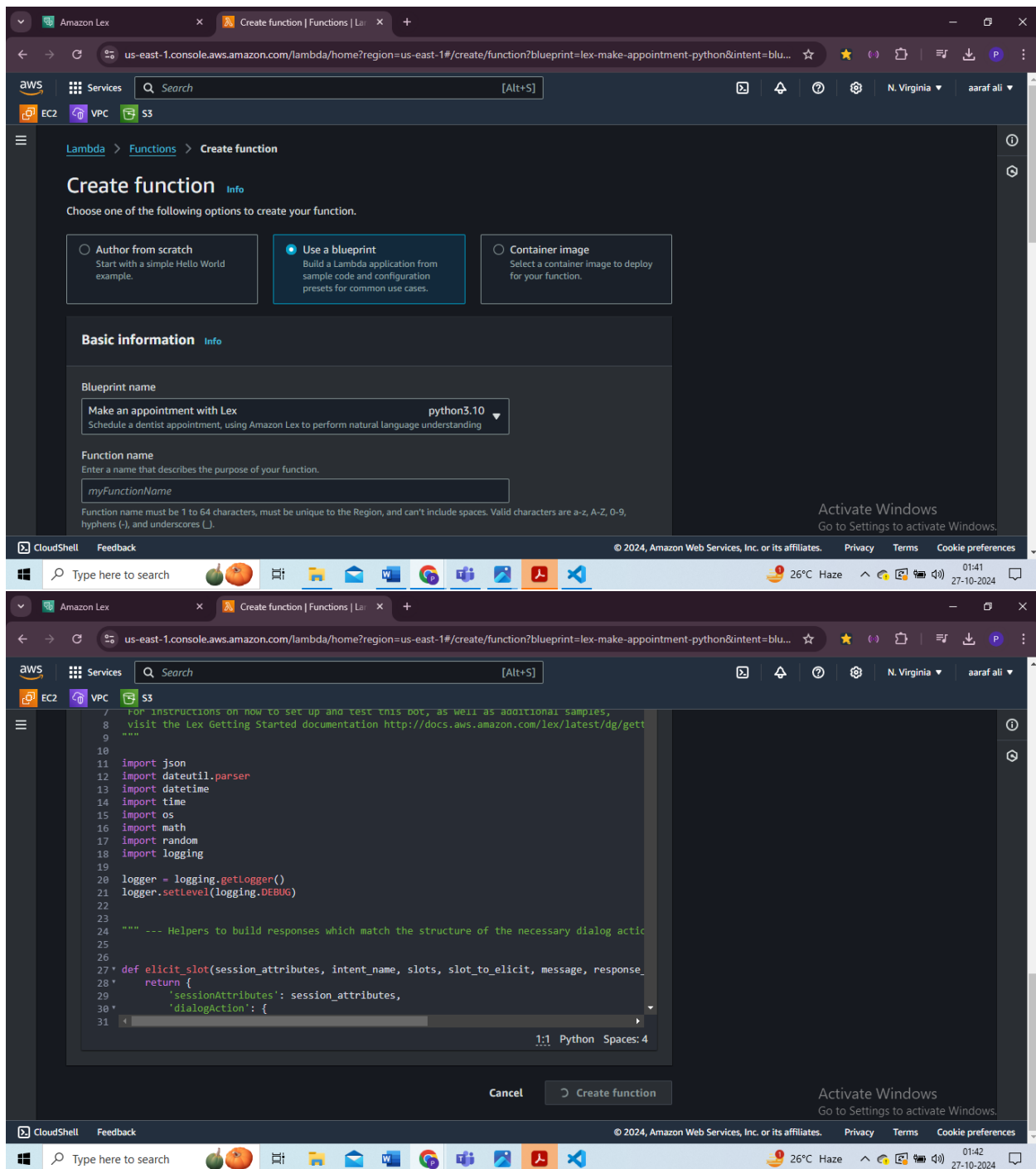
### 4. \*\*Connect Lambda to Lex\*\*:

