

# PROJECT REPORT

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**TITLE :** Intelligent Customer Help Desk With  
Smart Document Understanding

**CATEGORY :** Artificial Intelligence

# INTRODUCTION

## Overview:

We will be able to write an application that leverages multiple Watson AI Services (Discovery , Assistant, Cloud function and Node Red). By the end of the project, we will be able to create a customer care services that will include more efficiency in terms customer support provided. All the work which is done is using IBM services which is really a great platform which helps to get a better understanding of the future with the use of Digital Skills.

- Project Deliverables: Smartinternz Internship
- Project Team: Hardik
- Project Duration: 30 days

## Purpose:

The typical customer care chatbot can answer 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. In this project, there will be another option. If the customer question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been pre-loaded with the device's owner's manual. So now, instead of "Would you like to speak to a customer representative?" we can return relevant sections of the owner's manual to help solve our customers problems. To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it . Using this we will have an advantage that efficiency of the answers from the owners manual will increase and accuracy of the support provided.

## Scope of Work:

- 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 & deploy.

## LITERATURE SURVEY

### Existing problem:

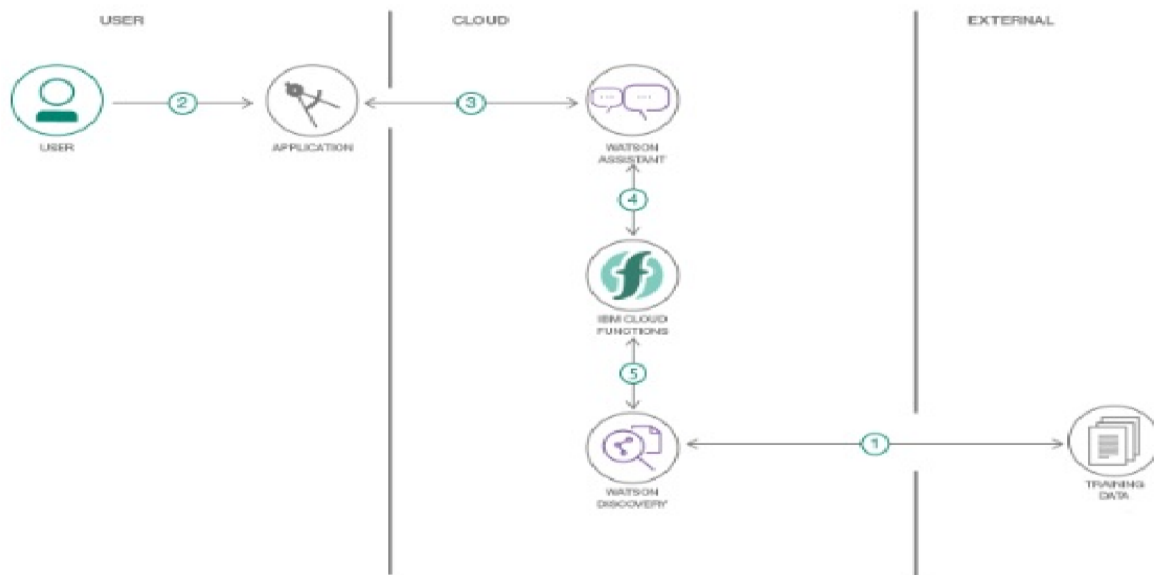
Generally Chatbots means getting input from users and getting only response questions and for some questions the output from bot will be like “try again”, “I don’t understand”, “will you repeat again”, and so on... and directs customer to customer agent but a good customer Chatbot should minimize involvement of customer agent to chat with customer to clarify his/her doubts. So to achieve this we should include an virtual agent in chatbot so that it will take care of real involvement of customer agent and customer can clarify his doubts with fast chatbots.

**Proposed solution:** For the above problem to get solved we have to put an virtual agent in chatbot so it can understand the queries that are posted by customers. The virtual agent should be trained from some insight records based on company background so it can answer queries based on the product or related to company. In this project I used Watson Discovery to achieve the above solution. And later including Assistant and Discovery on Node-RED.

## THEORETICAL ANALYSIS

- 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 a product operation question, a search query is passed to a predefined IBM Cloud Functions action.
- 5 . The Cloud Functions action will query the Watson Discovery service and return the results.

## BLOCK/FLOW DIAGRAM:



## Hardware / Software designing:

- 1 . Create IBM Cloud services .
- 2 . Configure Watson Discovery .
- 3 . Create IBM Cloud Functions action .
- 4 . Configure Watson Assistant.
- 5 . Create flow and configure node
- 6 . Deploy and run Node Red app.

## Create IBM Cloud services:

Create the following services:

- Watson Discovery
- Watson Assistant
- Node Red
- IBM cloud function

## Creation of Node-RED in IBM cloud:

- Step-1: Login to IBM and go to the catalog
- Step-2: Search for node-red and select "Node-RED Starter " Service
- Step-3: Enter the Unique name and click on create a button

👤 Note: Your Node-red service is starting

- Step – 5: We have to configure Node red for the first time. Click on next to continue.

### Welcome to your new Node-RED instance on IBM Cloud

We know you're eager to start wiring up your flows, but first there are a couple of tasks you should do:

- Secure your Node-RED editor
- Browse available IBM Cloud nodes

Previous

Next

- Step – 6: Secure your node red editor by giving a username and password and click on Next.

### Secure your Node-RED editor

☒ Secure your editor so only authorised users can access it

Username

Password

Must be at least 8 characters

☐ Allow anyone to view the editor, but not make any changes

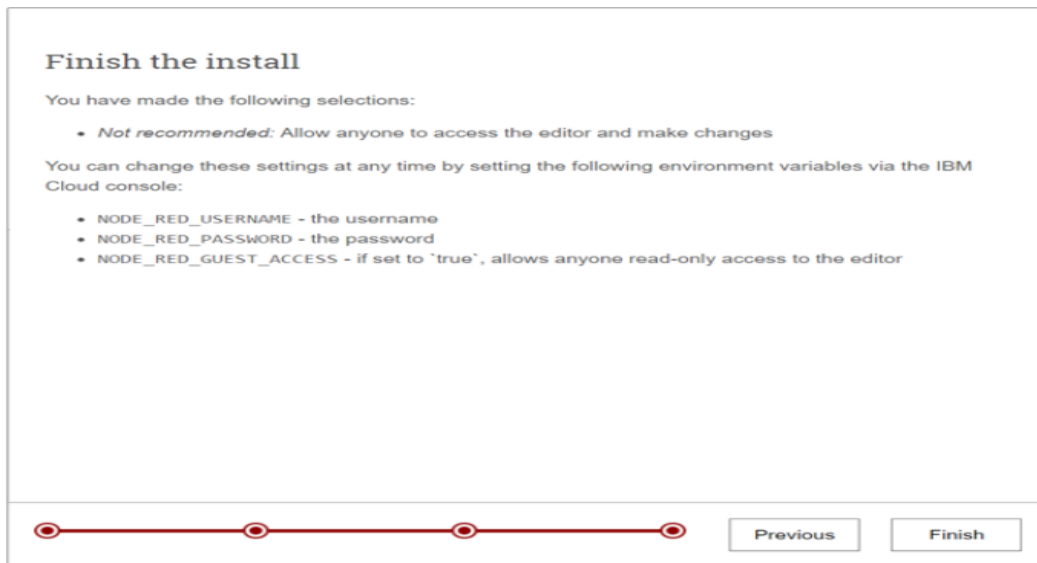
☐ *Not recommended:* Allow anyone to access the editor and make changes

