# SIG788

Engineering AI solutions

## Credit & Distinction Task 6

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Target = Distinction

## Drug Tariff Advisor Bot

### Introduction

The **healthcare** sector **domain** continuously seeks enhancements in the delivery of information and services to both providers and patients. Access to accurate and timely information about drug tariffs and healthcare products is crucial for efficient healthcare management. The Drug Tariff Advisor Bot aims to streamline the information by leveraging advanced natural language processing technologies to provide instant, reliable answers to inquiries about drug tariffs and healthcare products.

### Objective:

The primary objective of the Drug Tariff Advisor Bot is to provide healthcare professionals and patients with immediate access to critical information for drug tariffs and healthcare product pricing in England.

**Key uses include:**

- Quickly answering common questions regarding drug prices and availability, which can enhance decision-making and planning for healthcare providers.
- Assisting pharmacy staff and healthcare providers in managing inventory and cost predictions based on the latest tariff information.
- Reducing the time spent by healthcare professionals in searching for product-specific information, thus improving operational efficiency.

### Approach:

The project involves several steps:

- **Data Collection**: Utilize NHS England's Drug Tariff information from the provided link.
  Link: https://faq.nhsbsa.nhs.uk/knowledgebase/category/?articlecategory=Drug%20Tariff&id=CAT-01087&parentid=
- **Bot Development**: Use **Azure Cognitive Services Language Studio** to build a Custom Question Answering Bot.
- **Integration**: Deploy the bot on Azure and integrate it with a channel such as Facebook, Team for easy access by users.
- **Testing & Feedback**: Conduct testing with bot's responses & compare against the website.

### Azure Cognitive Language Studio:

**Azure Cognitive Services Language Studio**:
A platform offering machine learning and AI algorithms for natural language processing.

**Custom Language Models**: Tools provided by the platform to create tailored language models without needing deep data science expertise.

**Custom Question Answering Feature**: A feature that enables the development of sophisticated bots that can understand and respond to user queries conversationally.

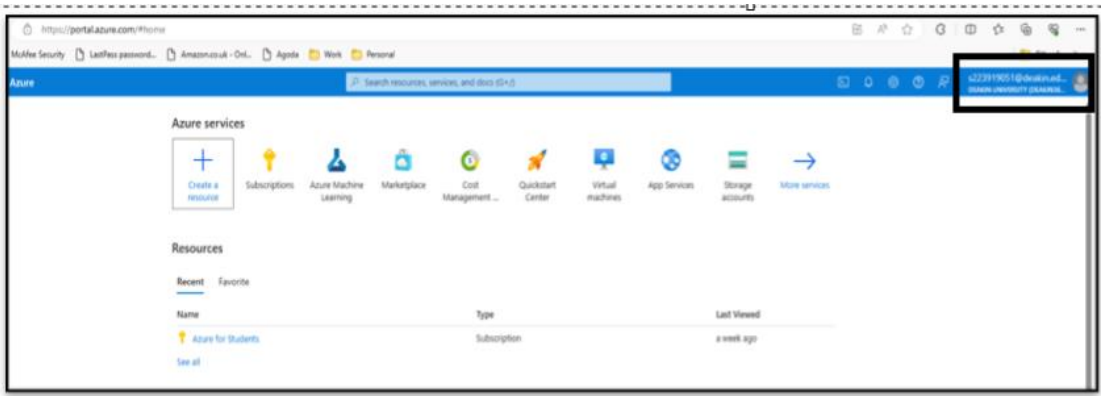
**Drug Tariff Advisor Bot**: A bot that will leverage this service to accurately interpret and answer complex questions related to **NHS England's** Drug Tariff and healthcare product prices.

## Creating Azure Cognitive Language Studio:

- **Sign in to Azure Portal:** Azure Portal and sign in with Microsoft account Deakin credentials.

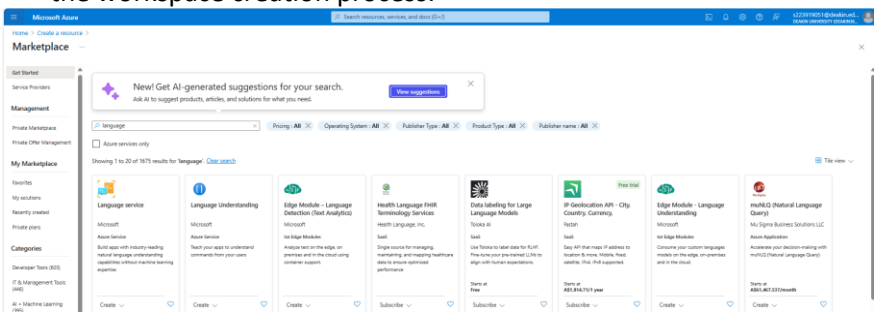
  Link: https://portal.azure.com/

  **Landing Page:**

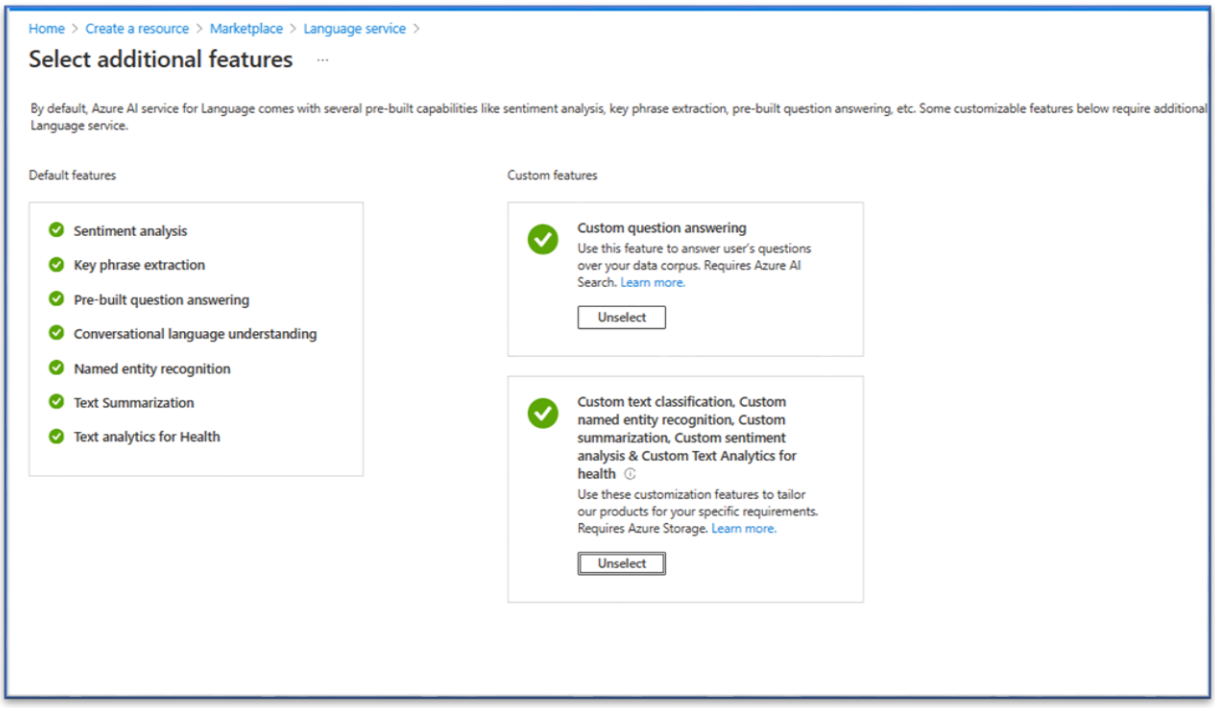



- **Create a New Workspace**:
  - Click on **Create a resource** at the top-left corner.


  - Search for **Language Service** & select **Create** from Azure Machine Learning to initiate the workspace creation process.



- Select **Custom question answering** and **Custom text classification, Custom named entity recognition, Custom summarization, Custom sentiment analysis & Custom Text Analytics for health** and then click **continue to create resource** as we our bot domain is **healthcare**




- **Configure the Project workspace**:

**Subscription**

**Azure Student**: Limited access to Azure resources without charge.

**Resource Group**

**RG-S223919051-Task6**: A collection of resources managed as a single unit.

**Instance Details**

**Region**: Central India
**Name**: ID-S223919051-Task
**Pricing Tier:** Free F0

**Custom Question Answering**

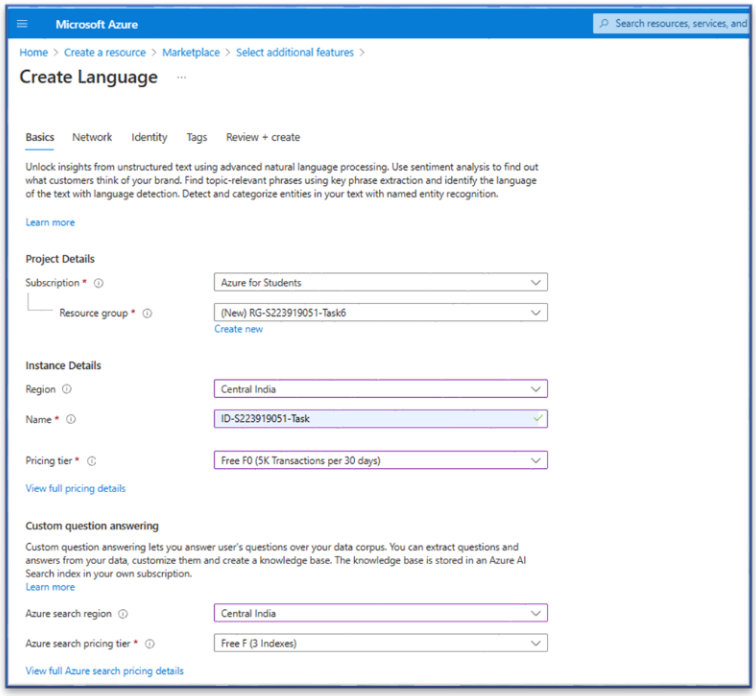
**Azure Search Region**: Central India
**Azure Search Pricing Tier**: Free F0

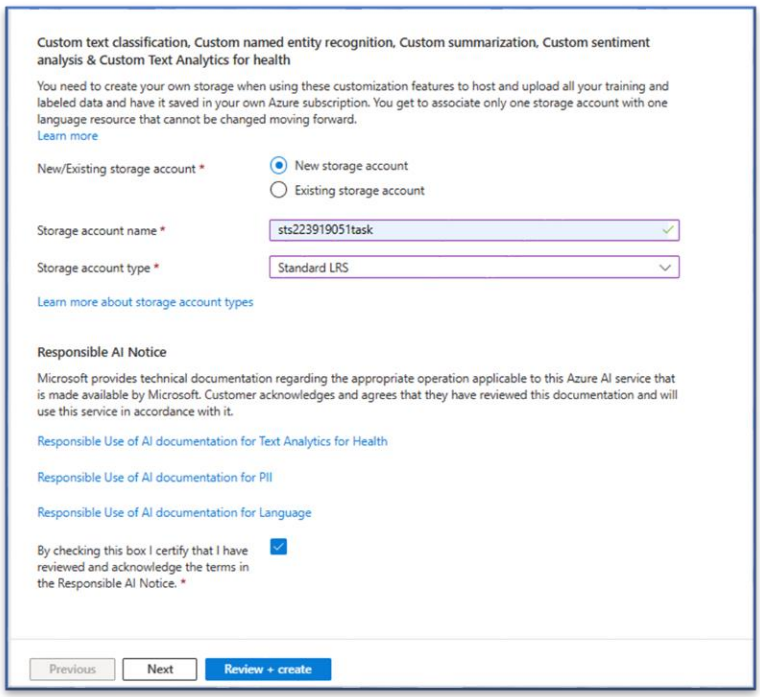
**Storage Account Details**

**Storage Account**: New
**Storage Account Name**: sts223919051task
**Storage Account Type**: Standard LRS

**Responsible AI Notice**

Acknowledged and agreed to Microsoft's Responsible AI Notice.