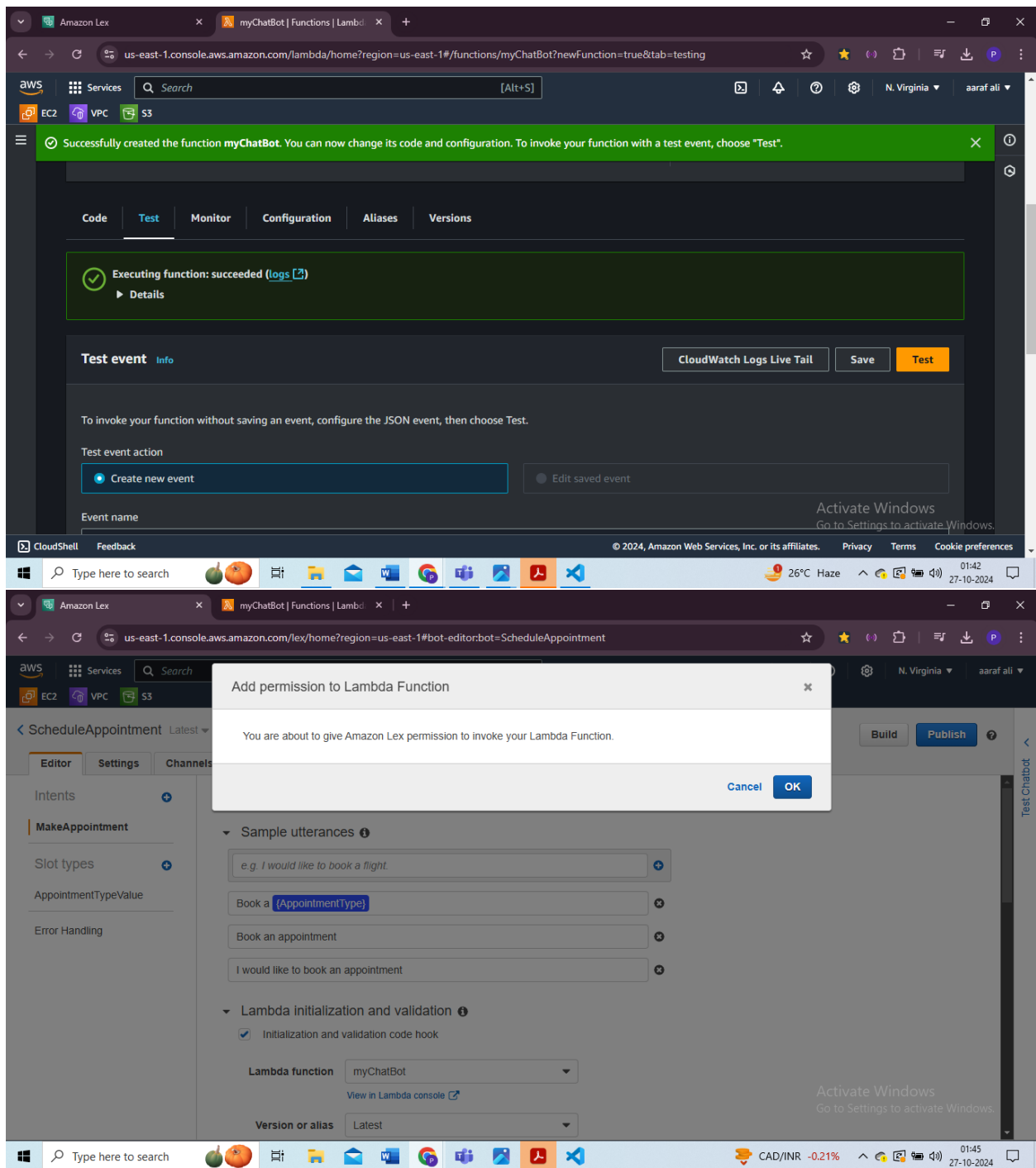
- In the Lex console, for each intent, choose the Lambda function `MyChatBot` in the fulfillment section.

### 5. \*\*Test the Lambda Integration\*\*:

- Verify that Lex sends inputs to the Lambda function and receives appropriate responses.









Amazon Lex | myChatBot | Functions | Lambda

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-editor:bot=ScheduleAppointment

ScheduleAppointment Latest

Build Publish

Editor Settings Channels Monitoring

Intents

MakeAppointment

Slot types

AppointmentTypeValue

Error Handling

MakeAppointment Latest

Sample utterances

e.g. I would like to book a flight.

Book a {AppointmentType}

Book an appointment

I would like to book an appointment

Lambda initialization and validation

Initialization and validation code hook

Lambda function myChatBot

View in Lambda console

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01:45  
27-10-2024

Amazon Lex | myChatBot | Functions | Lambda

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-editor:bot=ScheduleAppointment

ScheduleAppointment Latest

Build Publish

Editor Settings Channels Monitoring

Intents

MakeAppointment

Slot types

AppointmentTypeValue

Error Handling

2. ^ v [Date] AMAZ... Built-in When should I sch

3. ^ v [Time] AMAZ... Built-in At what time shou

Confirmation prompt

Fulfillment

AWS Lambda function Return parameters to client

Lambda function myChatBot

Version or alias Latest

Response

Add Message

Test bot (Latest) Ready. Build complete.

You're now ready for complete testing. Type an utterance below to begin conversation with your chatbot.

Clear chat history

Chat with your bot...

Inspect response

Hide

When you chat with your bot, you can see the fulfillment state of your intent and the response here.

Activate Windows  
Go to Settings to activate Windows.

