

## Task 1. API Gateway

The screenshot shows the AWS API Gateway main page. It features three main sections:

- REST API:** Develop a REST API where you gain complete control over the request and response along with API management capabilities. Works with Lambda, HTTP, AWS Services.
- REST API Private:** Create a REST API that is only accessible from within a VPC. Works with Lambda, HTTP, AWS Services.
- Lambda:** Works with the following: Lambda, HTTP, AWS Services.

Each section has an "Import" and a "Build" button.

The screenshot shows the "Create REST API" wizard, step 1: API details. The user has selected "New API". The form includes:

- API name:** courses
- Description - optional:** A large text input field.
- API endpoint type:** A dropdown menu set to "Regional".

At the bottom are "Cancel" and "Create API" buttons.

Sun Apr 28 2:44 PM

about lexus | Is it END of | Gmail | Inbox (1) - | Facebook | Mail - Sanjay | MUM Global | Items | Amazon | myCourseList | API Gateway | +

Services Search [Option+S]

**Method type**  
PATCH

**Integration type**

- Lambda function**  
Integrate your API with a Lambda function.  

- HTTP**  
Integrate with an existing HTTP endpoint.  

- Mock**  
Generate a response based on API Gateway mappings and transformations.  


**AWS service**  
Integrate with an AWS Service.  


**VPC link**  
Integrate with a resource that isn't accessible over the public internet.  


**Lambda proxy integration**  
Send the request to your Lambda function as a structured event.

**Lambda function**  
Provide the Lambda function name or alias. You can also provide an ARN from another account.  
us-east-1

Grant API Gateway permission to invoke your Lambda function. To turn off, update the function's resource policy yourself, or provide an invoke role that API Gateway uses to invoke your function.

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CloudShell Feedback Services Search [Option+S] API actions Deploy API

**API Gateway**

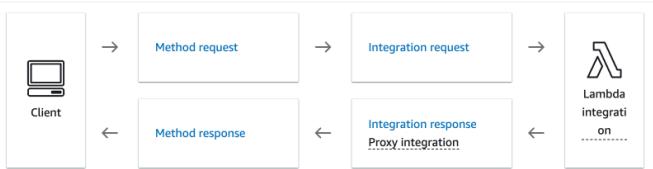
- APIs
- Custom domain names
- VPC links
- API: course**
  - Resources**
    - Stages
    - Authorizers
    - Gateway responses
    - Models
    - Resource policy
    - Documentation
    - Dashboard
    - API settings
  - Usage plans
  - API keys
  - Client certificates
  - Settings

**Resources**

**/course/{courseName} - GET - Method execution**

ARN: arn:aws:execute-api:us-east-1:851725257835:oxndxlflyk/\*GET/course/{courseName}

Resource ID: h25ijf



**Method request settings**

Authorization: NONE	API key required: False
Request validator: None	SDK operation name: Generated based on method and path

**Postman** API Network Sun Apr 28 2:49PM

**Hankman**

**cloud-computing / createCourse**

**POST** https://oxndxflyk.execute-api.us-east-1.amazonaws.com/dev/course

Params Authorization Headers (8) Body Pre-request Script Tests Settings

Body (JSON)

```
1 {
2   "courseCode": "CS516",
3   "courseName": "Cloud Computing",
4   "teacherName": "Sanjaya Koju",
5   "students": ["Alice", "Bob"],
6   "month": "10",
7   "year": "2024"
8 }
```

Cookies Beautify

Status: 200 OK Time: 206 ms Size: 484 B Save as example

Body Cookies Headers (7) Test Results

Pretty Raw Preview Visualize JSON

```
1 {
2   "response": {
3     "$metadata": {
4       "httpStatusCode": 200,
5       "requestId": "23KRID59G7V5TVN069TKNKUFUVV4KQNS05AEMVJF66Q9ASUAAJG",
6       "attempts": 1,
7       "totalRetryDelay": 0
8     }
9   }
10 }
```

