PROJECT REPORT

TOPIC: Intelligent Customer Help Desk with Smart Documentation Understanding

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Category: Artificial Intelligence

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1. Introduction

1.1 Overview:

We will be able to write an application that leverages multiple Watson AI services like Discovery, Assistant, Cloud Function and Node Red. By the end of the project we will learn best practices of combining Watson Services, and how we can build interactive retrieval system with discovery + assistant.

- Project Requirements: Python, IBM Cloud, IBM Watson
- Functional Requirements: IBM Cloud
- Technical Requirements: Python, Watson AI, ML
- Software Requirements: Watson Assistant, Watson Discovery
- Project Deliverables: Smartinternz Internship
- Project Duration: 1 Month

1.2 Purpose

The project's goal is to make a customer care chatbot which can answer simple questions such as location of the store, directions to the store, store timings or even book appointments. Furthermore, if there are some queries regarding the product and the information is available in the user's manual then the chatbot can extract the result from the manual as well.

The main objective of this chatbot is to support and scale business teams in their relations with customers.

2. Literature Survey

2.1 Existing Problem

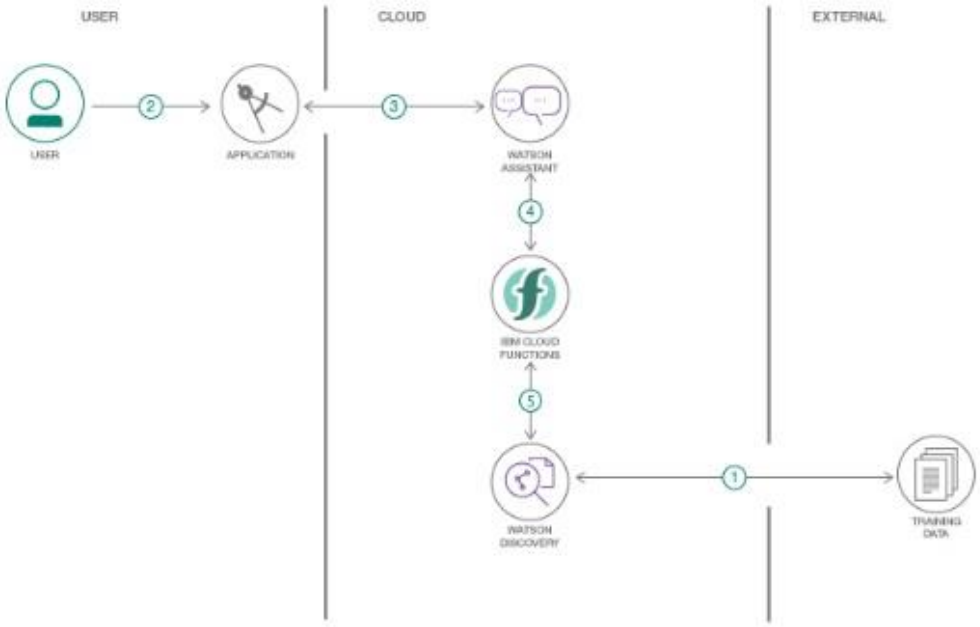
Earlier there was an issue where whenever a customer care executive had to be replaced, they had to be trained all over again which costed quite a lot of capital to the company.

2.2 Proposed Solution

To fix the problem mentioned above chatbots where introduced. Chatbots required a one-time investment but thereafter it reduced a lot of expenditure which was earlier induced by the company. The virtual agent should be trained from some insight based on company backgrounds, working hours, store locations and product related information.

3. Theoretical Analysis:

3.1. Block Diagram



1. The document is annotated using Watson Discovery SDU.

2. The user interacts with the backend server via the app UI. The frontend app UI is a chatbot that engages the user in a conversation.

3. Dialog between the user and backend server is coordinated using a Watson Assistant dialog skill.

4. If the user asks the product operation question, a search query is passed to a predefined IBM Cloud Function action.

5. Cloud function action will query the Watson Discovery service and return the results.

3.2 Hardware/Software Designing

- Create IBM Cloud services.
- Configure Watson Discovery
- Create IBM Cloud Function action
- Configure Watson Assistant
- Create flow and configure node
- Deploy and run node red app

4. EXPERIMENTAL INVESTIGATIONS

1) **Create IBM Cloud Services**
   a. Watson Discovery
   b. Watson Assistant
   c. Node Red