Amazon Lex | myChatBot | Functions | Lambda

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-editor:bot=ScheduleAppointment

ScheduleAppointment Latest

Editor Settings Channels Monitoring

Intents

MakeAppointment

Slot types

No slots created

Error Handling

MakeAppointment Latest

Sample utterances

e.g. I would like to book a flight.

Book a (AppointmentType)

Book an appointment

I would like to book an appointment

Lambda initialization and validation

Initialization and validation code hook

Lambda function myChatBot

Version or alias Latest

Test bot (Latest) Preparing build for express testing

We are building the bot. When the status changes to "Ready for express testing", you can test it by entering the utterances exactly as shown under Sample utterances. You can test complex conversations once the build is complete. [Clear chat history](#)

Chat with your bot...

Inspect response

Hide

When you chat with your bot, you can see the fulfillment state of your intent and the response here.

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Amazon Lex | myChatBot | Functions | Lambda

us-east-1.console.aws.amazon.com/lex/home?region=us-east-1#bot-editor:bot=ScheduleAppointment

ScheduleAppointment Latest

Editor Settings Channels Monitoring

Intents

MakeAppointment

Slot types

AppointmentTypeValue

Error Handling

Response

Add Message

Enable response card

Wait for user reply  
If the user says "no," the following message will be presented.

\* Required

Save Intent Detach intent

Test bot (Latest) Ready for express testing  
Completing build...

You can now test conversations with input that is an exact match to sample utterances. After the build is complete, you will be able to test more complex conversations. [Clear chat history](#)

Chat with your bot...

