

INTELLIGENT CUSTOMER HELPDESK WITH SMART DOCUMENT UNDERSTANDING

Project Report

Category: Artificial Intelligence (Career Basic Program)

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1	INTRODUCTION
	1.1 Overview
	1.2 Purpose
2	LITERATURE SURVEY
	2.1 Existing problem
	2.2 Proposed solution
3	THEORETICAL ANALYSIS
	3.1 Block diagram
	3.2 Hardware / Software designing
4	EXPERIMENTAL INVESTIGATIONS
5	FLOWCHART
6	RESULT
7	ADVANTAGES & DISADVANTAGES
8	APPLICATIONS
9	CONCLUSION
10	FUTURE SCOPE
11	BIBILOGRAPHY
	APPENDIX
	A. Source code

1. INTRODUCTION

1.1 Overview

A chatbot is a software application used to conduct an on-line chat conversation via text or text-to-speech, in lieu of providing direct contact with a live human agent. The term "ChatterBot" was originally coined by Michael Mauldin (creator of the first Verbot) in 1994 to describe these conversational programs.

Chatbots are typically used in dialog systems for various purposes including customer service, request routing, or for information gathering. While some chatbot applications use extensive word-classification processes, Natural Language processors, and sophisticated AI, others simply scan for general keywords and generate responses using common phrases obtained from an associated library or database.

1.2 Purpose

Many high-tech organizations are looking to integrate automated AI-based solutions such as chatbots into their customer service in order to provide faster and cheaper assistance to their clients who are becoming increasingly comfortable with technology. In particular, chatbots can efficiently conduct a dialogue, usually replacing other communication tools such as email, phone, or SMS.

This project aims at creating a customer helpdesk chatbot for a Samsung Mobile Store that can respond to basic user queries like store information, device information and also perform actions like placing an order, cancelling an order, etc, Using a chatbot for basic customer helpdesk functions reduces the need for dedicated customer helpdesk individuals to respond to repetitive user queries. This saves the time of the customer helpdesk individual who can then be employed for other tasks requiring human intervention.

2.LITERATURE SURVEY

2.1 Existing Problem

A customer care individual can manage only 2-3 user queries simultaneously before losing track of the users. But a chatbot can handle hundreds of thousands of user queries based on its server capacity without getting confused.

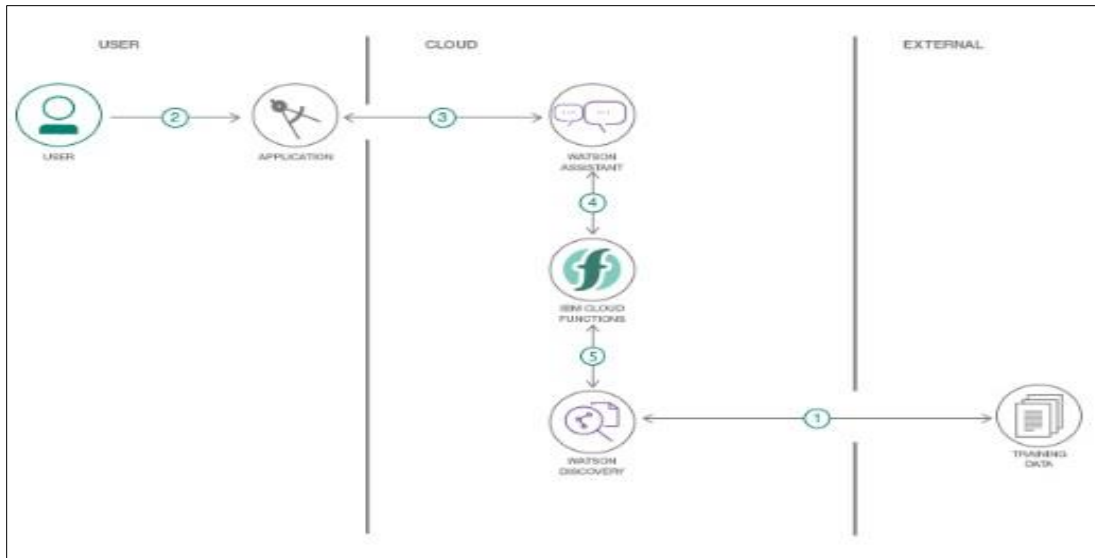
But, the typical customer care chatbot can answer only simple questions, such as store locations and hours, directions, and maybe even making appointments. When a question falls outside of the scope of the pre-determined question set, the option is typically to tell the customer the question isn't valid or offer to speak to a real person.

2.2 Proposed Solution

The chatbot developed by this project can answer simple questions such as store information and perform actions such as placing an order or cancelling an order. In addition to that, the bot can also answer user queries related to the operation of a device by referring to the device user manual and extracting relevant parts of the user manual.

3. THEORETICAL ANALYSIS

3.1 Block Diagram



3.2 Software Designing

The software designing requires the knowledge of the following domains:

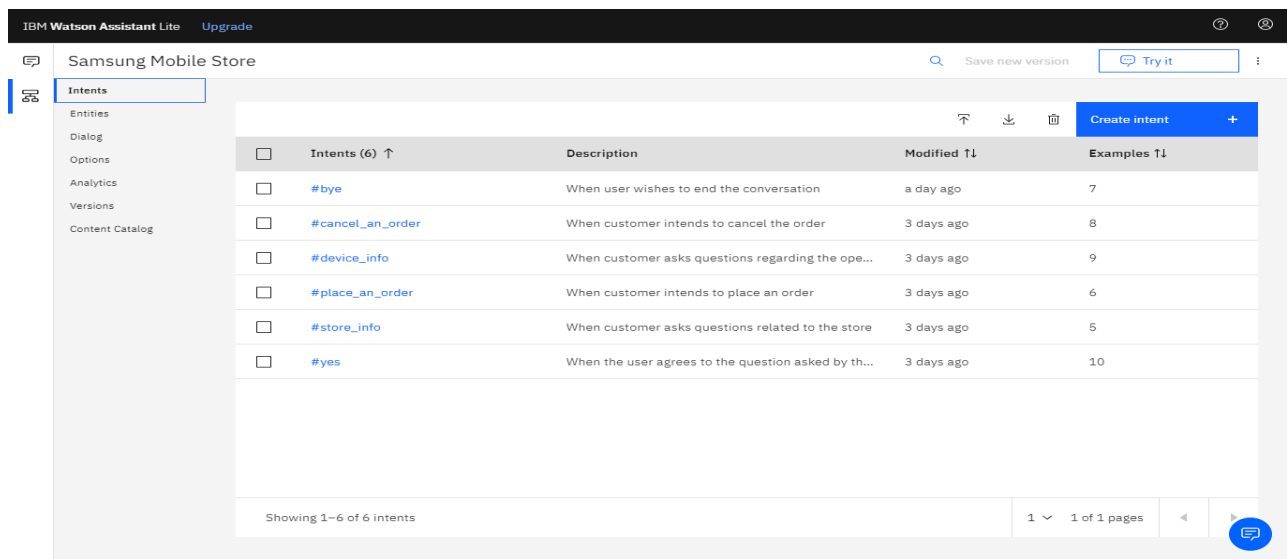
- Python
- IBM Watson
- IBM Discovery

The software designing consists of the following steps:

- Create a customer care dialog skill in Watson Assistant
- Use Smart Document Understanding to build an enhanced Watson Discovery collection
- Create an IBM Cloud Functions web action that allows Watson Assistant to post queries to Watson Discovery
- Build a web application with integration to all these services and deploy the same on IBM Cloud Platform

4. EXPERIMENTAL INVESTIGATION

- **Create a customer care dialog skill in Watson Assistant:**
 - i. Create an IBM Watson Assistant service on IBM Cloud.
 - ii. Create a new dialog skill named 'Samsung Mobile Store'.
 - iii. Create the necessary intents such as store information, place an order, cancel an order, device information, bye, etc. and add relevant examples to it.