Previous

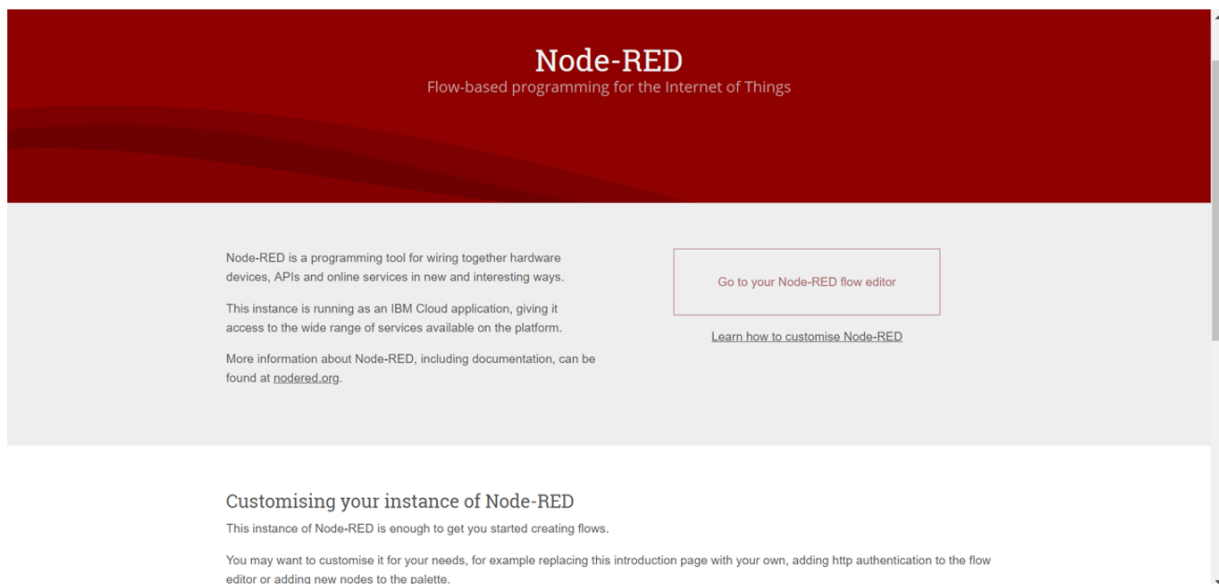
Next

- Step – 7: Click Next to continue.

- Step – 8: Click Finish.



- Step – 9: Click on Go to Node-Red flow editor to launch the flow editor.



After installing we can use different node to get our work done.

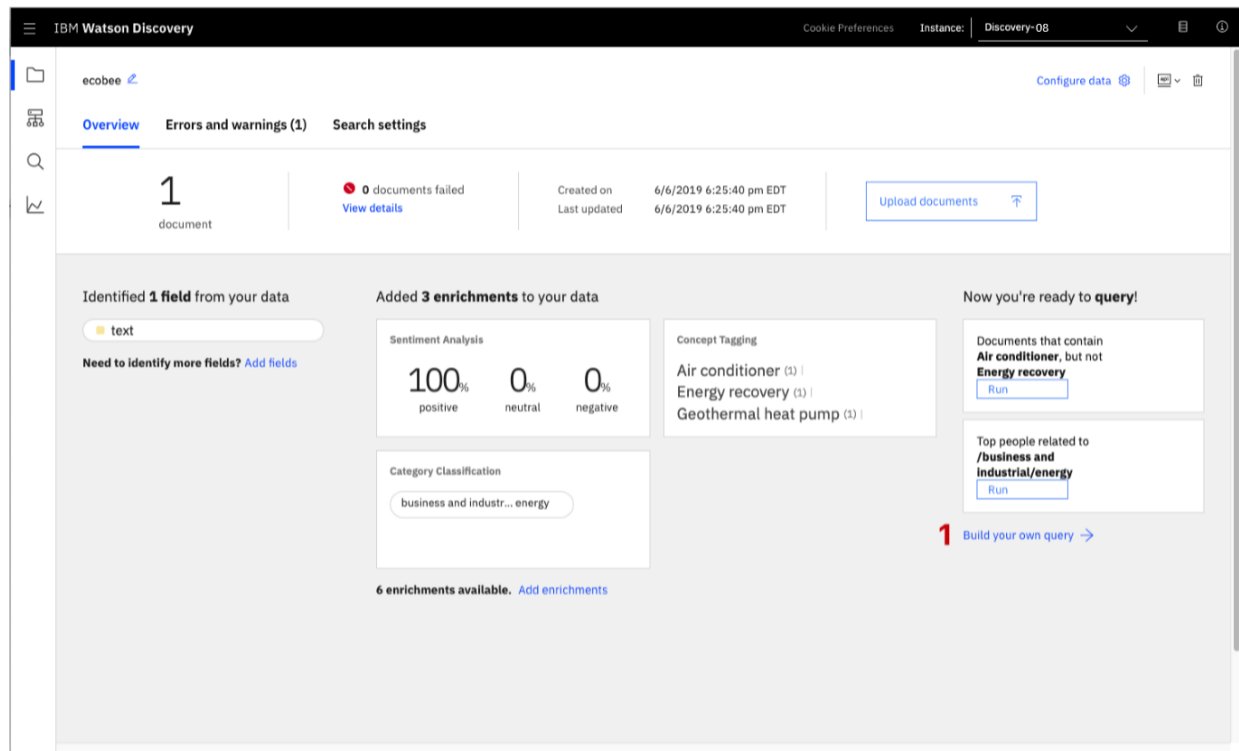
## Creation of Watson discovery instance in IBM Cloud:

- **Import the document:**

Launch the Watson Discovery tool and create a new data collection by selecting the Upload your own data option. Give the data collection a unique name. When prompted,

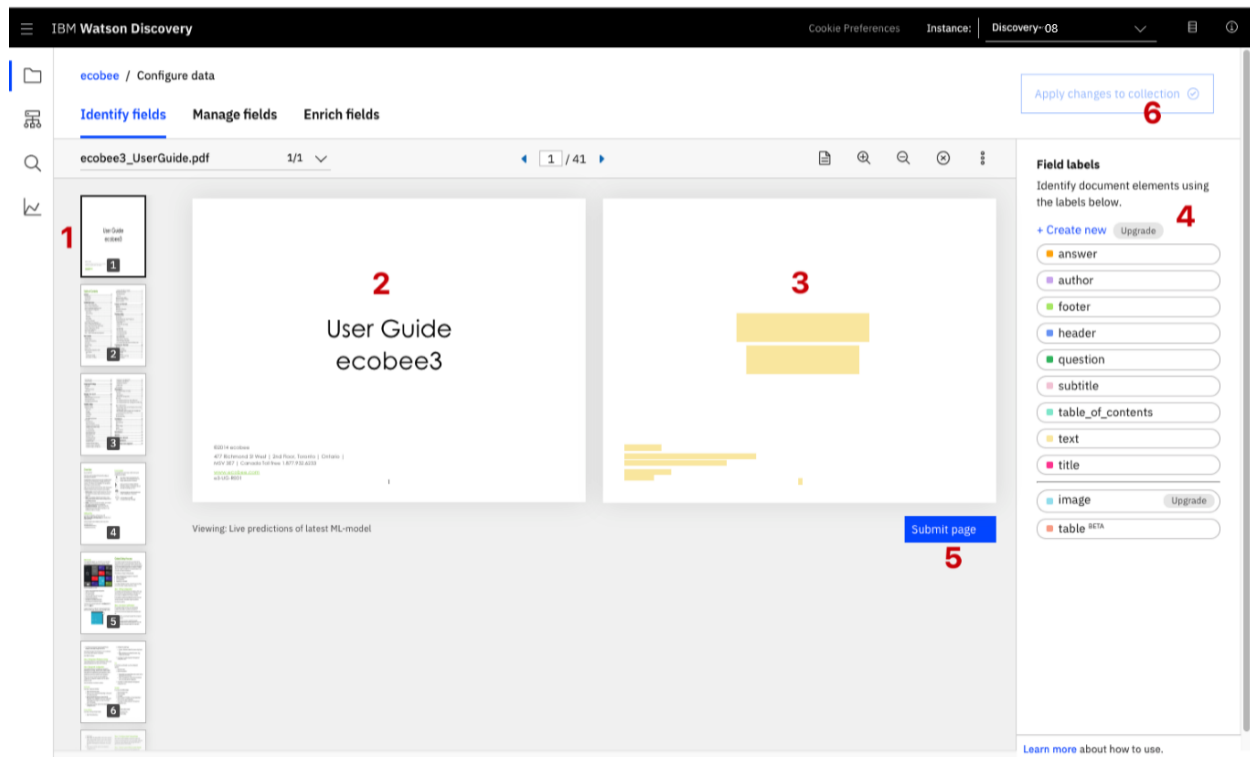
select and upload the ecobee3\_UserGuide.pdf. The Ecobee is a popular residential thermostat that has a wifi interface and multiple configuration options. Before applying SDU to our document, let's do some simple queries on the data so that we can compare it to results found after applying SDU.