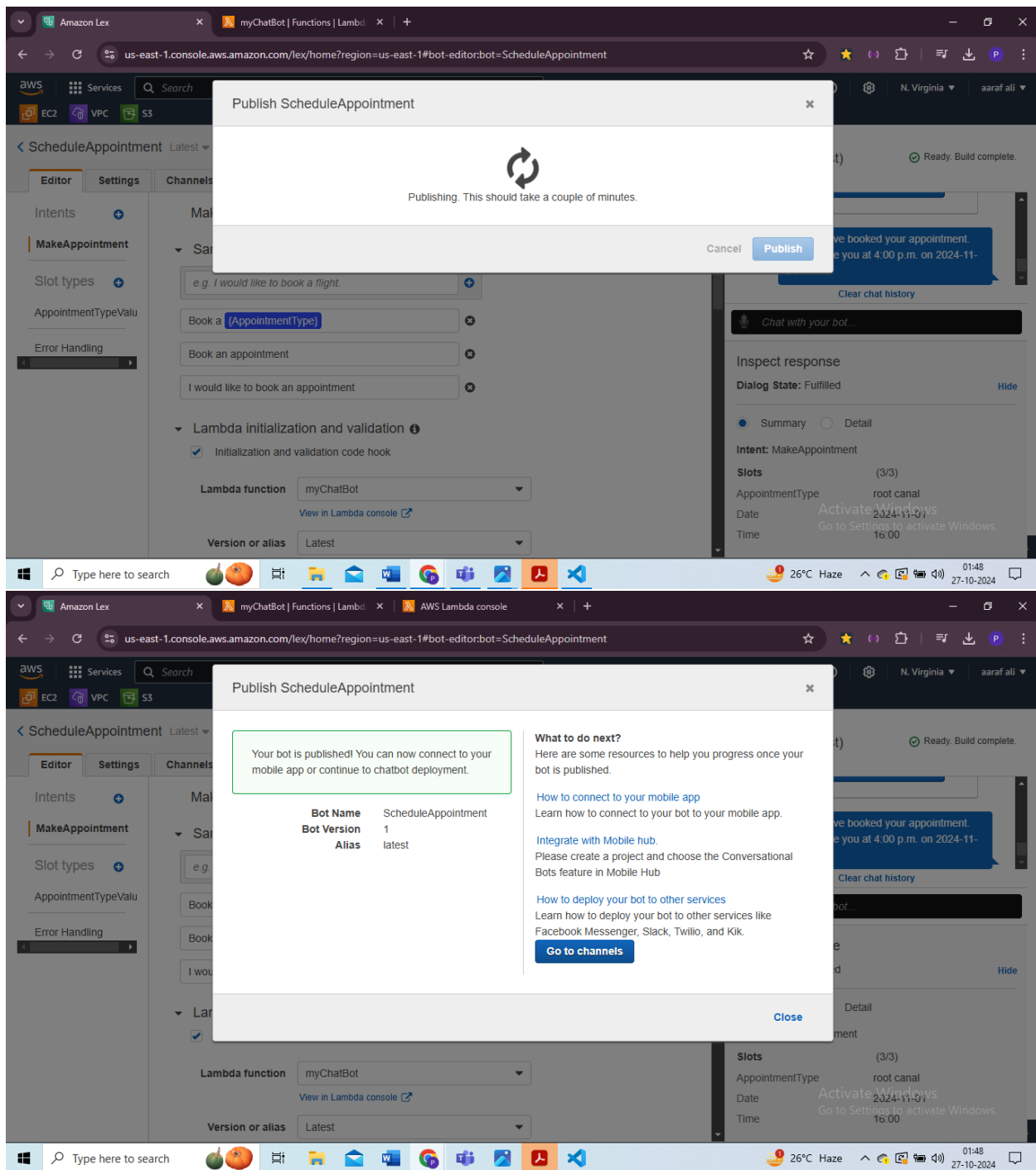
Inspect response

Hide

When you chat with your bot, you can see the fulfillment state of your intent and the response here.

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### Step 3: Use Amazon Cognito for User Authentication

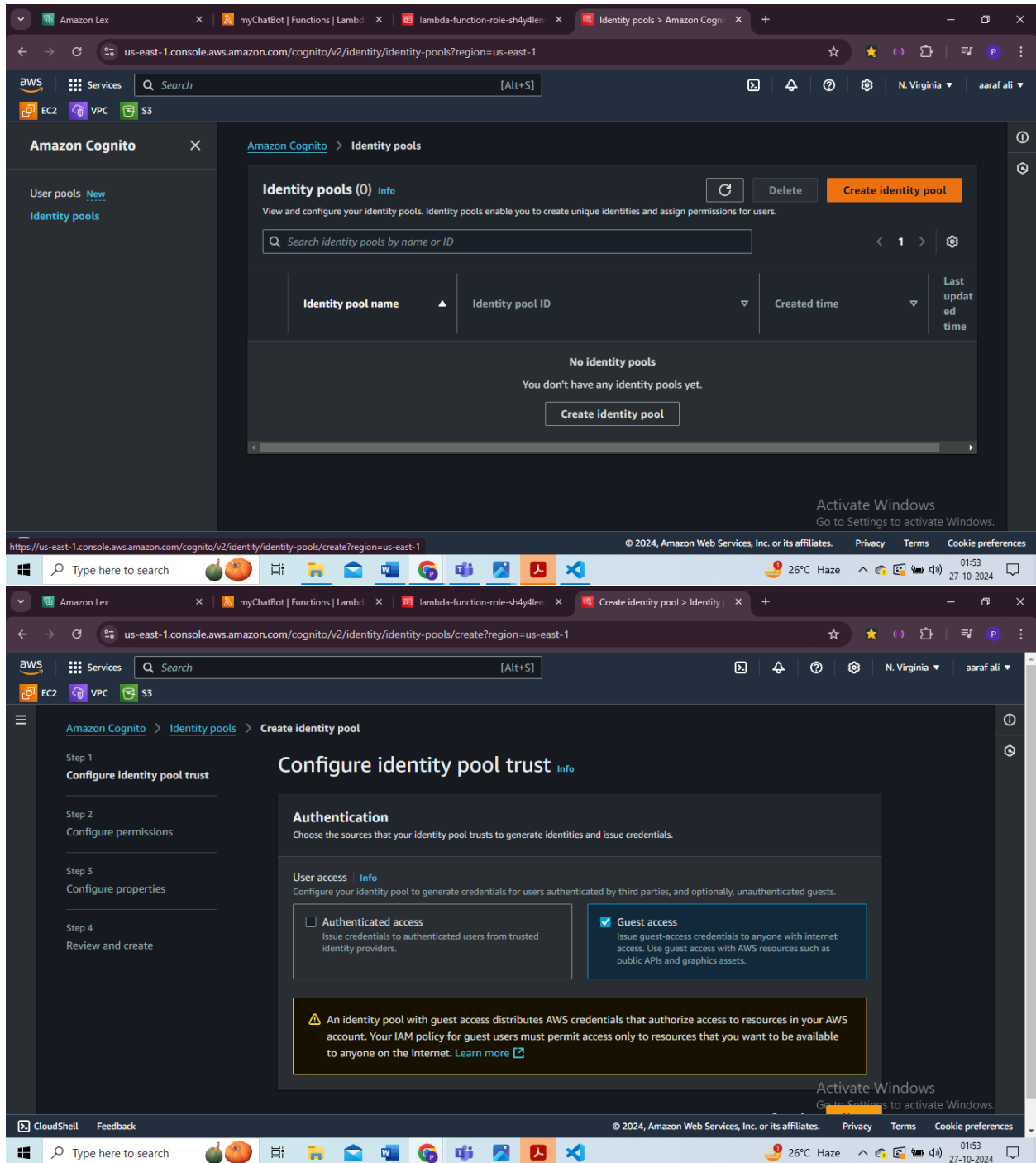
#### 1. **\*\*Create a Cognito Identity Pool\*\***:

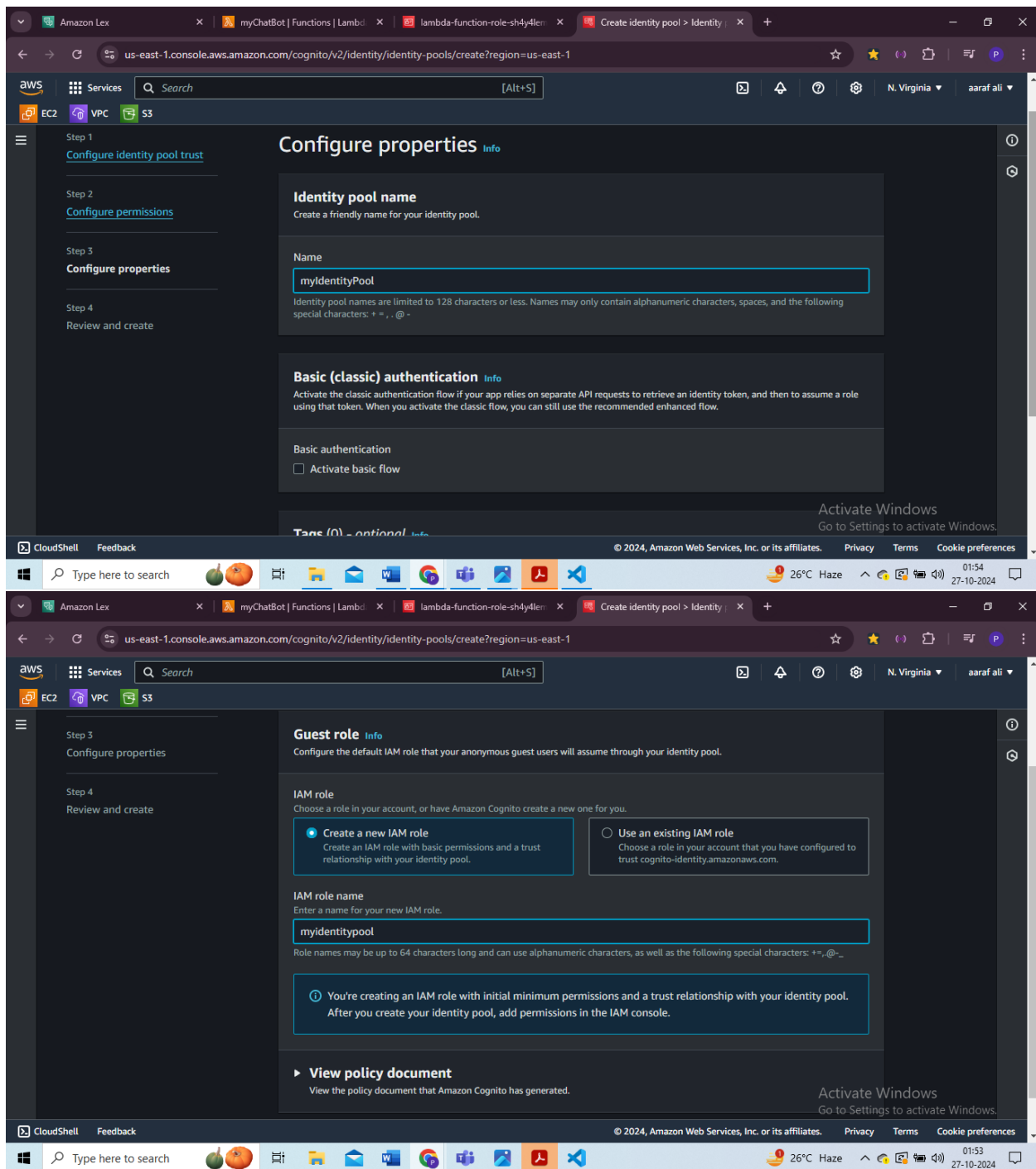
- Create an identity pool to enable authenticated access.
- Configure the identity pool to allow both authenticated and unauthenticated users if needed.

## 2. \*\*Configure Authentication in Your Application\*\*:

- Integrate Cognito in your front-end application (e.g., mobile or web) to handle user sign-in and sign-up.

- Upon authentication, Cognito will issue tokens that can be used for secure API calls.





## Step 4: Set Up IAM Roles and Policies

### 1. \*\*Create an IAM Role for Lambda\*\*:

- Attach an IAM role to the Lambda function with permissions to interact with Lex, S3, and other required services.

### 2. \*\*Create an IAM Role for Cognito\*\*:

- Create separate IAM roles for authenticated and unauthenticated users in Cognito.
- Define policies that limit access to specific resources based on user roles.

### 3. **\*\*Set Permissions\*\***:

- Ensure that your IAM policies provide the minimum necessary permissions, following the principle of least privilege.

