Project Report

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Title : Intelligent Customer Help Desk With Smart Document Understanding

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 (Discovery , Assistant, Cloud function and Node Red). By the end of the project, we'll learn best practices of combining Watson services, and how they can build interactive information retrieval systems with Discovery + Assistant.

- Project Requirements: Python, IBM Cloud, IBM Watson
- Functional Requirements: IBM cloud
- Technical Requirements: AI,ML,WATSON AI,PYTHON
- Software Requirements: Watson assistant, Watson discovery.
- Project Deliverables: Smartinternz Intership
- Project Team: Manav Jain
- Project Duration:19 days

1.2 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 owners manual. So now, instead of "Would you like to speak to a customer representative?" we can return relevant sections of the owners 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 on what text in the

owners manual is important and what is not. This will improve the answers returned from the queries.

1.2.1 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 the same on IBM Cloud Platform 2.

2.LITERATURE SURVEY

2.1 Existing problem

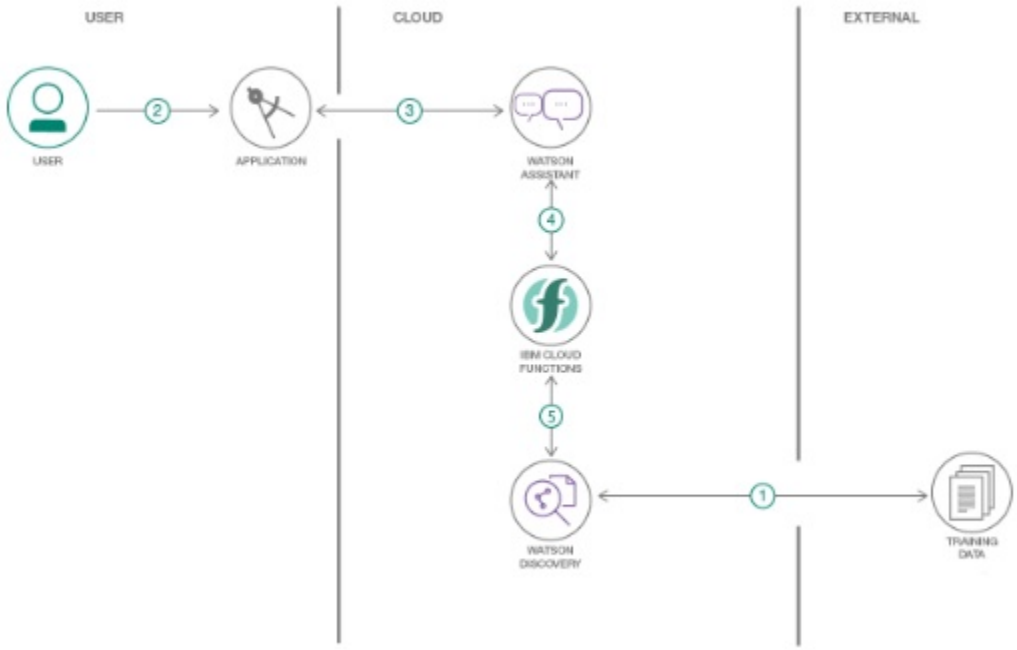
Generally Chatbots means getting input from users and getting only response questions and for some questions the output from bot will be like “try again”, “I don’t understand”, “will you repeat again”, and so on… and directs customer to customer agent but a good customer Chatbot should minimize involvement 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 clarifies his doubts with fast chatbots.

2.2 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 trained from some insight records based 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

3.THEORITICAL ANALYSIS

3.1 Block/Flow 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 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.

3.2 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.

4.EXPERIMENTAL INVESTIGATIONS

1.Create IBM Cloud services

Create the following services:

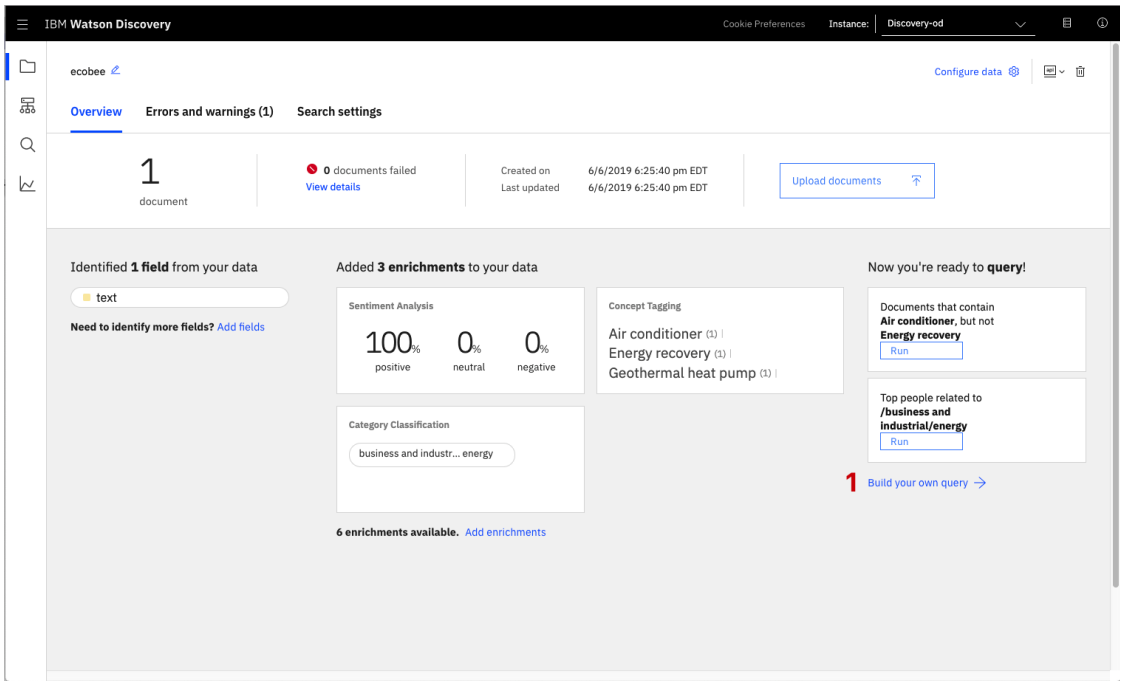
- Watson Discovery
- Watson Assistant
- Node Red

2. Configure Watson Discovery

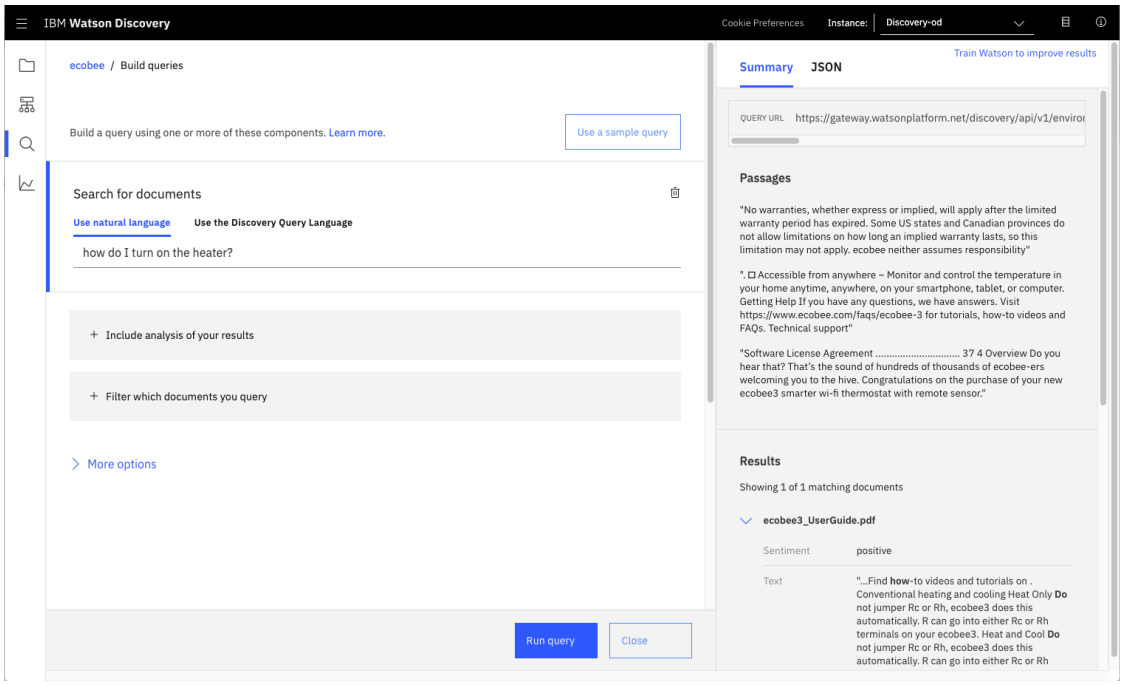
Import the document Launch the Watson Discovery tool and create a new data collection by selecting the Upload your own data option. Give the data collection a unique name. When prompted, select and upload the ecobee3_UserGuide.pdf file located in the data directory of your local repo.

The Ecobee is a popular residential thermostat that has a wifi interface and multiple configuration options.

Before applying SDU to our document, lets 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.

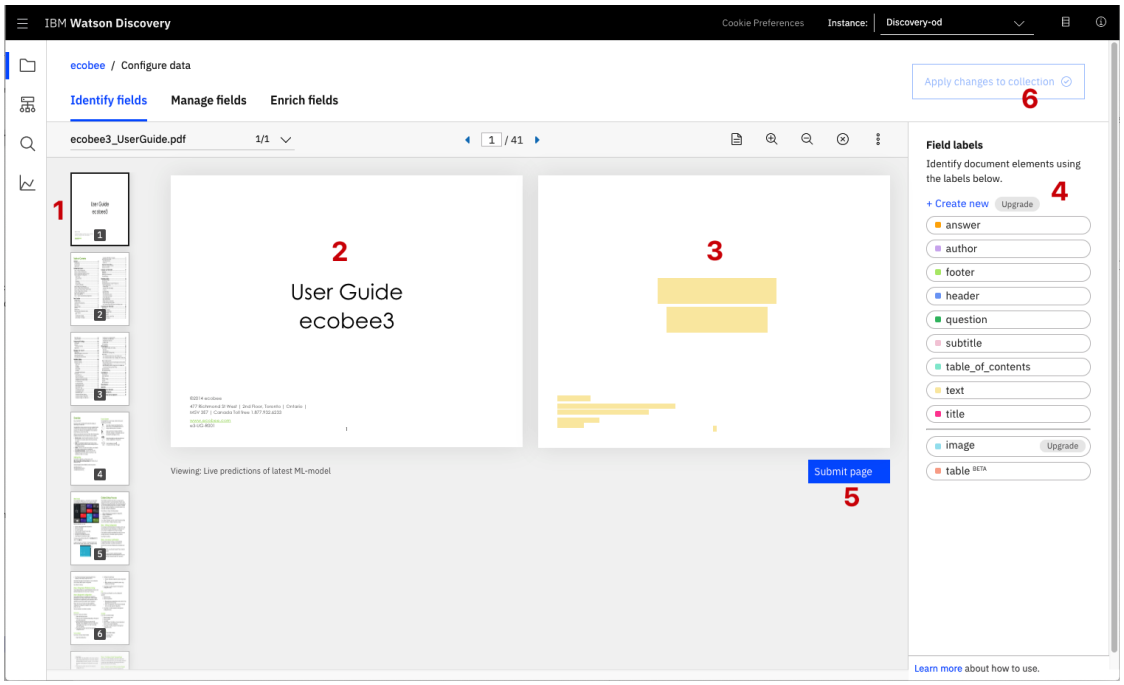


Enter queries related to the operation of the thermostat and view the results. As you will see, the results are not very useful, and in some cases, not even related to the question.