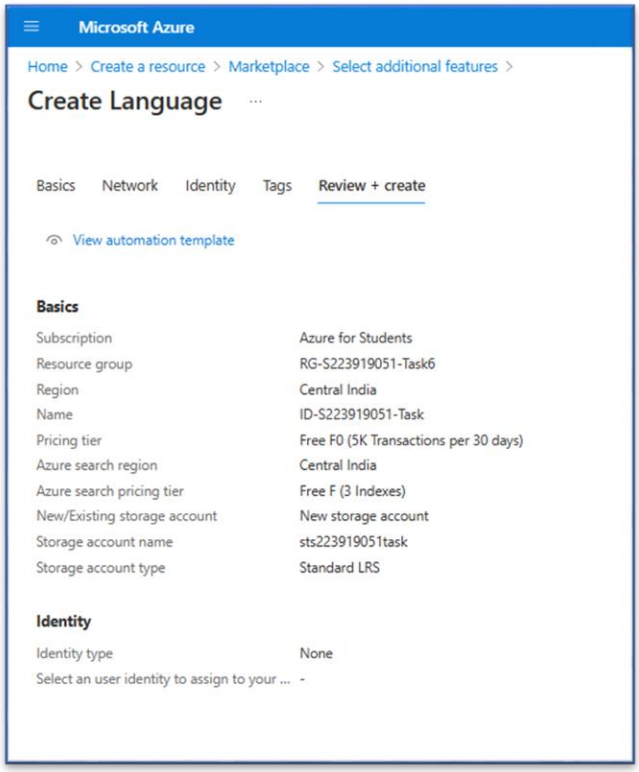


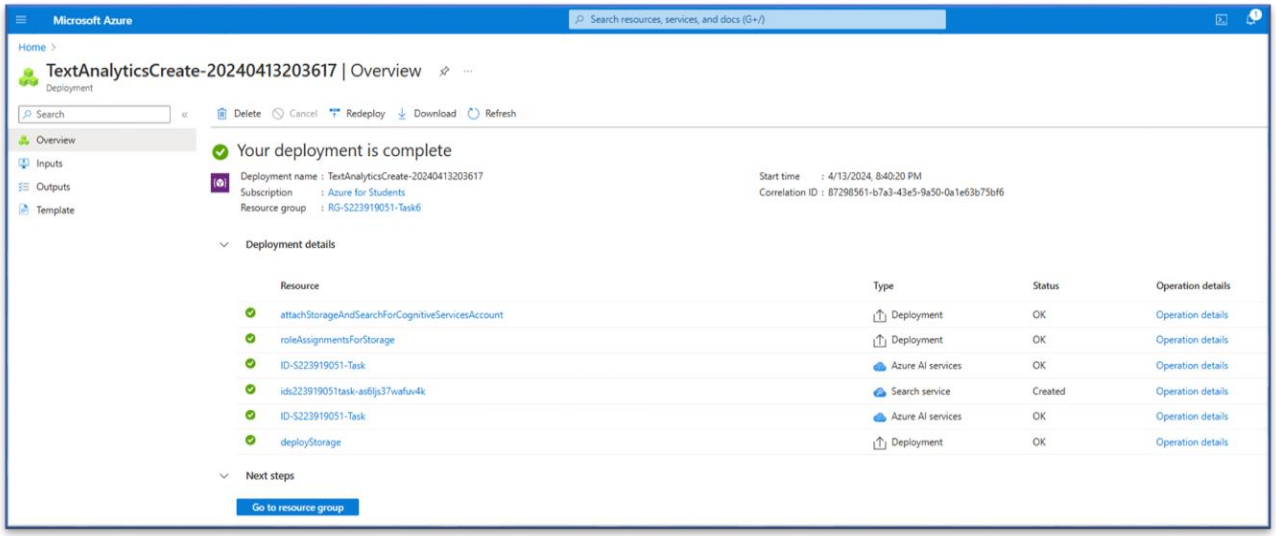

**Summary**

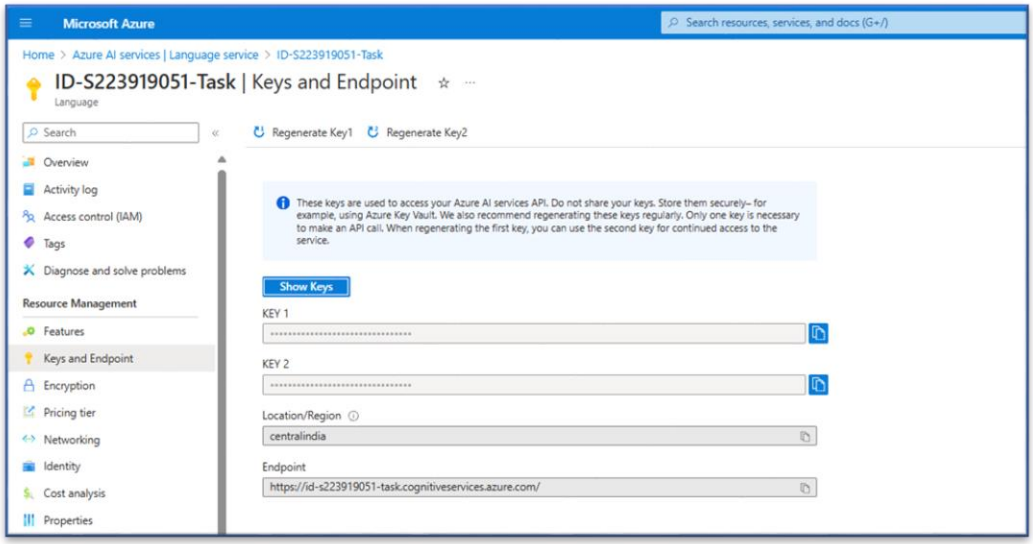
Using an Azure Student subscription.
Resources are under the "RG-S223919051-Task6" resource group.
Language resource ("ID-S223919051-Task") is in Central India on a free tier.
Azure Search is also in Central India on a free tier.
Using an existing standard LRS storage account named "sts223919051task".
Certified review and agreement with the Responsible AI Notice by Microsoft.

- **Review and Create**: After configuring the details click on **Review + create** button. Once Azure validates configuration. Click on **Create** button to deploy workspace.
  **Review:**




**Bot workspace deployed:**






Let's move forward with the Python SDK to develop the **Drug Tariff Advisor Bot**.

## Pre-requisites:

Install pre-requisites for **Azure Cognitive Language Studio** in Anaconda prompt.

- pip install azure-ai-language-questionanswering
- pip install python-dotenv
- pip install azure-storage-blob

- **azure-ai-language-questionanswering**: This Python package is used to install the Azure AI Language Question Answering library in Python. This library provides tools to interact with the Azure Cognitive Services Language Studio's Question Answering service. It allows developers to build, test, and refine bots that can understand and respond to user queries in a conversational manner

- **python-dotenv**: This package reads key-value pairs from a .env file and sets them as environment variables, enhancing the security and flexibility of application's configuration management.

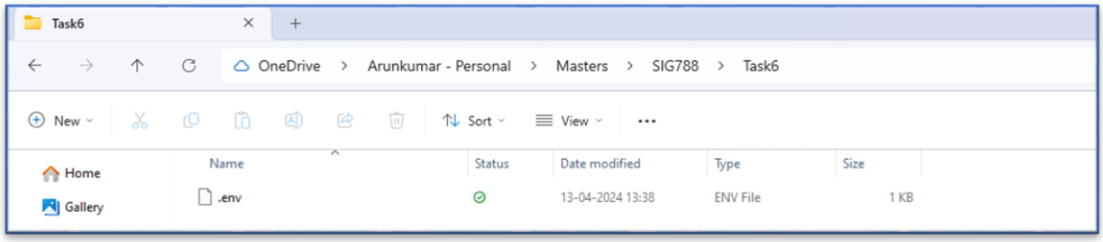
- **azure-storage-blob:** This package is used for Azure's Blob Storage Service to store the files.

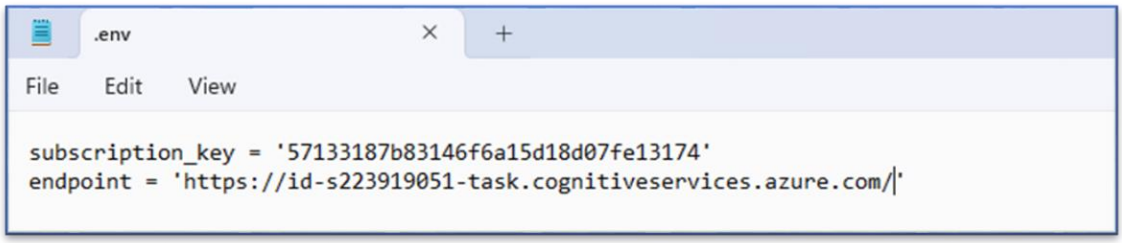
## Configure .env file:

For Azure Computer Vision services, follow these steps to enhance security:

- After deployment, copy Key1 (**subscription_Key**) and the **endpoint**.
- Paste these into a **.env** file in working directory.
- These will be assigned as environment variables and can be read directly in Python code.

This method ensures **subscription_key** and **endpoint** are not displayed to users, enhancing the security of application. Please refer to the snapshot of the **.env** file.




## FAQ & Dataset selection for Bot:

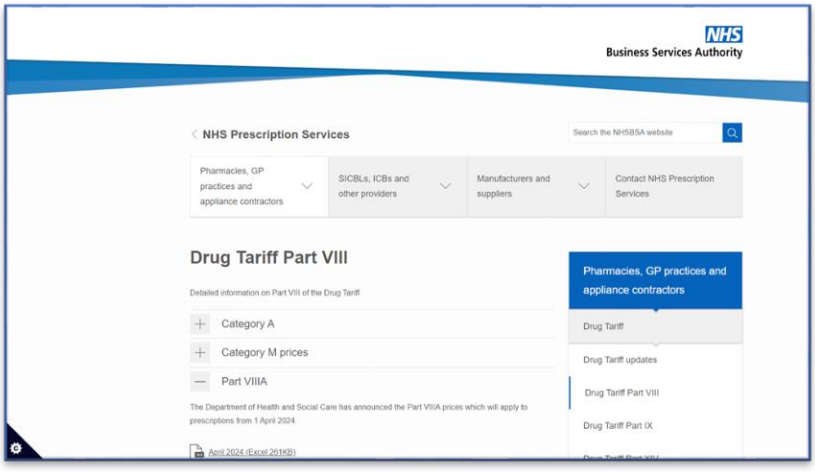
I've curated the **PART VIIIA** dataset from the **Drug Tariff** and merged it with the **FAQs** to create a custom **Q&A** for the **Drug Tariff Advisor bot**. This bot will provide timely and accurate information about drug tariffs and healthcare products, which is vital for efficient healthcare management.

The **Drug Tariff** in NHS England is a comprehensive guide that details the reimbursement prices for medications and appliances dispensed under NHS prescriptions. It plays a key role in the financial and operational management of NHS prescription services.

**PART VIIIA** of the Drug Tariff is a specific section that lists generic and certain branded medicines that are not available as generics. These items are reimbursed based on fixed prices determined by the **NHS Business Services Authority**. This section is crucial for pharmacies as it ensures consistent reimbursement for these products.

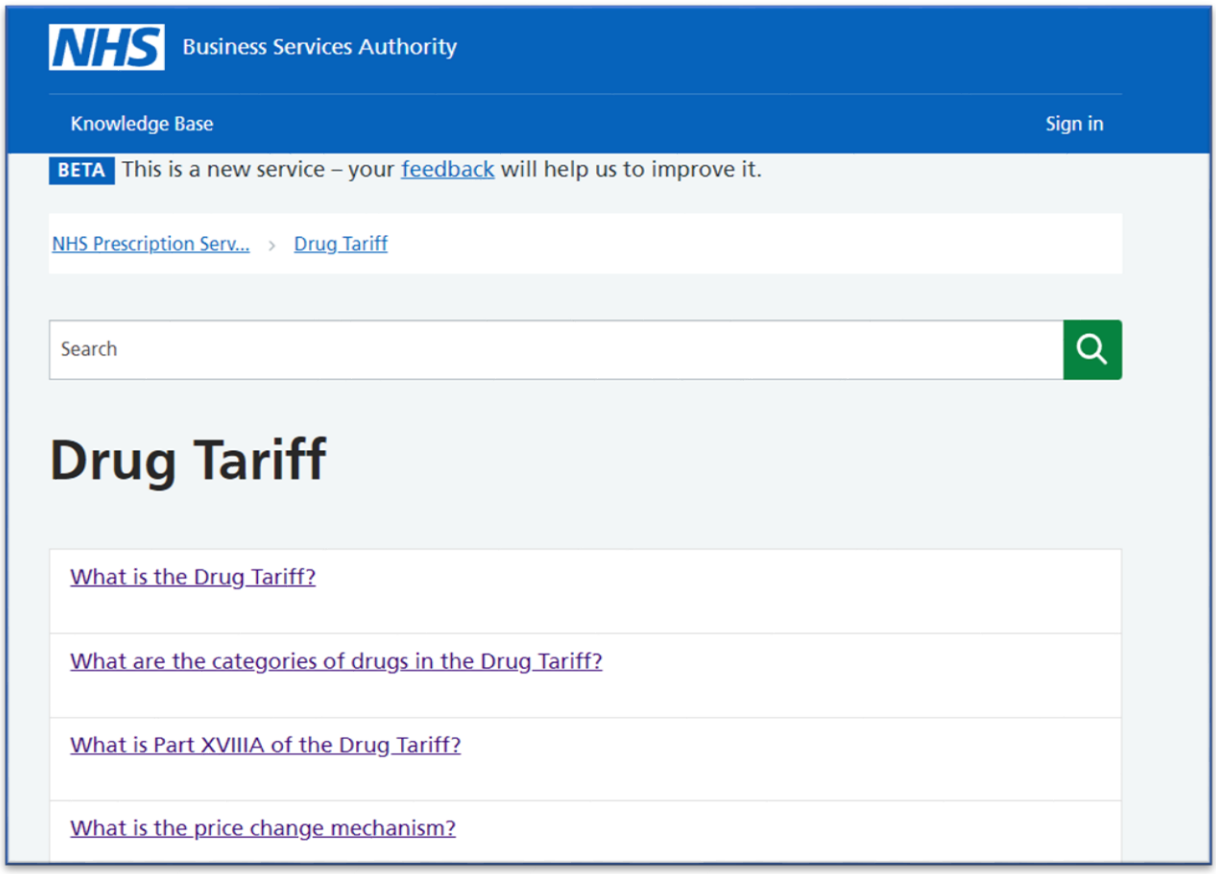
The **Drug Tariff** is a monthly publication produced by NHS Prescription Services. It's available in both **electronic** and **PDF formats** and can be accessed online a few days before the start of each month. This allows for the inclusion of any necessary updates or changes in drug pricing. It is regularly communicated to contractors through the **NHS's digital platforms**.

**Dataset:**



**FAQs**

The **FAQs**, which are in hyperlink format, have been selected. Their questions and answers have been integrated with the dataset questions mentioned below.




**Data Preparations:**

For the creation of the **Drug Tariff Advisor bot** services using **Azure Language Service**, I've performed the following steps:

- Loaded the **Part VIIIA dataset** directly from the NHS digital site using Python. This dataset includes alternative question options, allowing Azure AI Language to detect them as such when the answers are the same. Here's the Python code used:

```
# Read NHS Dataset (Part VIIIA)
df = pd.read_csv('https://www.nhsbsa.nhs.uk/sites/default/files/2024-03/Part%20VIIIA%20Apr%2024.xls.csv',skiprows=2)
df.head()
```

- Applied **data preprocessing** to format the dataset into a QnA structure suitable for loading into Azure Cognitive Language Studio.