The first screenshot shows the 'Add permissions' page for the 'myidentitypool' role. It displays 'Current permissions policies (1)' and a list of 'Other permissions policies (974)'. The list includes AWS managed policies like 'AdministratorAccess', 'AdministratorAccess-Amplify', 'AdministratorAccess-AWSElasticBeanstalk', and 'AlexaForBusinessDeviceSetup'.

The second screenshot shows the 'Permissions policies (3)' page after permissions have been successfully attached. A green banner at the top states 'Policies have been successfully attached to role.' The list of policies now includes 'AmazonLexFullAccess', 'AmazonLexReadOnly', and 'Cognito-unauthenticated-1729...'. The 'Attached entities' column shows the number of entities each policy is attached to (2, 2, and 1 respectively).

## Step 5: Store Data and Files in S3

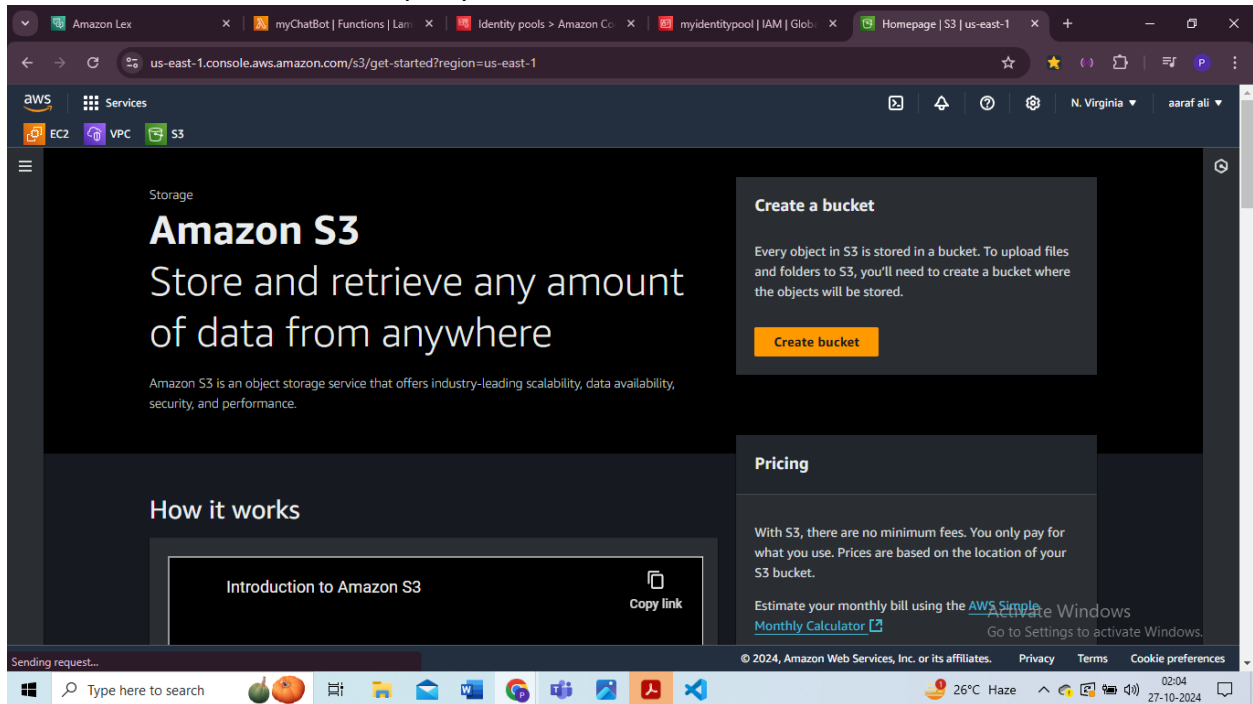
### 1. \*\*Create an S3 Bucket\*\*:

- In the S3 Console, create a bucket for storing files, such as appointment records or logs.

### 2. \*\*Configure Permissions\*\*:

- Set bucket policies or object policies to restrict access to the files only to authorized users (e.g., via Cognito roles).

### 3. \*\*Enable Static Website Property\*\*:



Amazon Lex

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Identity pools > Amazon Co

myidentitypool | IAM | Glob

Create S3 bucket | S3 | us-e

us-east-1.console.aws.amazon.com/s3/bucket/create?region=us-east-1&bucketType=general

Services Search [Alt+S]

EC2 VPC S3

Amazon S3 > Buckets > Create bucket

Create bucket Info

Buckets are containers for data stored in S3.

General configuration

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

Bucket type Info

☒ General purpose  
Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.

☐ Directory  
Recommended for low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone.