Annotate with SDU

Now let's apply SDU to our document to see if we can generate some better query responses.From the Discovery collection panel, click the Configure data button (located in the top right corner) to start the SDU process.

Here is the layout of the Identify fields tab of the SDU annotation panel:

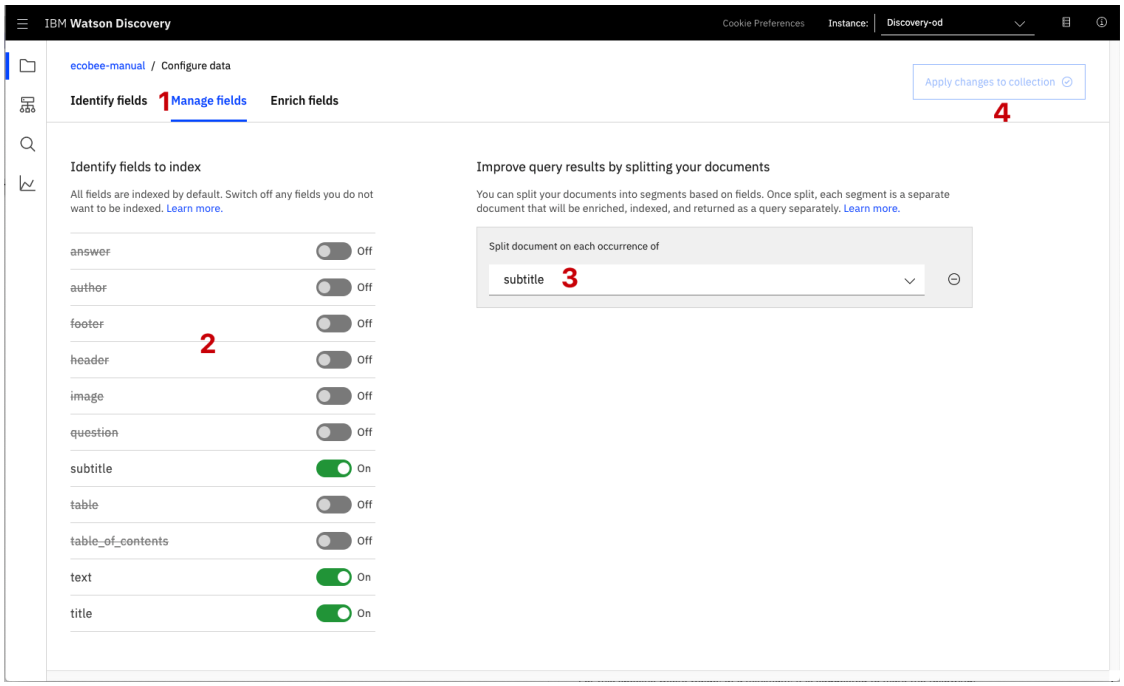


The goal is to annotate all of the pages in the document so Discovery can learn what text is important, and what text can be ignored.
[1] is the list of pages in the manual. As each is processed, a green check mark will appear on the page.
[2] is the current page being annotated.
[3] is where you select 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 though 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 infomation (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.



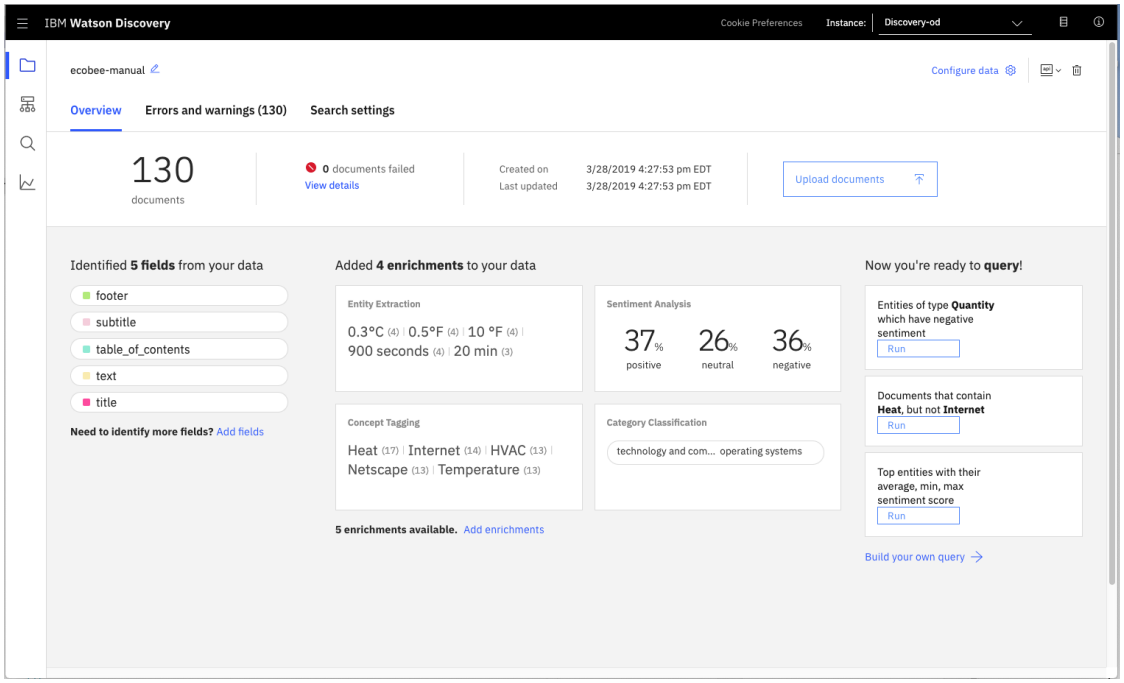
- [2] Here is where you tell Discovery which fields to ignore. Using the `on/off` buttons, turn off all labels except `subtitles` and `text`.

- [3] is telling Discovery to split the document apart, based on `subtitle`.
- Click [4] to submit your changes.

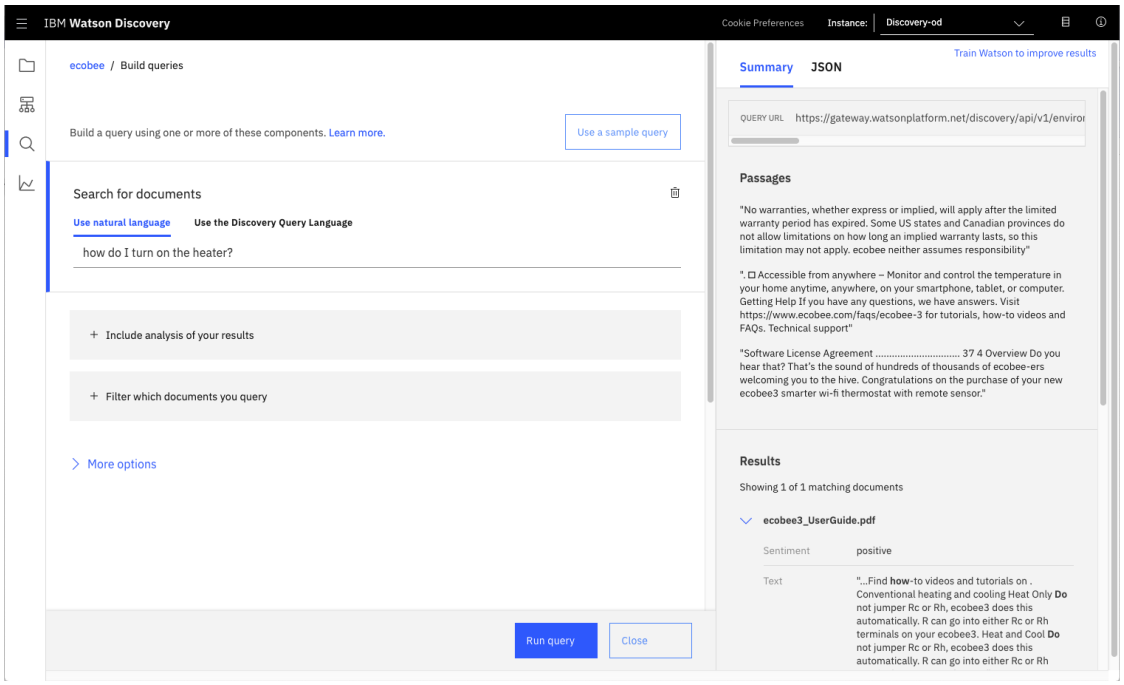
Once again, you will be asked to reload the document.