- Copied each question from the **NHS FAQs section** into a notepad and prepared the corresponding questions and answers. These were then appended to the above dataset. The specific codes for this process will be detailed in the code section.

- Included **greetings** (like 'hi', 'hello', 'greetings') and **end notes** ('bye', 'good bye', etc.) in the dataset to facilitate a more conversational interaction with the bot.

## Python SDK:

### File Processing:

Import the necessary libraries in Python SDK:

```
# To read the secret keys for Authentication
import os
from dotenv import load_dotenv
from azure.core.credentials import AzureKeyCredential

# To create new project
from azure.ai.language.questionanswering.authoring import AuthoringClient

# to create a question-answering client, and to ask questions using the knowledge base
from azure.ai.language.questionanswering import QuestionAnsweringClient
from azure.ai.language.questionanswering import models as qna

# dataframe
import pandas as pd

# Blob Storage
from azure.storage.blob import BlobServiceClient, BlobClient, ContainerClient
```

Setting up Working directory

```
# Setting Working Directory
os.chdir(r'C:\Users\arunk\OneDrive\Masters\SIG788\Task6')
print(os.getcwd())
```

Read NHS PART VIIIA drug tariff file

```
# Read NHS Dataset (Part VIIIA)
df = pd.read_csv('https://www.nhsbsa.nhs.uk/sites/default/files/2024-03/Part%20VIIIA%20Apr%2024.xls.csv',skiprows=2)
df.head()
```

| | Medicine | Pack size | Unnamed: 2 | VMP Snomed Code | VMPP Snomed Code | Drug Tariff Category | Basic Price |
|---|---|---|---|---|---|---|---|
| 0 | Abacavir 600mg / Lamivudine 300mg tablets | 30.0 | tablet | 39724011000001106 | 8991611000001104 | Part VIIIA Category C | 19000 |
| 1 | Abatacept 125mg/1ml solution for injection pre... | 4.0 | pre-filled disposable injection | 29767011000001106 | 29747011000001102 | Part VIIIA Category C | 120960 |
| 2 | Abatacept 125mg/1ml solution for injection pre... | 4.0 | pre-filled disposable injection | 21704711000001107 | 21699511000001107 | Part VIIIA Category C | 120960 |
| 3 | Acamprosate 333mg gastro-resistant tablets | 168.0 | tablet | 42267511000001104 | 994511000001109 | Part VIIIA Category M | 2319 |
| 4 | Acarbose 100mg tablets | 90.0 | tablet | 42080211000001108 | 13152110000001104 | Part VIIIA Category A | 4893 |

Pre-process the loaded file and restrict the data to only 1000 rows along with preparing QnA pair for **BOT** services

```
# drop any NA from dataframe
df.dropna(inplace=True)
```

```
# 'Basic Price' is a float & it need to divide by 100 for price
df['Basic Price'] = df['Basic Price'].astype(float) / 100

# Group by 'Medicine'
grouped = df.groupby('Medicine').agg({
    'Pack size': 'unique',
    'Drug Tariff Category': 'first',
    'Basic Price': lambda prices: ['{:.2f}'.format(price) for price in prices]
}).reset_index()

# Creating a descriptive answer
grouped['Answer'] = grouped.apply(lambda row: f"We have {len(row['Pack size'])} pack
sizes for {row['Medicine']} with the pack sizes of {', '.join(map(str, row['Pack size']))} and the
category {row['Drug Tariff Category']} with the prices {', '.join(row['Basic Price'])}
respectively.", axis=1)

# Creating alternate questions for each medicine
grouped['Alternate Questions'] = grouped.apply(lambda row: [
    f"What is the price of {row['Medicine']}?",
    f"Detail on product {row['Medicine']}",
    f"What do you know about {row['Medicine']}"
], axis=1)

# Expand the DataFrame to have one row per question (original and alternate)
qna_pairs_expanded = grouped.explode('Alternate Questions')
qna_pairs_expanded.rename(columns={'Alternate Questions': 'Question'}, inplace=True)

# QnA pairs & restrict for 1000 rows
qna_pairs = qna_pairs_expanded[['Question', 'Answer']].head(1000)

# head
qna_pairs.head()
```

| | Question | Answer |
|---|---|---|
| 0 | What is the price of Abacavir 600mg / Lamivudi... | We have 1 pack sizes for Abacavir 600mg / Lami... |
| 0 | Detail on product Abacavir 600mg / Lamivudine ... | We have 1 pack sizes for Abacavir 600mg / Lami... |
| 0 | What do you know about Abacavir 600mg / Lamivu... | We have 1 pack sizes for Abacavir 600mg / Lami... |
| 1 | What is the price of Abatacept 125mg/1ml solut... | We have 1 pack sizes for Abatacept 125mg/1ml s... |
| 1 | Detail on product Abatacept 125mg/1ml solution... | We have 1 pack sizes for Abatacept 125mg/1ml s... |

Manually picked up QnA from the NHS site

```
nhs_qna_content = [
  {
    "Question": "What is the Drug Tariff?",
    "Answer": (
```

```
        "NHS Prescription Services produces the Drug Tariff on a monthly basis on behalf of
the "
        "Department of Health and Social Care (DHSC).\n\n"
        "The Drug Tariff outlines:\n\n"
        "- What will be paid to pharmacy contractors for NHS services provided either for
reimbursement "
        "or for remuneration\n"
        "- Rules to follow when dispensing\n"
        "- Value of the fees and allowances you will be paid\n"
        "- Drug and appliance prices you will be paid\n\n"
        "The Preface of the Drug Tariff contains additions, deletions, and any other
alterations to the Drug Tariff.\n\n"
        "Definitions:\n"
        "This section outlines the meaning of common terms used in the Tariff.\n\n"
        "Where to access the Drug Tariff:\n"
        "The Drug Tariff is available in two versions on our website, a PDF version and the
electronic Drug Tariff (eDT).\n"
        "The PDF version is a duplicate of the paper tariff. This can be downloaded and used
offline.\n"
        "The electronic tariff requires a continuous connection to the internet. There are no
page numbers, "
        "and the format is different to the paper Tariff."
    )
  },
  {
    "Question": "What are the categories of drugs in the Drug Tariff?",
    "Answer": (
        "There are 3 categories of drugs in the Drug Tariff, categories A, C, and M.\n\n"
        "Category A:\n"
        "This category lists the drugs that are readily available.\n"
        "The reimbursement price for each of these drugs is calculated from a basket list of
suppliers.\n\n"
        "Category C:\n"
        "This category lists drugs that are not readily available as a generic and their price is
based on a particular brand or supplier.\n\n"
        "Category M:\n"
        "This category lists drugs which are readily available.\n"
        "The reimbursement price is calculated by the Department of Health and Social Care
(DHSC) based on information submitted by manufacturers."
    )
  },
  {
    "Question": "What is Part XVIIIA of the Drug Tariff?",
    "Answer": (
        "Part XVIIIA of the Drug Tariff contains a list of drugs, medicines, and other
substances that cannot be ordered under the NHS.\n\n"
        "The list is made up of specific products and not generic drugs. Only those items
specified would be disallowed if prescribed.\n\n"
        "Items in Part XVIIIA are also referred to as Schedule 1 drugs.\n\n"
```

```
        "The decision to add a product to Part XVIIIA is made by the Department of Health and Social Care and published in Schedule 1 of the National Health Service (General Medical Services Contracts)(Prescription of Drugs etc.) Regulations 2004.\n\n"
        "This is reproduced in Part XVIIIA of the Drug Tariff.\n\n"
        "Access Drug Tariff from link [https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff](https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff)"
      )
    },
    {
      "Question": "What is the price change mechanism?",
      "Answer": (
        "The Price Change Mechanism is an agreed system that changes the reimbursement price of drugs due to changing market prices.\n\n"
        "If the drug is:\n"
        "- Propriety and the indicative price changed on or before the eighth of the month, the reimbursement price will change for prescriptions dispensed in the following month\n"
        "- Propriety and the indicative price changed after the eighth of the month, the reimbursement price will be changed for prescriptions dispensed the month after the following month\n"
        "- Generic and the indicative price changed on or before the eighth of the month, the reimbursement price will change for prescriptions dispensed in the same month\n"
        "- Generic and the indicative price changed after the eighth of the month, the reimbursement price will be changed for prescriptions dispensed in the following month\n\n"
        "This is intended to consider pharmacies having stock of certain products already on their shelves when a price change is first introduced.\n\n"
        "Community Pharmacy England keeps the proprietary and non-proprietary price change mechanisms under close review."
      )
    },
    {
      "Question": "Can I apply for a drug to be added, deleted or amended in Part VIII of the Drug Tariff?",
      "Answer": (
        "Specified procedures are carried out monthly to identify items which meet the criteria for addition, deletion, or amendment within Part VIIIA and Part VIIIB. \n\n"
        "These items and their prices are determined by the Secretary of State for Health and Social Care. This process at no time requires application from a manufacturer.\n\n"
        "Inclusion, amendment, or deletion of a drug in Part VIIIA or VIIIB cannot be requested."
      )
    },
    {
      "Question": "Can I apply for an appliance or device to be included in the Drug Tariff?",
      "Answer": (
        "You can apply for an appliance or device to be included in the Drug Tariff by completing the application form DT1 Form A. You must also complete the relevant Form B. \n\n"
        "Read more information on the application process and view the application forms from link [https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-
```

```
information](https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-information)\n\n"
            "The completed form should be returned to:\n"
            "Email: pixie@nhsbsa.nhs.uk"
        )
    },
    {
        "Question": "How do I amend or delete my appliances in the Drug Tariff?",
        "Answer": (
            "To notify us of any changes or deletions, you'll need to complete a DT3 change of product listing form.\n\n"
            "Read more information on the process and view the DT3 change form from link [https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-information](https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-information)\n\n"
            "The completed form should be returned to:\n"
            "Email: pixie@nhsbsa.nhs.uk\n\n"
            "Price increase\n"
            "To notify of us of a price increase, you'll need to complete a Part IX price increase request template.\n\n"
            "Read more information on the price increase mechanism and view the request template from link [https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff/drug-tariff-part-ix](https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff/drug-tariff-part-ix)\n\n"
            "The completed form should be emailed to:\n"
            "Email: pixie@nhsbsa.nhs.uk"
        )
    }
]
```

Conversion and merge:

```
# create dataframe from dictionary
nhs_qna_df = pd.DataFrame(nhs_qna_content)

# merge dataframe with dataset QnA
final_qna_df = pd.concat([qna_pairs, nhs_qna_df], ignore_index=True)
```

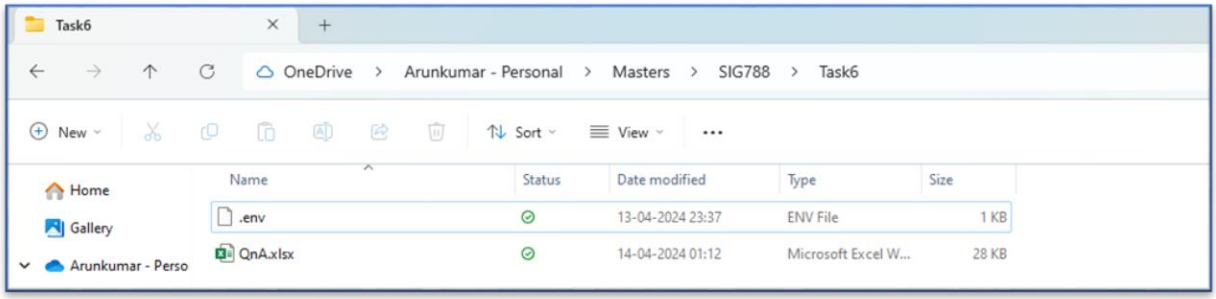
Greetings and Farewell pair:

```
qna_greetings_and_farewells = [
    {
        "Question": "Hi",
        "Answer": "Hello! How can I assist you today?"
    },
    {
        "Question": "Hello",
        "Answer": "Hi there! What can I help you with?"
    },
    {
        "Question": "Greetings",
```

```
        "Answer": "Greetings! How may I be of service to you?"
    },
    {
        "Question": "Good morning",
        "Answer": "Good morning! How can I help you today?"
    },
    {
        "Question": "Good afternoon",
        "Answer": "Good afternoon! What do you need assistance with?"
    },
    {
        "Question": "Good evening",
        "Answer": "Good evening! What can I do for you?"
    },
    {
        "Question": "Hey",
        "Answer": "Hey there! How's it going?"
    },
    {
        "Question": "Bye",
        "Answer": "Goodbye! Have a great day!"
    },
    {
        "Question": "Goodbye",
        "Answer": "Farewell! Contact us again if you need more help."
    },
    {
        "Question": "See you",
        "Answer": "See you next time! Take care!"
    },
    {
        "Question": "Good night",
        "Answer": "Good night! Sleep well."
    }
]

# create dataframe from dictionary
greetingsdf = pd.DataFrame(qna_greetings_and_farewells)

# merge dataframe with dataset QnA
final_qna_df = pd.concat([final_qna_df, greetingsdf], ignore_index=True)
```

QnA file to working Directory:

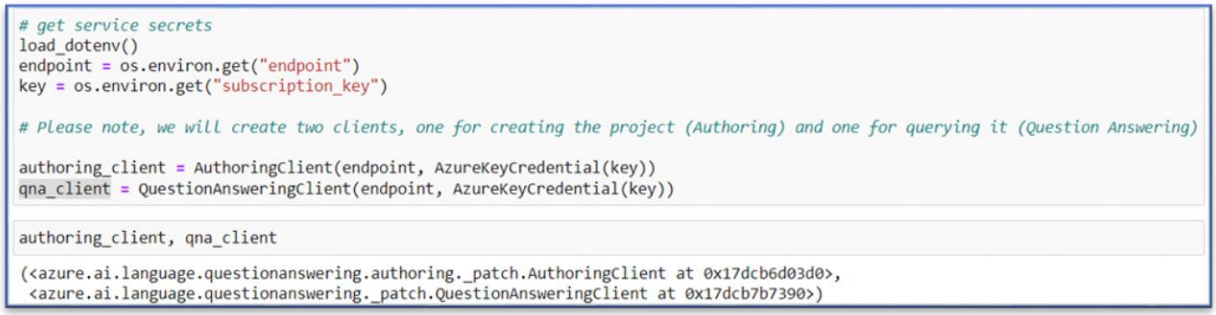
```
# Create the final QnA pair to working directory
final_qna_df.to_excel('QnA.xlsx', index=False)
```




## Authentication:

Load environment variables and create clients

```
# get service secrets
load_dotenv()
endpoint = os.environ.get("endpoint")
key = os.environ.get("subscription_key")

# Please note, we will create two clients, one for creating the project (Authoring) and one for querying it (Question Answering)

authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))
```



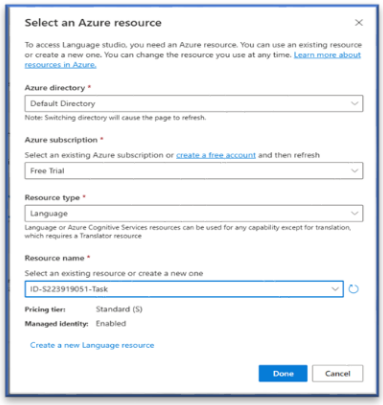
```
# get service secrets
load_dotenv()
endpoint = os.environ.get("endpoint")
key = os.environ.get("subscription_key")

# Please note, we will create two clients, one for creating the project (Authoring) and one for querying it (Question Answering)

authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))
```

```
authoring_client, qna_client
```

```
(<azure.ai.language.questionanswering.authoring._patch.AuthoringClient at 0x17dcb6d03d0>,
 <azure.ai.language.questionanswering._patch.QuestionAnsweringClient at 0x17dcb7b7390>)
```

## Language service portal:

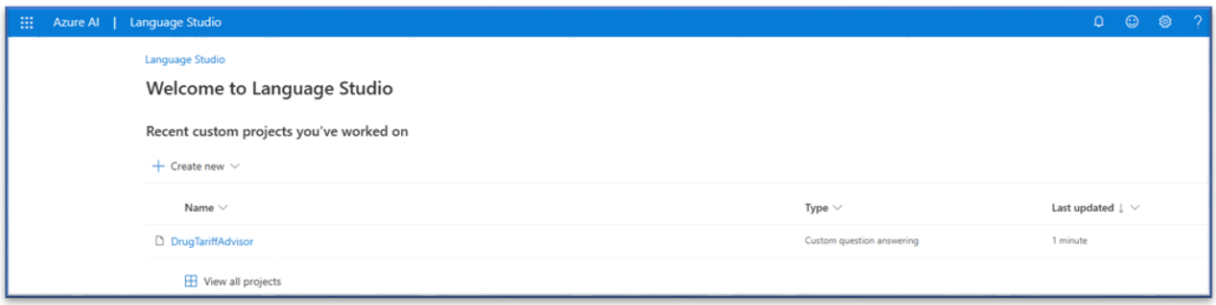
1. Sign in to the portal
2. Select Azure resource



3. Create the project in Python SDK and validate the same in Python SDK and Language portal.

```
# Create new project, add knowldege base and deploy it.
authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))

with authoring_client:

    # Step 1: create project
    print("\n********** Creating a new project **********")
    project_name = "DrugTariffAdvisor"
    project = authoring_client.create_project(
        project_name=project_name,
        options={
            "description": "FAQs & Pricing information of Drug Tariff in England",
            "language": "en",
            "multilingualResource": True,
            "settings": {
                "defaultAnswer": "no answer, please contact arunkumarbalaraman@outlook.com"
            }
        })

    # Output 1: View the project details

    print("view created project info:")
    print("\tname: {}".format(project["projectName"]))
    print("\tlanguage: {}".format(project["language"]))
    print("\tdescription: {}".format(project["description"]))
```

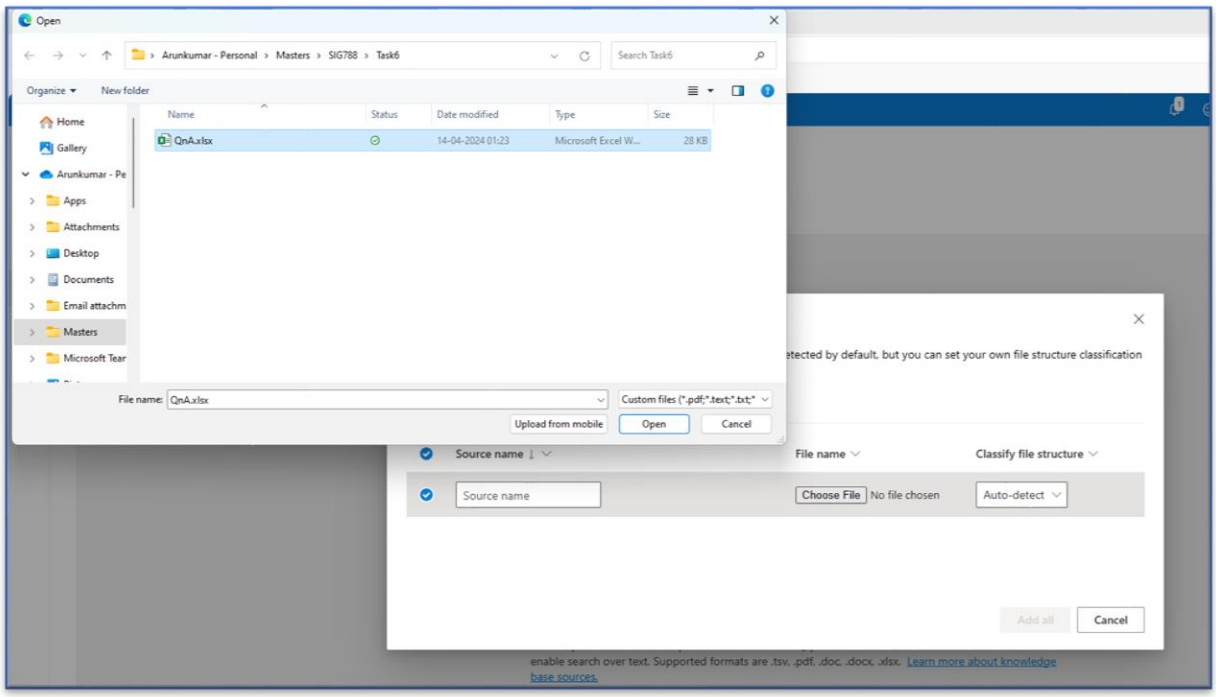
```
********** Creating a new project **********
view created project info:
        name: DrugTariffAdvisor
        language: en
        description: FAQs & Pricing information of Drug Tariff in England
```

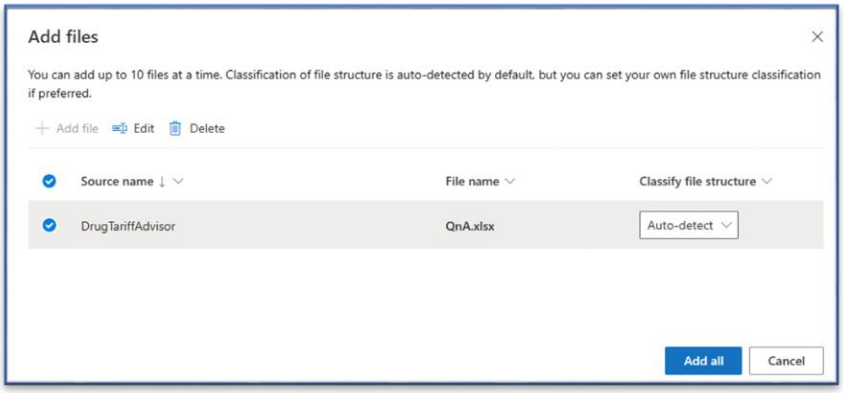


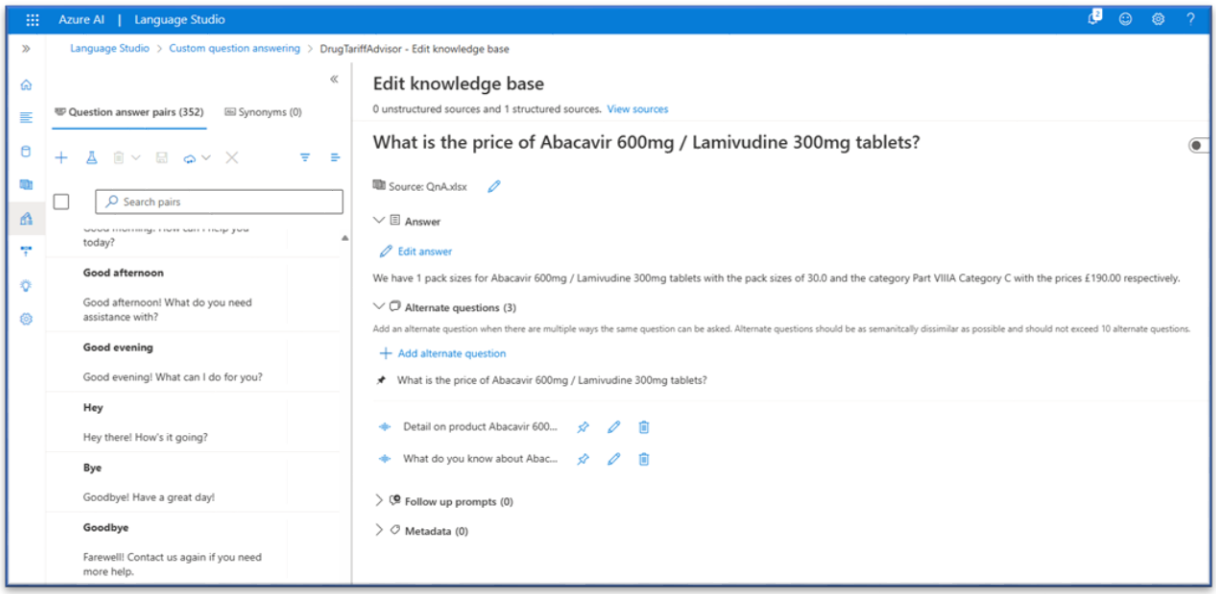

4. The project is loaded and the source Excel file, created in the previous steps, is added. This is then verified in the portal and confirmed in the 'Edit Knowledge Base'.

   In the Knowledge Base, it's evident that all the questions from the Excel file have been added. This includes dataset questions, FAQs, and greetings.

   The screenshots below clearly show that all the QnAs from the Excel file, along with the alternate questions, FAQs, and greetings, have been successfully loaded


Open
Arunkumar - Personal › Masters › SIG788 › Task6
Search Task6
Organize
New folder
Home
Gallery
Apps
Attachments
Desktop
Documents
Masters
Name
Status
Date modified
Type
Size
QnA.xlsx
14-04-2024 01:23
Microsoft Excel W...
28 KB
File name: QnA.xlsx
Custom files (*.pdf;*.text;*.txt;*
Upload from mobile
Open
Cancel
Source name
File name
Classify file structure
Source name
Choose File
No file chosen
Auto-detect
Add all
Cancel

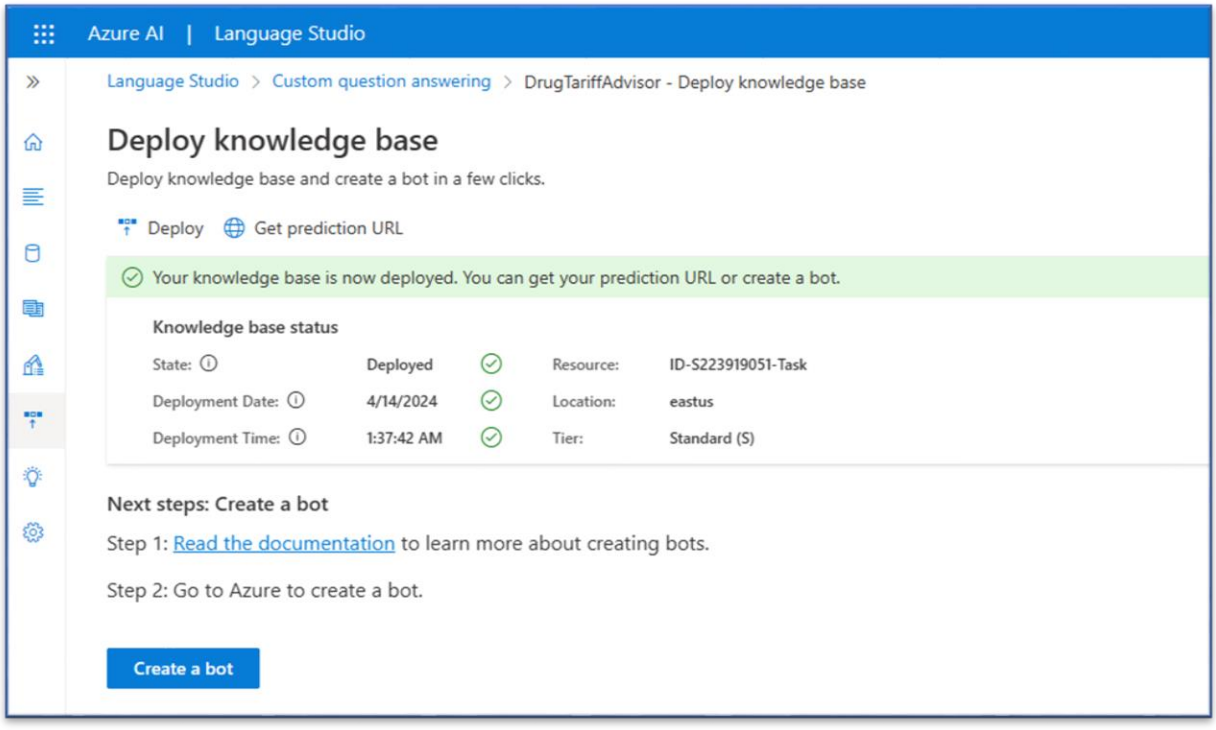

Add files
You can add up to 10 files at a time. Classification of file structure is auto-detected by default, but you can set your own file structure classification if preferred.
Add file
Edit
Delete
Source name
File name
Classify file structure
DrugTariffAdvisor
QnA.xlsx
Auto-detect
Add all
Cancel