Click the Build your own query[1] button.



Enter queries related to the operation of the thermostat and view the results. As you will see, the results are not very useful, and in some cases, not even related to the question. Annotate with SDU.

From the Discovery collection panel, click the Configure data button (located in the top right corner) to start the SDU process.



The goal is to annotate all of the pages in the document so Discovery can learn what text is important, and what text can be ignored.

- [1] is the list of pages in the manual. As each is processed, a green check mark will appear on the page.
- [2] is the current page being annotated.
- [3] is where you select text and assign it a label.
- [4] is the list of labels you can assign to the page text.
- Click [5] to submit the page to Discovery.
- Click [6] when you have completed the annotation process.

As you go through the annotations one page at a time, Discovery is learning and should start automatically updating the upcoming pages. Once you get to a page that is already correctly annotated, you can stop, or simply click Submit [5] to acknowledge it is correct. The more pages you annotate, the better the model will be trained. For this specific owner's manual, at a minimum, it is suggested to mark the following:

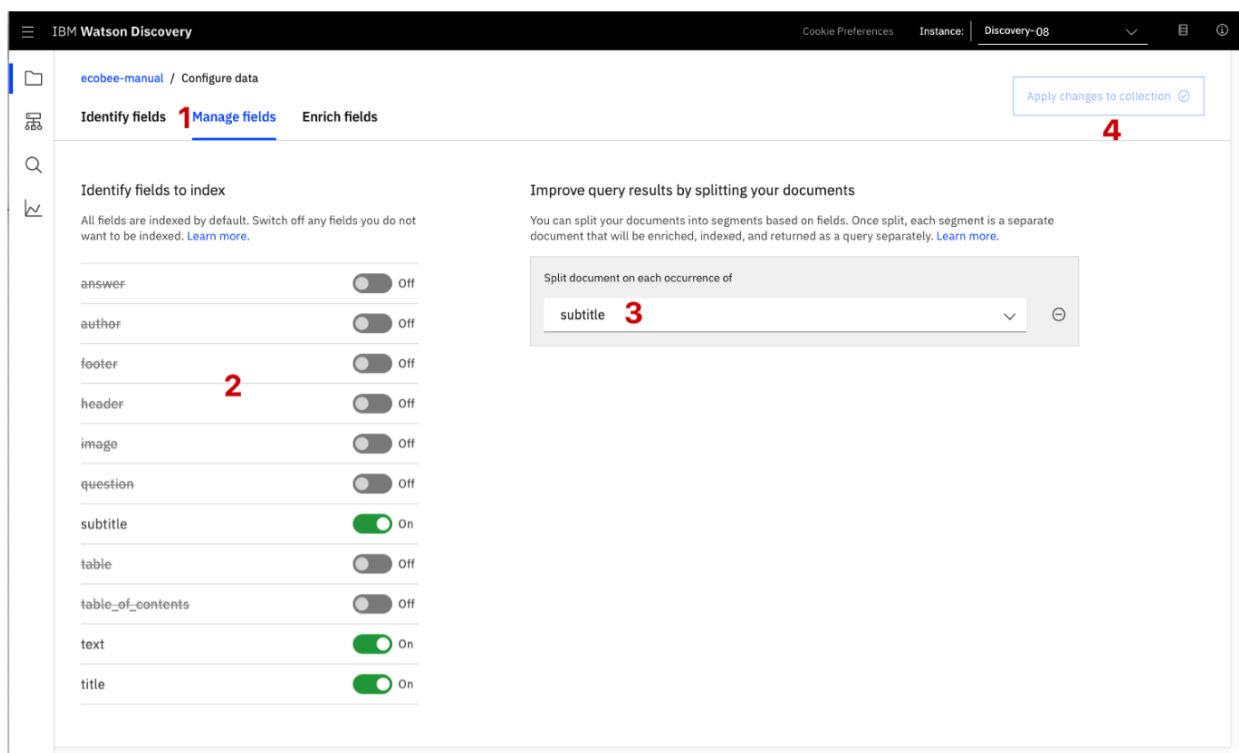
- The main title page as title

- The table of contents (shown in the first few pages) as table\_of\_contents.



- All headers and sub-headers (typed in light green text) as a subtitle.
- All page numbers as footers.
- All warranty and licensing information (located in the last few pages) as a footer.
- All other text should be marked as text.

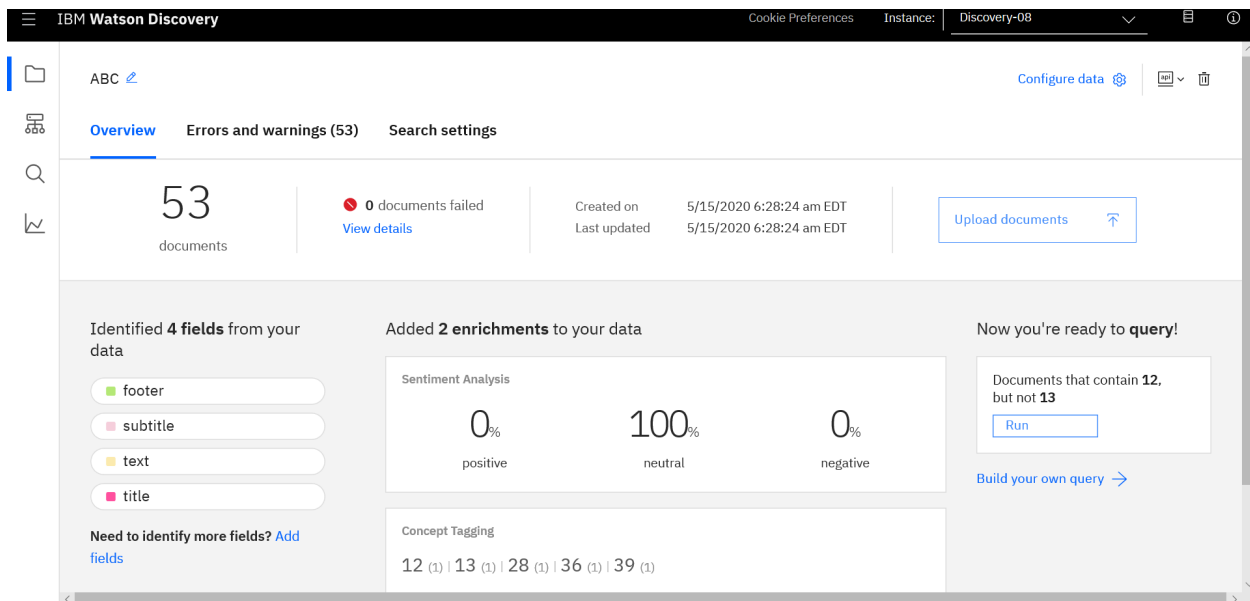
Once you click the Apply changes to collection button [6], you will be asked to reload the document. Choose the same owner's manual .pdf document as before. Next, click on the Manage fields [1] tab.



- [2] Here is where you tell Discovery which fields to ignore. Using the on/off buttons, turn off all labels except subtitles and text.
- [3] is telling Discovery to split the document apart, based on subtitle.
- Click [4] to submit your changes.

Once again, you will be asked to reload the document.