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

different:



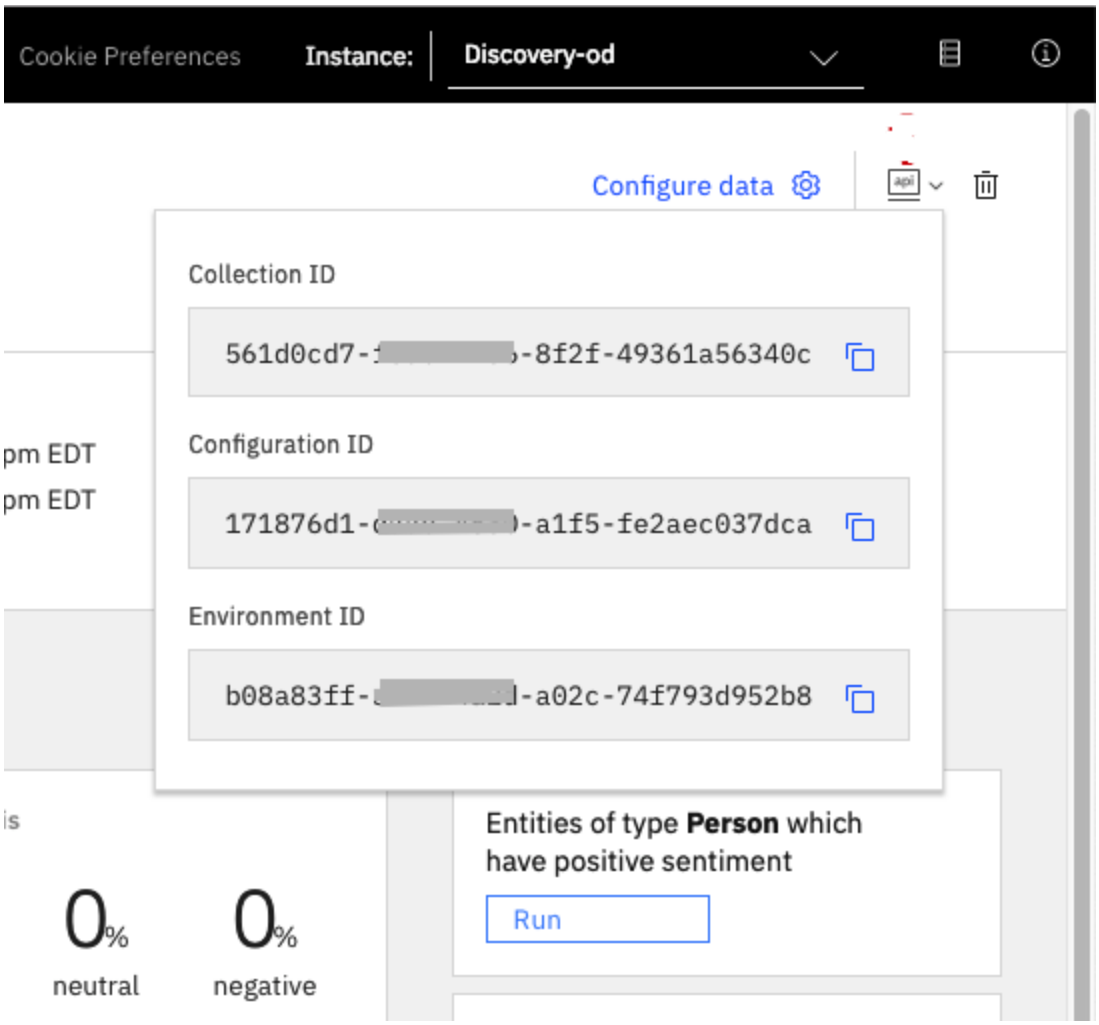
Return to the query panel (click `Build your own query`) and see how much better the results are.



Store credentials for future use

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 [1] located at the top right side of your collection panel:



For credentials, return to the main panel of your Discovery service, and click the `Service credentials` [1] tab:

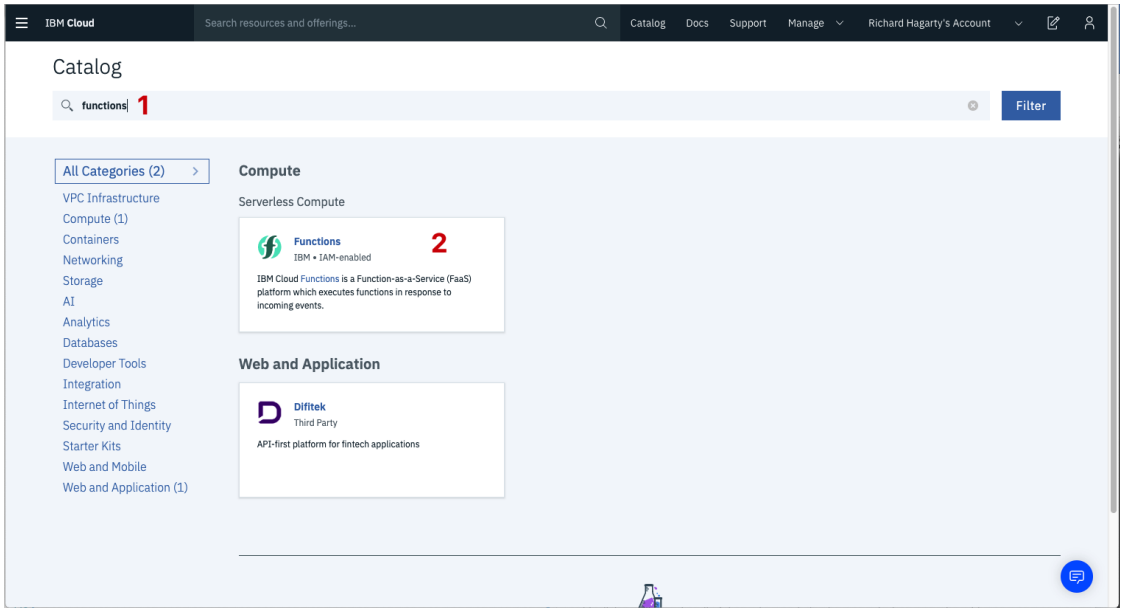
Click the `View credentials` [2] drop-down menu to view the IAM `apikey` [3] and `URL` endpoint [4] for your service.

3. Create IBM Cloud Functions action

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 [1], then select the

`Functions` card [2]:

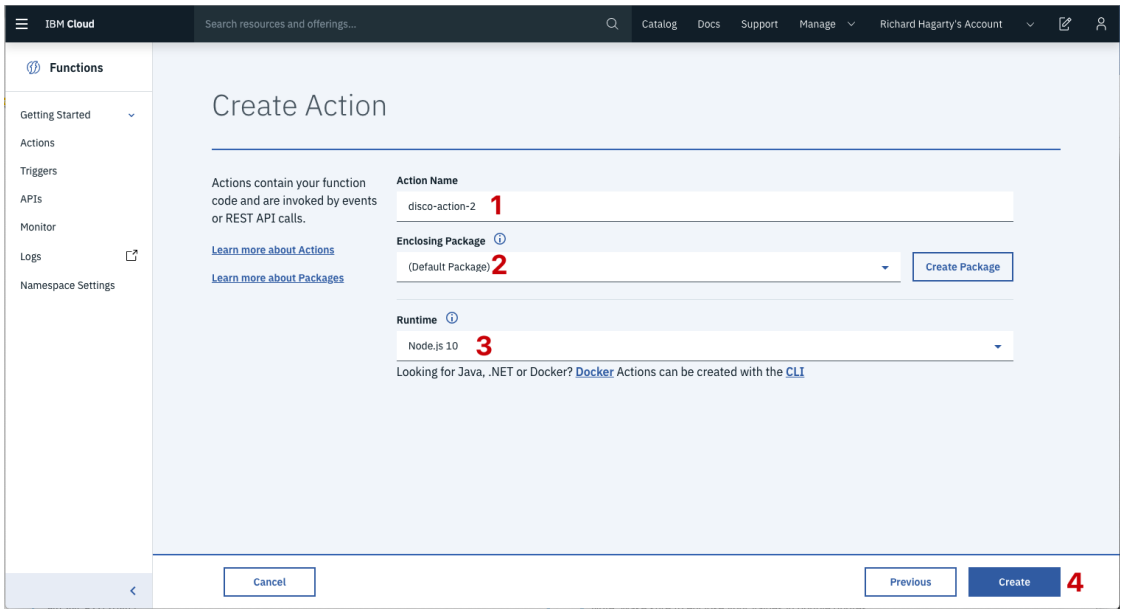


From the `Functions` main panel, click on the `Actions` tab. Then click on `Create`.

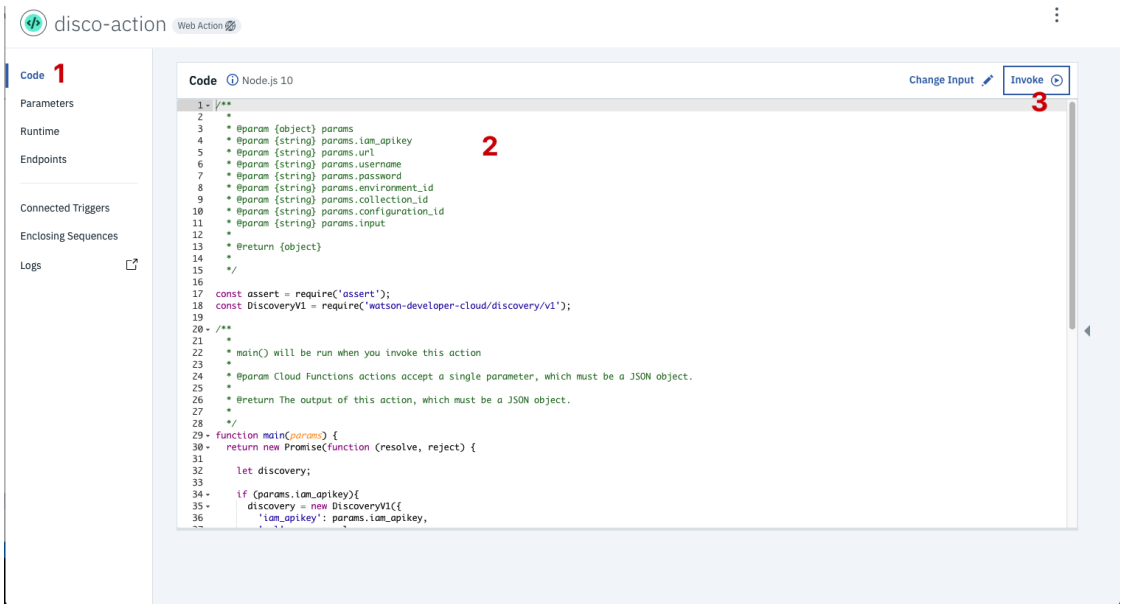
From the `Create` panel, select the `Create Action` option.

On the `Create Action` panel, provide a unique `Action Name` [1], keep the default package [2], and select the `Node.js 10` [3] runtime.

Click the `Create` button [4] to create the action.



Once your action is created, click on the `Code` tab [1]:

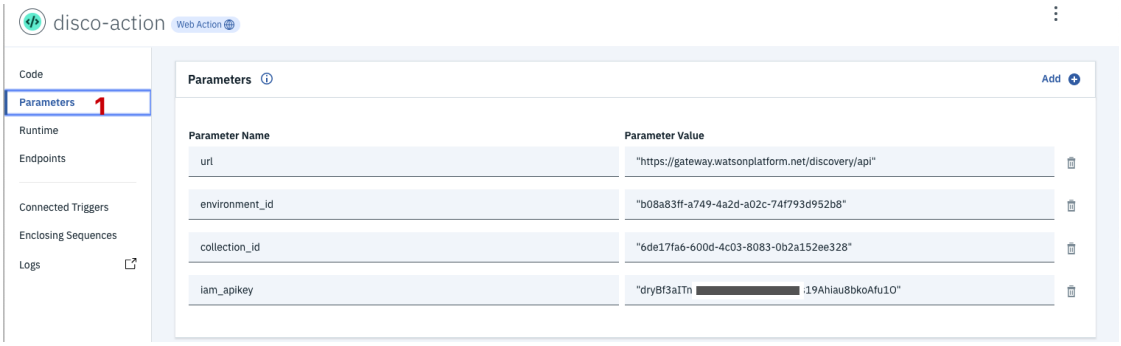


In the code editor window [2], cut and paste in the code from the `disco-action.js` file found in the `actions` directory of your local repo. The

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 [3], it will fail due to credentials not being defined yet. We'll do this next.