Bucket name Info

mydentalchatbot

Bucket name must be unique within the global namespace and follow the bucket naming rules. See rules for bucket naming

Copy settings from existing bucket - optional

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Amazon Lex

myChatBot | Functions | Lam

Identity pools > Amazon Co

myidentitypool | IAM | Glob

Upload objects - S3 bucket

us-east-1.console.aws.amazon.com/s3/upload/mydentalchatbot?region=us-east-1&bucketType=general

Services Search [Alt+S]

EC2 VPC S3

Upload succeeded

View details below.

Destination  
s3://mydentalchatbot

Succeeded  
3 files, 227.5 KB (100.00%)

Failed  
0 files, 0 B (0%)

Files and folders Configuration

Files and folders (3 Total, 227.5 KB)

Find by name

Name	Folder	Type	Size	Status	Error
<a href="#">dentist.jpg</a>	-	image/jpeg	210.4 KB	Succeeded	-
<a href="#">error.html</a>	-	text/html	3.0 KB	Succeeded	-
<a href="#">index.html</a>	-	text/html	14.0 KB	Succeeded	-

Activate Windows  
Go to Settings to activate Windows.

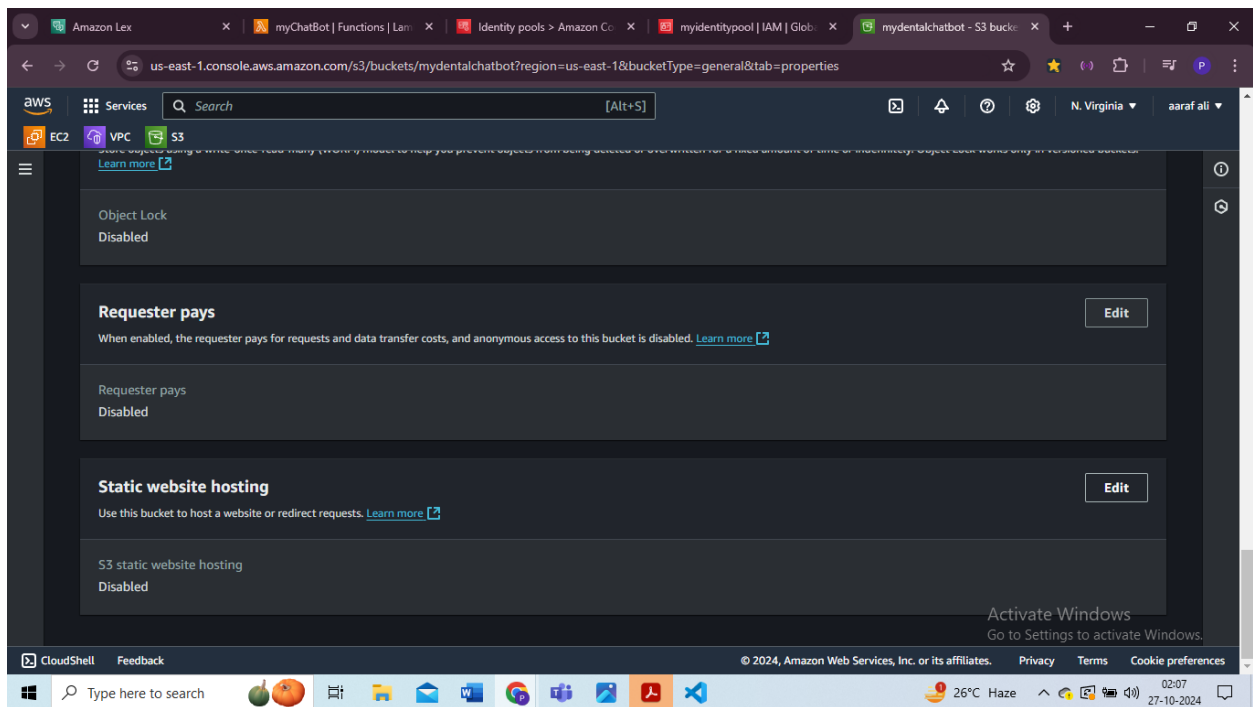
CloudShell Feedback

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## Step 6: Test the Dental Chatbot End-to-End

### 1. \*\*Test in the Lex Console\*\*:

- Test the chatbot to ensure that it correctly recognizes intents, invokes Lambda, and retrieves information.

### 2. \*\*Test Authentication and File Storage\*\*:

- Verify that only authenticated users can schedule appointments and that S3 files are accessible only to users with proper permissions.

Amazon Lex - Dental Appointment BOT

Hi there! What do you want to do?

book a appointment

**Specify Appointment Type**  
What type of appointment would you like to schedule?

root canal (60 min)

**Specify Date**  
When would you like to schedule your root canal?

10-28 (Mon) 10-29 (Tue)  
10-30 (Wed) 10-31 (Thu)  
11-1 (Fri)

What do you want to do?