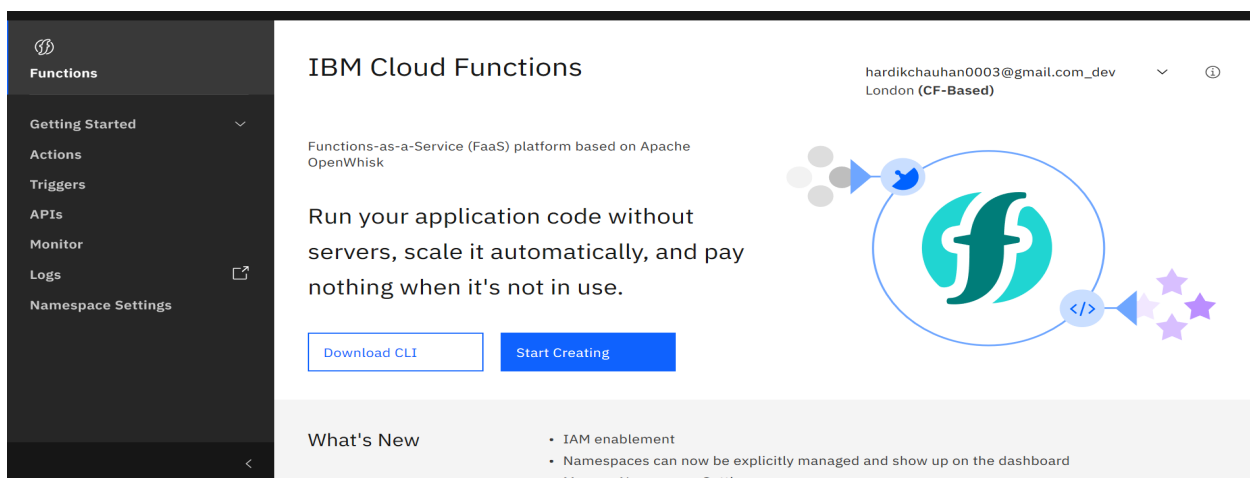
Now, as a result of splitting the document apart, your collection will look very different:



Later the no. of documents increased to 130. In upcoming steps, you will need to provide the credentials to access your Discovery collection. The values can be found in the following locations. The Collection ID and Environment ID values can be found by clicking the dropdown button located at the top right side of your collection panel.

## Creating IBM cloud functions:

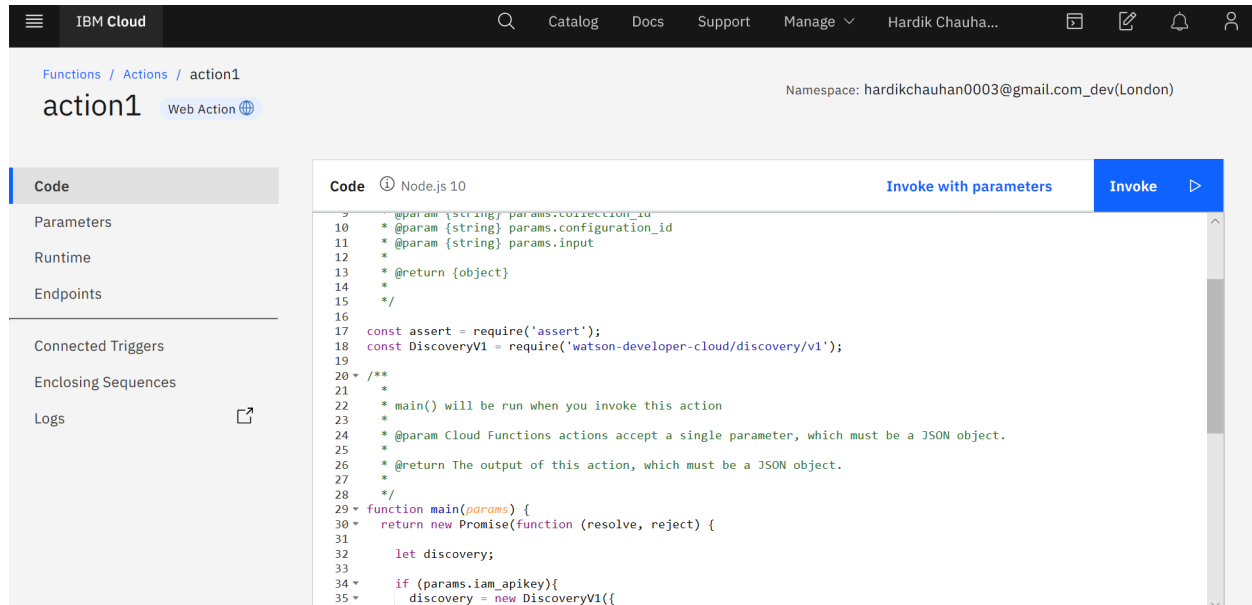
Now let's create the web action that will make queries against our Discovery collection. Start the IBM Cloud Functions service by selecting Create Resource from the IBM Cloud dashboard. Enter functions as the filter, then select the Functions card :



From the Functions main panel, click on the Actions tab. Then click on Create. From the

Create panel, select the Create Action option. On the Create Action panel, provide a unique Action Name [1], keep the default package, and select the Node.js 10 runtime. Click the Create button to create the action.

Once your action is created, click on the Code tab -

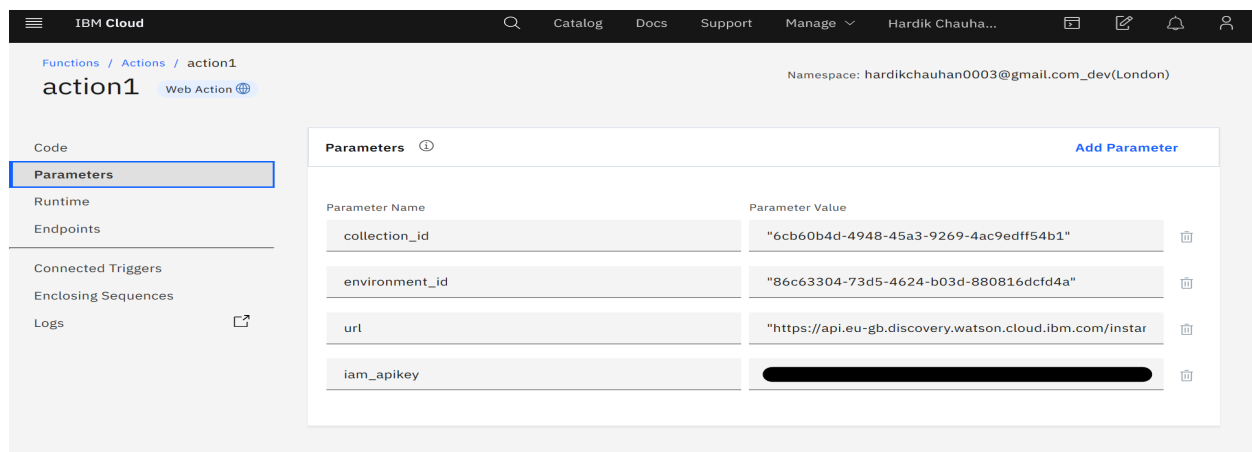


The screenshot shows the IBM Cloud Functions console. The top navigation bar includes the IBM Cloud logo, a search icon, and links to Catalog, Docs, Support, and Manage. The user's name, Hardik Chauha..., is displayed. The breadcrumb trail shows Functions / Actions / action1. The action name 'action1' is highlighted, with a 'Web Action' icon. The namespace is 'hardikchauhan0003@gmail.com\_dev(London)'. On the left, a sidebar lists tabs: Code (selected), Parameters, Runtime, Endpoints, Connected Triggers, Enclosing Sequences, and Logs. The main area shows the 'Code' tab for 'Node.js 10'. It includes a 'Code' icon, a 'Node.js 10' label, and buttons for 'Invoke with parameters' and 'Invoke'. The code is a JavaScript file named 'disco-action.js' that uses the 'discovery' service. It defines a 'main' function that takes 'params' and returns a Promise. The code is as follows:

```
10 * @param {string} params.collection_id
11 * @param {string} params.configuration_id
12 * @param {string} params.input
13 *
14 * @return {object}
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({
```

In the code editor window, cut and paste in the code from the disco-action.js file found in the actions directory of your local repo. The code is pretty straight-forward - it simply connects to the Discovery service, makes a query against the collection, then returns the response. If you press the Invoke button, it will fail due to credentials not being defined yet. We'll do this next.

