**Option B : Normal**

This solution is using Keycloak OAuth for REST API authentication, Java Spring Boot and PostgreSQL for databases.

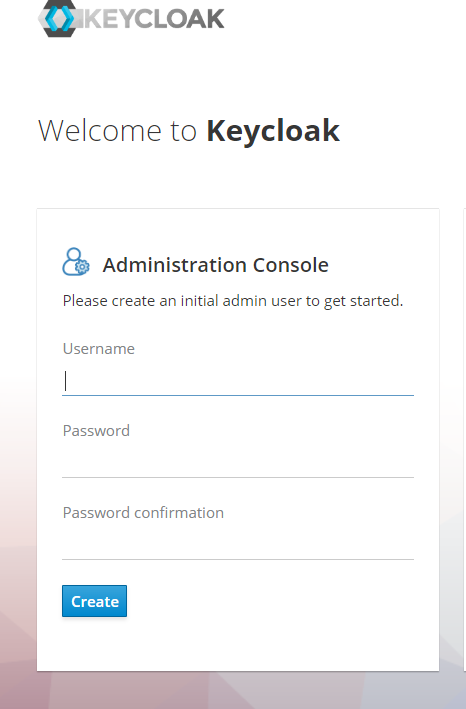
I have created 8 APIs for the CRUD of Customer and Trans and all the API require the authentication. For example:

* <http://localhost:8080/api/all/customer> (get all customer)
* [http://localhost:8080/api/customer?id=](http://localhost:8080/api/customer?id=6)? (get customer by id)
* <http://localhost:8080/api/save/customer> (save or update customer with request body)
* [http://localhost:8080/api/delete/customer?id=](http://localhost:8080/api/delete/customer?id=4)? (delete customer by id)
* [http://localhost:8080/api/trans?id=](http://localhost:8080/api/trans?id=2)? (get trans by id)
* <http://localhost:8080/api/all/trans> (get all trans)
* <http://localhost:8080/api/save/trans> (save or update trans with requestbody)
* [http://localhost:8080/api/delete/trans?id=](http://localhost:8080/api/delete/trans?id=1)? (delete trans by id)

Kindly run the java program only after the keycloak and database are ready.

**Keycloak OAuth Set Up**

1. Go to <https://www.keycloak.org/downloads> and download as ZIP and extract it.
2. **Changing Http Port:** go to folder keycloak-22.0.3 > conf > edit keycloak.conf with notepad, add http-port=8081 to the top of the file > save and close
3. **Run Keycloak:** go to folder keycloak-22.0.3 > bin, run kc.bat start-dev command in the command prompt. If having issue to start the keycloak, kindly refer to section **Java JDK Set Up**
4. **Create admin account:** Key in the username (admin) and password (admin123) into the input fields

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1. **Login:** Click on Administration Console and input the username and password you created earlier to login
2. Click Clients located on the left side of the screen
3. Click Create Client button
4. **General Settings**: Key in login-app into Client ID field
5. **Capability Settings:** toggle on Client Authentication, checked the Standard Flow, Direct access grant and Service account roles
6. **Login Settings:** key in [http://localhost:8080/\*](http://localhost:8080/*) into Valid redirect URIs field and /\* into Web origins field

**Java JDK Set Up**

1. **Install Java JDK:** If you haven't already, download and install the Java JDK. You can download the zip file from <https://www.openlogic.com/openjdk-downloads> with version 17.
2. **Set JAVA\_HOME Environment Variable:**

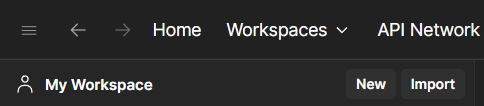
* Right-click on "This PC" or "My Computer" (depending on your Windows version) and select "Properties."
* Click on "Advanced system settings" on the left sidebar.
* In the System Properties window, click the "Environment Variables" button.
* Under the "System variables" section, look for "JAVA\_HOME" and make sure it points to the directory where you installed the Java JDK. For example, it might be something like "C:\Program Files\Java\jdk1.8.0\_XXX" or "C:\Program Files\AdoptOpenJDK\jdk-11.X.X.XX".
* If "JAVA\_HOME" doesn't exist, you can create it by clicking the "New" button and entering "JAVA\_HOME" as the variable name and the JDK path as the variable value.
* Click "OK" to save the environment variable.

1. **Update Path Variable:**

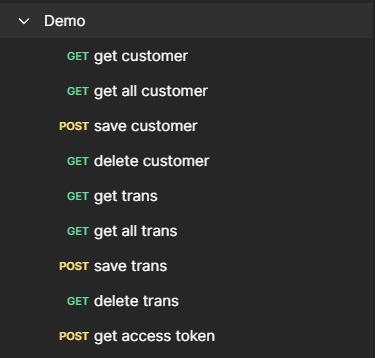
* In the same "Environment Variables" window, find the "Path" variable in the "System variables" section, select it, and click "Edit."
* Add the path to the "bin" directory of your JDK installation to the list of paths. For example, you might add something like "C:\Program Files\Java\jdk1.8.0\_XXX\bin" or "C:\Program Files\AdoptOpenJDK\jdk-11.X.X.XX\bin".
* Click "OK" to save the changes.