Select the `Parameters` tab [1]:



Add the following keys:

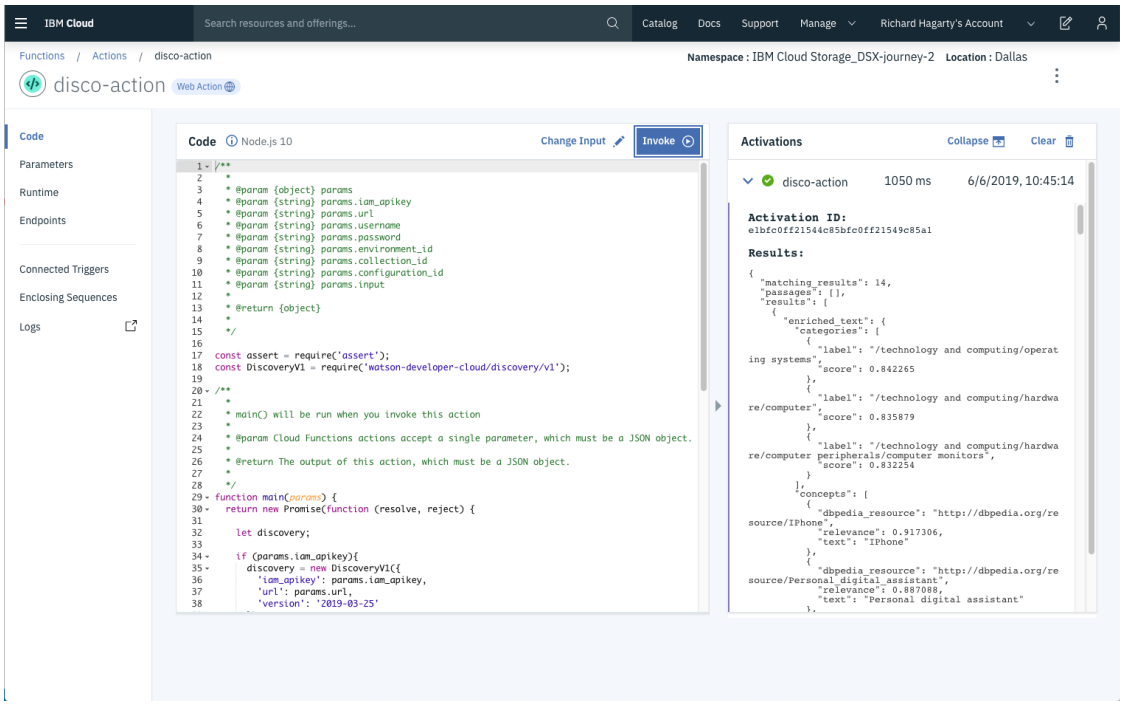
- url

- environment_id
- collection_id
- iam_apikey

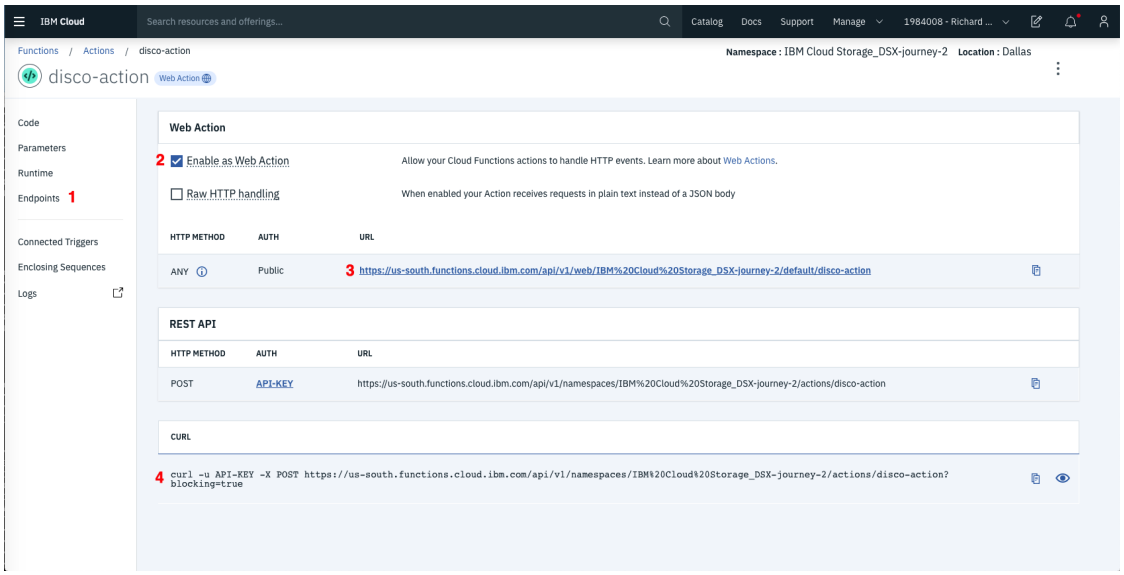
For values, please use the values associated with the Discovery service you created in the previous step.

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:



Next, go to the `Endpoints` panel [1]:



Click the checkbox for `Enable as Web Action` [2]. This will generate a public endpoint URL [3].

Take note of the URL value [3], as this will be needed by Watson Assistant in a

future step.

To verify you have entered the correct Discovery parameters, execute the provied `curl` command [4]. If it fails, re-check your parameter values.

NOTE: An IBM Cloud Functions service will not show up in your dashboard resource list. To return to your defined `Action`, you will need to access Cloud Functions by selecting `Create Resource` from the main dashboard panel (as shown at the beginning of this step).

4. 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

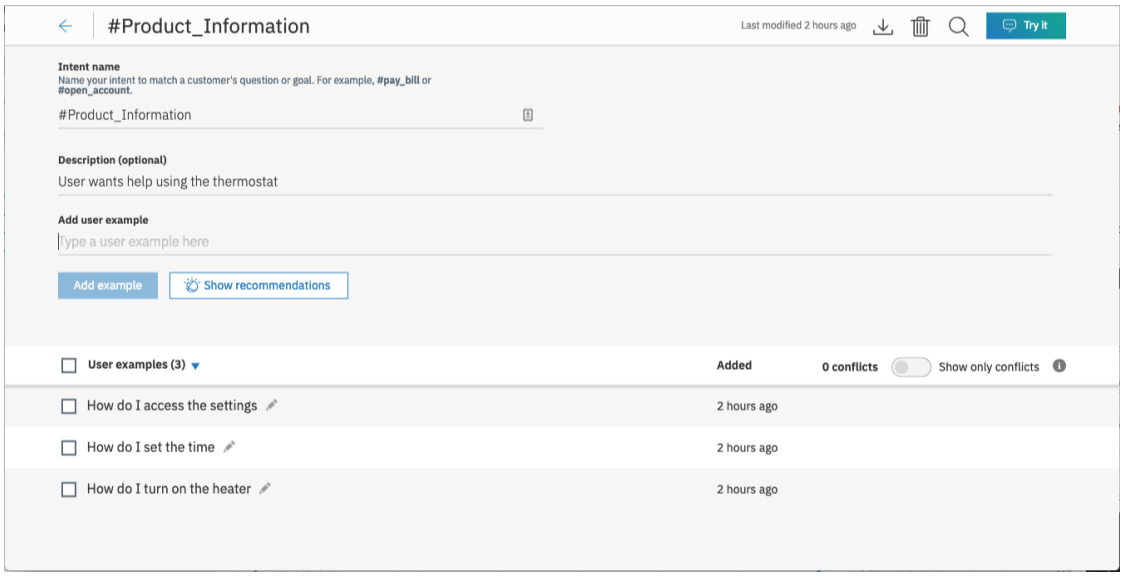
The default customer care dialog does not have a way to deal with any questions involving outside resources, so we will need to add this.

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.

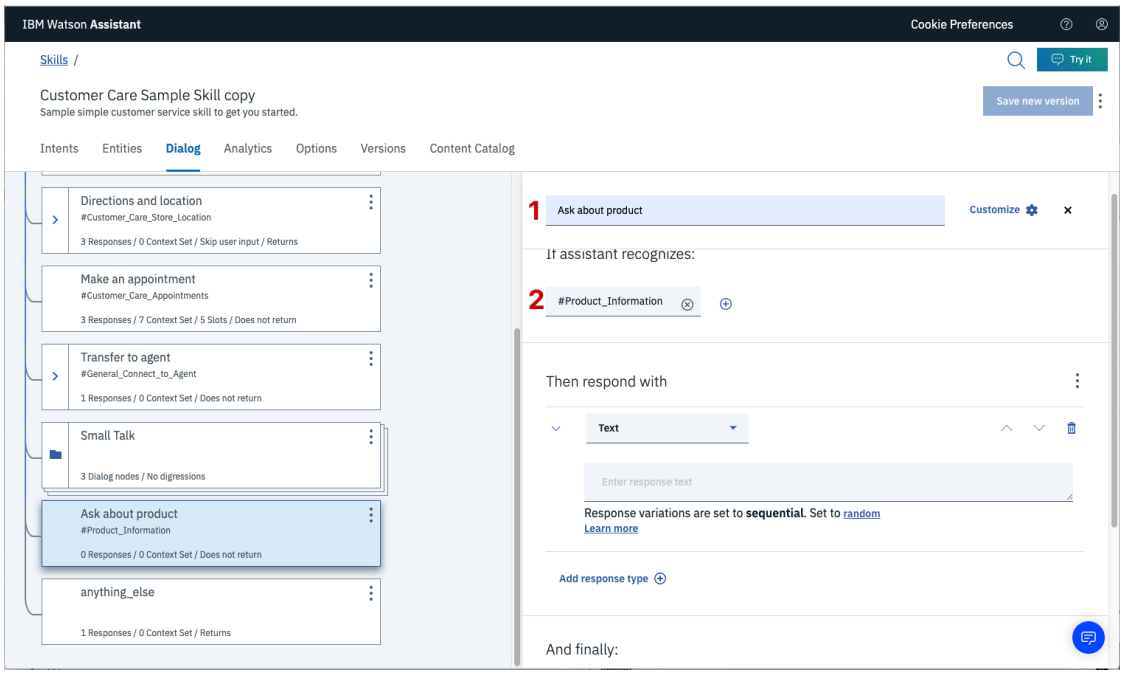
Click the `Create intent` button.