IBM Watson Assistant Lite Upgrade

Samsung Mobile Store

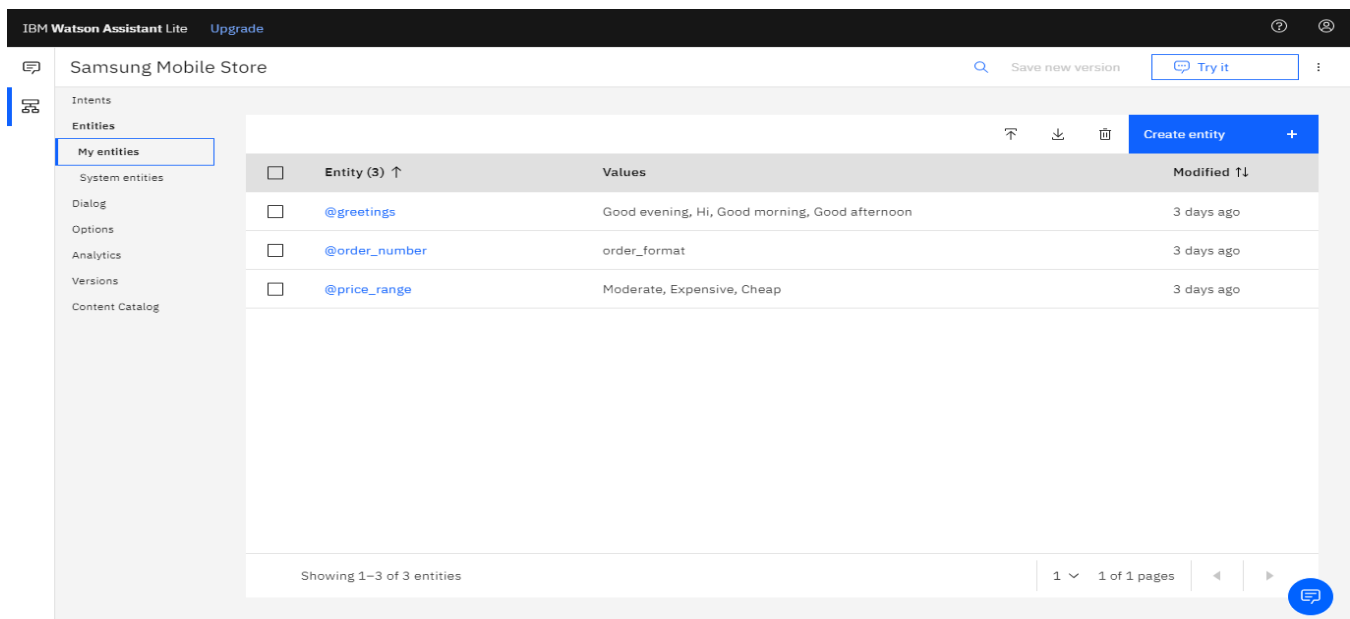
Intents

Intents (6) ↑	Description	Modified ↑↓	Examples ↑↓
#bye	When user wishes to end the conversation	a day ago	7
#cancel_an_order	When customer intends to cancel the order	3 days ago	8
#device_info	When customer asks questions regarding the ope...	3 days ago	9
#place_an_order	When customer intends to place an order	3 days ago	6
#store_info	When customer asks questions related to the store	3 days ago	5
#yes	When the user agrees to the question asked by th...	3 days ago	10

Showing 1–6 of 6 intents

1 1 of 1 pages

- iv. Create the necessary entities such as greetings, order format, price range, etc. and add relevant examples to it.



IBM Watson Assistant Lite Upgrade

Samsung Mobile Store

Entities

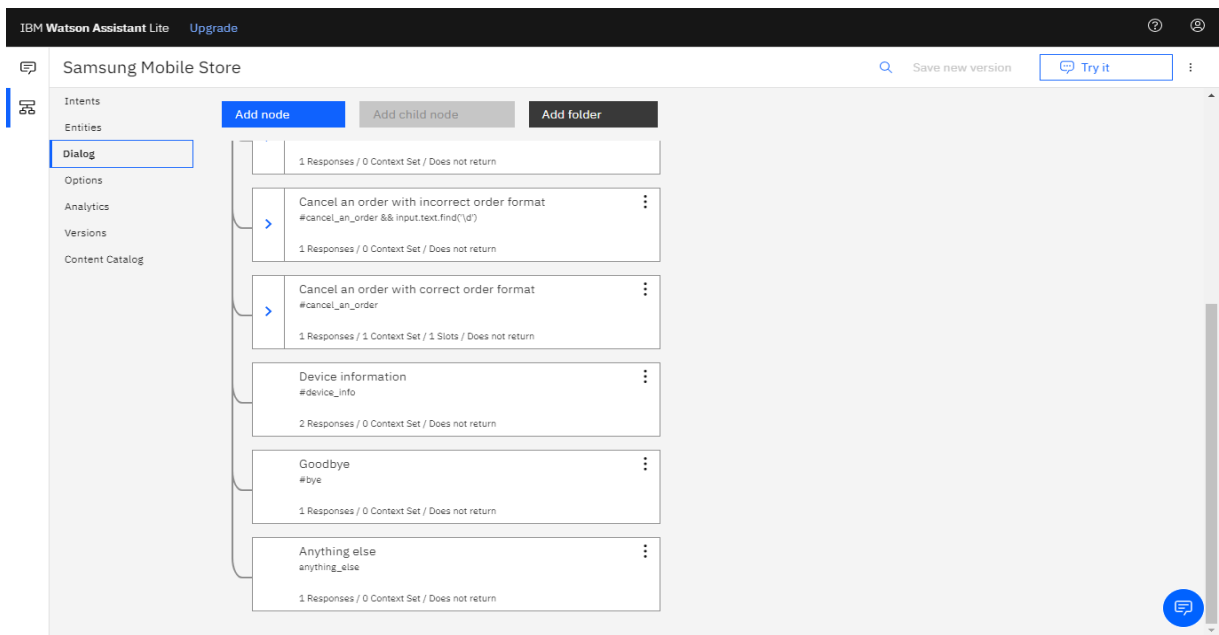
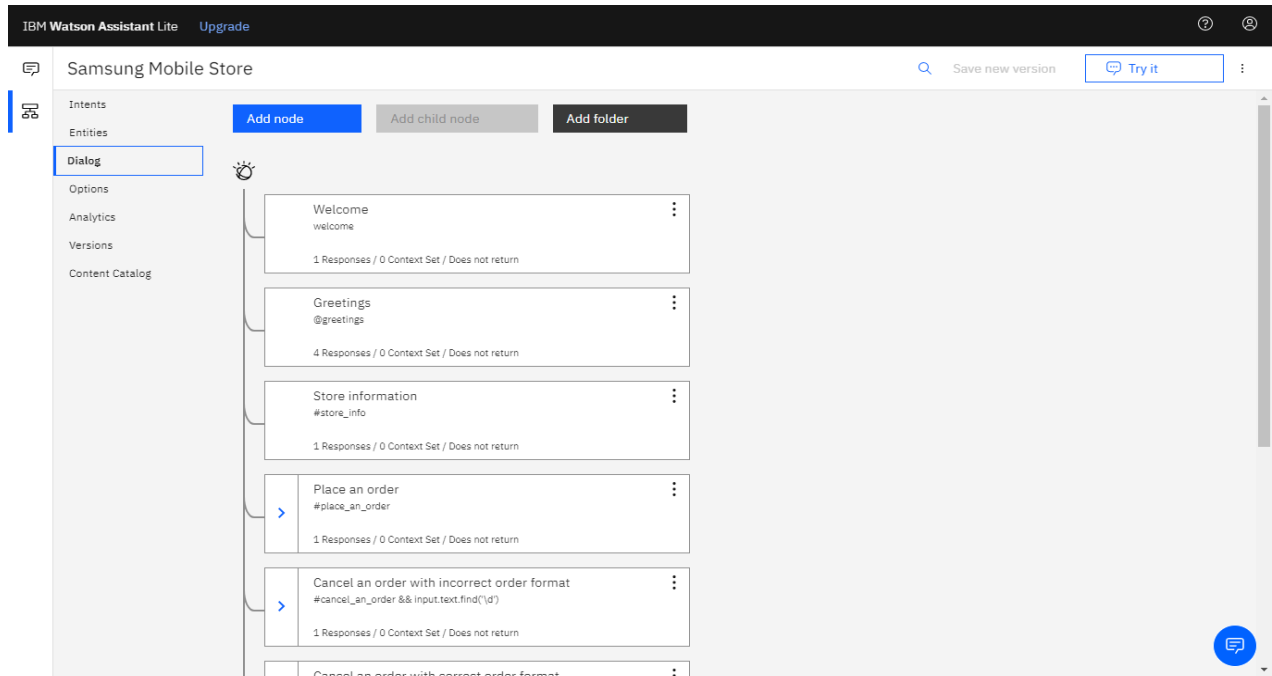
My entities

