PROJECT REPORT

“Intelligent Customer Help Desk with Smart Document Understanding”

Category: Machine Learning

Under SmartInternz, SmartBridge

Project ID: SPS_PRO_99
Application ID: SPS_APL_20200000938
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Github :
https://github.com/SmartPracticeschool/llSPS-INT-465-Intelligent-Customer-Help-Desk-with-Smart-Document-Understanding

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INTRODUCTION:

We will aim to create a chatbox application which utilises various IBM Watson services, how to combine and design their work flow and how they can build interactive information retrieval systems with Discovery + Assistant.
Project Requirements: json, javascript, IBM Watson, Owner's Manual for Discovery
Functional Requirements: IBM cloud, NODE-RED, Smart Document Understanding
Technical Requirements: Artificial intelligence, Machine Learning, Watson elements
Software Requirements: Watson assistant, Watson discovery.
Project Deliverables: Intelligent Customer Help Desk with Smart Document Understanding
Project Duration: 19 days

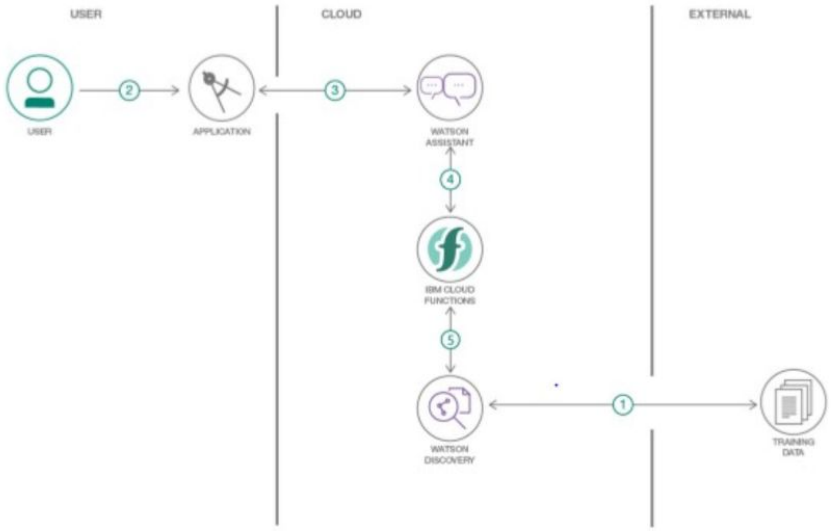
A chatbot usually faces the problem of confusion in replying when posed with a question out of its predefined database of queries. It will then propose to forward the customer's query to a human correspondent.
An intelligent chatbot instead will be able to give answers for the customer's queries by referring to a smartly documented manual of the product and there would be no need for human intervention. This project aims to create such an intelligent chatbot engine.
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 owner's manual is important and what is not. This will improve the answers returned from the queries.

WORKING MECHANISM

Usually, Chatbots get input from users and and only respond to questions from its database and for some questions the output from bot will reply “try again”, “I don’t understand”, “will you repeat again”, and so on… eventually the bot directs customer to a human agent but a versatile Chatbot should minimize human involvement and converse with customer to clarify his/her doubts.
To achieve this we should include a virtual agent in chatbot that will replicate agent-customer interaction.

For the above problem to get solved we have to put a 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 company background so it can answer queries based on the product or related to the company. Watson Discovery is used to achieve the above solution. And later included Assistant and Discovery on Node-RED.