Online Find and replace Console Postbot Runner Start Proxy Cookies Trash

**Postman** API Network Sun Apr 28 2:49PM

**Hankman**

**cloud-computing / getCourse**

**GET** https://oxndxflyk.execute-api.us-east-1.amazonaws.com/dev/course

Params Authorization Headers (6) Body Pre-request Script Tests Settings

Query Params

Key	Value	Description
Key	Value	Description

Body Cookies Headers (7) Test Results

Pretty Raw Preview Visualize JSON

```
1 {
2   "response": {
3     "$metadata": {
4       "httpStatusCode": 200,
5       "requestId": "157U90VQ1DDKL50NQIG2GV2CCVV4KQNS05AEMVJF66Q9ASUAAJG",
6       "attempts": 1,
7       "totalRetryDelay": 0
8     },
9     "Count": 3,
10    "Items": [
11      {
12        "year": {
13          "N": "2024"
14        },
15        "courseCode": {
16          "S": "CS516"
17        },
18        "students": {
19          "SS": [
20            "Alice",
21            "Bob"
22          ]
23        },
24        "courseName": {
25          "S": "Cloud Computing"
26        },
27        "month": {
28          "N": "10"
29        }
30      }
31    ]
32  }
33 }
```

Cookies Beautify

Status: 200 OK Time: 193 ms Size: 886 B Save as example

Online Find and replace Console Postbot Runner Start Proxy Cookies Trash

**Postman** API Network Sun Apr 28 2:51 PM

**Hankman**

**cloud-computing / getCourseByCourseID**

**GET** https://oxndxiflyk.execute-api.us-east-1.amazonaws.com/dev/course/item

Params Authorization Headers (8) Body Pre-request Script Tests Settings Cookies Beautify

Body JSON

```
1 "courseCode": "CS516",
2 "teacherName": "Sanjaya Koju"
```

Status: 400 Bad Request Time: 285 ms Size: 383 B Save as example

Pretty Raw Preview Visualize JSON

1 "You must pass 'courseCode' and 'teacherName'"

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This screenshot shows the Postman interface with a collection named 'Hankman'. A GET request is made to 'https://oxndxiflyk.execute-api.us-east-1.amazonaws.com/dev/course/item'. The 'Body' tab is selected with 'JSON' chosen. The request body contains two fields: 'courseCode' with value 'CS516' and 'teacherName' with value 'Sanjaya Koju'. The response status is 400 Bad Request, with the message 'You must pass 'courseCode' and 'teacherName''.