Entity (3) ↑	Values	Modified ↑↓
@greetings	Good evening, Hi, Good morning, Good afternoon	3 days ago
@order_number	order_format	3 days ago
@price_range	Moderate, Expensive, Cheap	3 days ago

Showing 1–3 of 3 entities

1 1 of 1 pages

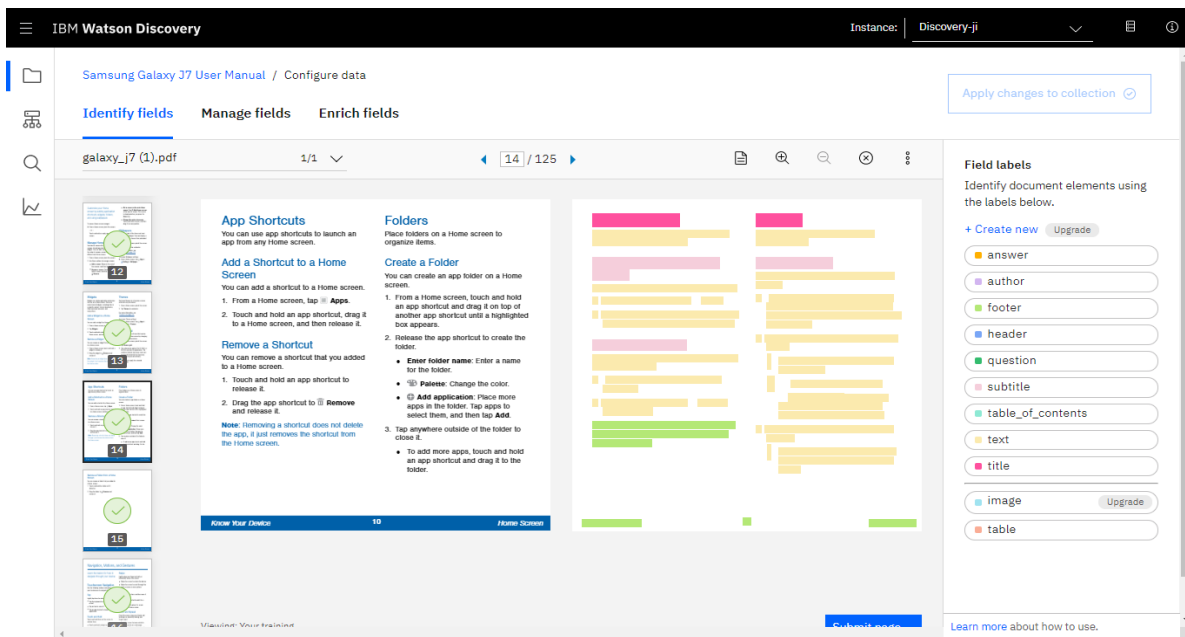
- v. Create the necessary dialog flow by creating nodes relevant to the conditions and connecting them appropriately.



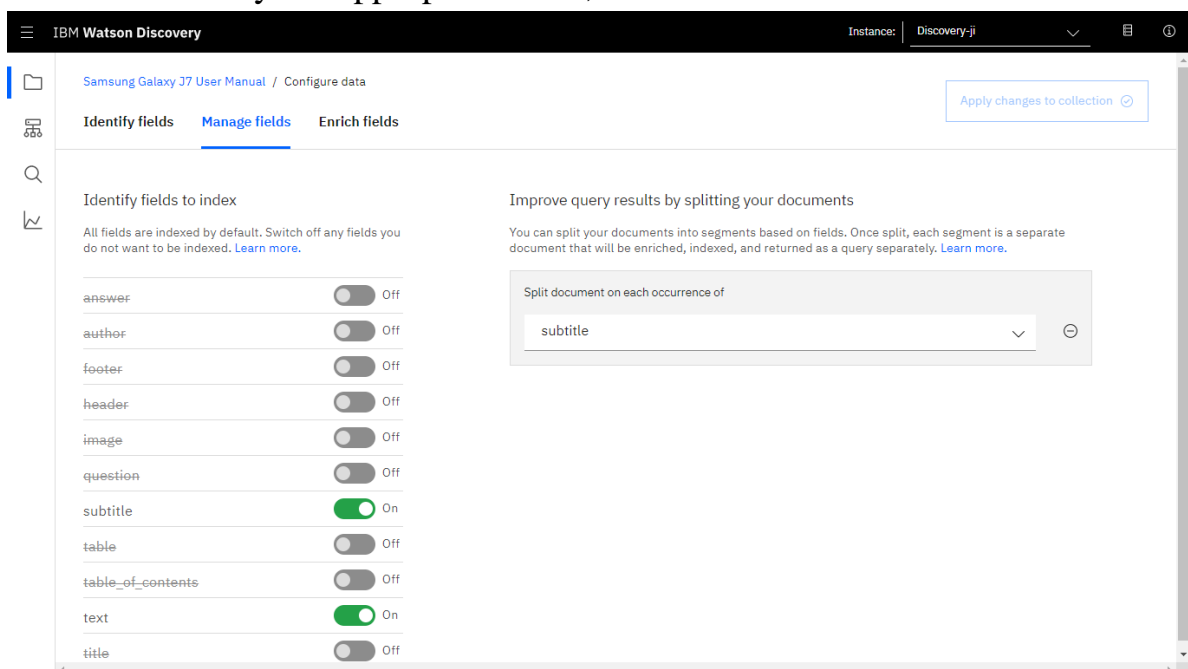
- vi. Create a new assistant named 'Samsung Mobile Store Helpdesk Chatbot' and link it with the created dialog skill.

- **Use Smart Document Understanding to build an enhanced Watson Discovery Collection:**

- Create a Watson Discovery service on IBM Cloud.
- Create a new collection named 'Samsung Galaxy J7 User Manual'.
- Upload the necessary device's user manual.
- Click on Configure data and identify fields and drag and select the appropriate fields on the document.