Name the intent `#Product_Information`, and at a minimum, enter the following example questions to be associated with it.

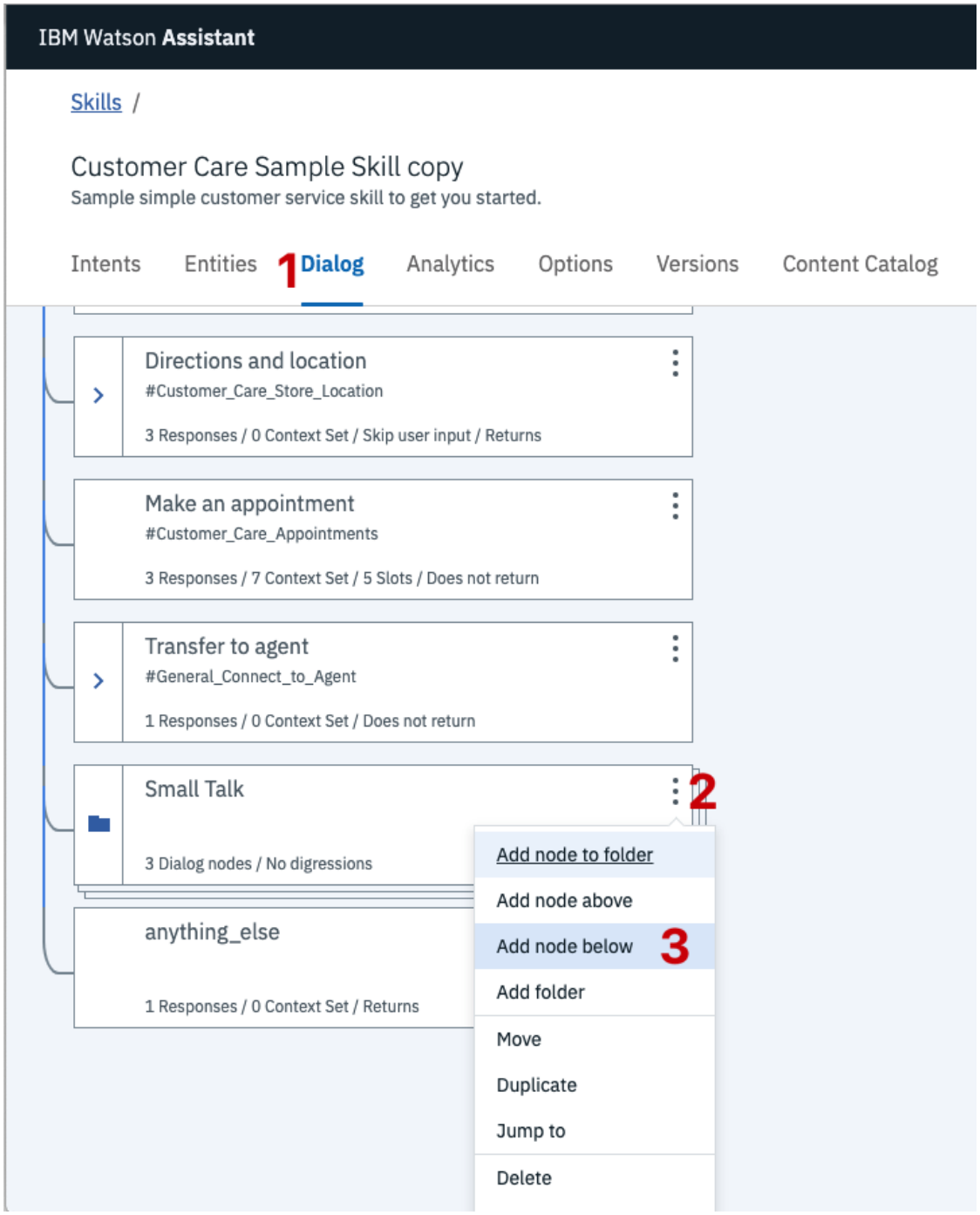


Create new dialog node

Now we need to add a node to handle our intent. Click on the `Dialog` [1] tab, then click on the drop down menu for the `Small Talk` node [2], and select the `Add node below` [3] option.



Name the node "Ask about product" [1] and assign it our new intent [2].

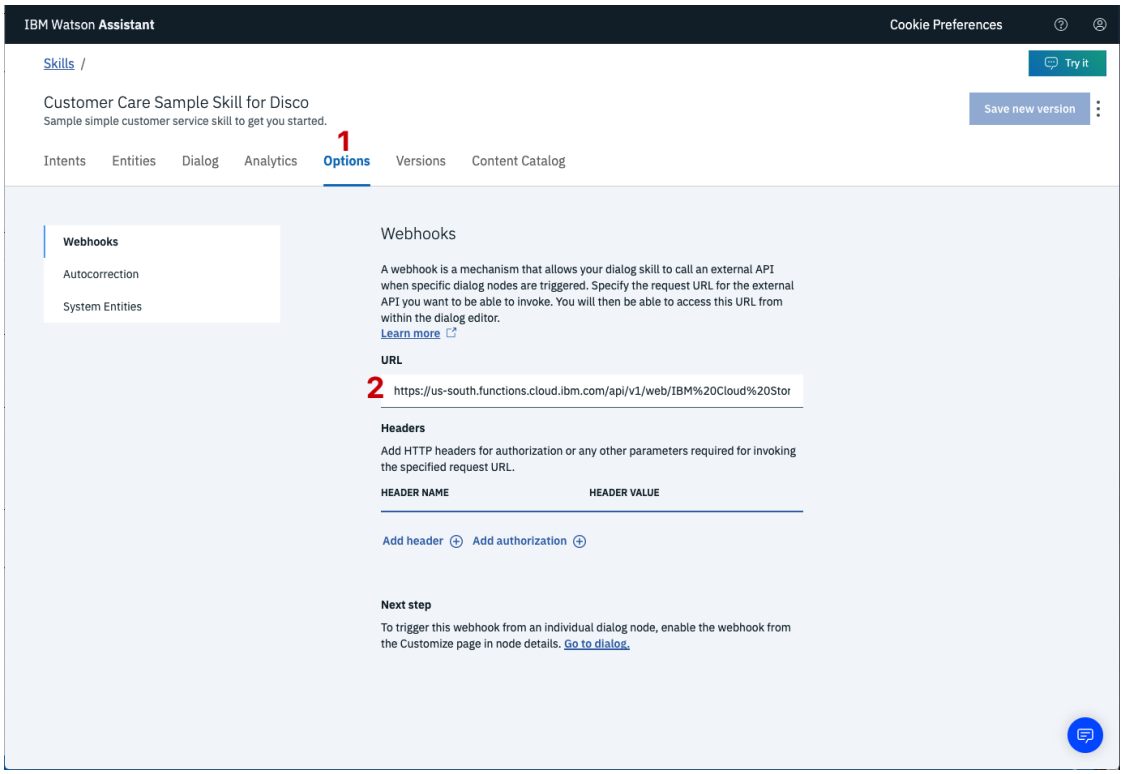


This means that if Watson Assistant recognizes a user input such as "how do I set the time?", it will direct the conversation to this node.

Enable webhook from Assistant

Set up access to our WebHook for the IBM Cloud Functions action you created in Step #4.

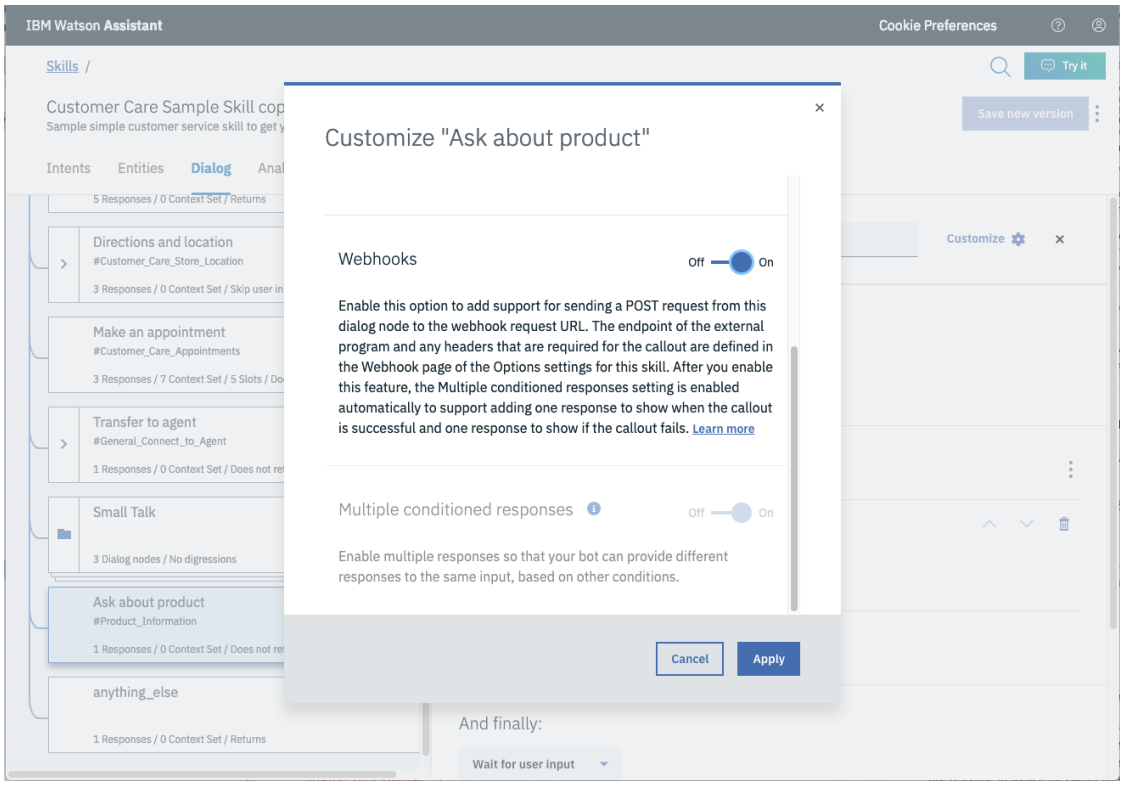
Select the `Options` tab [1]:



Enter the public URL endpoint for your action [2].