Select the Parameters tab :



The screenshot shows the IBM Cloud Functions console with the 'Parameters' tab selected for 'action1'. The sidebar on the left shows the 'Parameters' tab selected. The main area displays the 'Parameters' tab with a table of parameters. The table has two columns: 'Parameter Name' and 'Parameter Value'. The parameters are:

Parameter Name	Parameter Value
collection_id	"6cb60b4d-4948-45a3-9269-4ac9edff54b1"
environment_id	"86c63304-73d5-4624-b03d-880816dcfd4a"
url	"https://api.eu-gb.discovery.watson.cloud.ibm.com/instar"
iam_apikey	[REDACTED]

Add the following keys:

- url
- environment\_id
- collection\_id
- iam\_apikey

For values, please use the values associated with the Discovery service you created in the previous step. Note: Make sure to enclose your values in double quotes. Now that the credentials are set, return to the Code panel and press the Invoke button again. Now you should see actual results returned from the Discovery service

The screenshot shows the IBM Cloud Functions console interface. The top navigation bar includes the IBM Cloud logo, a search icon, and links to Catalog, Docs, Support, and Manage. The user's name 'Hardik Chauha...' is visible. The main content area shows the configuration for a function named 'action1' in the namespace 'hardikchauhan0003@gmail.com\_dev(London)'. The left sidebar contains a menu with options: Code, Parameters, Runtime, Endpoints (highlighted), Connected Triggers, Enclosing Sequences, and Logs. The 'Endpoints' panel displays the 'Web Action' configuration. It includes a checkbox 'Enable as Web Action' which is checked, with a note explaining that this allows the function to handle HTTP events and return JSON or HTML. Below this is a checkbox for 'Raw HTTP handling' which is unchecked. A table lists the HTTP endpoints:

HTTP Method	Auth	URL
ANY	Public	<a href="https://eu-gb.functions.cloud.ibm.com/api/v1/web/hardikchauhan0003%40gmail.com_dev/default/action1">https://eu-gb.functions.cloud.ibm.com/api/v1/web/hardikchauhan0003%40gmail.com_dev/default/action1</a>

Below the table, there is a section for 'REST API'.

Click the checkbox for Enable as Web Action. This will generate a public endpoint URL . Take note of the URL value, as this will be needed by Watson Assistant in a future step. To verify you have entered the correct Discovery parameters, execute the provided curl command [4]. If it fails, re-check your parameter values.

## Configure Watson Assistant:

As shown below, launch the Watson Assistant tool and create a new dialog skill. Select the Use sample skill option as your starting point. This dialog skill contains all of the nodes needed to have a typical call center conversation with a user.

## Add new intent

The default customer care dialog does not have a way to deal with any questions involving outside resources, so we will need to add this. Create a new intent that can detect when the user is asking about operating the Ecobee thermostat. From the Customer Care Sample Skill panel, select the Intents tab. Click the Create intent button. Name the intent #Product\_Information, and at a minimum, enter the following example questions to be associated with it.

The screenshot shows the 'Intents' tab in the IBM Watson Assistant interface. The breadcrumb navigation shows a back arrow, a vertical bar, and the text '#Product\_information'. The top right corner indicates 'Last updated: 6 minutes ago' and includes icons for download, delete, search, and a 'Try it' button. The main form area has three sections: 'Intent name' with a text box containing '#Product\_information', 'Description (optional)' with a text box containing 'Add a description to this intent', and 'User example' with a text box containing 'Type a user example here, e.g. I want to pay my credit card bill'. Below the text boxes are 'Add example' and 'Show recommendations' buttons. At the bottom, there is a section for 'User examples (3)' with a table showing three examples. The first example is 'How do I access the settings...' and is highlighted. The table has columns for 'Added' and '↓↑'. The bottom right corner shows 'Showing 1-3 of 3 examples' and a pagination control for '1 of 1 pages'.

## Create new dialog node

Now we need to add a node to handle our intent. Click on the Dialog tab, then click on the drop down menu for the Small Talk node, and select the Add node below option.

Name the node "Ask about product" and assign it our new intent.

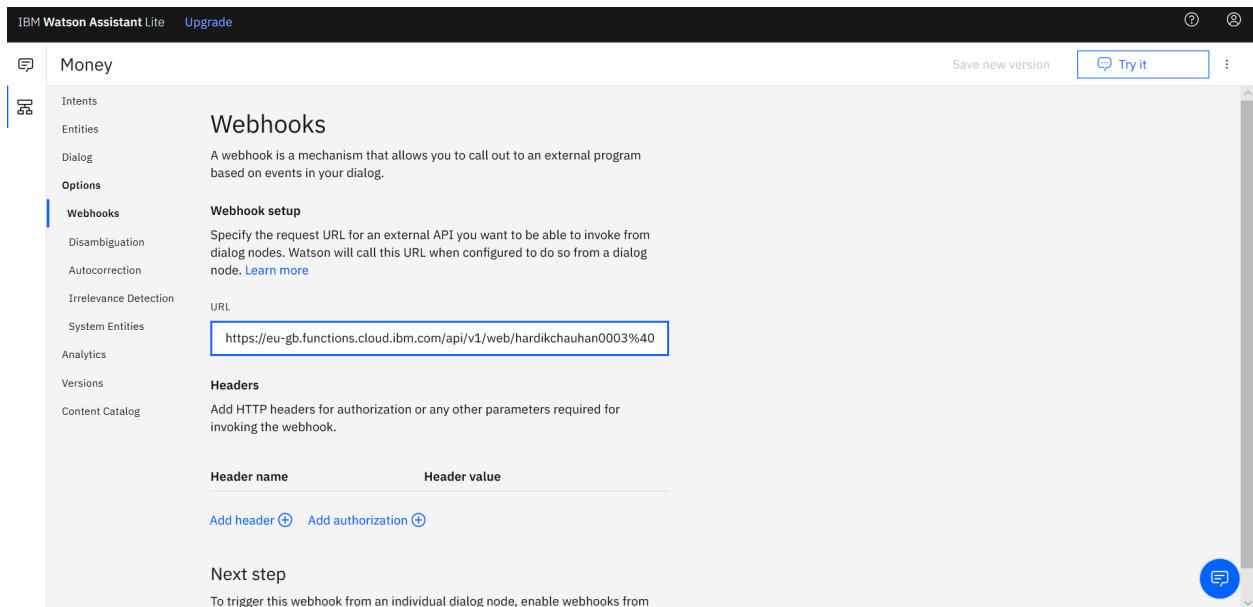
The screenshot shows the 'Dialog' tab in the IBM Watson Assistant interface for a skill named 'Money'. The left sidebar shows a tree view with 'Intents', 'Entities', 'Dialog', 'Options', 'Analytics', 'Versions', and 'Content Catalog'. The 'Dialog' node is selected, and a list of nodes is shown: 'Order', 'Enquiry', '#Greetings', 'Ask about product', and 'Anything else'. The 'Ask about product' node is highlighted. The main area shows the configuration for the 'Ask about product' node. The 'Node name' is 'Ask about product'. The 'If assistant recognizes' section has a dropdown menu with '#Product\_information' selected. The 'Assistant responds' section has a dropdown menu with 'Text' selected and a text box containing 'Enter response text'. The bottom right corner has an 'Add response type' button.

This means that if Watson Assistant recognizes a user input such as "how do I set the time?", it will direct the conversation to this node.