**Postman** API Network Sun Apr 28 2:51 PM

**Hankman**

**cloud-computing / getCourseByCourseID**

**GET** https://oxndxiflyk.execute-api.us-east-1.amazonaws.com/dev/course/item?courseCode=CS516&teacherName=Sanjaya Koju

Params Authorization Headers (8) Body Pre-request Script Tests Settings Cookies

Query Params

Key	Value	Description	... Bulk Edit
courseCode	CS516		
teacherName	Sanjaya Koju		

Status: 200 OK Time: 291 ms Size: 660 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "response": {
3     "$metadata": {
4       "httpStatusCode": 200,
5       "requestId": "10V1NRJLE6I74UG8K3JRPFVMLRVV4KQNS05AEMVJF66Q9ASUAAJG",
6       "attempts": 1,
7       "totalRetryDelay": 0
8     },
9     "Item": {
10       "year": {
11         "N": "2024"
12       },
13       "courseCode": {
14         "S": "CS516"
15       },
16       "students": {
17         "SS": [
18           "Alice",
19           "Bob"
20         ]
21       }
22     }
23   }
24 }
```

Online Find and replace Console Postbot Runner Start Proxy Cookies Trash

This screenshot shows the same Postman session after adding query parameters 'courseCode=CS516' and 'teacherName=Sanjaya Koju'. The response status is now 200 OK, and the JSON response body is displayed, containing course information like year, course code, and student names.

## Task 2. Cognito

The screenshot shows the 'Configure sign-in experience' step in the Cognito User Pools creation wizard. On the left, a sidebar lists steps from 1 to 6. Step 1 is selected, showing 'Configure sign-in experience'. The main panel has a heading 'Configure sign-in experience' with a sub-section 'Authentication providers'. It says 'Configure the providers that are available to users when they sign in.' Below this is a 'Provider types' section with a note about pricing. Two options are shown: 'Cognito user pool' (selected) and 'Federated identity providers'. A note at the bottom states 'Cognito user pool sign-in options can't be changed after the user pool has been created.'

**Amazon Cognito**

User pools New

Identity pools

Step 1 Configure sign-in experience

Step 2 Configure security requirements

Step 3 Configure sign-up experience

Step 4 Configure message delivery

Step 5 Integrate your app

Step 6 Review and create

Configure sign-in experience

Advanced security features can protect your production user accounts from malicious sign-in attempts. Activate it today from App Integration. [Learn more](#)

Authentication providers

Configure the providers that are available to users when they sign in.

Provider types

Choose whether users will sign in to your Cognito user pool, a federated identity provider, or both. Amazon Cognito has different pricing for federated users and user pool users. [Learn more about pricing](#)

Cognito user pool

Users can sign in using their email address, phone number, or user name. User attributes, group memberships, and security settings will be stored and configured in your user pool.

Federated identity providers

Users can sign in using credentials from social identity providers like Facebook, Google, Amazon, and Apple; or using credentials from external directories through SAML or Open ID Connect. You can manage user attribute mappings and security for federated users in your user pool.

Cognito user pool sign-in options [Info](#)

Choose the attributes in your user pool that are used to sign in. If you select only one attribute, or you select a user name and at least one other attribute, your user can sign in with all of the selected options. If you select only phone number and email, your user will be prompted to select one of the two sign-in options when they sign up.

User name

Email

Phone number

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The screenshot shows the 'Multi-factor authentication' step in the Cognito User Pools creation wizard. It includes sections for temporary password expiration (7 days), MFA enforcement (Require MFA - Recommended, Optional MFA, No MFA), and user account recovery (Self-service account recovery, Enable self-service account recovery - Recommended). A note at the bottom indicates delivery methods for account recovery messages via SMS or Email.

Temporary passwords set by administrators expire in  
7 day(s)

Multi-factor authentication

Configure secure access to your app by enforcing multi-factor authentication (MFA) during the user sign-in process. MFA settings are applied to all app clients.

MFA enforcement [Info](#)

Require MFA - Recommended

Users must provide an additional authentication factor when signing in.

Optional MFA

Users can sign in with a single authentication factor, and can choose to add additional authentication factors.

No MFA

Users can only sign in with a single authentication factor. This is the least secure option.

User account recovery

Configure how users will recover their account when they forget their password. Recipient message and data rates apply.

Self-service account recovery [Info](#)

Enable self-service account recovery - Recommended

Allow forgot-password operations in your user pool. In the hosted UI sign-in page, a "Forgot your password?" link is displayed. When this feature is not enabled, administrators reset passwords with the Cognito API.

Delivery method for user account recovery messages [Info](#)

Select how your user pool will deliver messages when users request an account recovery code. SMS messages are charged separately by Amazon SNS. Email messages are charged separately by Amazon SES. [Learn more about pricing](#)

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us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Services Search [Option+S]

Amazon Cognito User pools New Identity pools

Step 1 Configure sign-in experience

Step 2 Configure security requirements

Step 3 Configure sign-up experience

Step 4 Configure message delivery

Step 5 Integrate your app

Step 6 Review and create