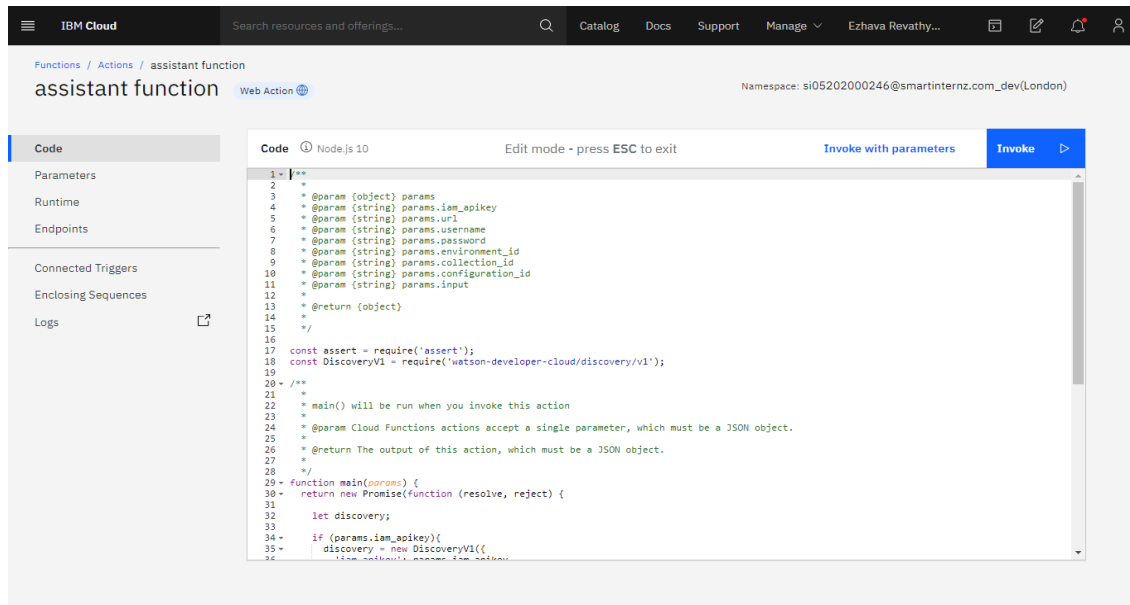


- Next click on manage fields and select only the necessary fields and split the document by the appropriate field,



- **Create an IBM Cloud Functions web action that allows Watson Assistant to post queries to Watson Discovery:**

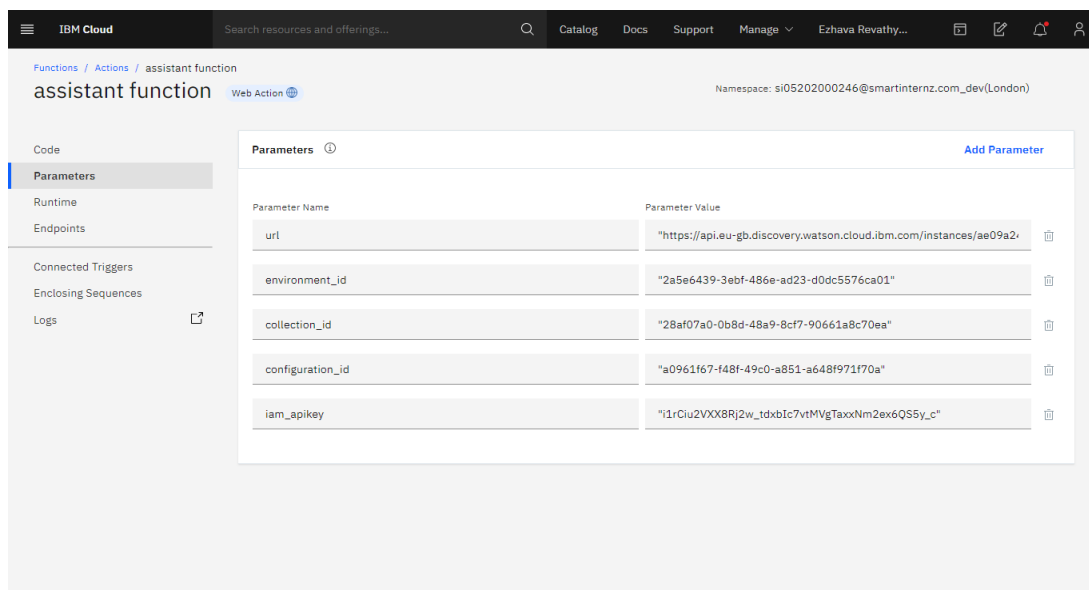
- Create a new Functions service on IBM Cloud.
- Create a new web action of the named 'assistant function'.
- Under the code tab write the appropriate code to allow Watson Assistant to post queries to Watson Discovery.



The screenshot shows the IBM Cloud Functions console for a function named 'assistant function'. The 'Code' tab is selected, displaying a Node.js function. The code defines a function 'main' that takes 'params' as an argument and returns a Promise. It uses the 'assert' module and the 'watson-developer-cloud/discovery/v1' package to interact with the Watson Discovery V1 API. The function checks for the presence of 'iam_apikey' in the parameters and then creates a new 'DiscoveryV1' instance. The code is as follows:

```
1- /**
2-  *
3-  * @param {object} params
4-  * @param {string} params.iam_apikey
5-  * @param {string} params.url
6-  * @param {string} params.username
7-  * @param {string} params.password
8-  * @param {string} params.environment_id
9-  * @param {string} params.collection_id
10-  * @param {string} params.configuration_id
11-  * @param {string} params.input
12-  *
13-  * @return {object}
14-  */
15-
16-
17- const assert = require('assert');
18- const DiscoveryV1 = require('watson-developer-cloud/discovery/v1');
19-
20- /**
21-  *
22-  * main() will be run when you invoke this action
23-  *
24-  * @param Cloud Functions actions accept a single parameter, which must be a JSON object.
25-  *
26-  * @return The output of this action, which must be a JSON object.
27-  */
28-
29- function main(params) {
30-   return new Promise(function (resolve, reject) {
31-
32-     let discovery;
33-
34-     if (params.iam_apikey){
35-       discovery = new DiscoveryV1({
36-         iam_apikey: params.iam_apikey,
```

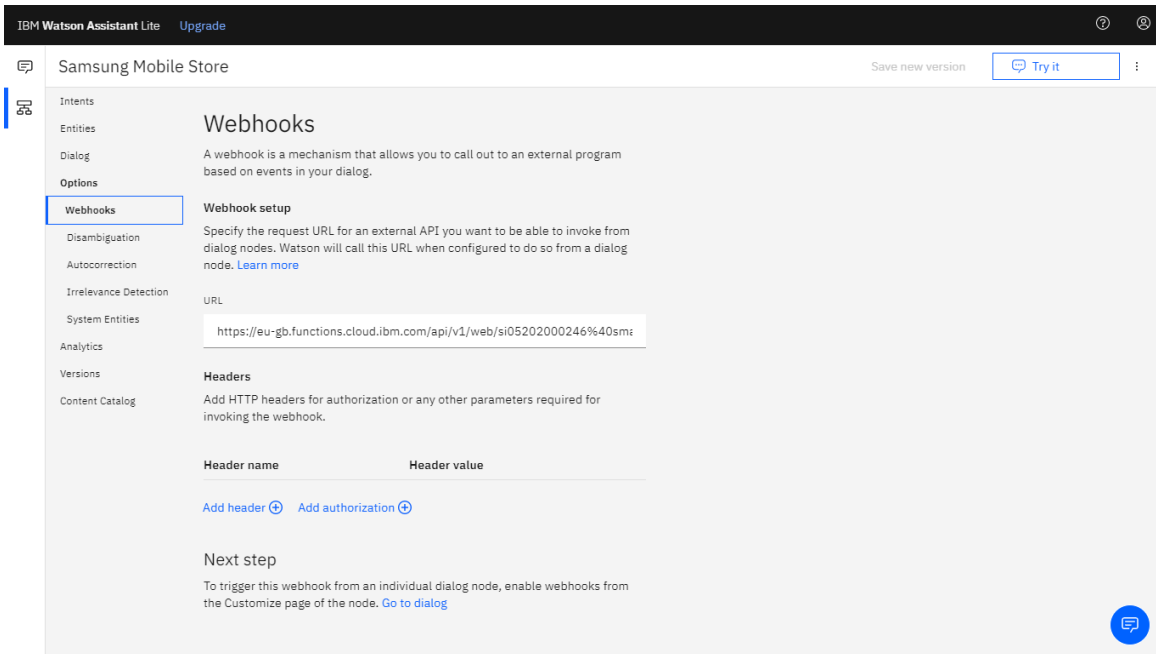
- Under the parameters tab provide the needed parameters from the Watson Discovery.