Azure AI | Language Studio
Language Studio › Custom question answering › DrugTariffAdvisor - Edit knowledge base
Question answer pairs (352)
Synonyms (0)
Search pairs
Good afternoon
Good afternoon! What do you need assistance with?
Good evening
Good evening! What can I do for you?
Hey
Hey there! How's it going?
Bye
Goodbye! Have a great day!
Goodbye
Farewell! Contact us again if you need more help.
Edit knowledge base
0 unstructured sources and 1 structured sources. View sources
What is the price of Abacavir 600mg / Lamivudine 300mg tablets?
Source: QnA.xlsx
Answer
Edit answer
We have 1 pack sizes for Abacavir 600mg / Lamivudine 300mg tablets with the pack sizes of 30.0 and the category Part VIIIA Category C with the prices £190.00 respectively.
Alternate questions (3)
Add an alternate question when there are multiple ways the same question can be asked. Alternate questions should be as semanitcally dissimilar as possible and should not exceed 10 alternate questions.
Add alternate question
What is the price of Abacavir 600mg / Lamivudine 300mg tablets?
Detail on product Abacavir 600...
What do you know about Abac...
Follow up prompts (0)
Metadata (0)

Deploy the project:

```
with authoring_client:
    # Step 3: deploy the project

    print("\n********************** Deploying the project **********************")

    deployment_poller = authoring_client.begin_deploy_project(
        project_name=project_name,
        deployment_name="production"
    )
    deployment_poller.result()

    # list all deployments
    deployments = authoring_client.list_deployments(
        project_name=project_name
    )

    print("view project deployments")
    for d in deployments:
        print(d)
```

```
********************** Deploying the project **********************
view project deployments
{'deploymentName': 'production', 'lastDeployedDateTime': '2024-04-13T20:07:42Z'}
```



## Test the project:

Testing the project with 1 question to ensure the model is working

```
# 1. Test by asking a question
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))

with qna_client:
    question= "Detail on product Abatacept 125mg/1ml solution for injection pre-filled disposable devices?"
    output = qna_client.get_answers(
        question=question,
        top=3,
        confidence_threshold=0.5,
        include_unstructured_sources=True,
        short_answer_options=qna.ShortAnswerOptions(
            confidence_threshold=0.5,
            top=1
        ),
        project_name=project_name,
        deployment_name="test"
    )
    if output.answers:
        best_candidate = [a for a in output.answers if a.confidence and a.confidence > 0.5][0]
        print("Q: {}".format(question))
        print("A: {}".format(best_candidate.answer))
    else:
        print(f"No answers returned from question '{question}'")
```

```
Q: Detail on product Abatacept 125mg/1ml solution for injection pre-filled disposable devices?
A: We have 1 pack sizes for Abatacept 125mg/1ml solution for injection pre-filled disposable devices with the pack sizes of 4.0
and the category Part VIIIA Category C with the prices £1209.60 respectively.
```

## Testing with Chit-Chat:

```
# 2. Testing by initiating a chit-chat.

qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))
with qna_client:
   first_question= "Hello"

   output = qna_client.get_answers(
      question=first_question,
      top=3,
      confidence_threshold=0.5,
      include_unstructured_sources=True,
      short_answer_options=qna.ShortAnswerOptions(
         confidence_threshold=0.5,
         top=1
      ),
      project_name=project_name,
      deployment_name="test"
   )
   if output.answers:
      best_candidate = [a for a in output.answers if a.confidence and a.confidence > 0.2][0]
      print(u"Q: {}".format(first_question))
      print(u"A: {}".format(best_candidate.answer))

print('\n**********************************************************************
***************\n')
   else:
      print(f"No answers returned from question '{first_question}'")
```

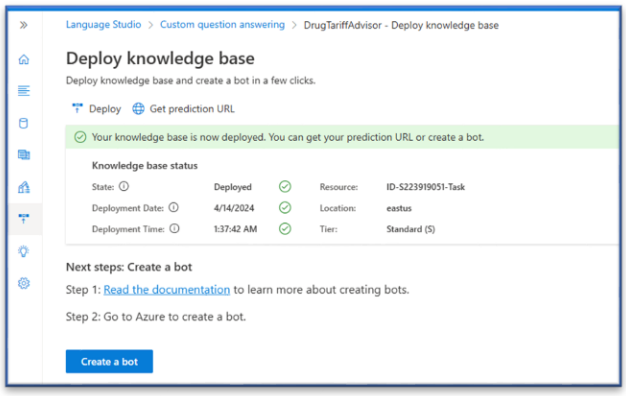
```
    if best_candidate.qna_id:
        followup_question = "What is the Drug Tariff?"

        output = qna_client.get_answers(
            question=followup_question,
            top=3,
            confidence_threshold=0.5,
            answer_context=qna.KnowledgeBaseAnswerContext(
                previous_question=first_question,
                previous_qna_id=best_candidate.qna_id
            ),
            short_answer_options=qna.ShortAnswerOptions(
                confidence_threshold=0.5,
                top=1
            ),
            include_unstructured_sources=True,
            project_name=project_name,
            deployment_name="test"
        )
        if output.answers:
            print(u"Q: {}".format(followup_question))
            print(u"A: {}".format(output.answers[0].answer))

print('\n**********************************************************************
**********\n')
        else:
            print(f"No answers returned from question '{followup_question}'")
```

```
Q: Hello
A: Hi there! What can I help you with?

**********

Q: What is the Drug Tariff?
A: NHS Prescription Services produces the Drug Tariff on a monthly basis on behalf of the Department of Health and Social Care
(DHSC).

The Drug Tariff outlines:

what will be paid to pharmacy contractors for NHS services provided either for reimbursement or for remuneration rules to follo
w when dispensing value of the fees and allowances you will be paid drug and appliance prices you will be  paid

The preface of the Drug Tariff contains additions, deletions and any other alterations to the Drug Tariff.

Definitions:

This section outlines the meaning of common terms used in the Tariff.

Where to access the Drug Tariff

The Drug Tariff is available in two versions on our website, a PDF version and the electronic Drug Tariff (eDT).

The PDF version is a duplicate of the paper tariff. This can be downloaded and used offline.

The electronic tariff requires a continuous connection to the internet. There are no page numbers, and the format is different
to the paper Tariff.

**********
```

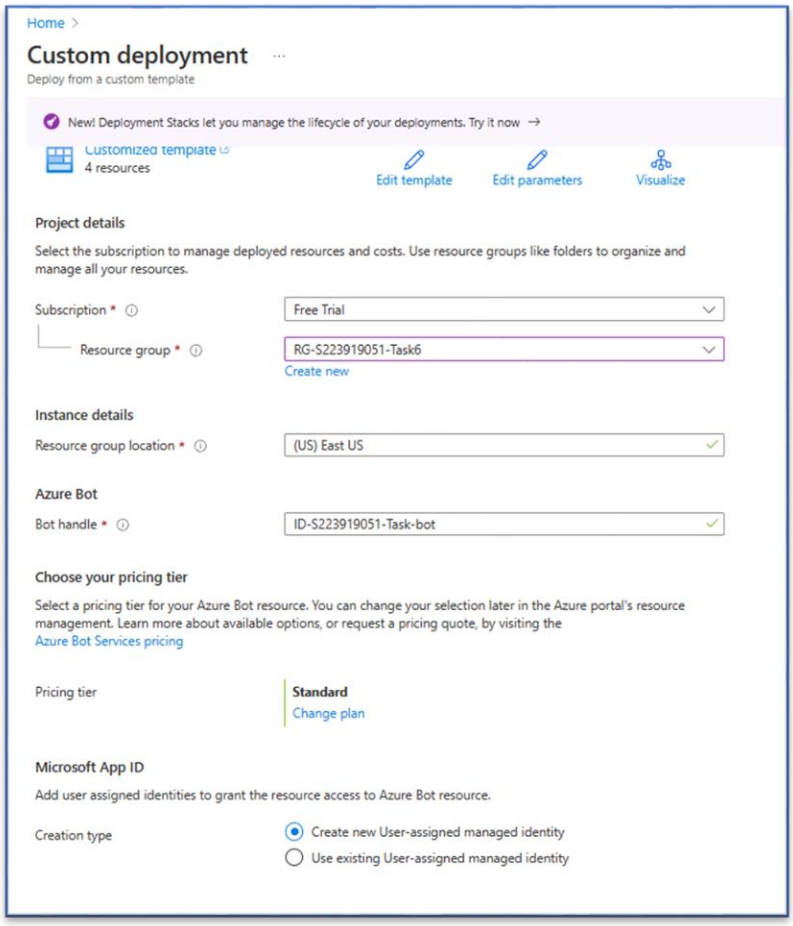
## Create the bot:

As now we have tested in Python SDK with the question, let's create the bot service in Azure portal.

1. Click Create a Bot.

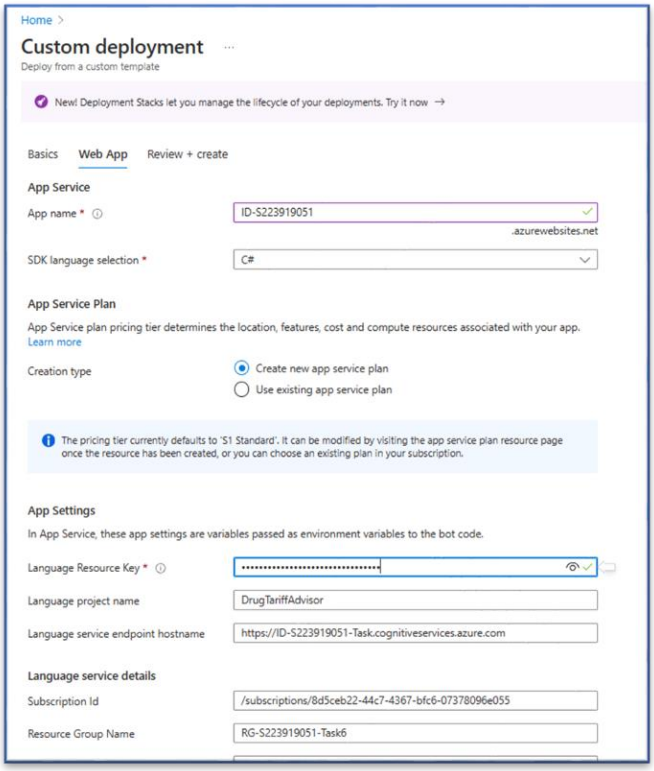


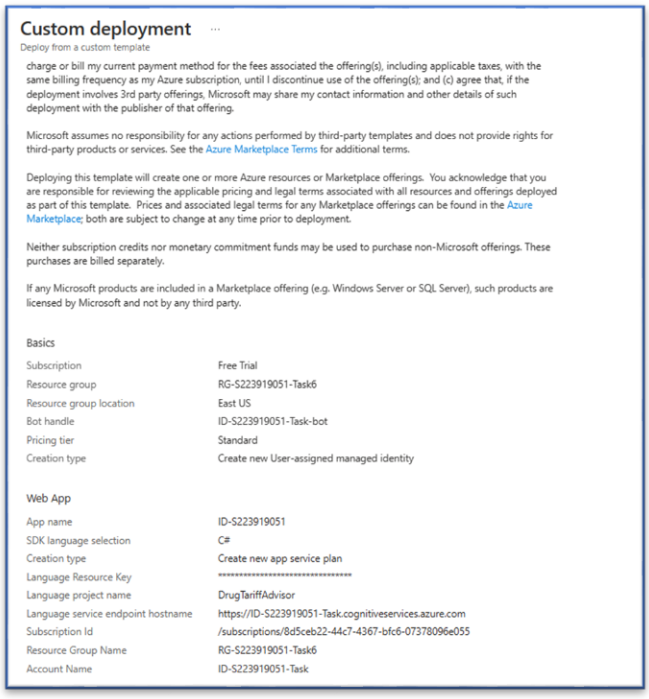

2. Create custom deployment to create a bot




3. Click Next and Provide the following

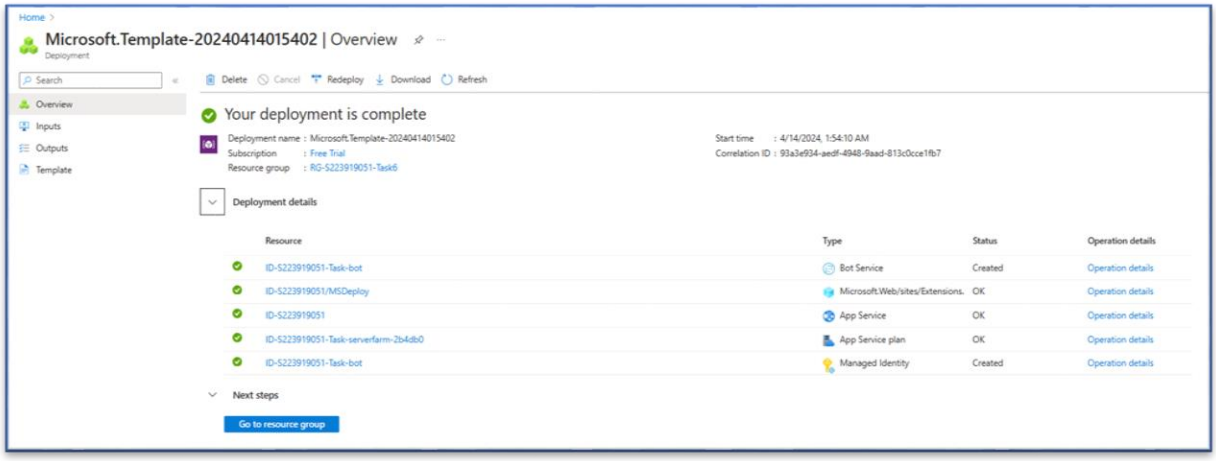
   a. App Name
   b. SDK Language to C#
   c. Select create new app service plan
   d. Get & update the Language resource Key from the Language deployed resource
   e. Then click on review + Create
   f. Then after validation click **Create**