Amazon Lex - Dental Appointment BOT

Hi there! What do you want to do?

book a appointment

**Specify Appointment Type**  
What type of appointment would you like to schedule?

root canal (60 min)

**Specify Date**  
When would you like to schedule your root canal?

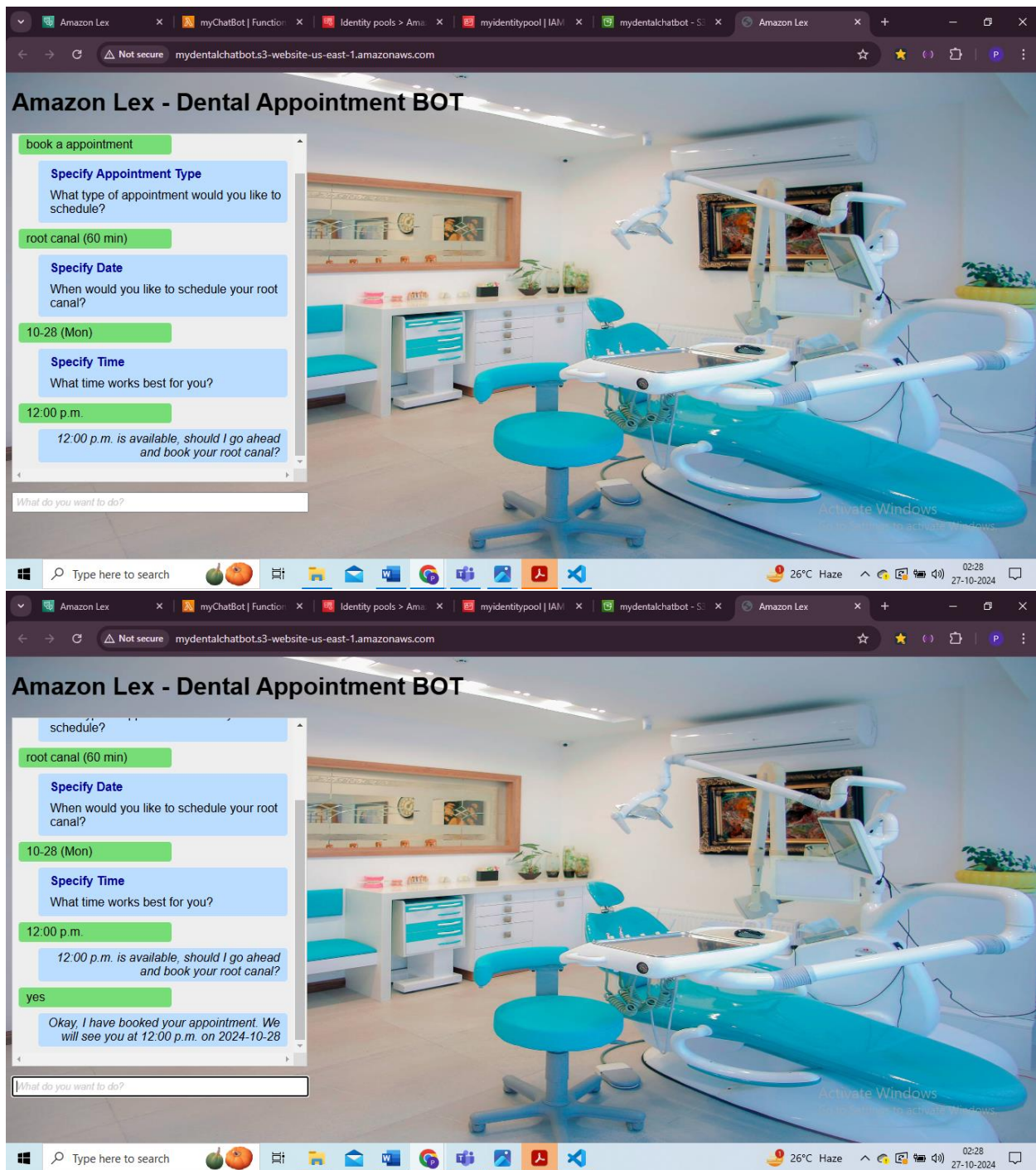
10-28 (Mon)

**Specify Time**  
What time works best for you?

12:00 p.m. 4:00 p.m.

What do you want to do?

mydentalchatbot.s3-website-us-east-1.amazonaws.com/#



## Additional Features (Optional)

- **Multi-turn Dialogues**: Create a more engaging experience by adding follow-up questions.
- **Logging and Monitoring**: Use CloudWatch for logging, performance monitoring, and setting up alarms for any issues.

- **\*\*Reminders\*\***: Set up reminders using Amazon SNS to send appointment reminders to patients.

This setup enables a secure, cloud-based dental chatbot that interacts with users, schedules appointments, and stores data safely in AWS.