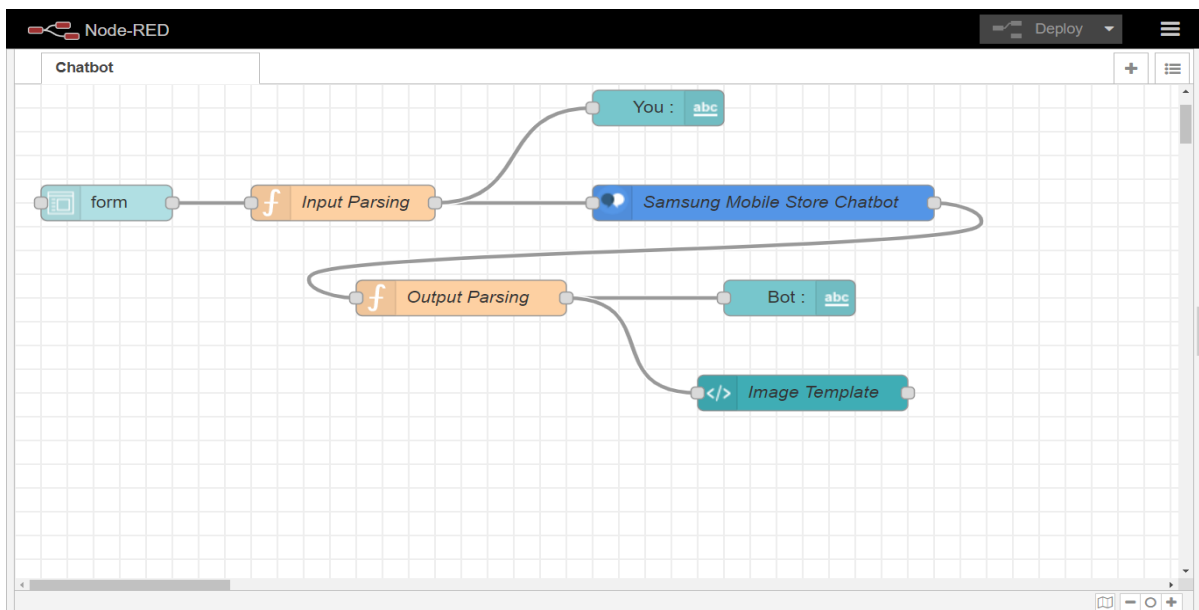
The screenshot shows the IBM Cloud Functions console for the same function 'assistant function', but with the 'Parameters' tab selected. The parameters are defined as a JSON object with the following values:

Parameter Name	Parameter Value
url	"https://api.eu-gb.discovery.watson.cloud.ibm.com/instances/ae09a2"
environment_id	"2a5e6439-3ebf-486e-ad23-d0dc5576ca01"
collection_id	"28af07a0-0b8d-48a9-8cf7-90661a8c70ea"
configuration_id	"a0961f67-f48f-49c0-a851-a648f971f70a"
iam_apikey	"i1rCiu2VXX8Rj2w_tdxIc7vtMvgTaxxNm2ex6QSSy_c"

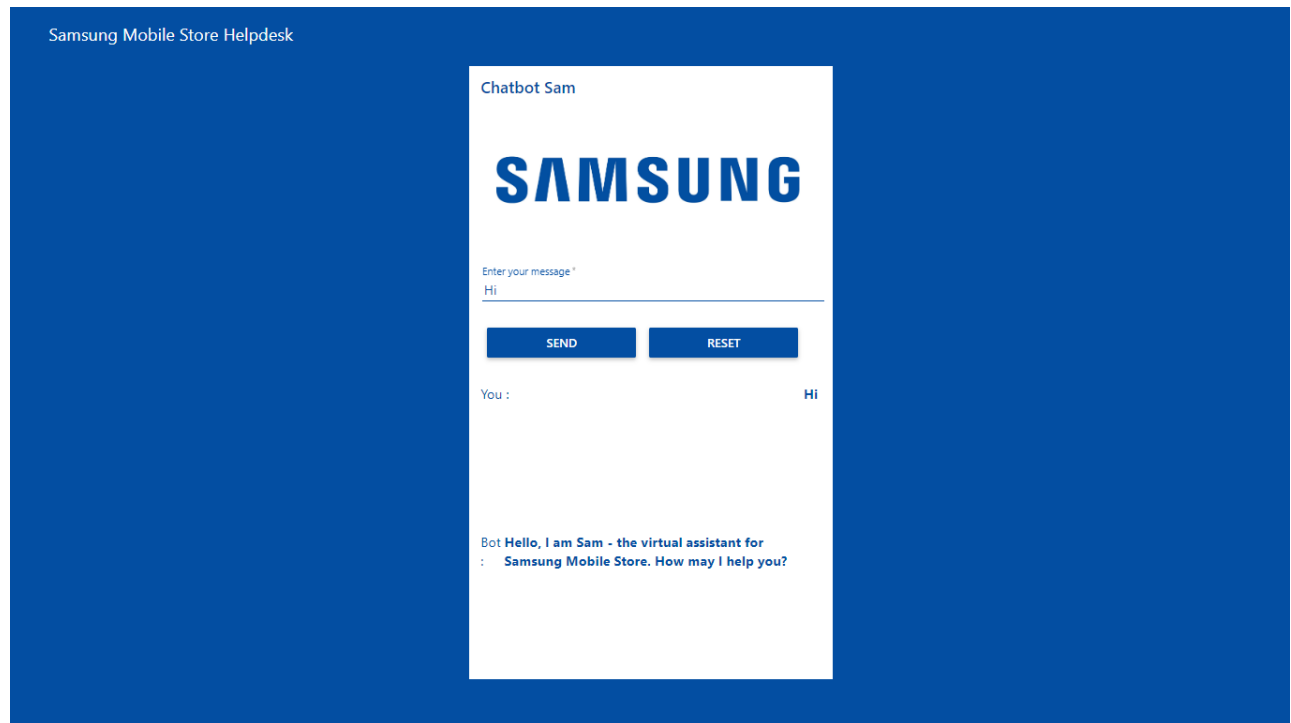
- v. In the Watson Assistant skill provide the URL of the Watson Discovery under the options tab.



- **Build a web application with integration to all these services and deploy the same on IBM Cloud Platform:**
 - i. Create a Node-RED application on IBM Cloud.
 - ii. Create the desired flow by connecting the nodes in an appropriate manner.