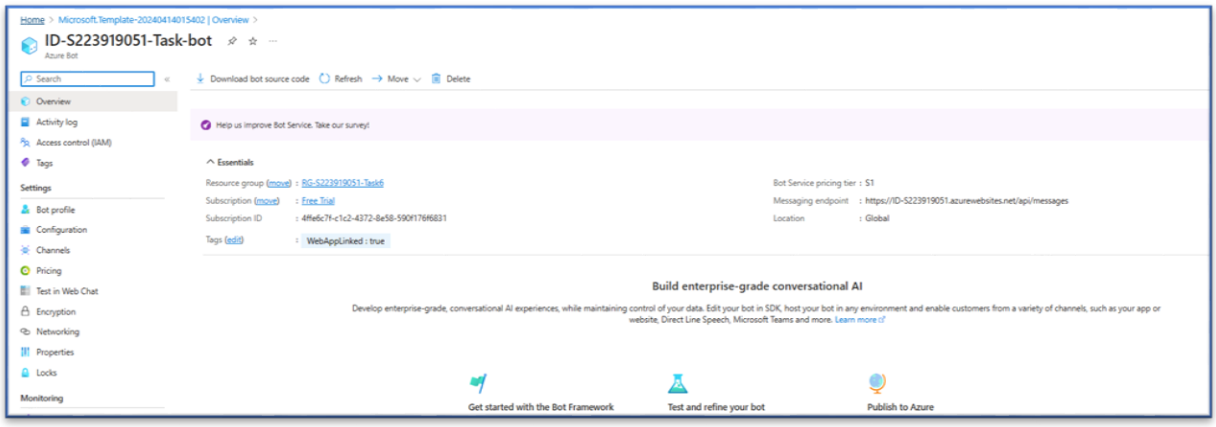


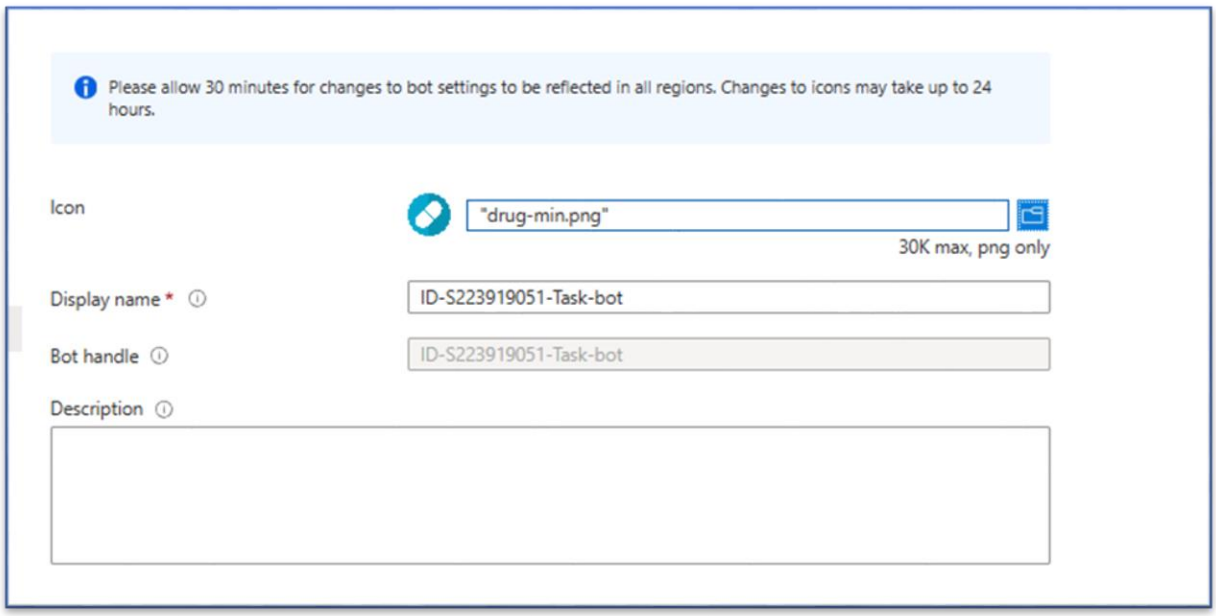

Currently deployment in progress, the deployment would create the following resources

1. App Service
2. App service plan
3. Managed Identity
4. Microsoft.Web/sites/Extensions
5. Bot Services



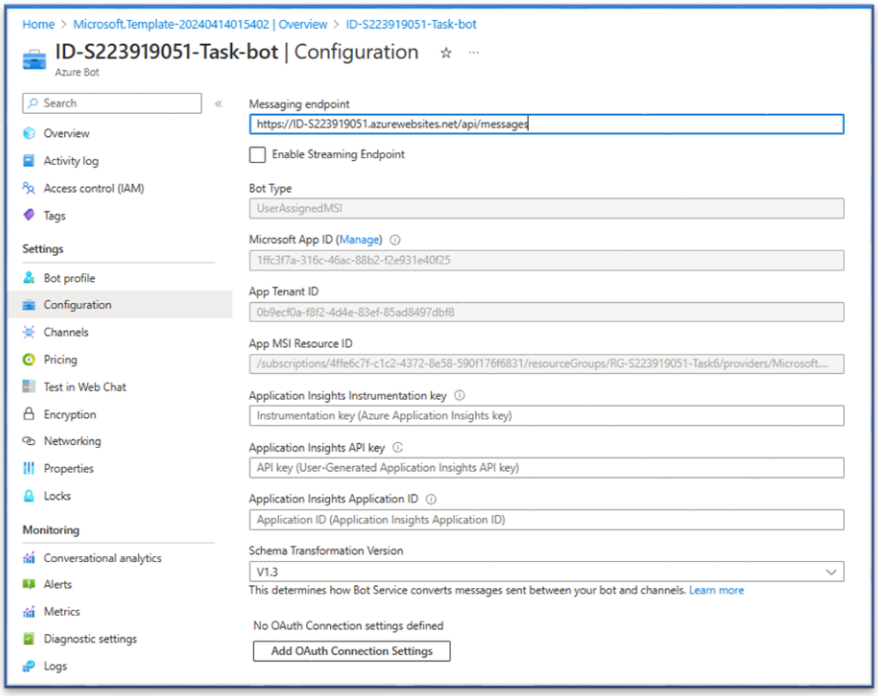




Drug icon has been updated to the model.



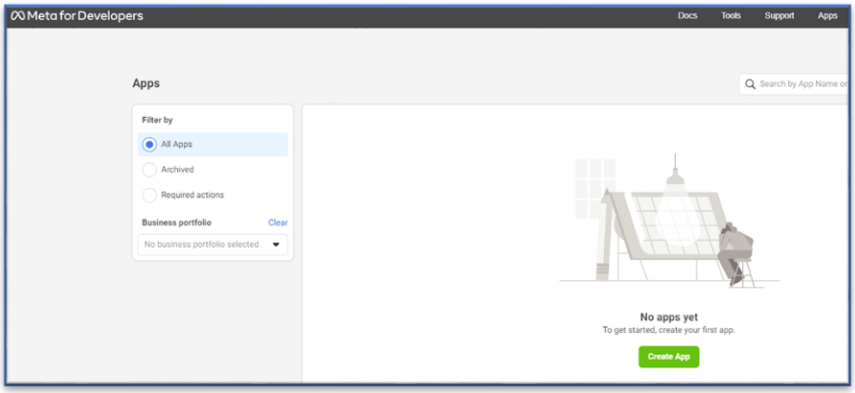

## Configuration page:

Below is the configuration details of the Bot service which includes messaging endpoint, BotType, AppID, Tenant ID, MSI resource ID, etc..

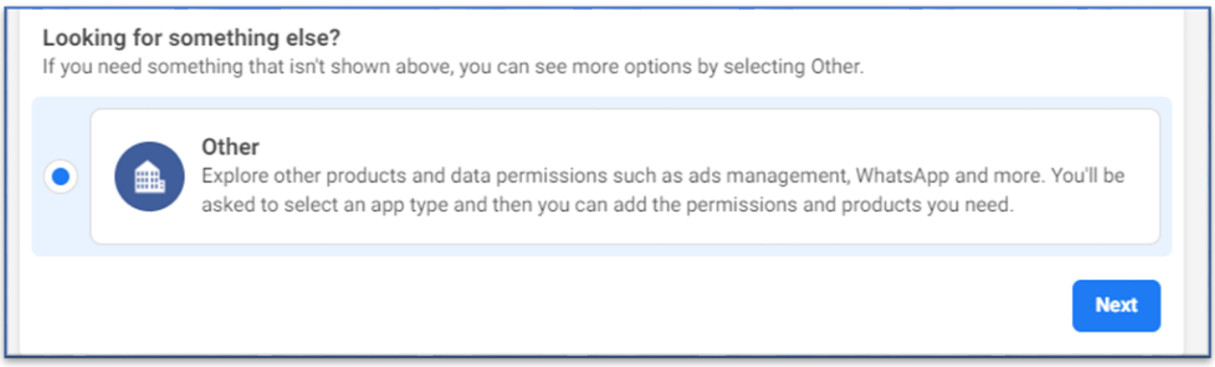



## Channel:

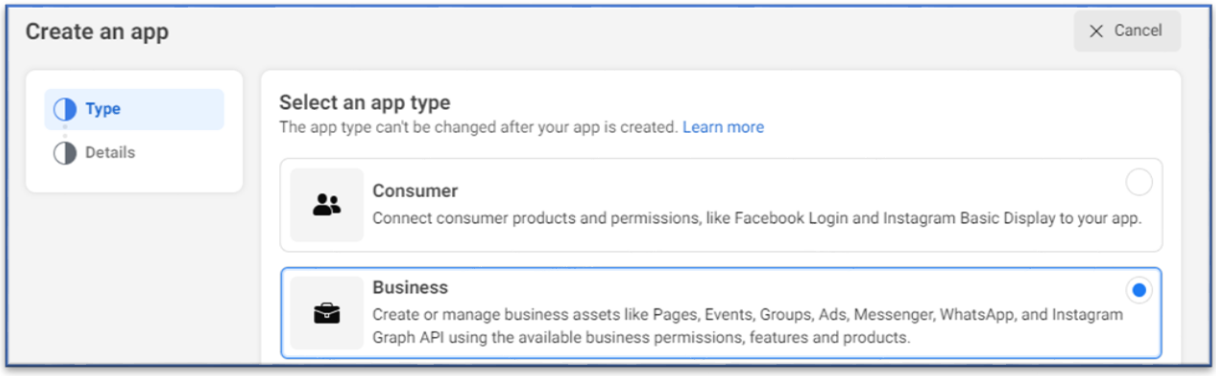
1. Click on Facebook channel & then go to https://developers.facebook.com/
2. Login into the facebook developer using the personal username and password.
3. Click on create new app