## Configure message delivery Info

Amazon Cognito uses Amazon SES and Amazon SNS to send email and SMS messages to your app users. Messages may incur additional SES and SNS costs.

**Email**  
Configure how your user pool sends email messages to users.

**Email provider** Info

Send email with Amazon SES - Recommended  
Send emails using an Amazon SES verified identity in your account. We recommend this option for higher email volume and production workloads.

Send email with Cognito  
Use Cognito's default email address as a temporary start for development. You can use it to send up to 50 emails a day.

You must have configured a verified sender with [Amazon SES](#) to use the SES feature. Learn more

**SES Region** Info  
US East (N. Virginia)

**FROM email address** Info  
By default "no-reply@verificationemail.com" will be used. You can also choose a different email address that you have previously verified with Amazon SES.

no-reply@verificationemail.com

**REPLY-TO email address - optional** Info  
If you set an invalid reply-to address, sending restrictions may be imposed on your account.

Enter an email address

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us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Services Search [Option+S]

Amazon Cognito User pools New Identity pools

Step 2 Configure security requirements

Step 3 Configure sign-up experience

Step 4 Configure message delivery

Step 5 Integrate your app

Step 6 Review and create

## Integrate your app Info

Set up app integration for your user pool with Cognito's built-in authentication and authorization flows.

**User pool name**  
Create a friendly name for your user pool.

**User pool name**  
 universityUsers

User pool names are limited to 128 characters or less. Names may only contain alphanumeric characters, spaces, and the following special characters: + = . @ -

**Warning** Your user pool name can't be changed once this user pool is created.

**Hosted authentication pages**  
Choose whether to use Cognito's Hosted UI and OAuth 2.0 server for user sign-up and sign-in flows.

Use the Cognito Hosted UI  
Build hosted sign-up, sign-in, and OAuth 2.0 service endpoints in Amazon Cognito. When this feature is not enabled, use Cognito API operations to perform sign-up and sign-in.

**Domain** Info  
Configure a domain for your Hosted UI and OAuth 2.0 endpoints. To use the Hosted UI, you must choose a domain where authentication endpoints will be created.

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us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Gmail YouTube Outlook Google Maps Java Note spring boot Algo Design Pattern MIU Sites Personal PM Blankfactor appartment asthetic jobs

AWS Services Search [Option+S] N. Virginia Sanjaya\_Koju

## Amazon Cognito

User pools New Identity pools

**Domain Info**  
Configure a domain for your Hosted UI and OAuth 2.0 endpoints. To use the Hosted UI, you must choose a domain where authentication endpoints will be created.

**Domain type**

Use a Cognito domain  
Enter an identifying prefix to use in an Amazon-owned domain. For production apps, we recommend using a custom domain instead.

Use a custom domain  
Enter a domain that you own for Cognito-hosted sign-up and sign-in pages. You must provide a DNS record and an AWS Certificate Manager (ACM) certificate to use a custom domain. We recommend using a custom domain for production workloads.

**Cognito domain**  
Enter a domain prefix:  
 .auth.us-east-1.amazonaws.com  
Domain prefixes may only include lowercase, alphanumeric characters, and hyphens. You can't use the text aws, amazon, or cognito in the domain prefix. Your domain prefix must be unique within the current Region.  
 Available

**Initial app client**  
Configure an app client. App clients are single-app platforms in your user pool that have permissions to call unauthenticated API operations. A user pool can have multiple app clients.

**App type**

Public client  
A native, browser or mobile-device app. Cognito API requests are made from user systems that are not trusted with a client secret.

Confidential client  
A server-side application that can securely store a client secret. Cognito API requests are made from a central server.

Other  
A custom app. Choose your own grant, auth flow, and client-secret settings.

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us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Gmail YouTube Outlook Google Maps Java Note spring boot Algo Design Pattern MIU Sites Personal PM Blankfactor appartment asthetic jobs

AWS Services Search [Option+S] N. Virginia Sanjaya\_Koju

## Amazon Cognito

User pools New Identity pools

**Initial app client**  
Configure an app client. App clients are single-app platforms in your user pool that have permissions to call unauthenticated API operations. A user pool can have multiple app clients.

**App type**

Public client  
A native, browser or mobile-device app. Cognito API requests are made from user systems that are not trusted with a client secret.

Confidential client  
A server-side application that can securely store a client secret. Cognito API requests are made from a central server.

Other  
A custom app. Choose your own grant, auth flow, and client-secret settings.

**App client name**

Enter a friendly name for your app client.

App client names are limited to 128 characters or less. Names may only contain alphanumeric characters, spaces, and the following special characters: + = , . @ -

**Client secret**

Choose whether your app client will have a client secret. Client secrets are used by the server-side component of an app to authorize API requests. Using a client secret can prevent a third party from impersonating your client.

Generate a client secret

Don't generate a client secret

**Warning:** You cannot change or remove a client secret after you allow Amazon Cognito to generate it for your app client.

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Apple Preview File Edit View Go Tools Window Help