2) **Configure Watson Discovery**

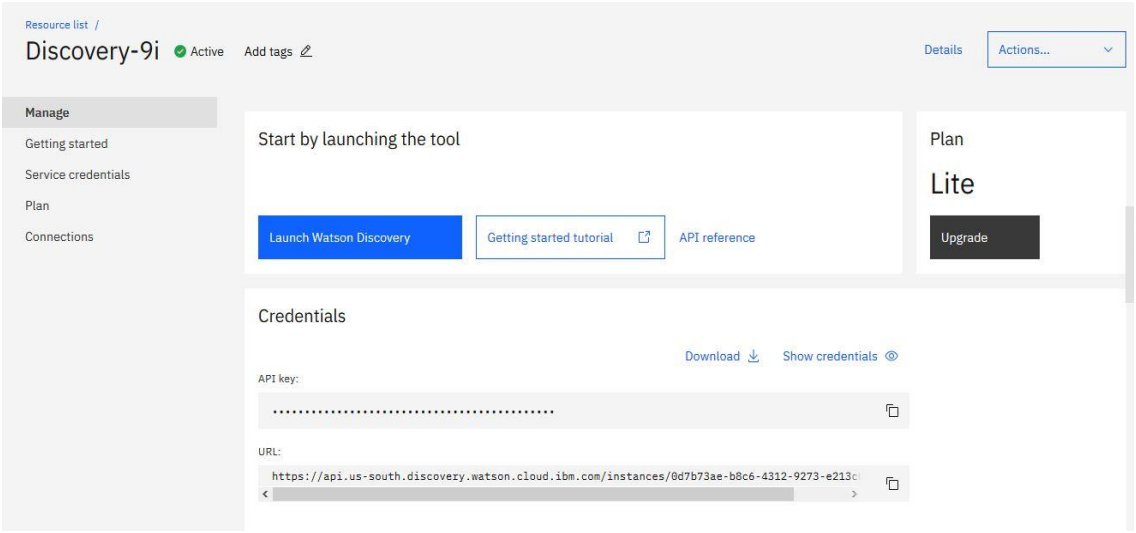
After creating and launching the discovery from the catalog, Import the document required for smart document understanding. I have selected the Samsung washing machine user manual.

The result of the queries performed without configuring the data present in the document won't be accurate. The results improve significantly after applying SDU (Smart Document Understanding). This can be done by configuring the document by labelling each word or element present in the document as their respective label such as title, subtitle, text, image and footer.

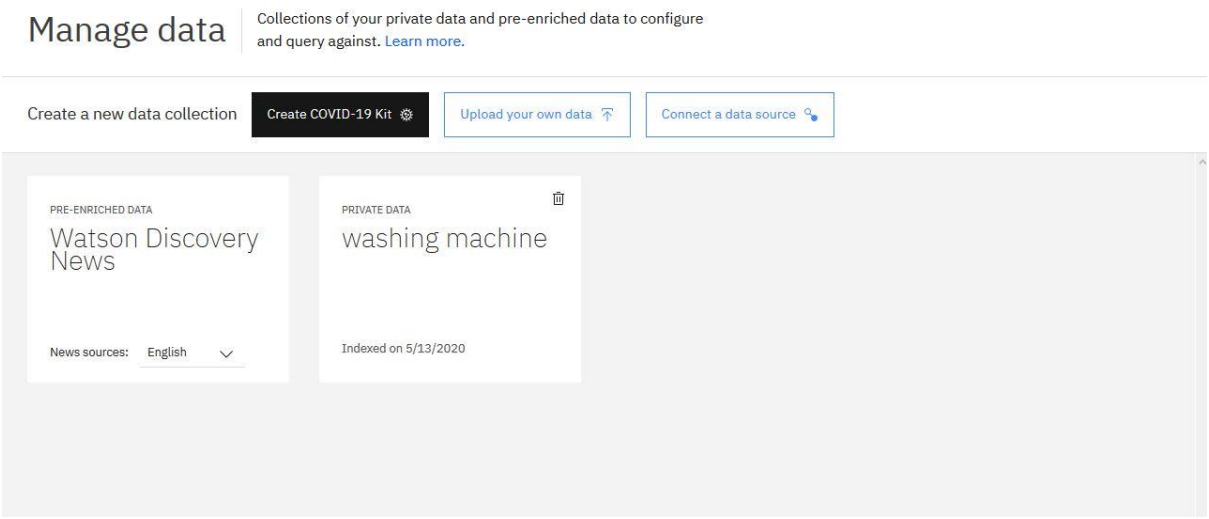
In the lite plan we are provided with limited content of IBM Watson, the labels help us in segmentation of the document which helps the discovery to understand the document better and provide better results. The results provided by the discovery can be improved, all the results are shown in assistant in which the discovery finds the sentiment to be positive i.e. matching between the question or query entered by the user and the data of the document.

Follow the below mentioned steps:

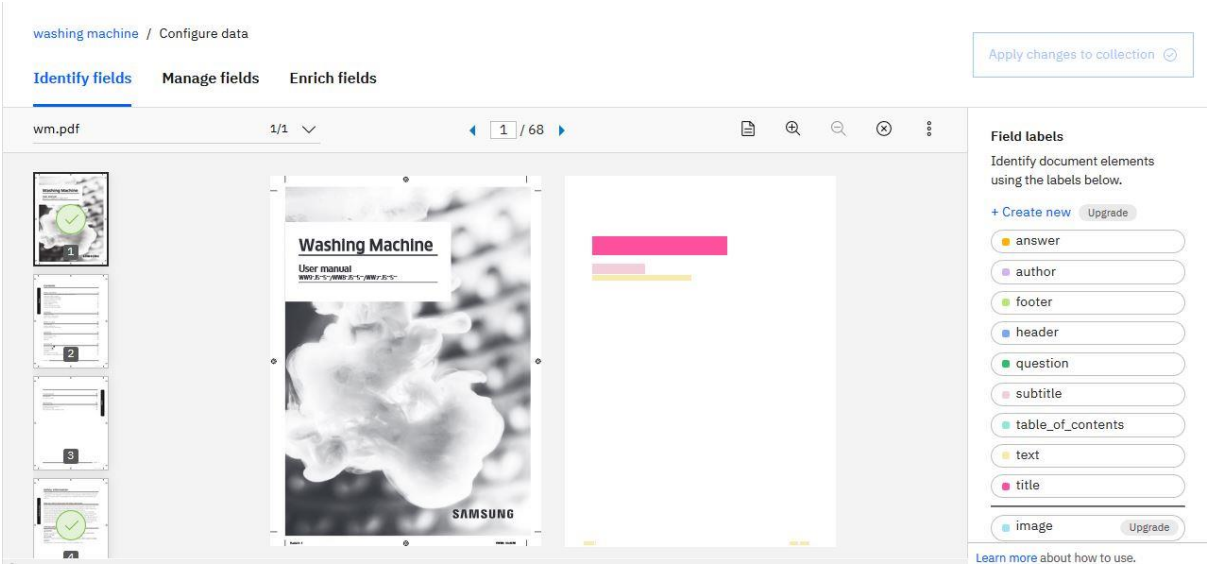
- After creating the discovery from the catalog, we will be redirected to this base page of discovery where the name of the discovery along with its API Key and URL are mentioned. These credentials will be used in further steps.



- Click on the Launch Watson Discovery to launch the discovery.
- Now in the next step we have to upload the data by clicking, upload your data. Here we have already uploaded the document.

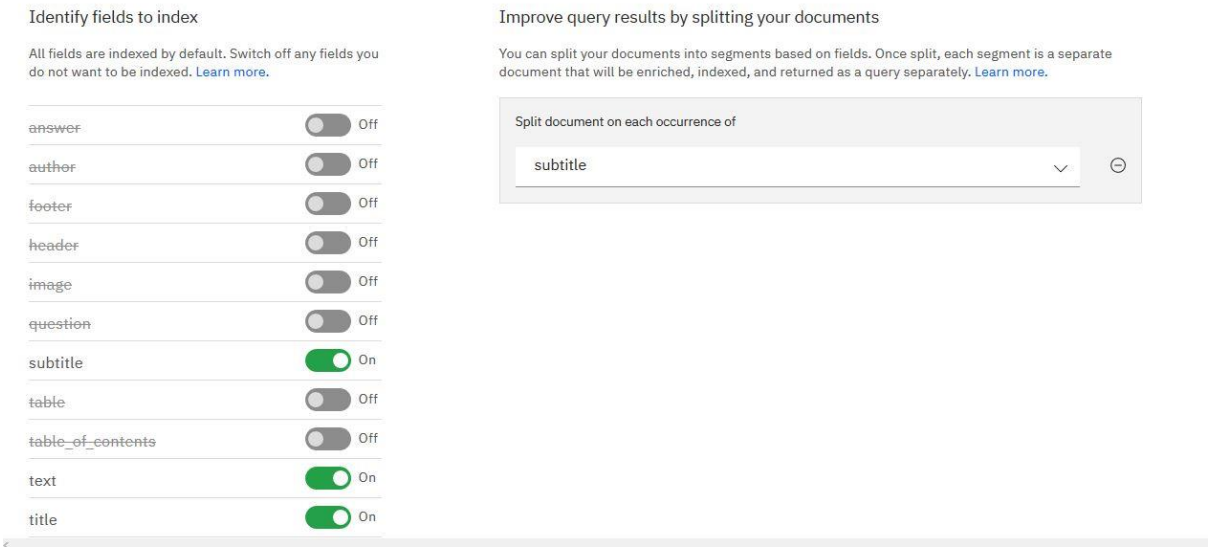


- After uploading the document, click on the build your own query and run an example. We will notice that the results are not very accurate and to improve this we need to configure the document by clicking on configure data. The next step is to annotate the document with SDU.
- Below is the layout of Identify fields tab of the SDU annotation panel:

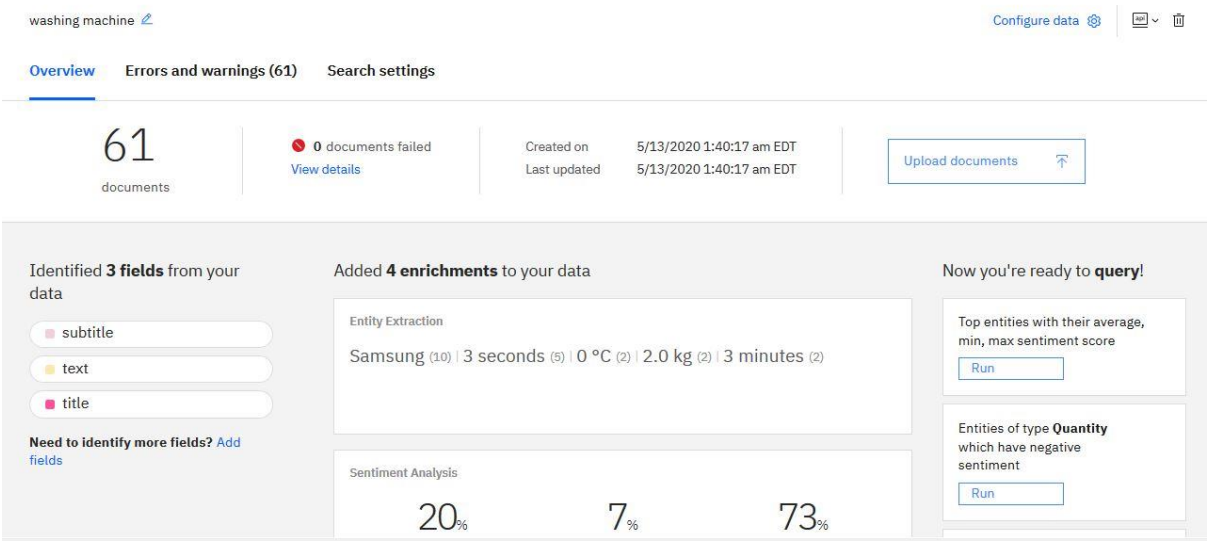


- The aim is to annotate most of the pages so that discovery can learn to distinguish between subfields.

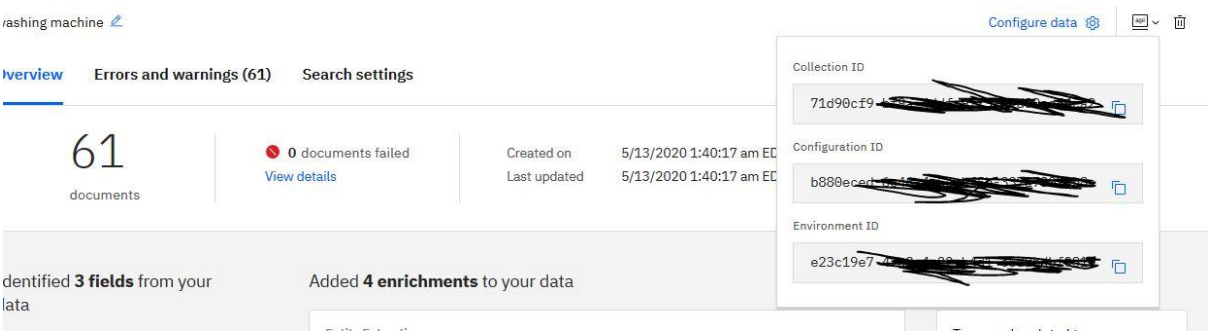
- For further segmentation and making the sub documents, we have to manage the fields. Here we are provided with the option of identifying field to index i.e. what all texts are important for us, as we can see in the below snip, we have turned on subtitle, title and text because they are the only labels which are useful for us. On the right side we have the option splitting the document as per choice of our label. We have selected subtitle here. This can vary as per different needs of user.



- It will take some time to process and after that we will have multiple documents as shown below, the document we uploaded earlier is segmented in 61 documents as shown below.

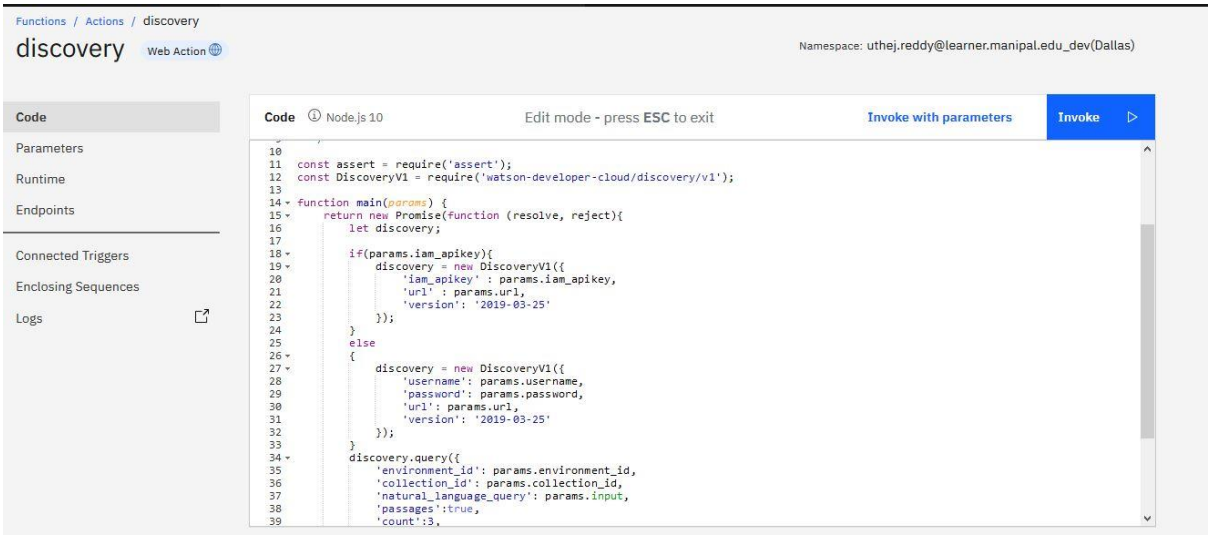


- Return to the query panel and try to build the same query as earlier and check the result. We will observe an improved result.
- Next, we have to store the credentials of Discovery which can be viewed as shown below:

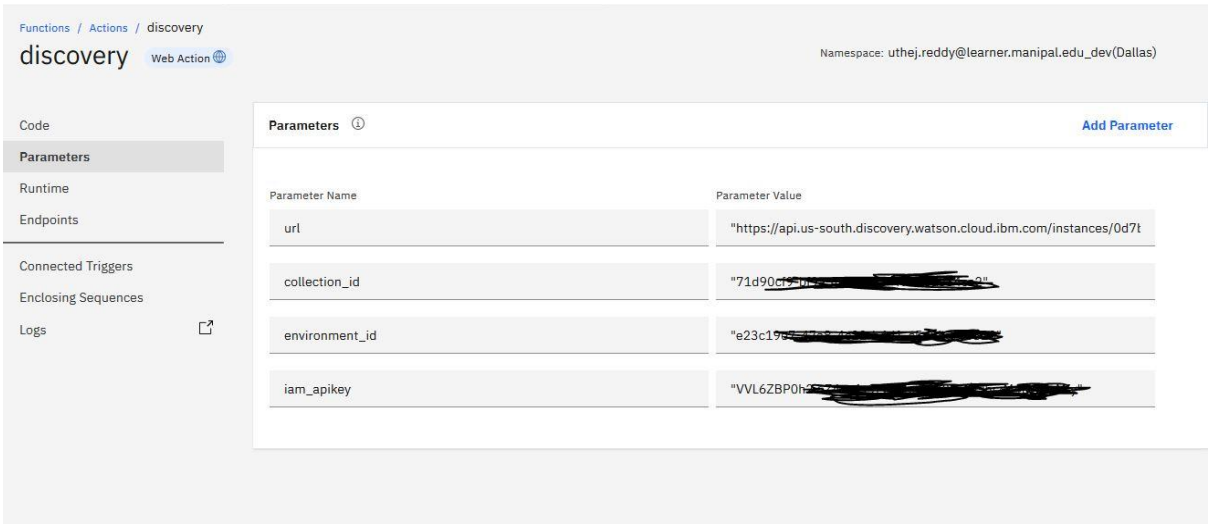


3. Cloud Function

It is used to link the discovery with assistant, so that our queries can be answered by the discovery. After selecting the action from the IBM catalog, we have to click on the action tab as shown on the left menu. Here we made the Information function.



• The parameters have to be in accordance to the variables used in the code and the parameter value are the Watson discovery credentials. After that we have to click on the endpoint and enable the web action which will generate a public URL and it will be further used.



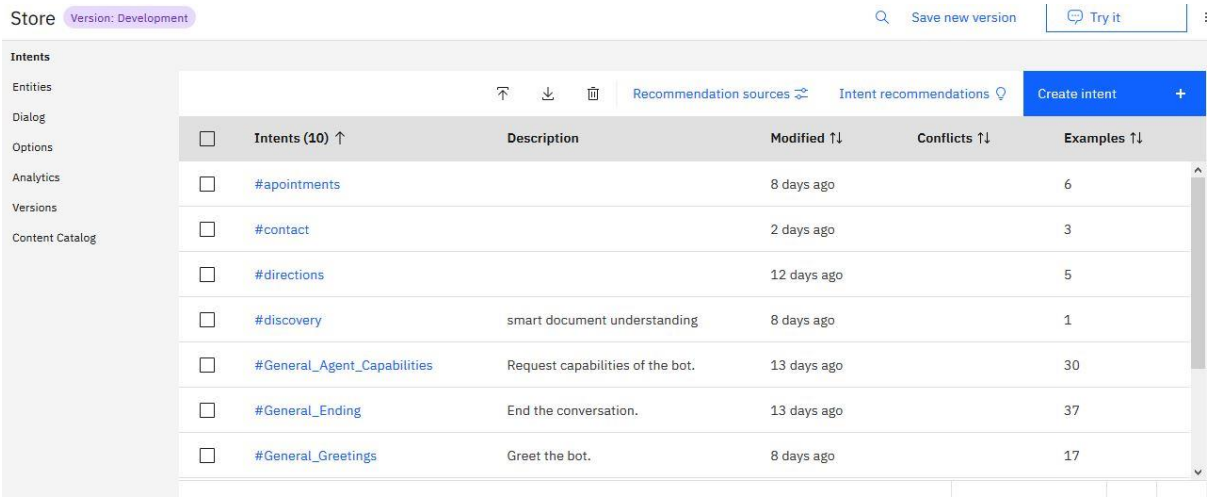
4. Watson Assistant

- Next, we have to make the Watson assistant and use the sample customer care skill for convenience. We can add intent related to product information and the related entities and dialog flow.