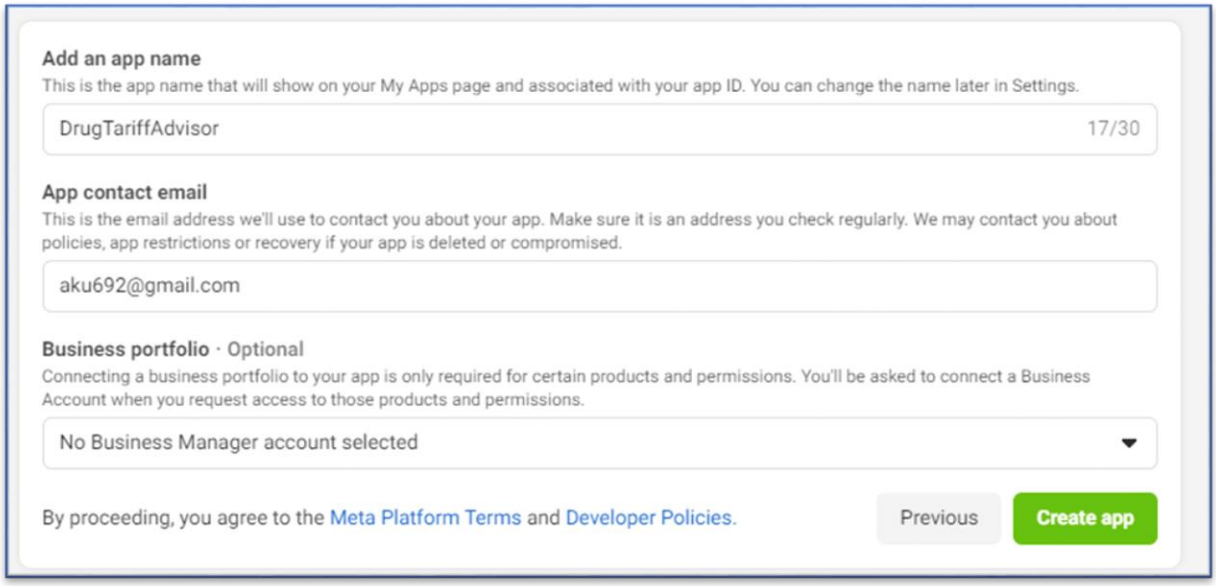

4. Select Other & next



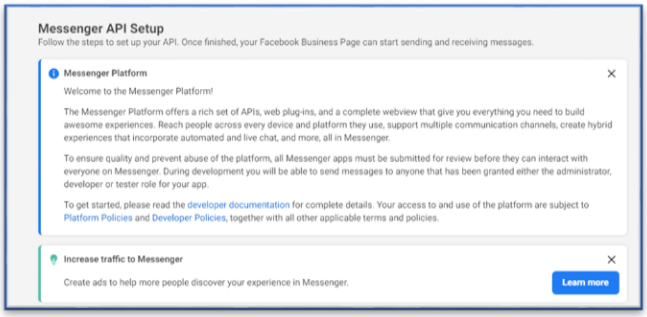

5. Click Consumer and click next



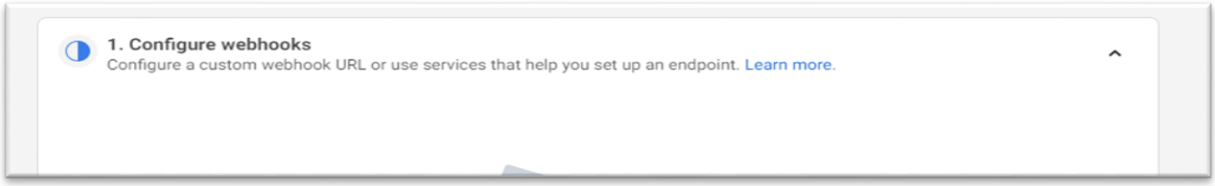

6. Name the App “” and create app



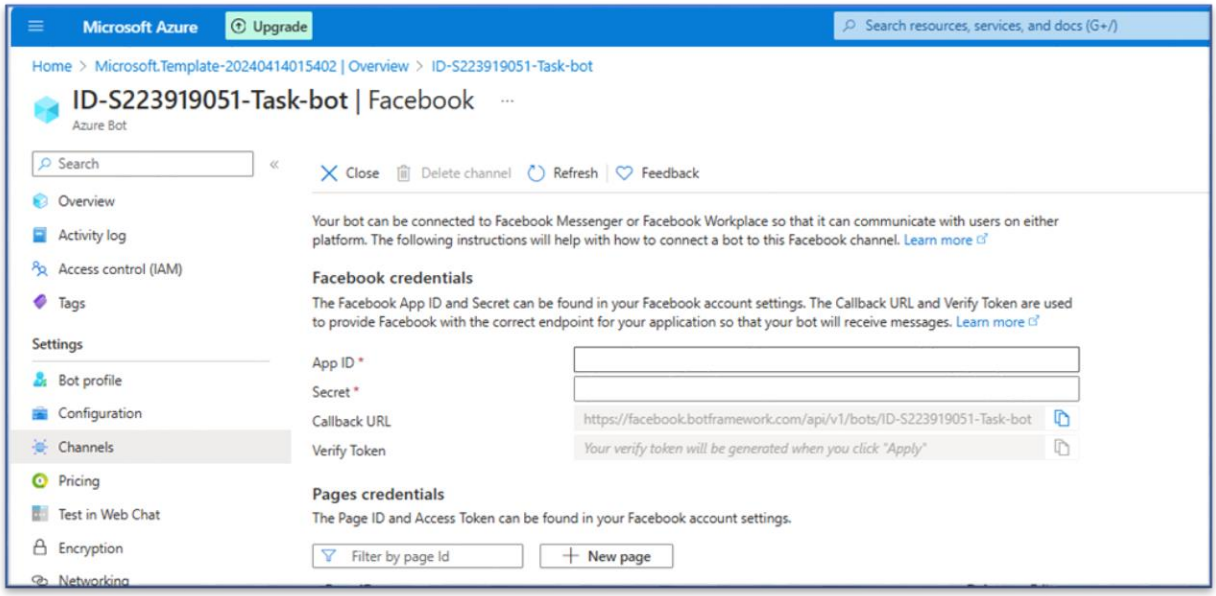

7. Add Product to app set up messenger & Configure the object.



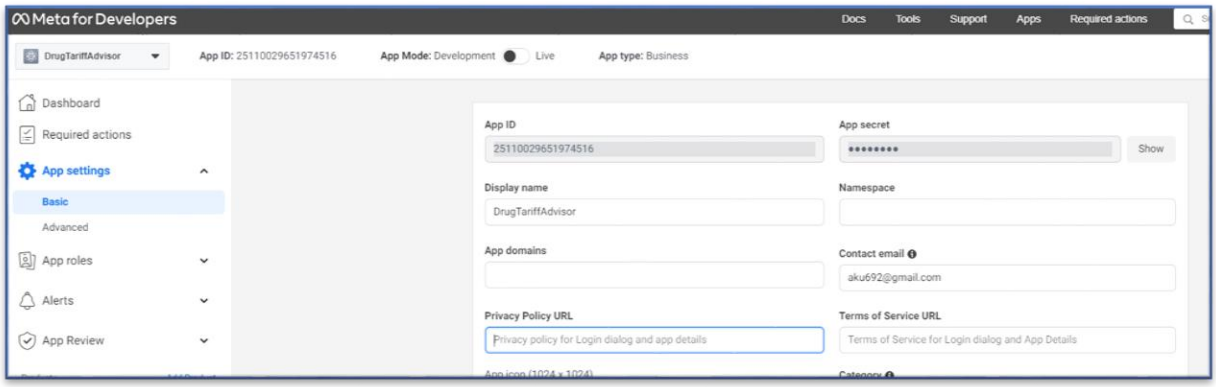

8. Configuration:



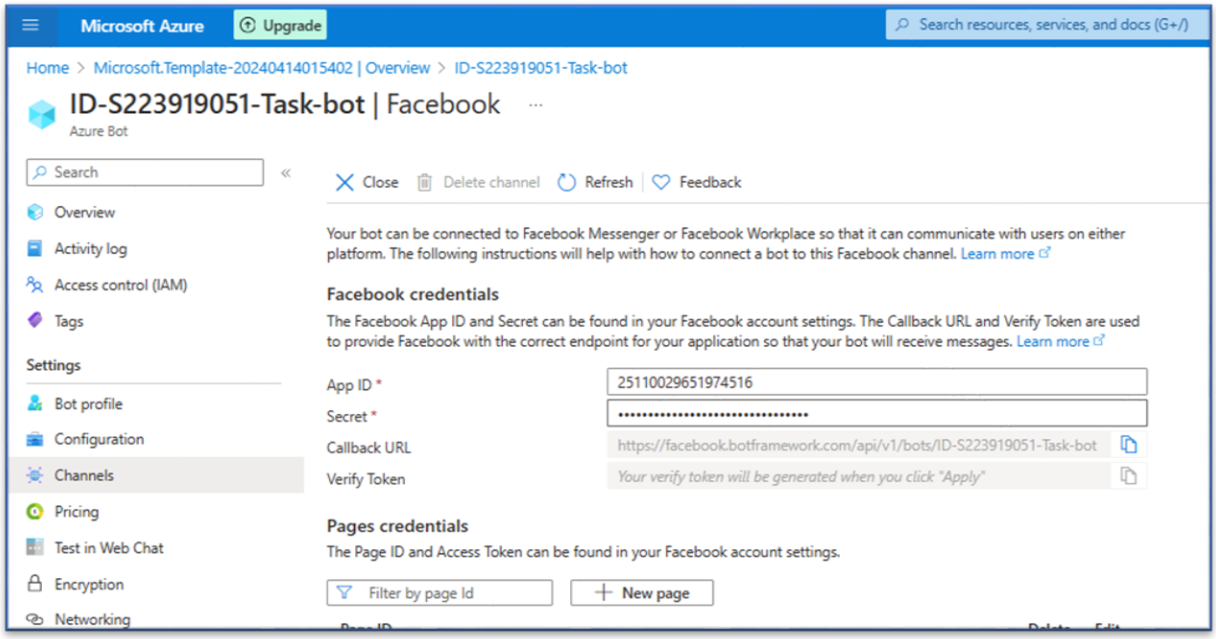

Configuring webhooks by getting into the Azure portal to create facebook channel



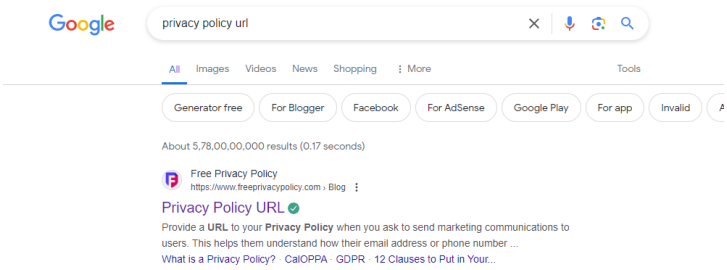

Get the AppID and Secret from the Facebook developer page in app setting basic.



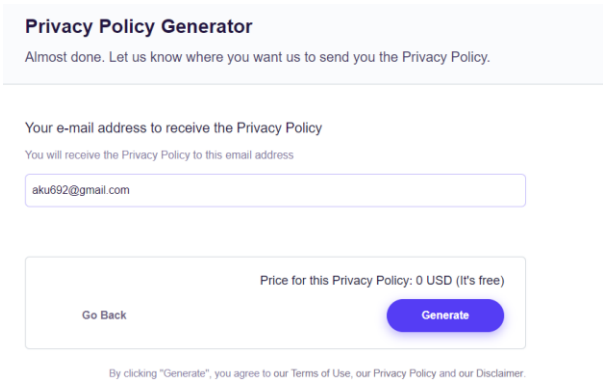

Updated the same in Azure portal

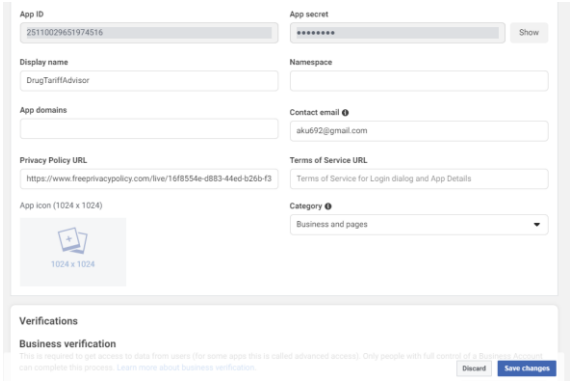



Then go to Facebook developer & before we need to create the privacy policy URL
Goto https://app.freeprivacypolicy.com/

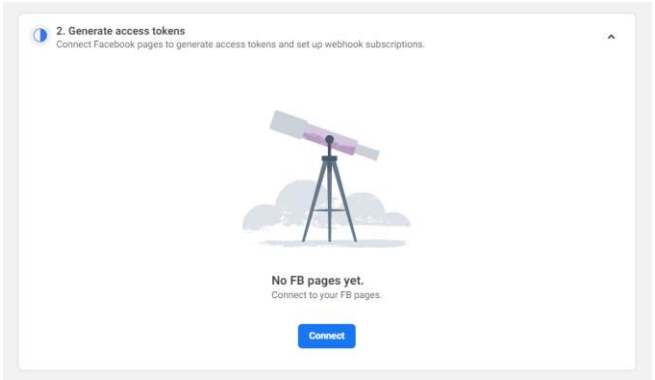



Click on free privacy policy URL & click generate the URL and update the same in the facebook developer Privacy policy URL & select category and save changes

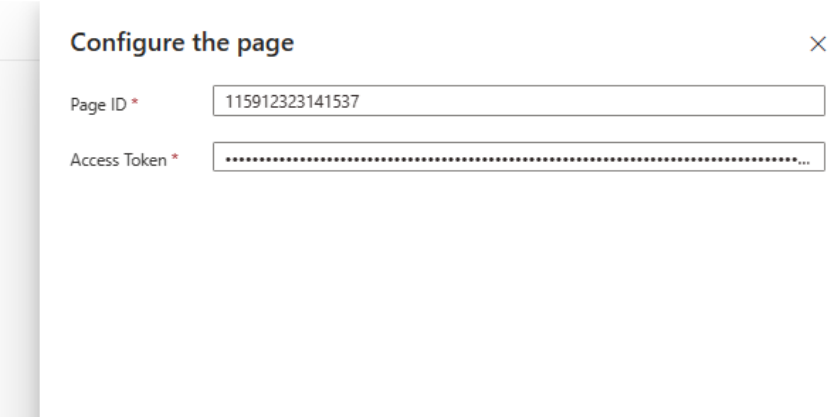


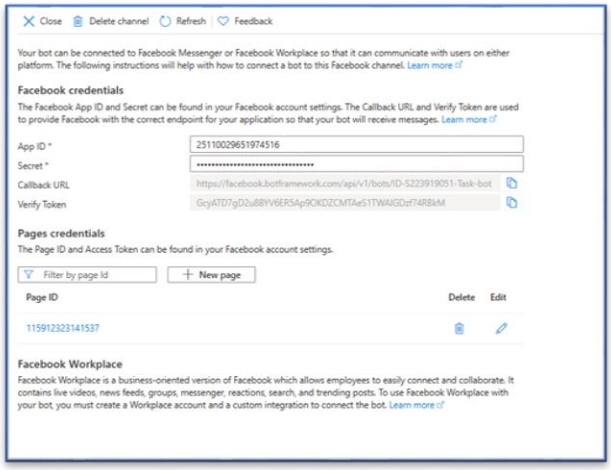




Now click on generate access token in Messenger API settings to generate the access token for the azure portal