**Steps to get access token for REST API**

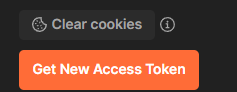
I use Postman to test the API, I have attached the collection file (Demo.postman\_collection.json) and you can import the file to postman to use the collection.



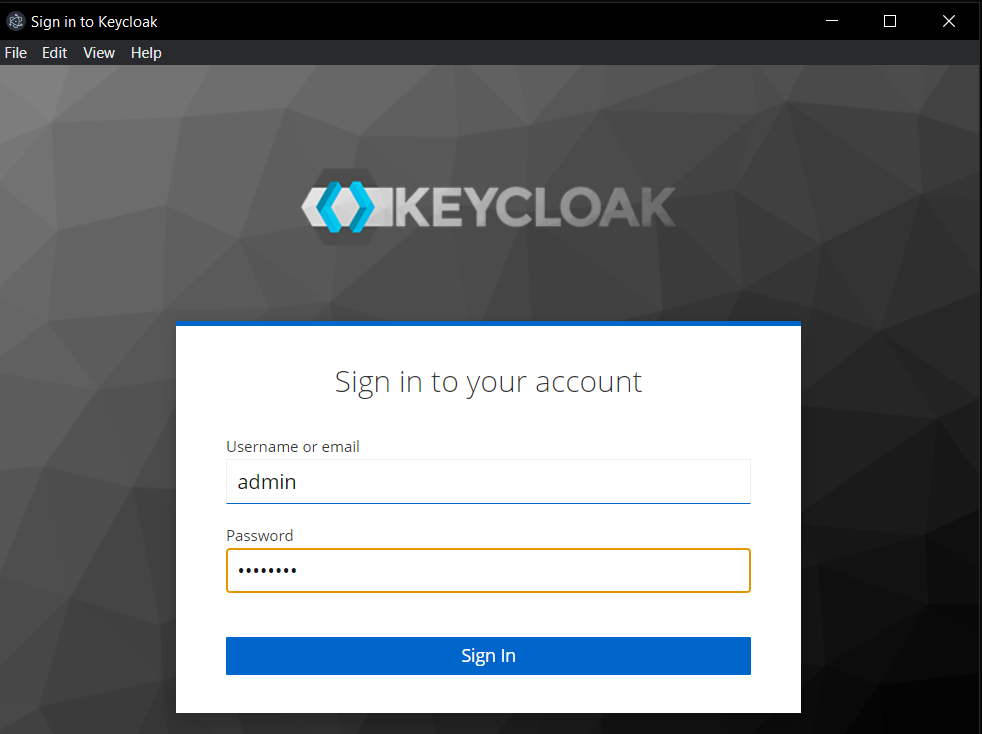
1. Click the demo



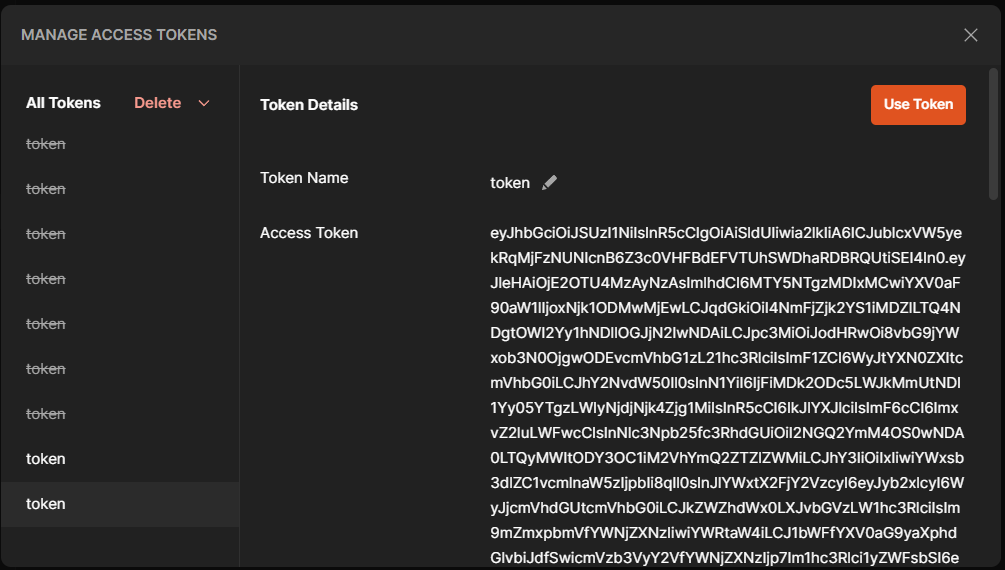
1. Go to Authorization tab and scroll to bottom and click “Get New Access Token” Button