Intents- These are the categories which we mention or we expect the user input to be, for example: Greetings can be an intent and in it we can have examples as Good Morning, Good Evening and all.

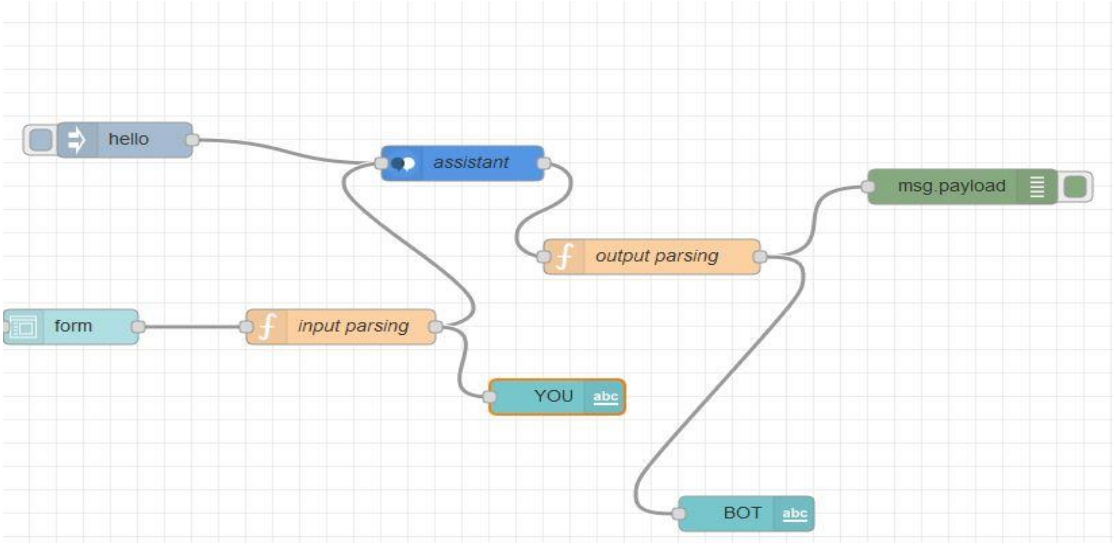
Entities- These are used to mention the usual typos of the user and the synonyms like some people write the good morning as gm, good morning, gud morning, so we can cover all these also instead of returning a message to rephrase.

Dialog- Here we mention the outputs to be given, these can be static as well as dynamic.