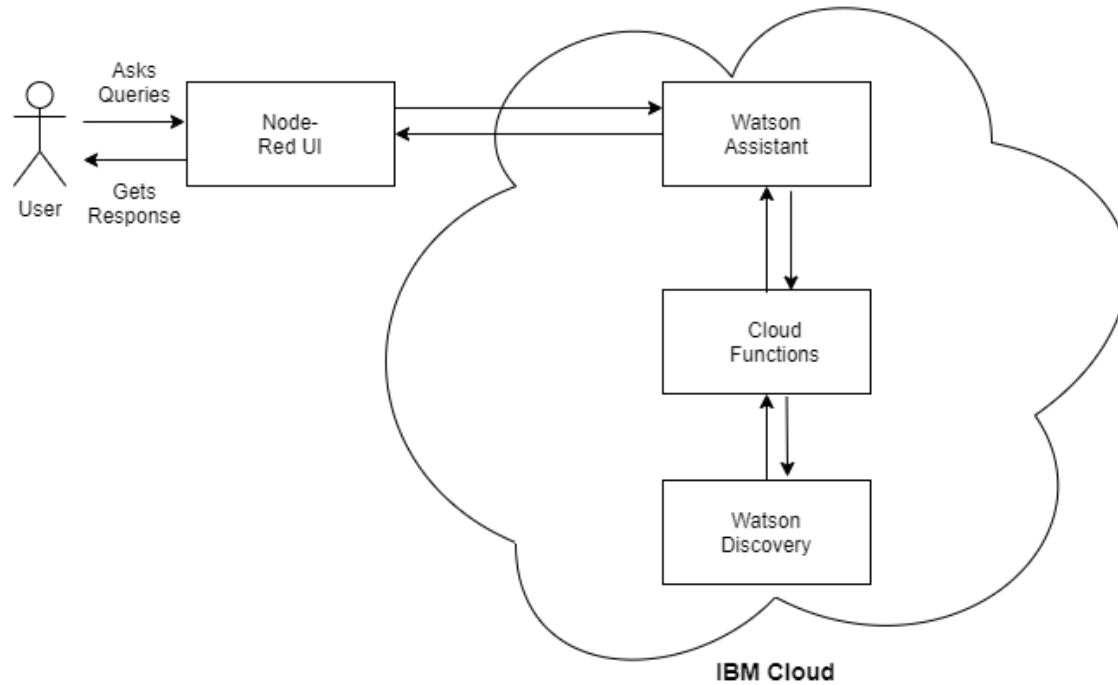


- iii. Change the layout of the widgets and groups by using the layout tab.
- iv. Deploy the flow and visit the user interface page by clicking the UI button.

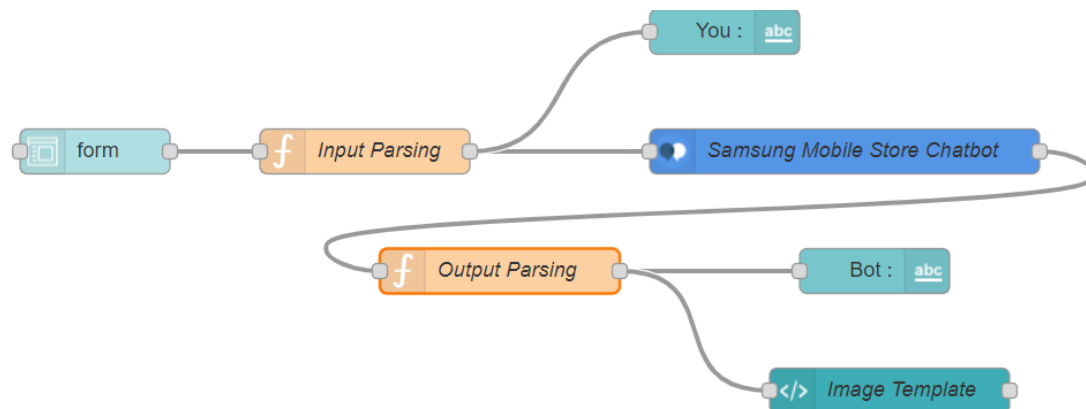


5. FLOWCHART

- **Flowchart of general flow of project:**



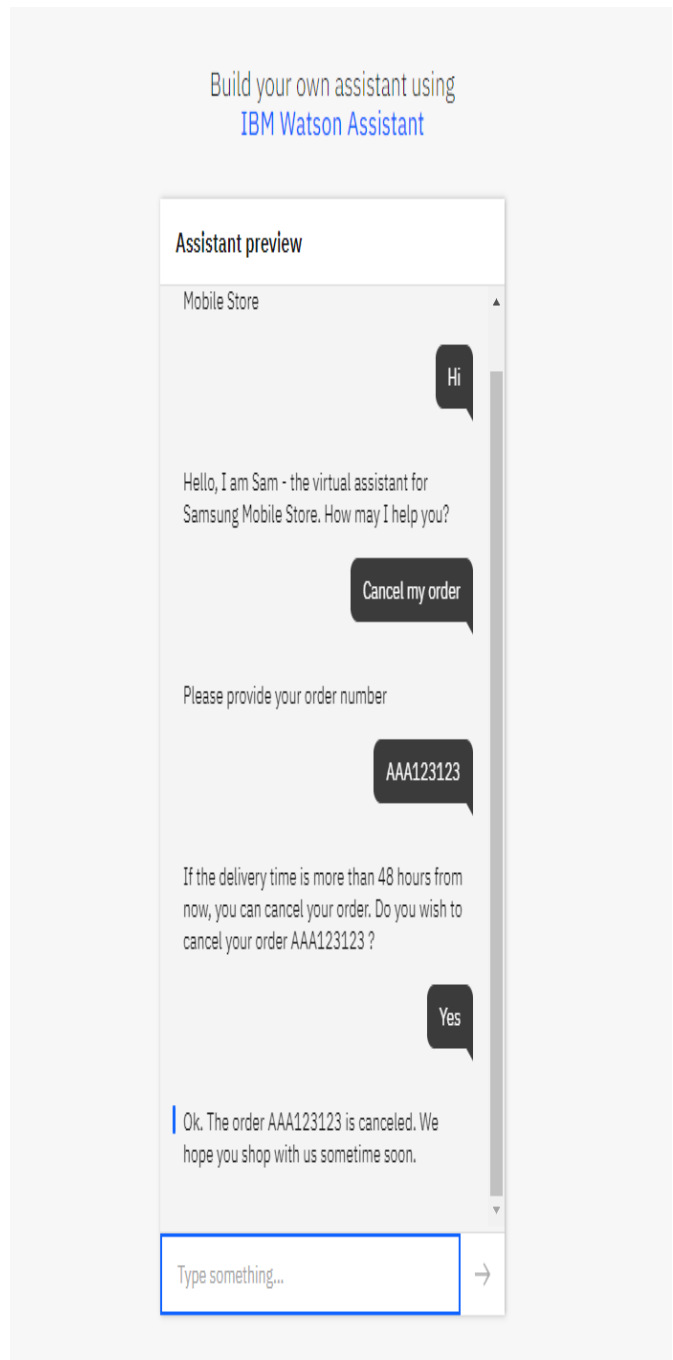
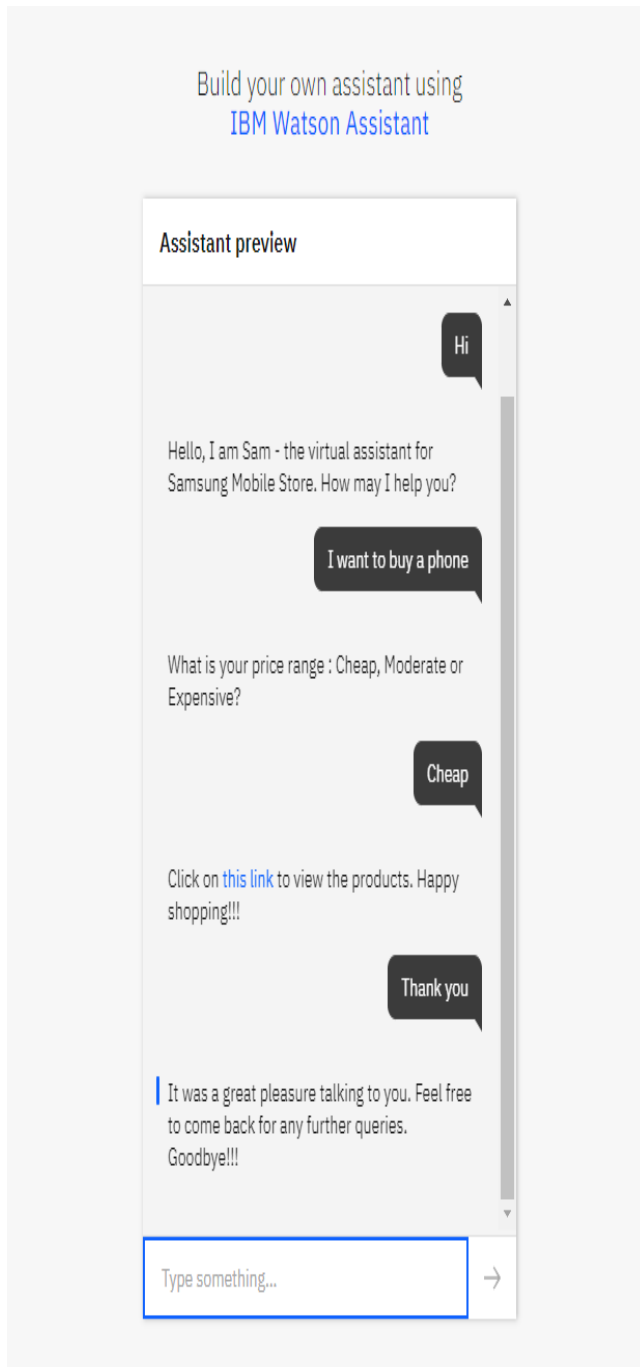
- **Node-RED flow:**