## Enable webhook from Assistant

Set up access to our WebHook for the IBM Cloud Functions action you created.

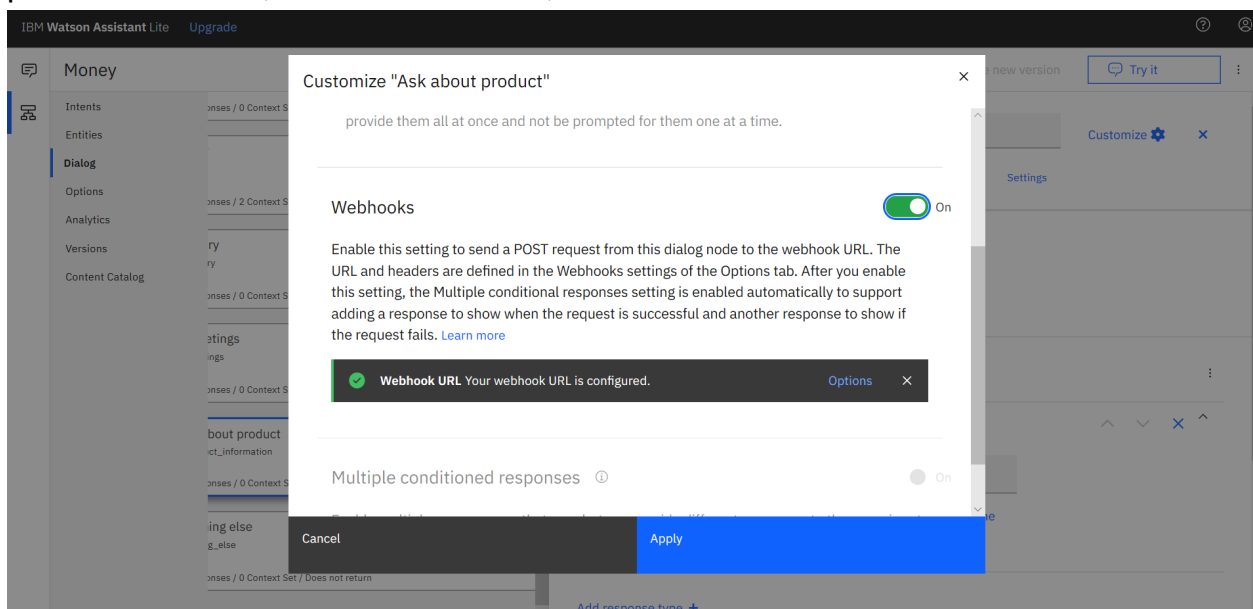
Select the Options tab:



Enter the public URL endpoint for your action.

**Important:** Add .json to the end of the URL to specify the result should be in JSON format.

Return to the Dialog tab, and click on the Ask about product node. From the details panel for the node, click on Customize, and enable Webhooks for this node:



Click Apply.

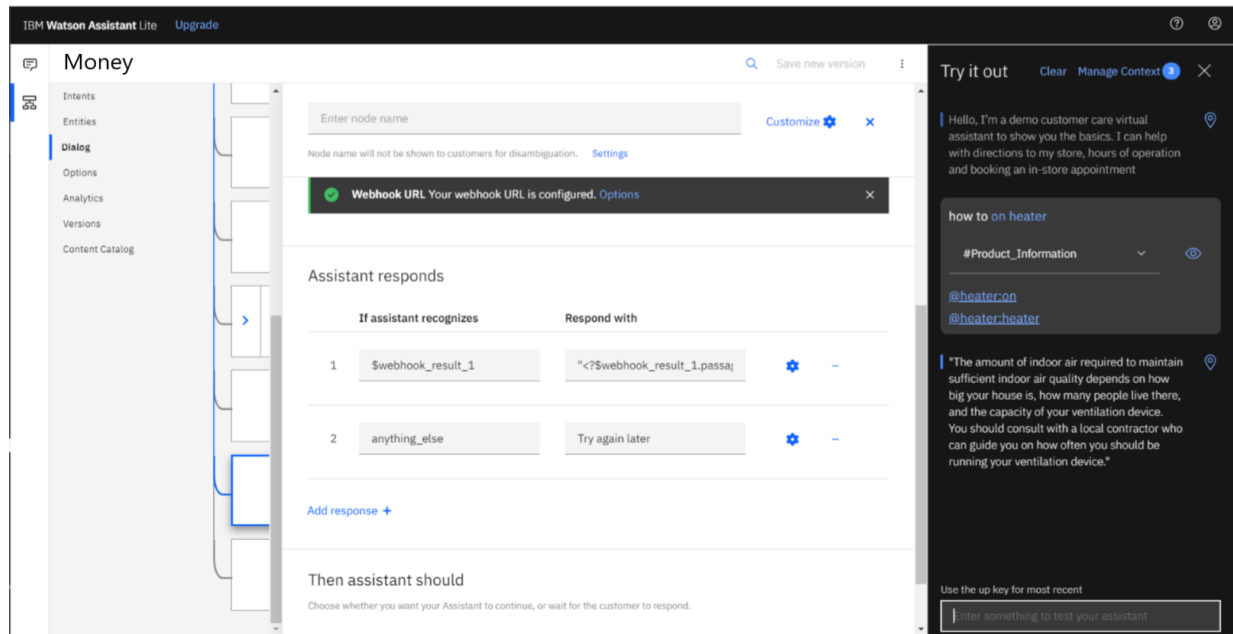
The dialog node should have a Return variable set automatically to \$webhook\_result\_1. This is the variable name you can use to access the result from the Discovery service query.

The screenshot shows the IBM Watson Assistant Lite interface. On the left, a sidebar lists navigation options: Intents, Entities, Dialog, Options, Analytics, Versions, and Content Catalog. The 'Dialog' section is selected, showing a list of dialog nodes. The 'Ask about product' node is highlighted with a blue border. This node has 2 Responses, 0 Context Set, and Does not return. The right pane shows the configuration for this node. The node name is 'Ask about product'. Below the name, there is a description: 'Node name will be shown to customers for disambiguation so use something descriptive.' and a 'Settings' link. The 'Parameters' section shows a table with one parameter: 'input' with a value of '<?input.text?>'. Below the parameters, there is a 'Return variable' section with the value 'webhook\_result\_1'. At the bottom, there is a green notification banner that says 'Webhook URL Your webhook URL is configured. Options'. The bottom of the interface shows the 'Assistant responds' section with a blue speech bubble icon.

You will also need to pass in the users question via the parameter input. The key needs to be set to the value: "<?input.text?>"

If you fail to do this, Discovery will return results based on a blank query. Optionally, you can add these responses to aid in debugging:

Add "<?webhook\_result\_1.passages[0].passage\_text?>" in respond with in Assistant responds block as shown below.