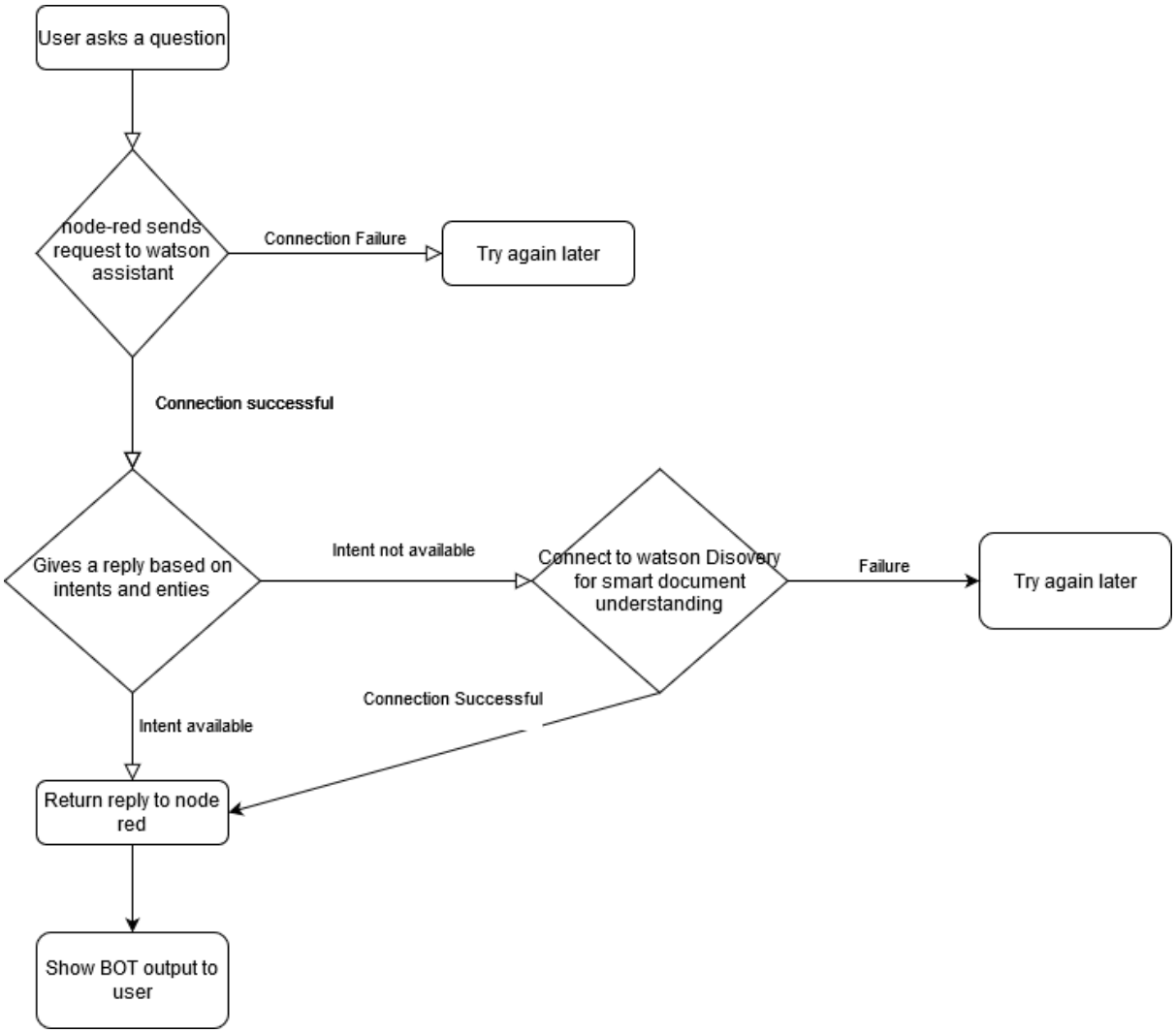


• We have to enable the webhooks which enables our dialog to send a POST request to the webhook URL.

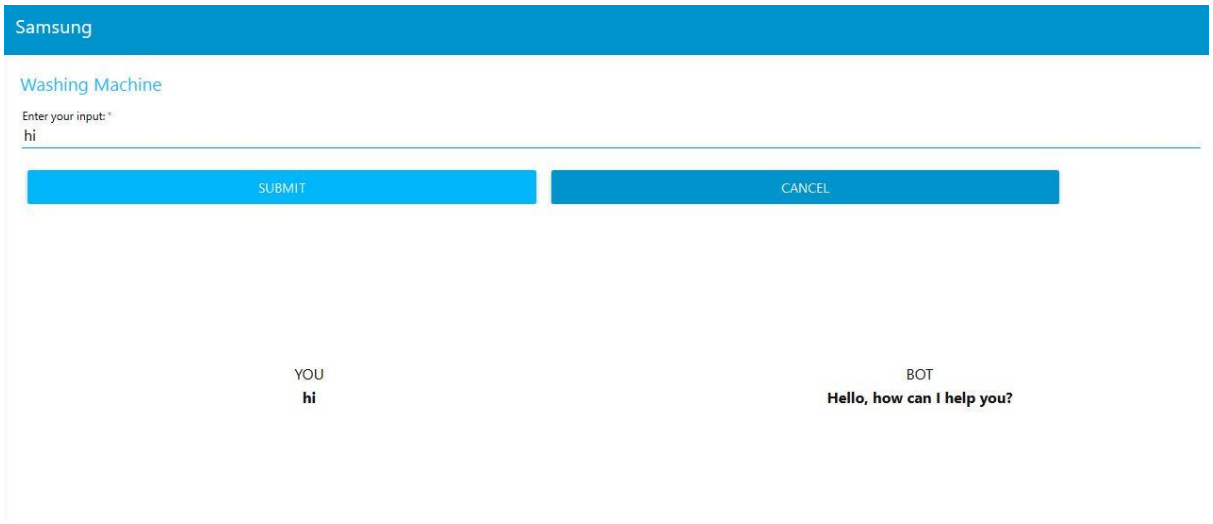
• After this we have to make the node-red flow, and link everything. We will get a UI from the node. The roles of different nodes can be understood by the references mentioned in in the end. The final flow will look like as shown below.