us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Services Search [Option+S] Mon Apr 29 1:05PM

Amazon Cognito User pools New Identity pools

Advanced security features can protect your production user accounts from malicious sign-in attempts. Activate it today from App Integration. Learn more

Allowed callback URLs [Info](#)  
Enter at least one callback URL to redirect the user back to after authentication. This is typically the URL for the app receiving the authorization code issued by Cognito. You may use HTTPS URLs, as well as custom URL schemes.

URL  Remove Add another URL You can add 99 more URLs

Advanced app client settings

We have populated suggested authentication flows, OAuth 2.0 grant types, and OIDC scopes based on the selections you made earlier.

Authentication flows [Info](#)  
Choose authentication flows that your app will support. Refresh token authentication is always enabled. We have populated options based on your app type.

Select authentication flows   Refresh token based authentication SRP (secure remote password) protocol based authentication

Authentication flow session duration [Info](#)  
3 minutes Must be between 3 and 15 minutes.

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Apple Chrome File Edit View History Bookmarks Profiles Tab Window Help

us-east-1.console.aws.amazon.com/cognito/v2/idp/user-pools/create?region=us-east-1

Services Search [Option+S] Mon Apr 29 1:07PM

Amazon Cognito User pools New Identity pools

Advanced security features can protect your production user accounts from malicious sign-in attempts. Activate it today from App Integration. Learn more

Identity providers [Info](#)  
Select the identity providers that will be available to this app client.

Select identity providers  Cognito user pool Users can sign in to Cognito using an email, phone number, or username.

OAuth 2.0 grant types [Info](#)  
Choose at least one OAuth grant type to configure how Cognito will deliver tokens to this app. We have populated suggested options based on the app type you selected.

Select OAuth 2.0 grant types  Implicit grant Specifies that the client should get the access token (and, optionally, ID token, based on scopes) directly

The implicit grant flow exposes OAuth tokens in the url. We recommend that you use only the authorization code flow with PKCE for public clients.

If using Cognito Hosted UI, client credentials grant type is disabled during the creation of this client. However, it can be added on the app client edit Hosted UI settings page.

OpenID Connect scopes [Info](#)  
Choose at least one OpenID Connect (OIDC) scope to specify the attributes this app client can retrieve for access tokens. We have populated suggested options based on the application type and required attributes you selected.

Select OIDC scopes   Requires OpenID to be selected  Requires OpenID to be selected

The screenshot shows a browser window with multiple tabs open, including Gmail, YouTube, and various developer tools. The main content is the AWS CloudShell interface for the Amazon Cognito service. A success message at the top states: "User pool 'universityUsers' has been created successfully." Below this, a notification encourages activating advanced security features. The main section displays a table of user pools, with one entry shown:

User pool name	User pool ID	Created time	Last updated time
universityUsers	us-east-1_pzr6bSEg6	1 second ago	1 second ago

### Task 3. Secure the API using tokens from the Cognito User pool.

Chrome File Edit View History Bookmarks Profiles Tab Window Help

us-east-1.console.aws.amazon.com/apigateway/main/apis/oxndxlflyk/authorizers/create?api=oxndxlflyk&region=us-east-1

Services Search [Option+S]

API Gateway > APIs > course (oxndxlflyk) > Authorizers > Create authorizer

### Create authorizer Info

**Authorizer details**

**Authorizer name**  
MyTokenValidator

**Authorizer type** Info  
Choose to authorize your API calls using one of your Lambda functions or a Cognito User Pool.  
 Lambda  
 Cognito

**Cognito user pool**  
Select the Cognito user pool that will authenticate requests to your API.  
us-east-1  X

**Token source**  
Enter the header that contains the authorization token.  
Authorization

**Token validation - optional**  
Enter a regular expression to validate tokens.

Cancel **Create authorizer**

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Chrome File Edit View History Bookmarks Profiles Tab Window Help

us-east-1.console.aws.amazon.com/apigateway/main/apis/oxndxlflyk/authorizers/api=oxndxlflyk&region=us-east-1

Services Search [Option+S]

API Gateway > APIs > course (oxndxlflyk) > Authorizers

**Authorizers (1) Info**

**MyTokenValidator**

Authorizer ID  
bqb5qi

Cognito pool  
universityUsers - pzr6bSEg6 (us-east-1)

Token source  
Authorization

Token validation - optional  
none

Edit Delete **Create authorizer**

CloudShell Feedback

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The screenshot shows a Chrome browser window with multiple tabs open, including Gmail, YouTube, Outlook, Google Maps, Java Note, spring boot, Algo, Design Pattern, MIU Sites, Personal, PM, Blankfactor, appartment, asthetic, and jobs. The main content area is the AWS API Gateway 'Edit method request' interface for a resource named 'course' under the API 'oxndxlflyk'. The 'Method request settings' section is visible, showing configuration for Authorization (selected 'MyTokenValidator'), Request validator (None), and Operation name (GetPets). There are sections for URL query string parameters and HTTP request headers, both currently collapsed.

## Task4. Test the API

Postman API Network - Mon Apr 29 1:41 PM

**Hankman**

**cloud-computing / createCourse**

**POST** https://oxndxiflyk.execute-api.us-east-1.amazonaws.com/dev/course

Params Authorization Headers (8) Body Pre-request Script Tests Settings

Body (Pretty Raw Preview Visualize JSON)