6. RESULT

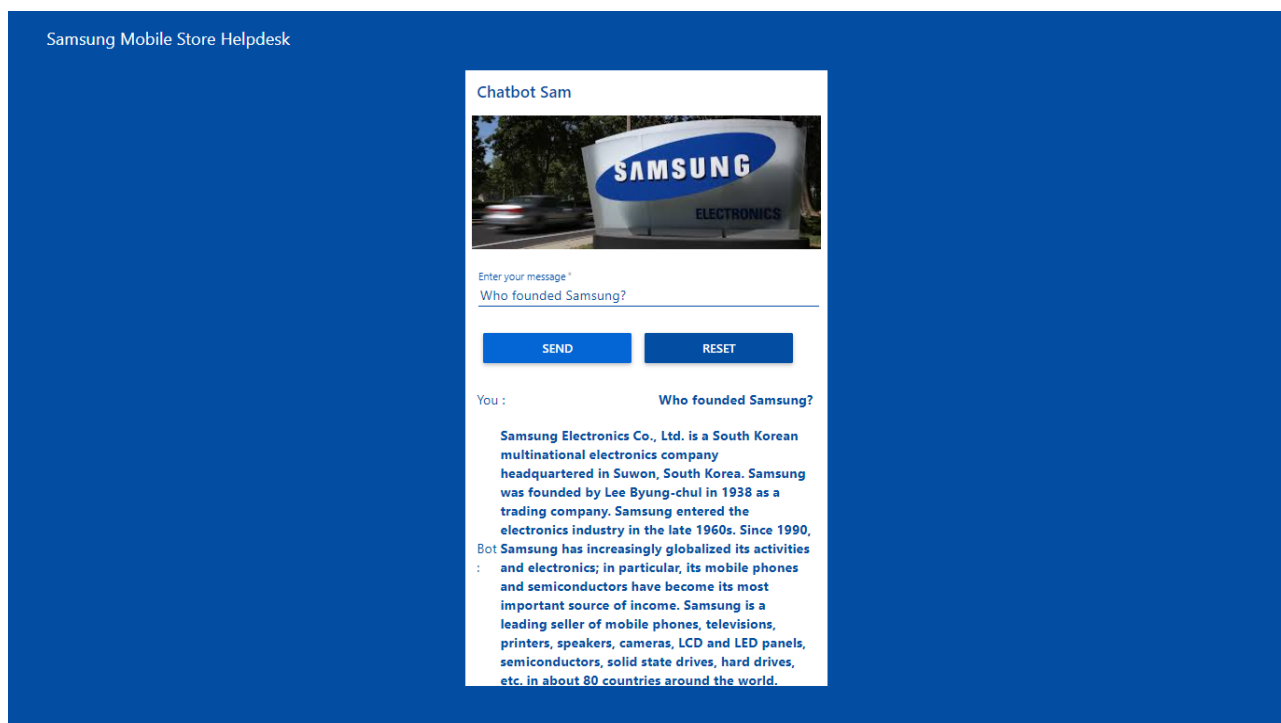
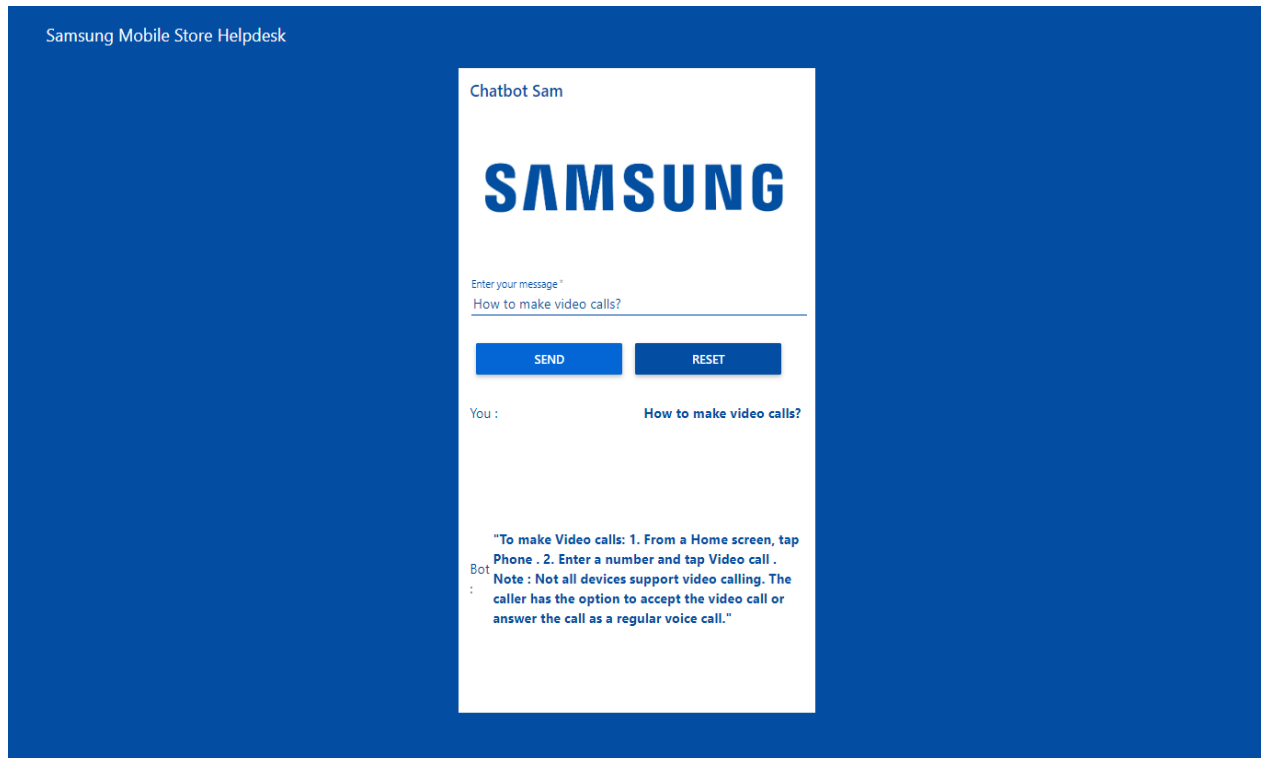
- **Watson Assistant Preview link:**