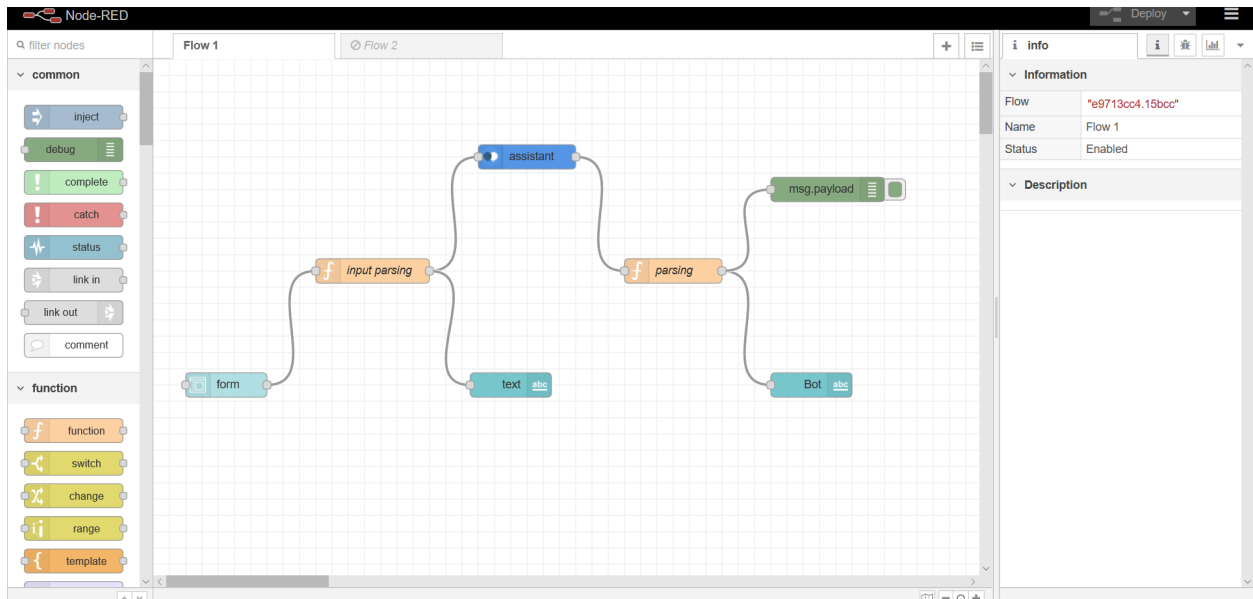
## Integration of watson assistant in Node-RED :

- Double-click on the Watson assistant node .
- Give a name to your node and enter the username, password and workspace id of your Watson assistant service .
- After entering all the information click on Done .
- Drag inject node on to the flow from the Input section .
- Drag Debug on to the flow from the output section.
- Double-click on the inject node .
- Select the payload as a string .
- Enter a sample input to be sent to the assistant service and click on done .
- Connect the nodes as shown below and click on Deploy .
- Open Debug window as shown below .
- Click on the button to send input text to the assistant node .
- Observe the output from the assistant service node .
- The Bot output is located inside "output.text".
- Drag the function node to parse the JSON data and get the bot response .
- Double click on the function node and enter the JSON parsing code



as shown below and click on done .

- Connect the nodes as shown below and click on Deploy.

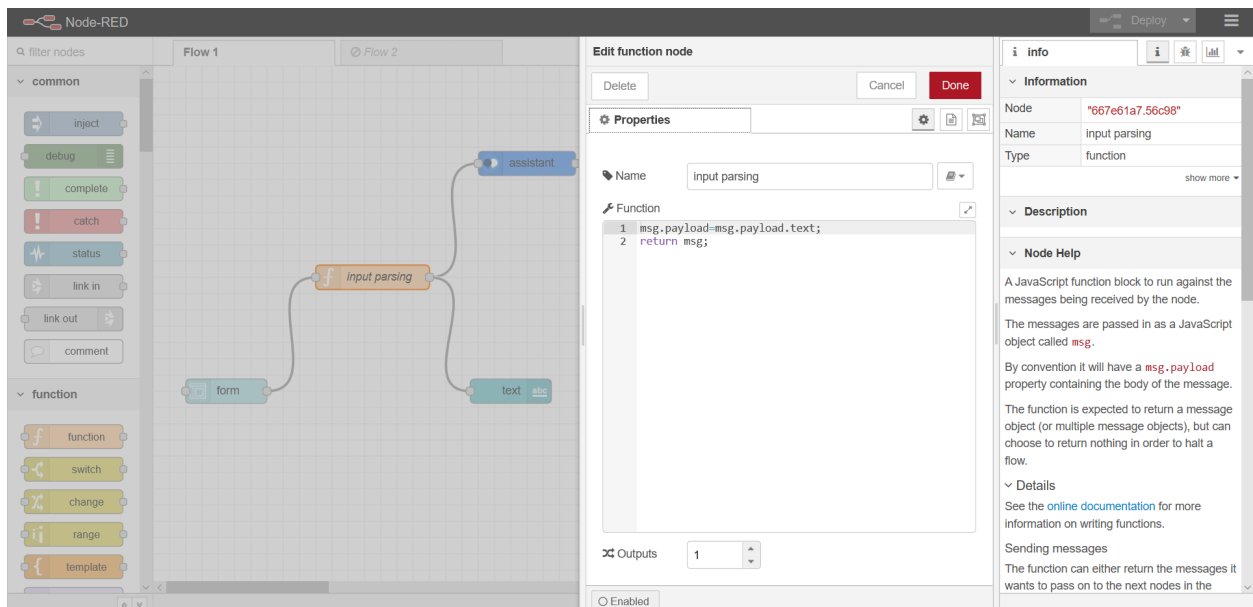


- Re-inject the flow and observe the parsed output.

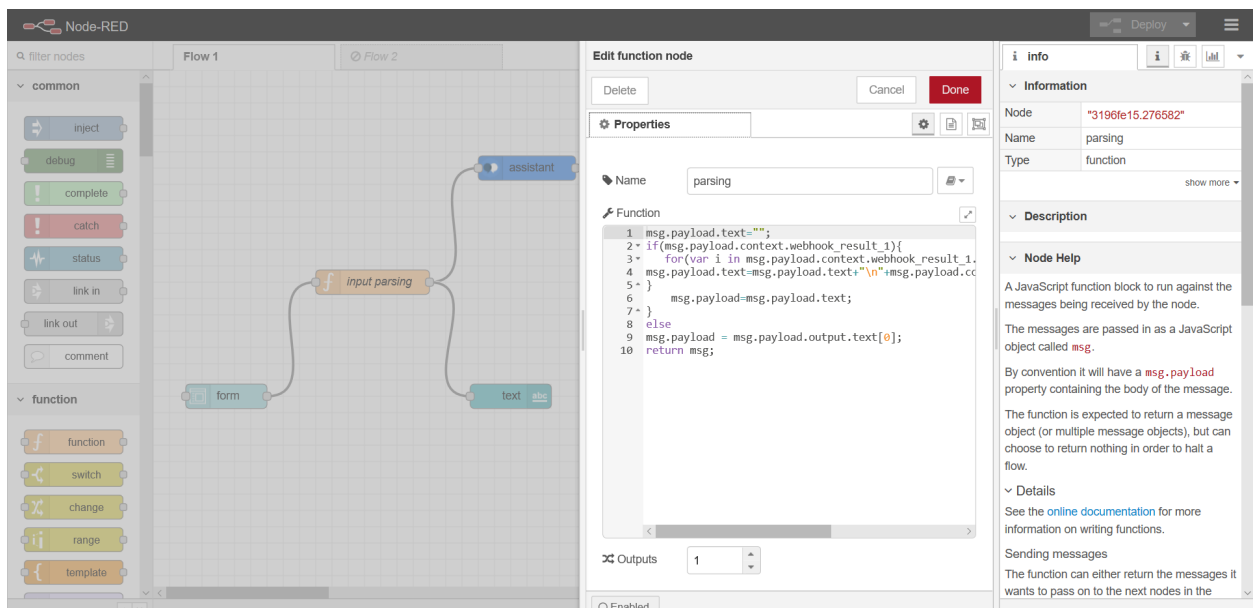
We are done integrating Watson assistant service to Node-red. In the next lab, we will create a web application using Node-red for the chatbot. For creating a web application UI we need “dashboard” nodes which should be installed manually.

- Go to navigation pane and click on manage palette .
- Click on install .
- Search for “node-red-dashboard” and click on install and again click on install on the prompt .
- The following message indicates dashboard nodes are installed, close the manage palette .
- Search for “Form” node and drag on to the flow .
- Double click on the “form” node to configure .
- Click on the edit button to add the “Group” name and “Tab” name .
- Click on the edit button to add tab name to web application .
- Give sample tab name and click on add do the same thing for the group .