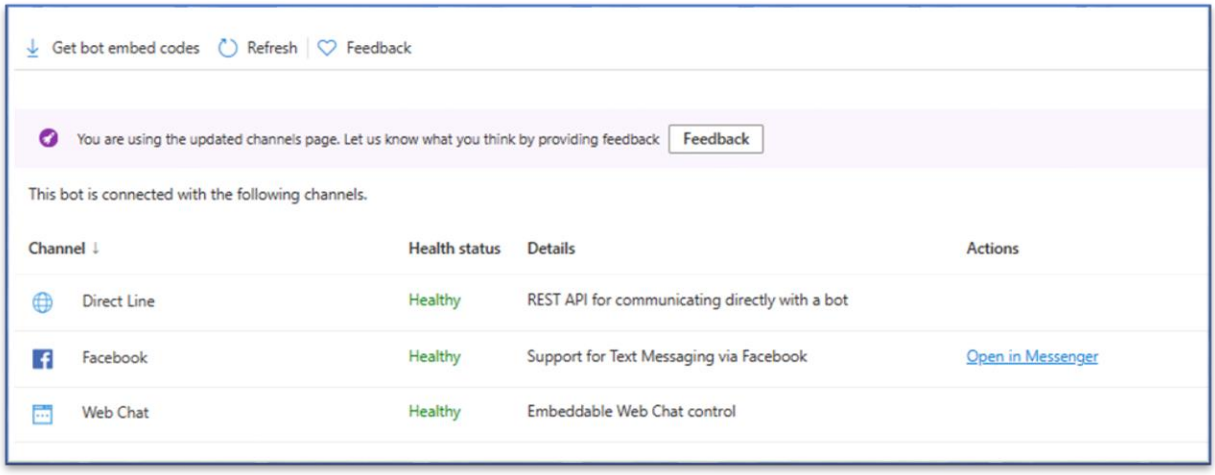



Then create the sign in to the facebook account to authenticate and create the page access token and ID then in **Azure portal** updated the page ID and Access Token and click **Apply**

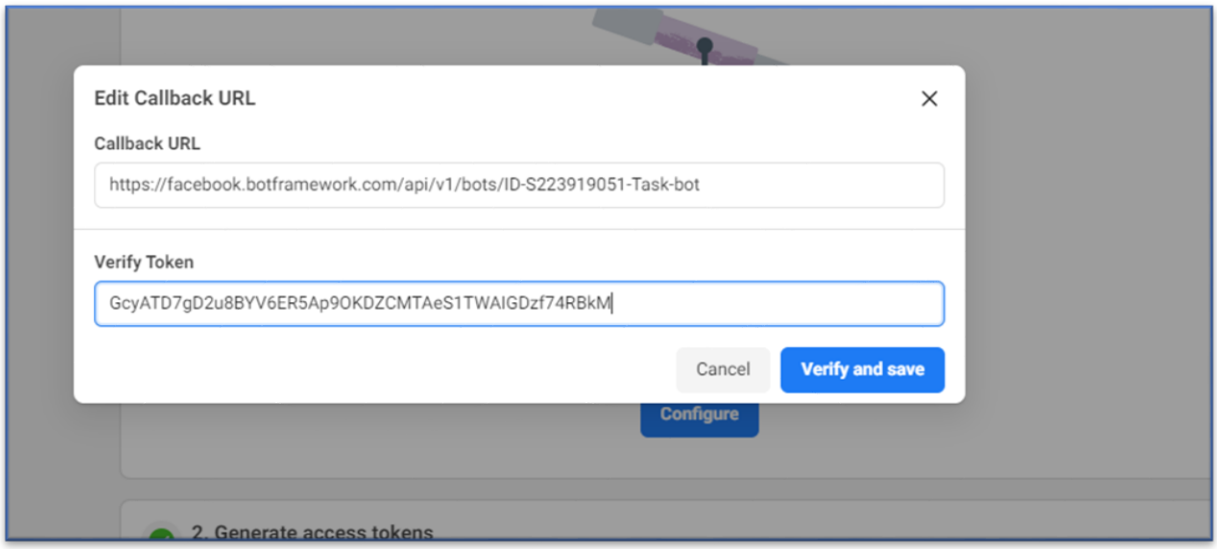



This would create the Facebook channel in the Azure Bot



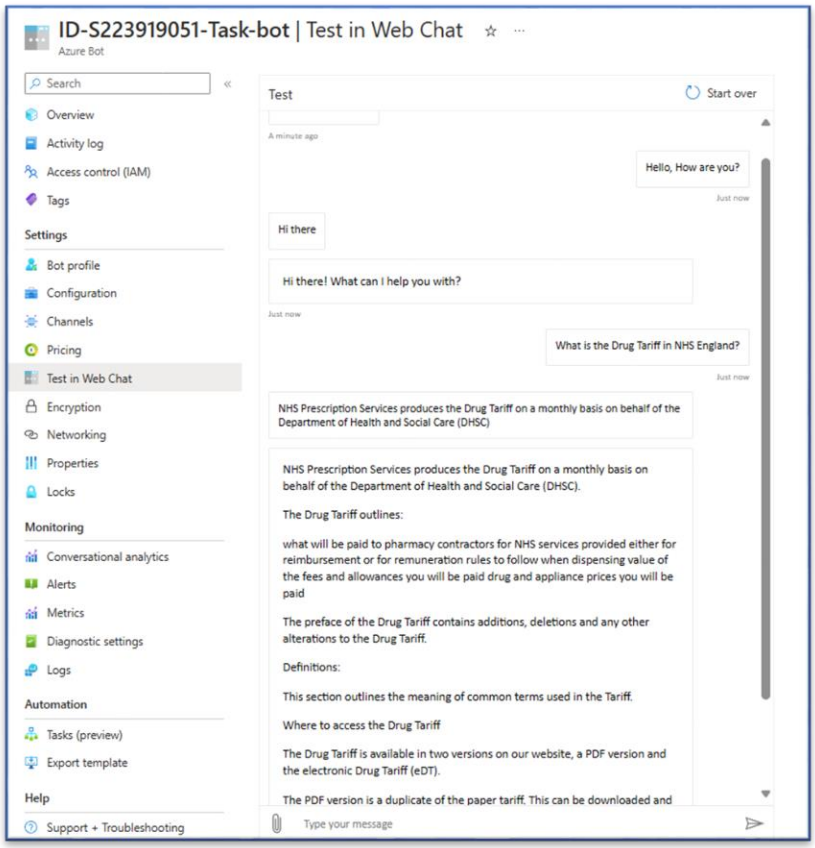
Then go back to Facebook developer to configure the Webhooks by providing the Callback URL and token created in the Microsoft azure portal.




Click verify and save.
We are all set to open the messenger and test the model but we will test the bot in the Webchat and then in the messenger.

## Webchat Test

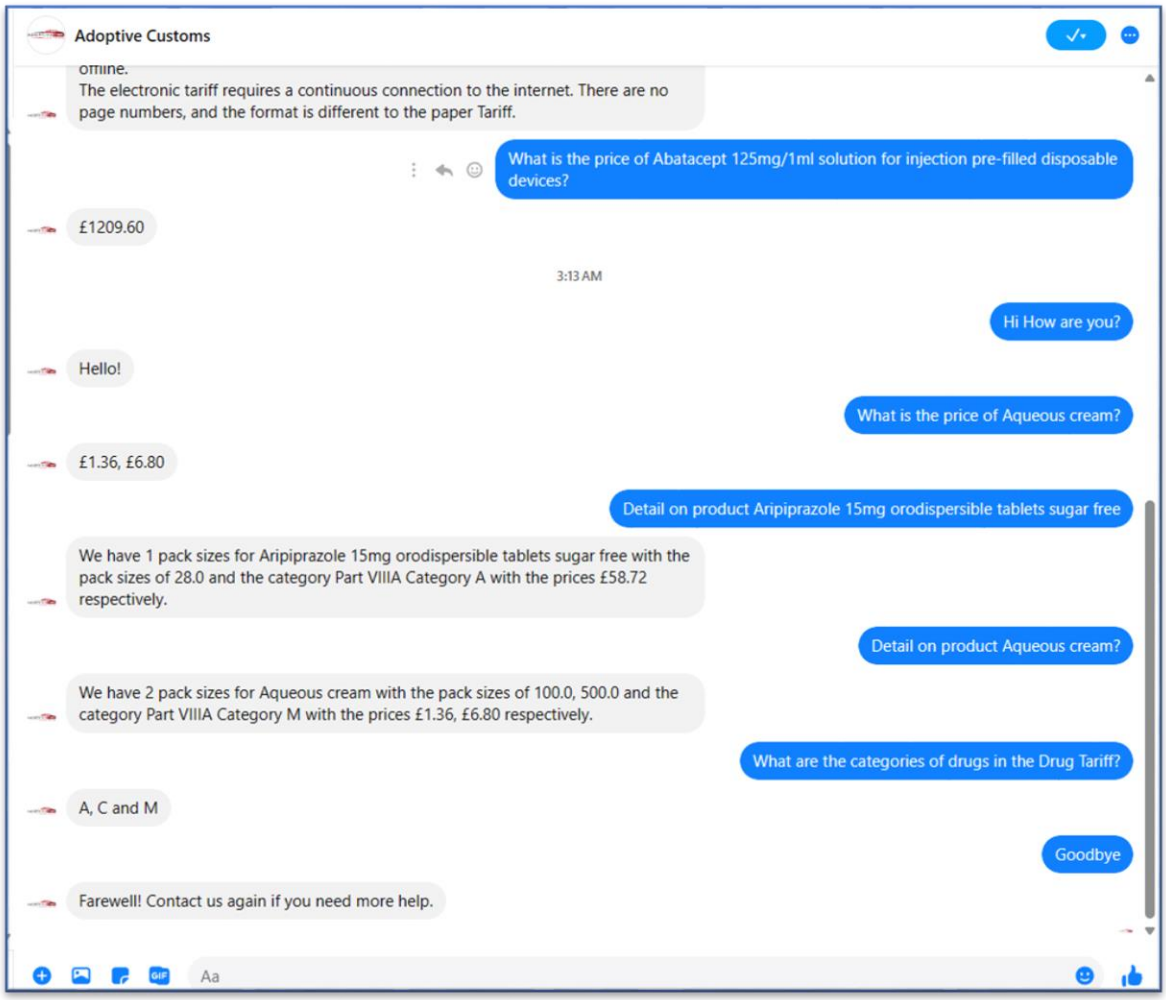
Click test in Webchat:



## Facebook Messenger Test:

Go to Channels, and click on open in messenger and fire questions to DrugAdvisorBot services.

Below is the outcome of the service.




As successfully completed the project, now let's delete the resource and resource group to ensure the billing is under control.

## Conclusion:

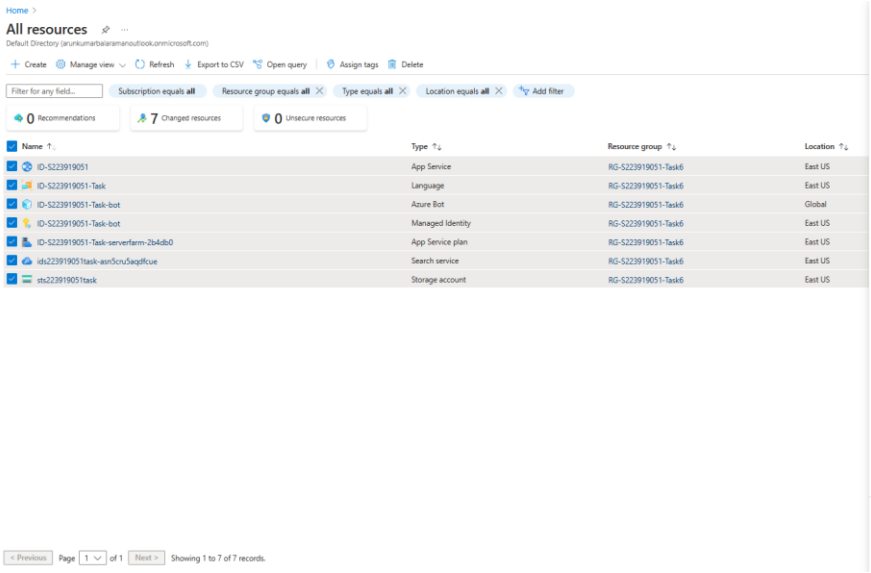
The Drug Tariff Advisor Bot, powered by Azure Cognitive Language Studio, provides healthcare professionals in England with easy access to up-to-date drug tariff information. It enhances decision-making and streamlines inventory management, contributing to healthcare efficiency.

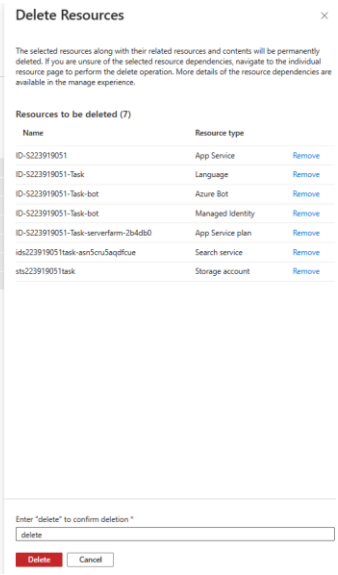
## Potential future enhancements include:

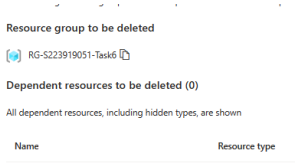
- Integrating with other healthcare platforms for a unified user experience.
- Adapting the bot for different languages and regional drug tariffs.
- Implementing a feedback mechanism for continuous improvement.
- Exploring advanced NLP features for enhanced interactivity.

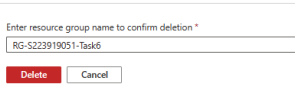
## Clean up Activity:

As completed the project, cleaning up the resources and resource group to reduce cost on the Azure Student subscription.




**All the resources are deleted!!**

## References: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