1. Will prompt dialog to login, please key in username: admin and password: admin123



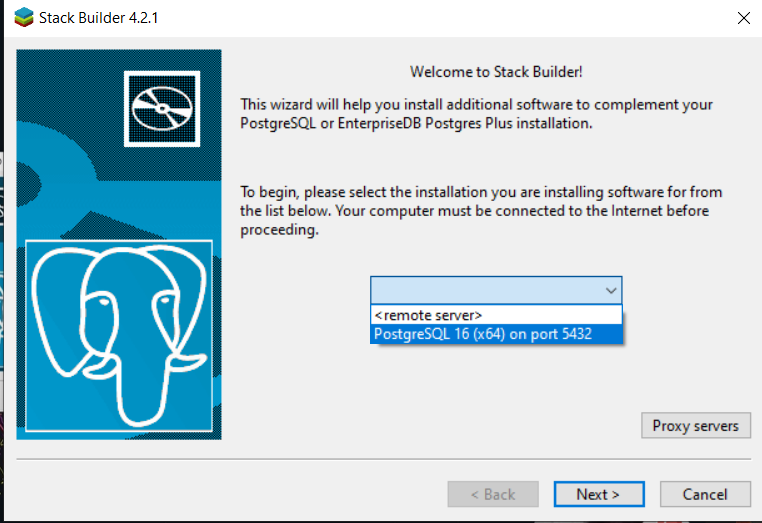
1. After sign in success then click on the use token button



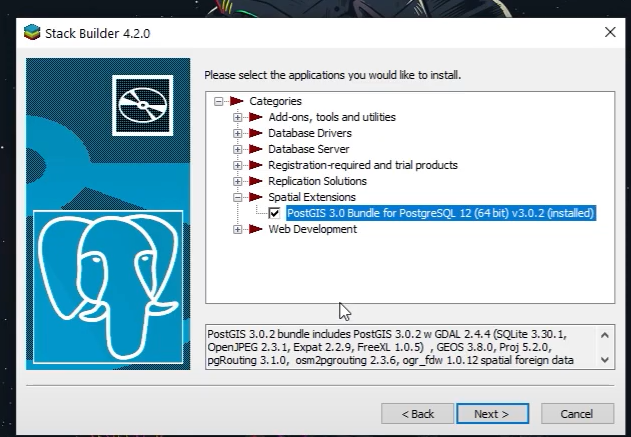
1. All done, you may proceed to call API

**PostgreSQL Set Up**

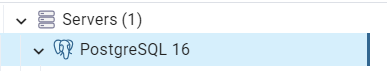
1. Please go to this link <https://www.postgresql.org/download/windows/> > click Download the installer > download version 16
2. Open the installer, click next until the page where need to input the password, key in postgres and continue to click next till the end
3. it will open the Stack Builder after the installation completes and choose the PostgreSQL 16



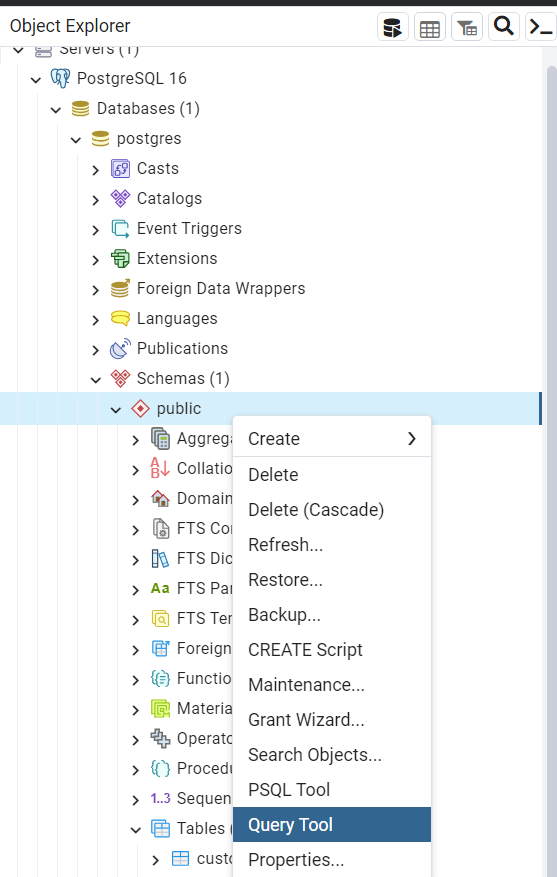
1. Tick the PostGIS only and click next



1. Click next or agree until the installation completes
2. Open pgAdmin 4 and click on the PostgreSQL 16



1. Then it will prompt a dialog to enter the password, key in the password we set earlier (postgres) and it will expand if the password is correct
2. If forgot the password please go to this link to reset a password <https://commandprompt.com/education/how-to-reset-forgotten-password-for-postgres-user/> and go back to pgAdmin 4 and input the password
3. Go postgres > Schemas > public > right click and select Query tool



1. Paste the query below to create the tables and execute the query.

CREATE TABLE public.customer (

id SERIAL PRIMARY KEY,

name VARCHAR(255) NOT NULL,

ic VARCHAR(20) NOT NULL

);

CREATE TABLE public.trans (

id SERIAL PRIMARY KEY,

custid INT REFERENCES Customer(id),

name VARCHAR(255) NOT NULL,

amount DECIMAL(10, 2) NOT NULL

);

**Result**

Below is the outcome if is authenticated or not authenticated when calling REST API