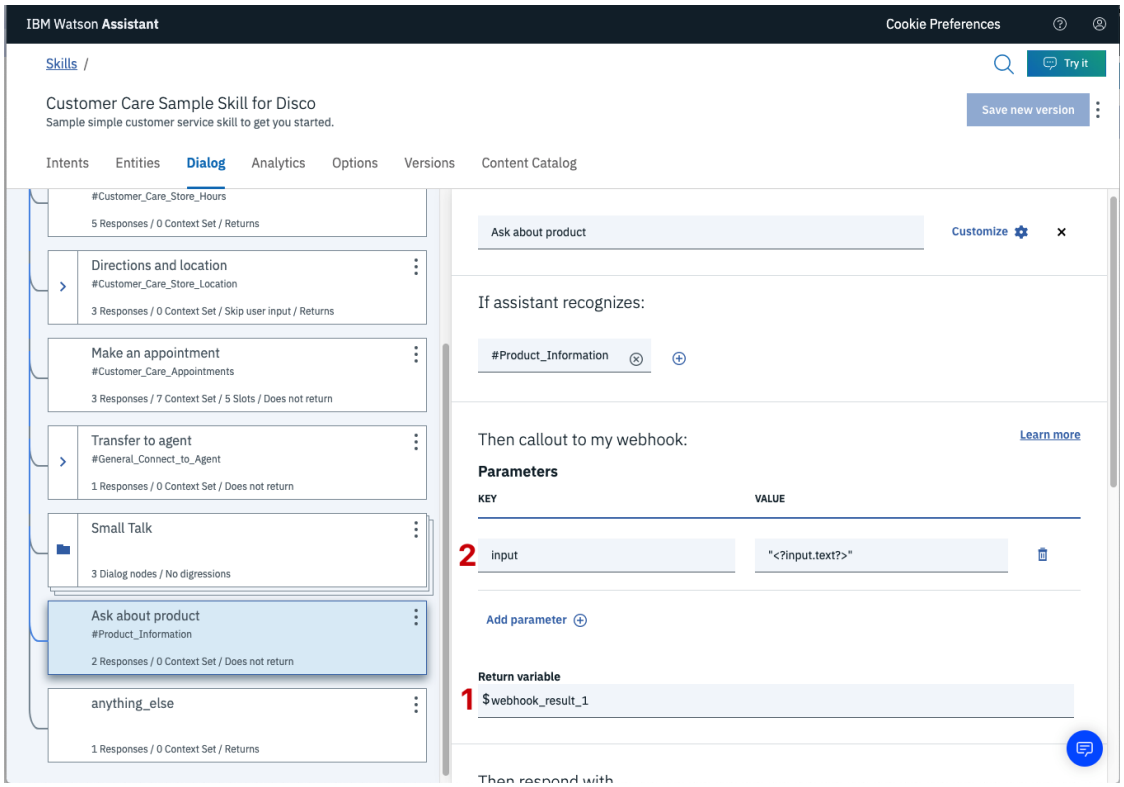
Important: Add `.json` to the end of the URL to specify the result should be in JSON format.

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` [1] set automatically to `$webhook_result_1`. This is the variable name you can use to access the result from the Discovery service query.

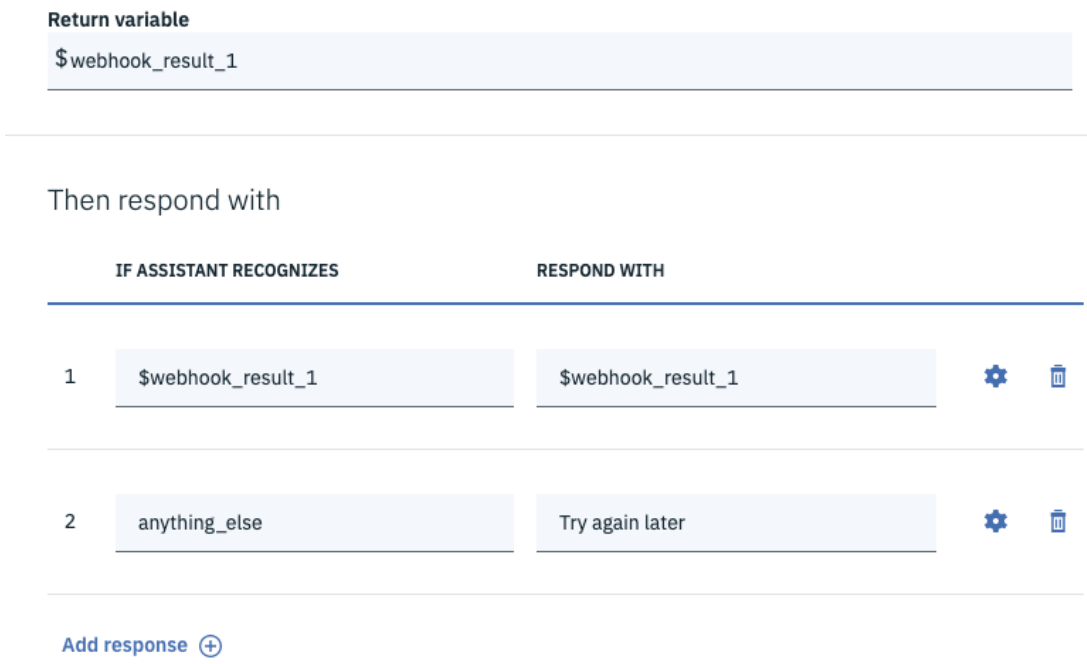


You will also need to pass in the users question via the parameter `input` [2]. The key needs to be set to the value:

```
"<?input.text?>"
```

If you fail to do this, Discovery will return results based on a blank query.

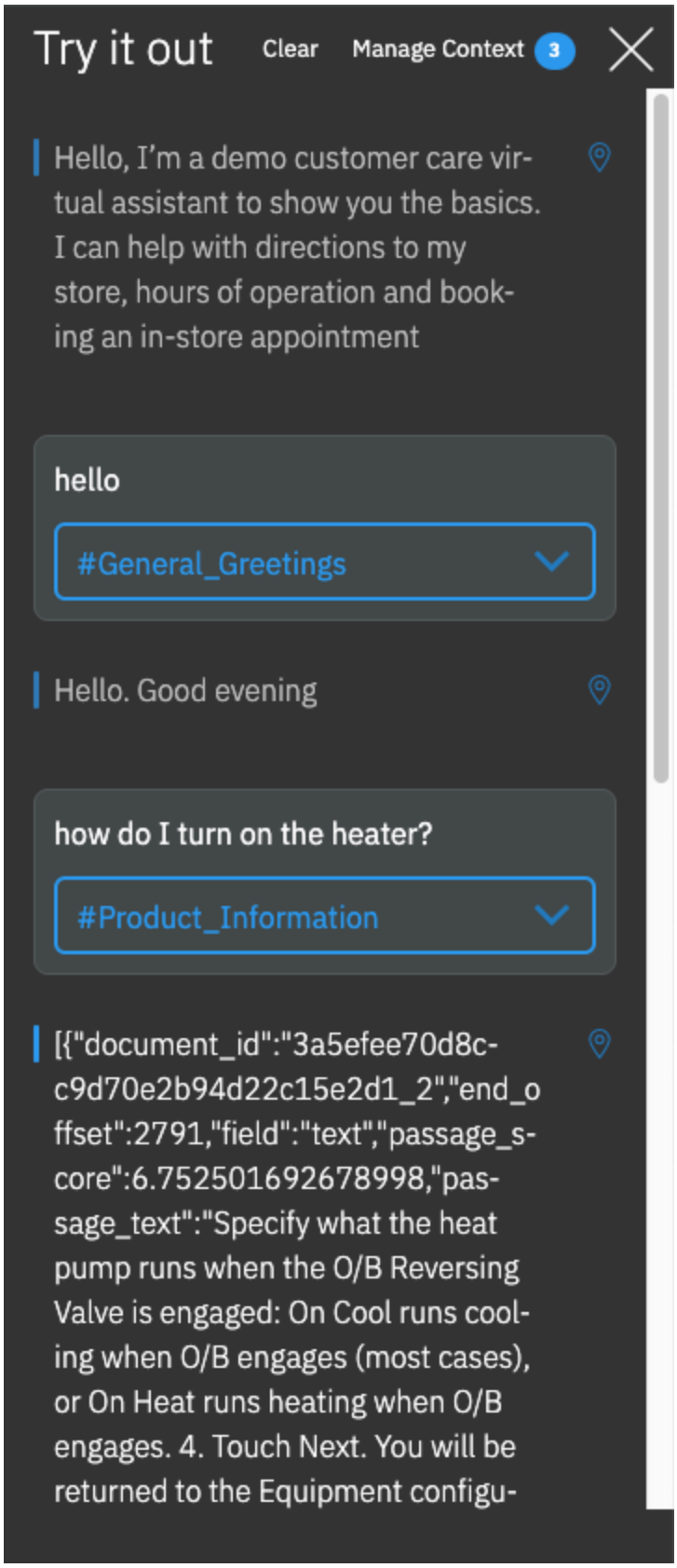
Optionally, you can add these responses to aid in debugging:



Test in Assistant Tooling

From the `Dialog` panel, click the `Try it` button located at the top right side of the panel.

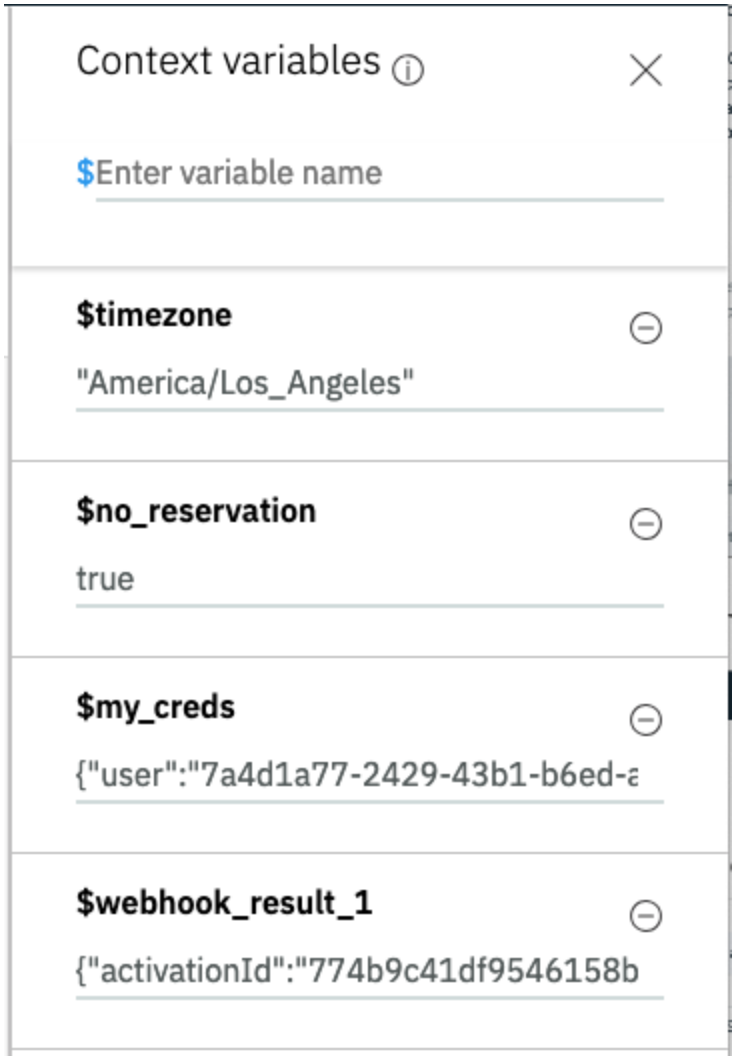
Enter some user input:


Try it out
Clear
Manage Context 3
Hello, I'm a demo customer care virtual assistant to show you the basics. I can help with directions to my store, hours of operation and booking an in-store appointment
hello
#General_Greetings
Hello. Good evening
how do I turn on the heater?
#Product_Information
[{"document_id":"3a5efee70d8c-c9d70e2b94d22c15e2d1_2","end_offset":2791,"field":"text","passage_score":6.752501692678998,"passage_text":"Specify what the heat pump runs when the O/B Reversing Valve is engaged: On Cool runs cooling when O/B engages (most cases), or On Heat runs heating when O/B engages. 4. Touch Next. You will be returned to the Equipment configu-

Note that the input "how do I turn on the heater?" has triggered our `Ask about product` dialog node, which is indicated by the `#Product_Information` response.