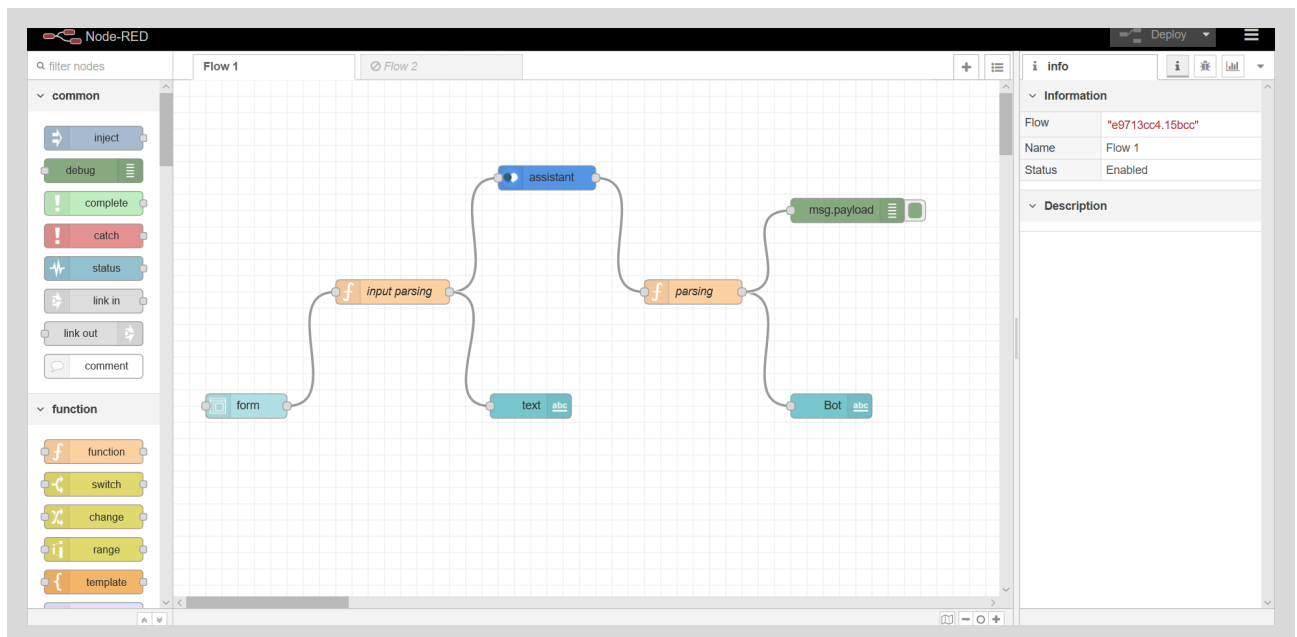
- Give the label as “Enter your input” Name as “text” and click on Done.
- Drag a function node, double-click on it and enter the input parsing code as shown below.



- Click on done.
- Connect the form output to the input of the function node and output of the function to input of assistant node.



- ## FLOWCHART



# RESULTS

**Home**

**Input**

Enter the query  
how to change settings

**SUBMIT** **CANCEL**

how to change settings

**Output**

**Bot**

You can configure how long a manual change to the set point will remain in effect. On Thermostat: 1. Select Main Menu > Settings > Preferences 2. Select Hold action. 3. Select the hold action from the list: 2 hours 4 hours Until the next scheduled activity Until you change it (default value) Decide at time of change On Web: 1. Select Settings tile. 2. Select Preferences. 3. Select Hold Action. 4. Select the hold action from the list: 2 hours 4 hours Until the next scheduled activity Until you change it (default value) Decide at time of change You can prevent people from making changes your thermostat's schedule, vacation, or system settings by configuring a 4-digit security code. If enabled, the security code will be required to access and change these settings. On Thermostat: To add a security code or change existing settings: 1. Select Main Menu > Settings > Access control 2. If the security code is currently disabled (default setting), touch Enable Security Code, enter a new code and touch Save. Otherwise, enter the existing security code. 3. Select the feature(s) you want to protect: Temperature & Quick Changes Schedule Vacation System & Settings To remove an existing security code: 1. Select Main Menu > Settings > Access control 2. Enter the existing security code. 3. Touch Change Security Code. 4. Delete the existing code and touch Save. On Web: 1. Select Settings tile. 2. Select Access Control. 3. If the security code is currently disabled (default setting), select Enable and enter a new code and touch Save. Otherwise, enter the existing security code. 4. Select the feature(s) you want to protect: Temperature & Quick Changes Schedule Vacation System & Settings Your ecobee3 supports Wi-Fi 802.11 b/g/n. Wi-Fi is normally configured during initial setup. You may, however, be required to reconfigure the settings if your Wi-Fi network settings change. On Thermostat: Select Main Menu > Settings > Wi-Fi.

Finally our Node-RED dash board integrates all the components and displayed in the Dashboard UI by typing URL-  
<https://node-red-srlan.eu-gb.mybluemix.net/ui> in browser .

## ADVANTAGES & DISADVANTAGES

### Advantages:

- Companies can deploy chatbots to rectify simple and general human queries .
- Reduces man power
- Cost efficient
- No need to divert calls to customer agent and customer agent can look on other works.

### Disadvantages:

- Some times chatbot can mislead customers
- Giving same answer for different sentiments.
- Some times cannot connect to customer sentiments and intentions.

## APPLICATIONS

- It can deploy in popular social media applications like facebook,slack,telegram.
- Chatbot can deploy any website to clarify basic doubts of viewers.

## CONCLUSION

By doing the above procedure and all we successfully created Intelligent helpdesk smart chatbot using Watson assistant, Watson discovery, Node-RED and cloud-functions. A tool which can be used in in our daily life and providing answers on the basis of processed data feeded to this intelligent system.

## FUTURE SCOPE

This chatbot can also be used to a great extent when artificial intelligence is blended in the context. We can include watson studio text to speech and speech to text services to access the chatbot handsfree. This is the future scope of this project.

## APPENDIX

Source code:

```
[{"id":"e9713cc4.15bcc","type":"tab","label":"Flow
1","disabled":false,"info":"","},{id":"a5974fec.b8a9f","type":"debug","z":"e9713cc4.15bcc","na
me":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"payload","ta
rgetType":"msg","x":830,"y":160,"wires":[]},{id":"3196fe15.276582","type":"function","z":"e97
13cc4.15bcc","name":"parsing","func":"msg.payload.text=\"\\\";\\nif(msg.payload.context.w
ebhook_result_1){\\n  for(var i in
msg.payload.context.webhook_result_1.results){\\nmsg.payload.text=msg.payload.text+
\\\"\\n\\\"+msg.payload.context.webhook_result_1.results[i].text;\\n}\\n
msg.payload=msg.payload.text;\\n}\\nelse\\nmsg.payload =
msg.payload.output.text[0];\\nreturn
msg;","outputs":1,"noerr":0,"x":640,"y":260,"wires":[["8f341609.f85c58","a5974fec.b8a9f"]]},{"
```

```
"id":"667e61a7.56c98","type":"function","z":"e9713cc4.15bcc","name":"input
parsing","func":"msg.payload=msg.payload.text;\nreturn
msg;","outputs":1,"noerr":0,"x":270,"y":260,"wires":[["6534297.2e494d8","ed0d94f3.d7d4c8"
]],{"id":"72f4f7bc.ee6d38","type":"ui_form","z":"e9713cc4.15bcc","name":"","label":"","group":
"88b07c1e.56cb2","order":1,"width":0,"height":0,"options":[{"label":"Enter the
query","value":"text","type":"text","required":true,"rows":null}],formValue":{"text":""},"payload
":"","submit":"submit","cancel":"cancel","topic":"","x":90,"y":400,"wires":[["667e61a7.56c98"]]},
{"id":"8f341609.f85c58","type":"ui_text","z":"e9713cc4.15bcc","group":"62bd488b.c7f688","
order":1,"width":15,"height":11,"name":"","label":"Bot","format":"{{msg.payload}}","layout":
"col-center","x":810,"y":400,"wires":[]},{"id":"6534297.2e494d8","type":"watson-conversatio
n-v1","z":"e9713cc4.15bcc","name":"","workspaceid":"1e0716bd-7d5a-4591-a542-f816fd6f
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