<https://web-chat.global.assistant.watson.cloud.ibm.com/preview.html?region=eu-gb&integrationID=539b05f9-1c29-4d69-be8a-2096371a52b2&serviceInstanceID=d39093cd-ae95-4dd9-803f-606c1b5daa59>



- **Node-RED User Interface:**

<https://node-red-joyi.eu-gb.mybluemix.net/ui/#!/0?socketid=4eJ0rHeBq4q92AkEAAAN>



7. ADVANTAGES & DISADVANTAGES

- **Advantages:**

- Chatbots eliminate the need for labor during online interaction with customers. Thus reducing the cost to the company.
- Unlike humans, once we install a chatbot, it can handle queries at any time of day.
- AI-based chatbots are able to learn from interactions and update independently.
- Humans can serve a limited number of customers at the same time. This restriction does not exist for chatbots, and they can manage all the necessary queries simultaneously.

- **Disadvantages:**

- It is often considered that chatbots are complicated and need a lot of time to understand what you want in customer.
- Fixed chatbots can get stuck easily. If a query doesn't relate to something you've previously taught it, it won't understand the query. This can lead to a frustrated customer and the loss of the sale.
- Chatbots are useful programs that help you save a lot of labor by ensuring availability at all times and serving several customers at once. But unlike humans, each chatbot needs to be programmed differently for each business, which increases the initial installation cost.
- The chatbots are not able to memorize a conversation already had, which forces the user to write the same thing over and over again.

8. APPLICATIONS

The e-commerce industry is improving shopping experience with chatbots. Customers can now search and shop more conveniently with the help of chatbots. eBay has invested in chatbot technology with their ShopBot, a virtual shopping assistant that helps customers find the items they want at the desired price range.

Similarly the chatbot developed in this project can be used to shop online for mobile phones that fall within a specific price range. It can also be used to cancel an order that a user has already placed. In addition to that the chatbot can also answer the user's queries regarding the operation of a device. With certain changes made to the chatbot, it can be employed in any mobile brand's webpage as a virtual assistant. Also it can be deployed to popular social media applications like Facebook, Slack, etc.

9. CONCLUSION

Thus an intelligent customer helpdesk chatbot with Smart Document Understanding feature using the IBM services like Watson Assistant, Watson Discovery has been created and deployed in the IBM Cloud and the results have been tested and verified.

10. FUTURE SCOPE

In future this project could include text to speech and speech to text nodes in the node red flow. This would enable the user to operate the bot hands-free.

The node red flow of the bot could also include language translator nodes to cater the needs of a wide spectrum of users.

11. BIBLIOGRAPHY

- <https://cloud.ibm.com/docs/assistant?topic=assistant-tutorial>
- <https://cloud.ibm.com/docs/assistant?topic=assistant-getting-started>
- https://youtu.be/Z_vmzC0tu60
- <https://youtu.be/ykFhCjkGWxA>

APPENDIX

A. Source Code:

i. Cloud Functions web action code:

```
/**
 *
 * @param {object} params
 * @param {string} params.iam_apikey
 * @param {string} params.url
 * @param {string} params.username
 * @param {string} params.password
 * @param {string} params.environment_id
 * @param {string} params.collection_id
 * @param {string} params.configuration_id
 * @param {string} params.input
 *
 * @return {object}
 */

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

/**
 *
 * main() will be run when you invoke this
action
 *
 * @param Cloud Functions actions accept a
single parameter, which must be a JSON object.
 *
 * @return The output of this action, which
must be a JSON object.
 */
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);
    });
});
}

```

ii. Node-RED flow code:

```
[{"id":"234c5fa6.9db5f","type":"tab","label":"Chatbot","disabled":false,"info":""},{ "id":"ca20934b.0f86d","type":"function","z":"234c5fa6.9db5f","name":"Output Parsing","func":"if(msg.payload.output.generic[0].response_type==\"image\"){\n    msg.url = msg.payload.output.generic[0].source\n    msg.payload = msg.payload.output.text[0];\n}\nelse{\n    msg.url=\"https://www.itravelat1.com/wp-content/uploads/2018/09/samsung-logo.jpg\"\n}\nmsg.payload = msg.payload.output.text[0];\n}\nreturn msg;","outputs":1,"noerr":0,"x":340,"y":260,"wires":[["55e1340e.eb73fc","94a66b79.c01968"]]}, {"id":"313e33ae.8abedc","type":"function","z":"234c5fa6.9db5f","name":"Input Parsing","func":"msg.payload=msg.payload.input;\nreturn msg;","outputs":1,"noerr":0,"x":250,"y":180,"wires":[["66152f3a.b1cf8","62d62e08.648e5"]]}, {"id":"66152f3a.b1cf8","type":"watson-conversation-v1","z":"234c5fa6.9db5f","name":"Samsung Mobile Store Chatbot","workspaceid":"ed013ef7-7967-4f49-ba42-bc4c5889b15d","multiuser":false,"context":true,"empty-payload":false,"service-endpoint":"https://api.eu-gb.assistant.watson.cloud.ibm.com/instances/d39093cd-ae95-4dd9-803f-606c1b5daa59","timeout":"","optout-learning":false,"x":570,"y":180,"wires":[["ca20934b.0f86d"]]}, {"id":"55e1340e.eb73fc","type":"ui_text","z":"234c5fa6.9db5f","group":"1c2d3c30.9984f4","order":4,"width":7,"height":5,"name":"","label":"Bot :
```

```
", "format": "{{msg.payload}}", "layout": "row-  
spread", "x": 590, "y": 260, "wires": [], {"id": "62d  
62e08.648e5", "type": "ui_text", "z": "234c5fa6.9d  
b5f", "group": "1c2d3c30.9984f4", "order": 3, "width  
h": 0, "height": 0, "name": "", "label": "You :  
", "format": "{{msg.payload}}", "layout": "row-  
spread", "x": 490, "y": 100, "wires": [], {"id": "2bb  
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db5f", "name": "", "label": "", "group": "1c2d3c30.9  
984f4", "order": 2, "width": 0, "height": 0, "options  
": [{"label": "Enter your  
message", "value": "input", "type": "text", "requir  
ed": true, "rows": null}], "formValue": {"input": ""  
}, "payload": "", "submit": "send", "cancel": "reset  
", "topic": "", "x": 70, "y": 180, "wires": [[{"313e33a  
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i_template", "z": "234c5fa6.9db5f", "group": "1c2d  
3c30.9984f4", "name": "Image  
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alt=\"Image\">", "storeOutMessages": true, "fwdIn  
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{ "id": "1c2d3c30.9984f4", "type": "ui_group", "z":  
"", "name": "Chatbot  
Sam", "tab": "252703b4.9cc4cc", "order": 1, "disp":  
true, "width": 7, "collapse": false}, {"id": "252703  
b4.9cc4cc", "type": "ui_tab", "z": "", "name": "Sams  
ung Mobile Store  
Helpdesk", "icon": "dashboard", "disabled": false,  
"hidden": false}]
```