And because we specified that `$webhook_result_1.passages` be the response, that value is displayed also.

You can also verify that the call was successfully completed by clicking on the `Manage Context` button at the top right. The response from the Discovery query will be stored in the `$webhook_result_1` variable:

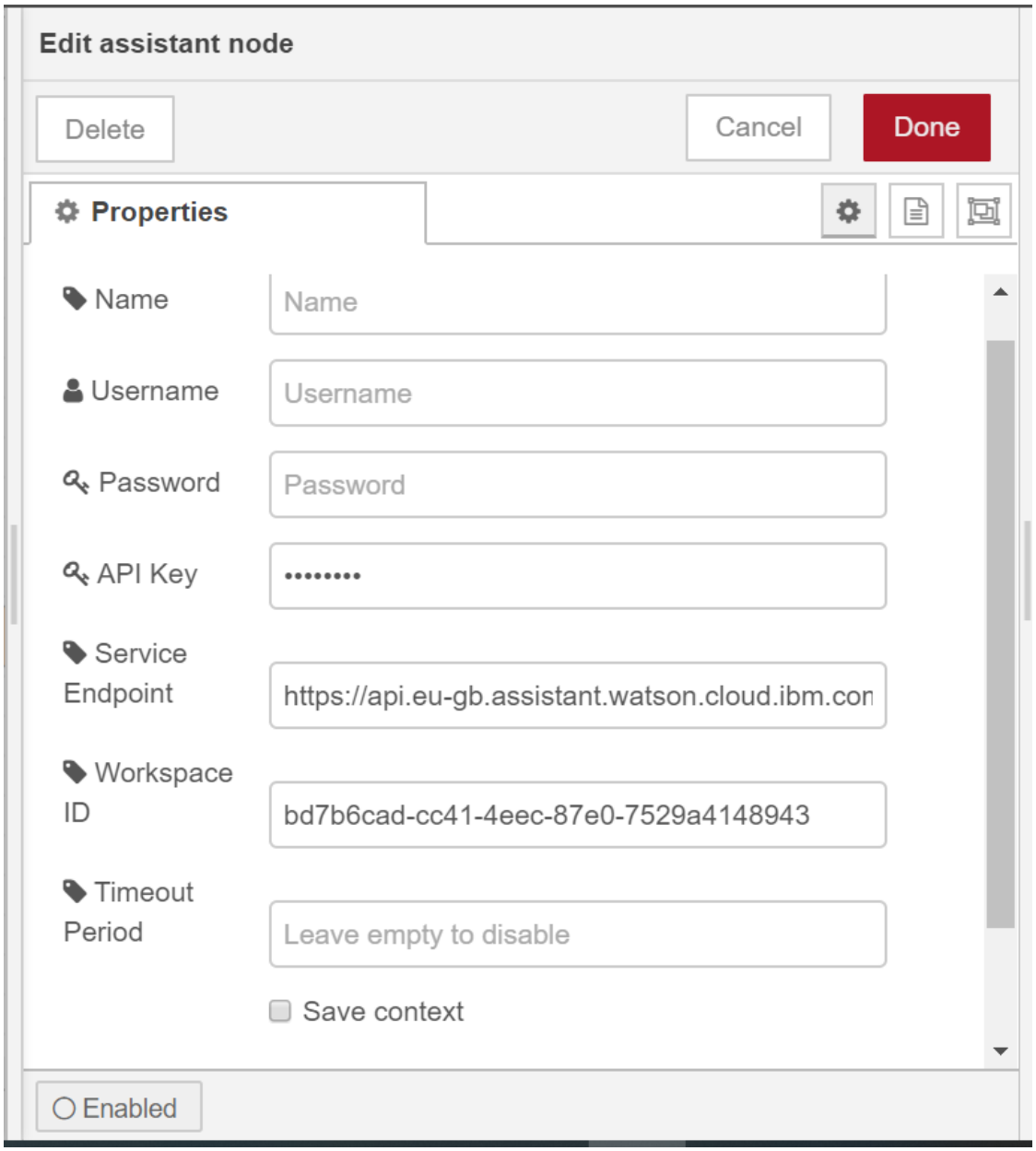


5.Create flow and configure node:

Integration of watson assistant in Node-RED

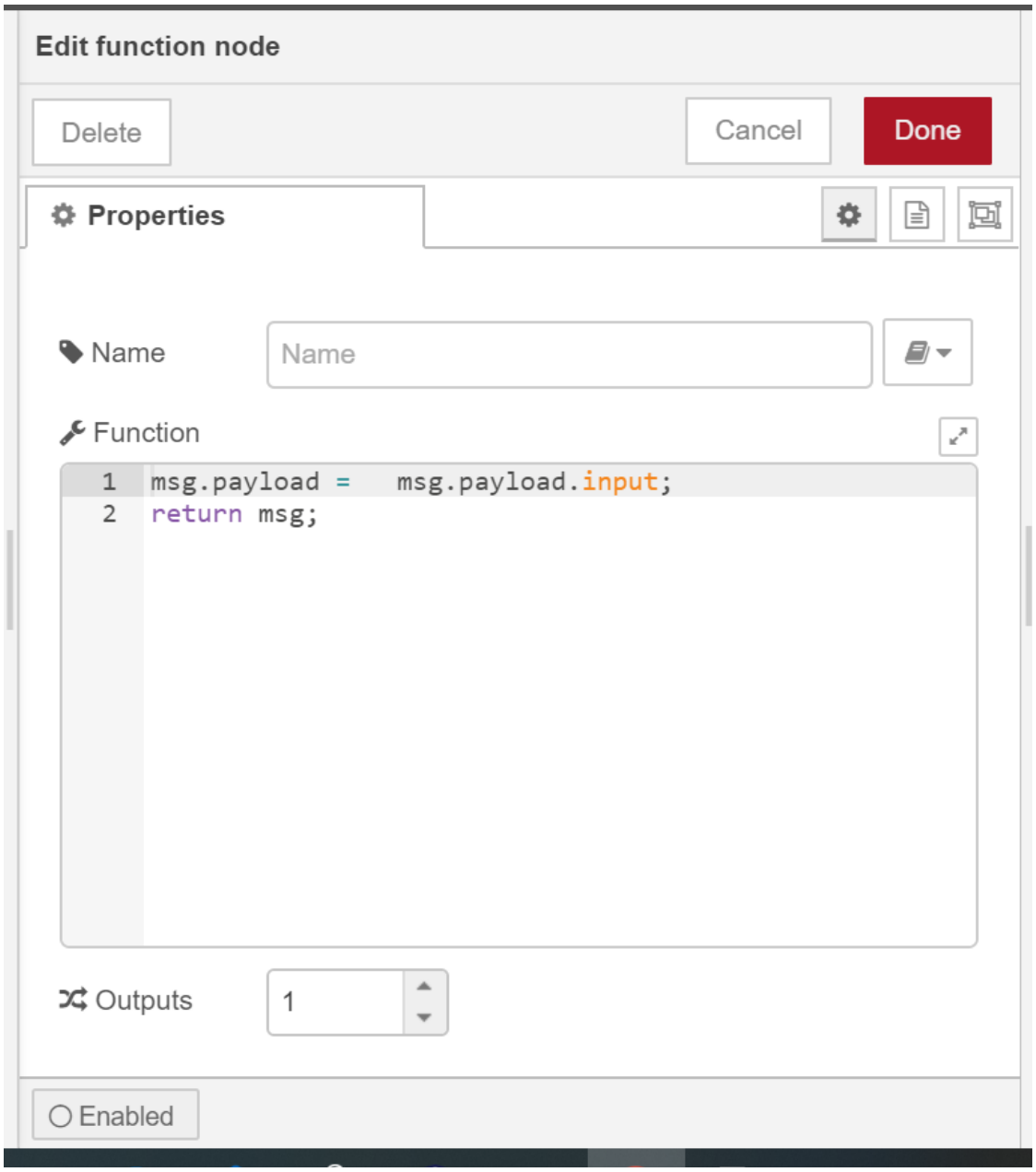
Double-click on the Watson assistant node

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
- 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
- Doube 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
- Search for “text” node from the “dashboard” section
- Drag two “text” nodes on to the flow
- Double click on the first text node, change the label as “You” and click