```
1: {
2:   "courseCode": "CS555",
3:   "courseName": "Web Development",
4:   "teacherName": "James Gosling",
5:   "students": ["Alice", "Bob"],
6:   "month": "10",
7:   "year": "2024"
8: }
```

Body Cookies Headers (7) Test Results

Status: 401 Unauthorized Time: 328 ms Size: 299 B Save as example

Body (Pretty Raw Preview Visualize JSON)

```
1: {
2:   "message": "Unauthorized"
3: }
```

Postman Runner Start Prvvy Cookies Trash

Postman API Network - Mon Apr 29 2:06 PM

**Hankman**

**cloud-computing / createCourse**

**POST** https://oxndxiflyk.execute-api.us-east-1.amazonaws.com/dev/course

Params Authorization Headers (9) Body Pre-request Script Tests Settings

Headers (8 hidden)

Key	Value	Description	... Bulk Edit Presets
Authorization	eyJraWQiOjIyIBTUlnaiZNWZ1UngwamZRU3Jkd0ZJ...		

Body Cookies Headers (7) Test Results

Status: 200 OK Time: 2.07 s Size: 484 B Save as example

Body (Pretty Raw Preview Visualize JSON)

```
1: {
2:   "response": {
3:     "$metadata": {
4:       "httpStatusCode": 200,
5:       "requestId": "K27732UOSUTG1D3G4L3H85JAHRRVV4KQNS05AEMVJF66Q9ASUAA3G",
6:       "attempts": 1,
7:       "totalRetryDelay": 0
8:     }
9:   }
10: }
```

Postman Runner Start Prvvy Cookies Trash