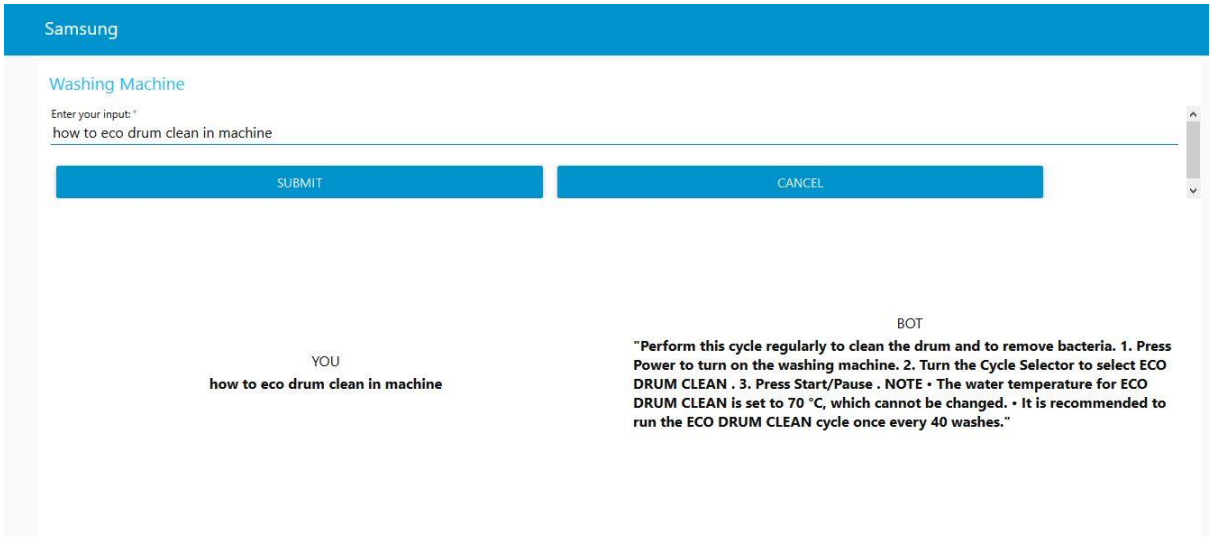


5. Flowchart:


User asks a question
node-red sends request to watson assistant
Connection Failure
Try again later
Connection successful
Gives a reply based on intents and enties
Intent not available
Connect to watson Disovery for smart document understanding
Failure
Try again later
Connection Successful
Intent available
Return reply to node red
Show BOT output to user

6. Result:


Samsung
Washing Machine
Enter your input: *
hi
SUBMIT
CANCEL
YOU
hi
BOT
Hello, how can I help you?


Samsung
Washing Machine
Enter your input: *
how to eco drum clean in machine
SUBMIT
CANCEL
YOU
how to eco drum clean in machine
BOT
"Perform this cycle regularly to clean the drum and to remove bacteria. 1. Press Power to turn on the washing machine. 2. Turn the Cycle Selector to select ECO DRUM CLEAN . 3. Press Start/Pause . NOTE • The water temperature for ECO DRUM CLEAN is set to 70 °C, which cannot be changed. • It is recommended to run the ECO DRUM CLEAN cycle once every 40 washes."

7. Advantages and Disadvantages

7.1 Advantages

- One of the great benefits of using chatbots in your business is that they save time.
- Chatbot use can be cheaper than hiring more workers.
- Another benefit of using chatbots in your business is that they give greater customer satisfaction.
- There is another benefit of using chatbots in your business. They may help you reach more people which can increase your customer base.
- Unfortunately, humans handling customer service questions and other issues can make errors. They can forget things, transpose numbers, and make other types of mistakes.

7.2 Disadvantages:

- Although using chatbots may provide faster customer service overall, they aren't perfect.
- Because many chatbots work from a limited data base, they can't improvise. In other words, if they get confused, the conversation could run in a circle. That can lead to customers who become frustrated.
- A Con is that not all business can use them. Some businesses are far too complex for chatbots to be practical
- Setting up AI is expensive due to the hours of work and testing involved. Sure, they can learn, but it still takes time.

8. Applications:

- Getting a quick answer in an emergency
- Resolving a complaint or problem
- Getting detailed answers or explanations
- Finding a human customer service assistant
- Making a reservation
- Paying a bill
- Market Research
- Booking flights
- Ordering food

9. Conclusion:

By following the above-mentioned steps, we can create a basic chatbot which can help us to answer the basic questions of the customer or user related to location of the office, working hours and the information about the product. We successfully create the intelligent helpdesk smart chatbot using Watson Assistant, Watson Cloud Function, Watson Discovery and Node-Red.

10. Future Scope

We can import the pre-built node-red flow and can improve our UI, moreover we can make a data base and use it to show the recent chats to the customer. We can also improve the results of discovery by enriching it with more fields and doing the Smart Data Annotation more accurately. We can get the premium version to increase the scope of our chatbot in terms of the calla and requests.

We can also include Watson text to audio and Speech to text services to access the chatbot handsfree. These are few of the future scopes which are possible.

11. Appendix

11.1 Code for Cloud Function

```
const assert = require('assert');
const DiscoveryV1 = require('watson-developer-cloud/discovery/v1');

function main(params) {
    return new Promise(function (resolve, reject){
        let discovery;

        if(params.iam_apikey){
            discovery = new DiscoveryV1({
                'iam_apikey' : params.iam_apikey,
                'url' : params.url,
                'version': '2019-03-25'
            });
        }
        else
        {
            discovery = new DiscoveryV1({
                'username': params.username,
                'password': params.password,
                'url': params.url,
                'version': '2019-03-25'
            });
        }
        discovery.query({
            'environment_id': params.environment_id,
            'collection_id': params.collection_id,
            'natural_language_query': params.input,
            'passages':true,
            'count':3,
            'passages_count':3
        }, function(err, data){
            if(err)
                return reject(err);
            return resolve(data);
        });
    });
}
```

11.2 References

- https://www.ibm.com/cloud/architecture/tutorials/cognitive_discovery
- https://cloud.ibm.com/docs/assistant?topic=assistant-getting-started
- https://developer.ibm.com/recipes/tutorials/how-to-create-a-watson-chatbot-on-nodered/
- http://www.iotgyan.com/learning-resource/integration-of-watson-assistant-to-node-red
- https://github.com/IBM/watson-discovery-sdu-with-assistant
- https://www.youtube.com/watch?v=Jpr3wVH3FVA