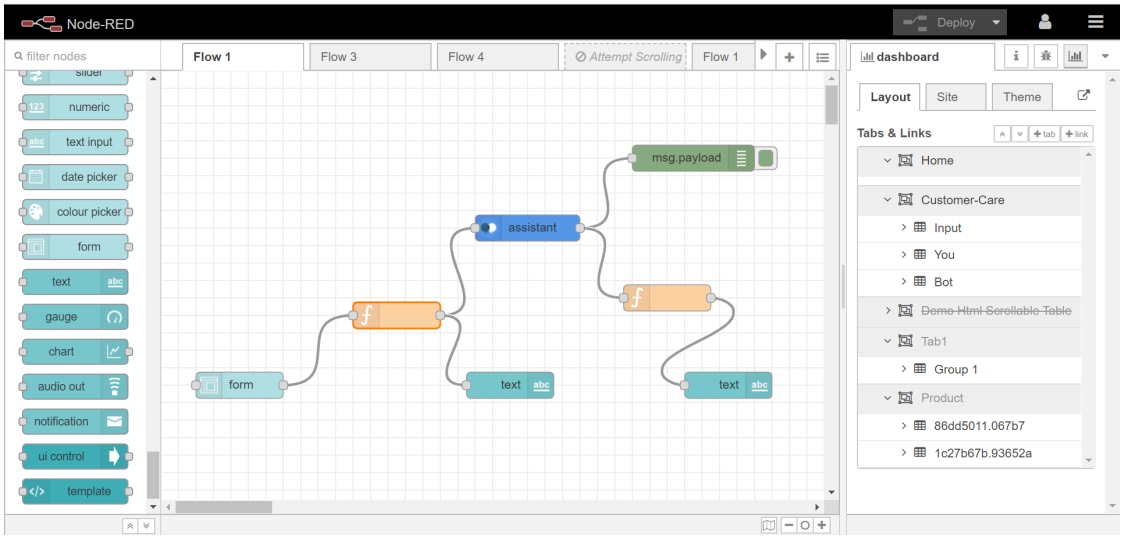
on Done

- Double click on the second text node, change the label as “Bot” and click on Done
- Connect the output of “input parsing” function node to “ You” text node and output of “Parsing” function node to the input of “Bot” text node
- Click on Deploy

5.FLOWCHART

At first go to manage pallete and install dashboard.
Now,Create the flow with the help of following node:

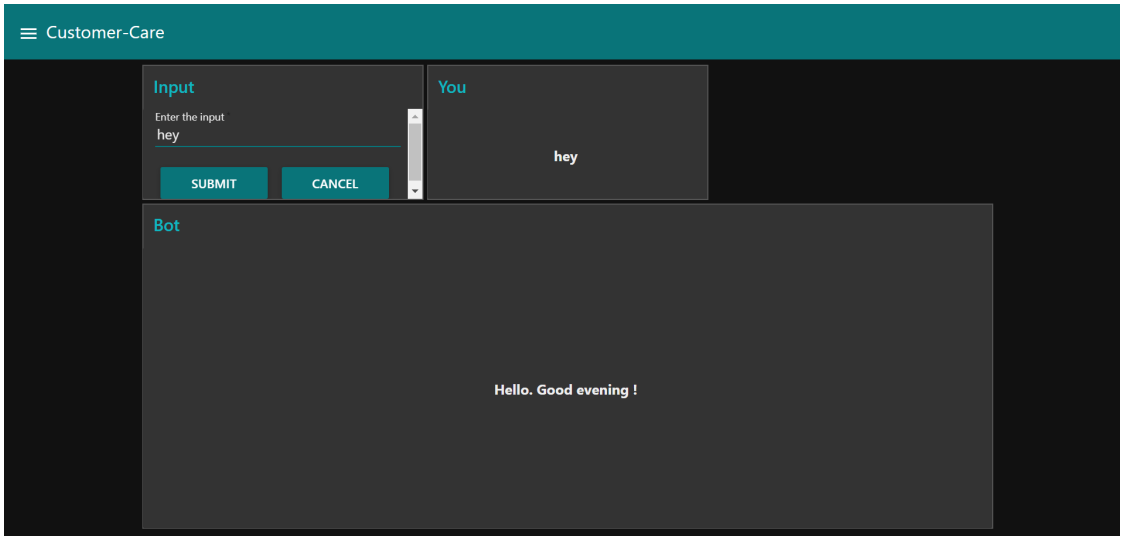
- ✓ Inject
- ✓ Assistant
- ✓ Debug
- ✓ Function
- ✓ Ui_Form
- ✓ Ui_Text

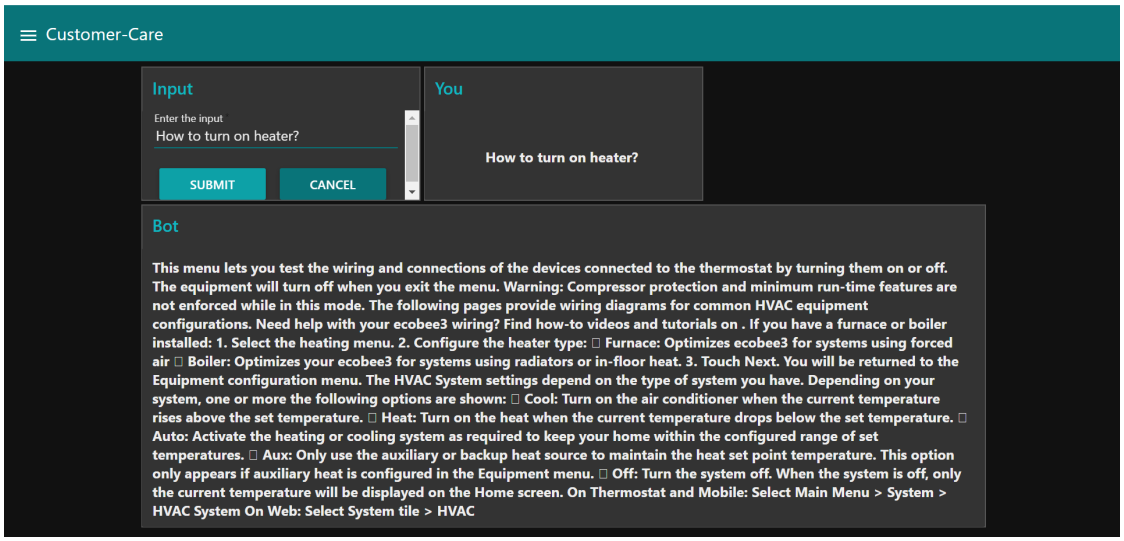


6.RESULTS

Finally our Node-RED dash board integrates all the components and displayed in the Dashboard UI by typing URL - https://node-red--smart.eu-gb.mybluemix.net/ui/#!/1?socketid=WlBFLUijr5ajh

1HZAAAN in browser.





7.ADVANTAGES & DISADVANTAGES

Advantages:

- Campanies can deploy chatbots to rectifiy 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

8.APPLICATIONS

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

9.CONCLUSION

By doing the above procedure and all we successfully created Intelligent helpdesk smart chartbot using Watson assistant, Watson discovery, Node-RED and cloud-functions.

10.FUTURE SCOPE

We can include watson studio text to speech and speech to text services to access the chatbot handsfree. This is one of the future scope of this project.

11. BIBILOGRAPHY

APPENDIX

Source Code

1.Cloud Function(Node.js)

```
/**
         *
         * @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': '2020-05-09'
      });
    }
    else {
      discovery = new DiscoveryV1({
        'username': params.username,
        'password': params.password,
        'url': params.url,
        'version': '2020-05-11'
      });
    }

    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);
    });
  });
}
```

2.Node Red (flow.json)


```
[{"id":"fa7ec4cb.ee4338","type":"tab","label":"Flow
1","disabled":false,"info":""},{"id":"f2f2649a.0d0d98","t
ype":"debug","z":"fa7ec4cb.ee4338","name":"","active":tru
e,"tosidebar":true,"console":false,"tostatus":false,"comp
lete":"payload","targetType":"msg","x":610,"y":100,"wires
":[]},{"id":"30b48a44.0807b6","type":"ui_form","z":"fa7ec
4cb.ee4338","name":"","label":"","group":"c8c57d62.c6dab"
,"order":0,"width":"6","height":"6","options":[{"label":"
Enter                                                the
input","value":"input","type":"text","required":true,"row
s":null}],"formValue":{"input":""},"payload":"","submit":
"submit","cancel":"cancel","topic":"","x":90,"y":360,"wir
es":[["c74f35b3.359468"]]},{"id":"c74f35b3.359468","type"
:"function","z":"fa7ec4cb.ee4338","name":"","func":"msg.p
ayload      =                  msg.payload.input;\nreturn
msg;","outputs":1,"noerr":0,"x":270,"y":280,"wires":[["95
eb3cdb.b8246","d0e9a30e.a7201"]]},{"id":"245a5441.9688cc"
,"type":"function","z":"fa7ec4cb.ee4338","name":"","func"
:"msg.payload.text=\"\";\nif(msg.payload.context.webhook_
result_1){\n                          for(var      i      in
msg.payload.context.webhook_result_1.results){\n
msg.payload.text=msg.payload.text+\"\\n\"+msg.payload.con
text.webhook_result_1.results[i].text;\n}\n
msg.payload=msg.payload.text;\n}\n\nelse\nmsg.payload    =
msg.payload.output.text[0];\nreturn       msg;\n\n\n\n\n//
msg.payload.text=\"\";\n//
if(msg.payload.context.webhook_result_1){\n           \n//
msg.payload.text=msg.payload.text+\"\\n\"+msg.payload.con
```

text.webhook_result_1.results[0].text;\n// msg.payload=msg.payload.text;\n// }\n\n// else\n// msg.payload = msg.payload.output.text[0];\n// return msg;\n\n\n","outputs":1,"noerr":0,"x":580,"y":260,"wires":[["6440ccbe.b7cac4"]]},{"id":"95eb3cdb.b8246","type":"watson-conversation-v1","z":"fa7ec4cb.ee4338","name":"","workspaceid":"bd7b6cad-cc41-4eec-87e0-7529a4148943","multiuser":false,"context":false,"empty-payload":true,"service-endpoint":"https://api.eu-gb.assistant.watson.cloud.ibm.com/instances/deb5b32c-0147-4100-bc81-c4453eb57fb8","timeout":"","optout-learning":false,"x":420,"y":180,"wires":[["f2f2649a.0d0d98","245a5441.9688cc"]]},{"id":"6440ccbe.b7cac4","type":"ui_text","z":"fa7ec4cb.ee4338","group":"5e9bf438.4618ec","order":0,"width":"18","height":"6","name":"","label":"","format":"{{msg.payload}}","layout":"col-center","x":650,"y":360,"wires":[]},{"id":"d0e9a30e.a7201","type":"ui_text","z":"fa7ec4cb.ee4338","group":"f56ca633.f95f78","order":1,"width":"6","height":"2","name":"","label":"","format":"{{msg.payload}}","layout":"col-center","x":400,"y":360,"wires":[]},{"id":"c8c57d62.c6dab","type":"ui_group","z":"","name":"Input","tab":"b99e7174.45895","order":1,"disp":true,"width":"6","collapse":false},{"id":"5e9bf438.4618ec","type":"ui_group","z":"","name":"Bot","tab":"b99e7174.45895","order":3,"disp":true,"width":"18","collapse":false},{"id":"f56ca633.f95f78","type":"ui_group","z":"","name":"You","tab":"b99e7174.45895","order":2,"disp":true,"width":"6","collapse":false},{"id":"b99e7174.45895","type":"ui_tab","z":"","name":"Customer-Care","icon":"dashboard","disabled":false,"hidden":false}]

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