THEORETICAL ANALYSIS



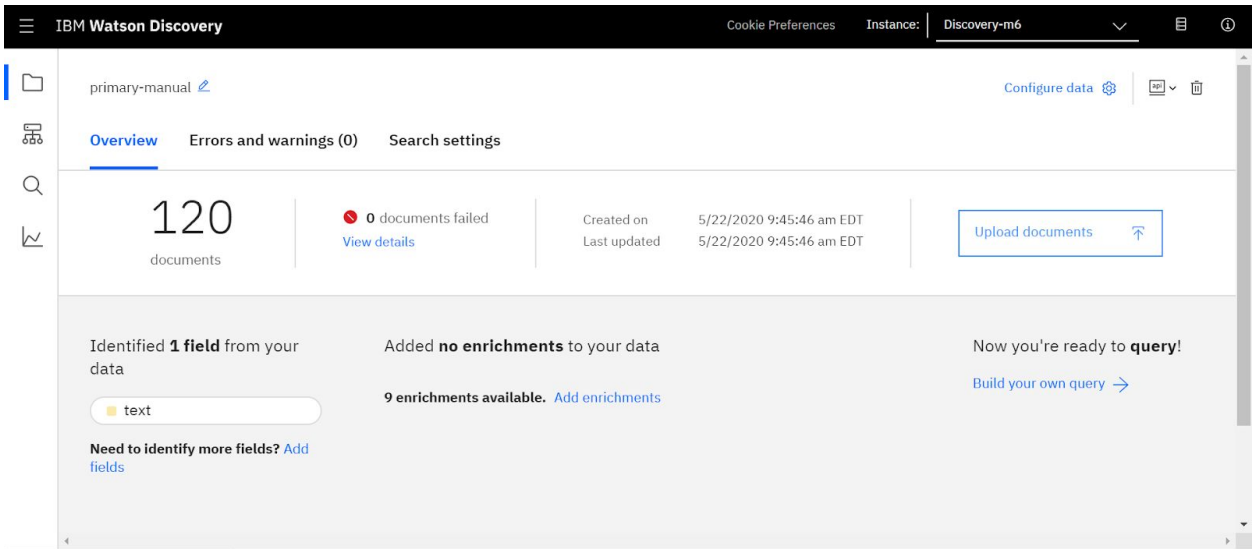
1. The document is annotated using Watson Discovery SDU
2. The user interacts with the backend server via the app UI. The frontend app UI is a chatbot that engages the user in a conversation.
3. Dialog between the user and backend server is coordinated using a Watson Assistant dialog skill.
4. If the 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.

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.

EXPERIMENTAL INVESTIGATIONS

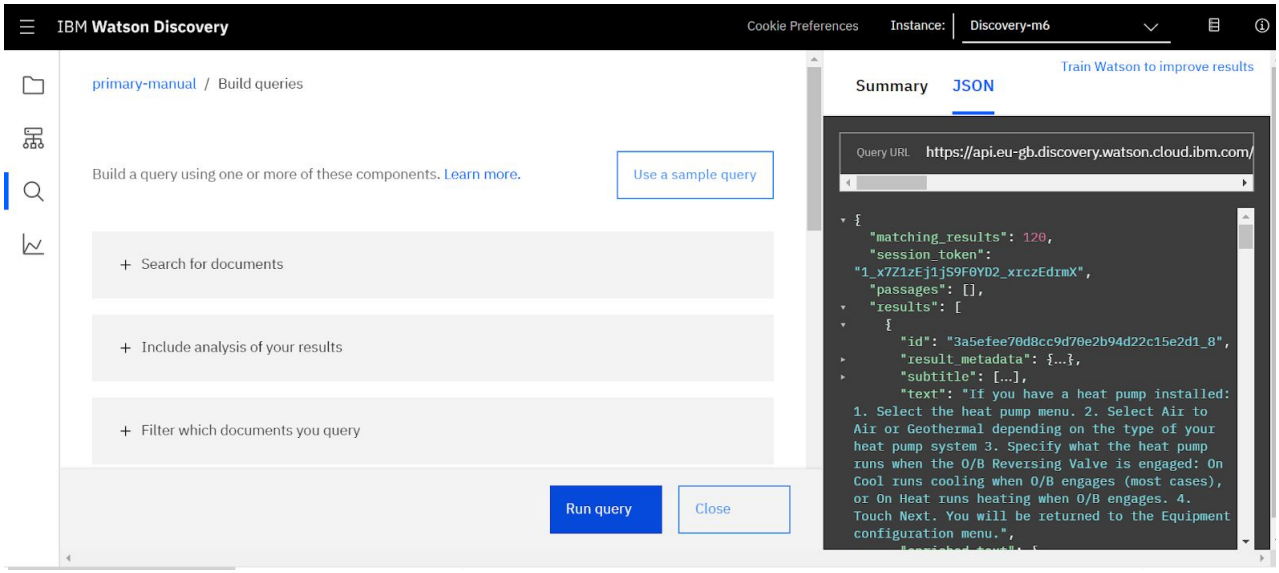
Watson Discovery

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.



Building Own Query

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.



After Smart Document Understanding

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.

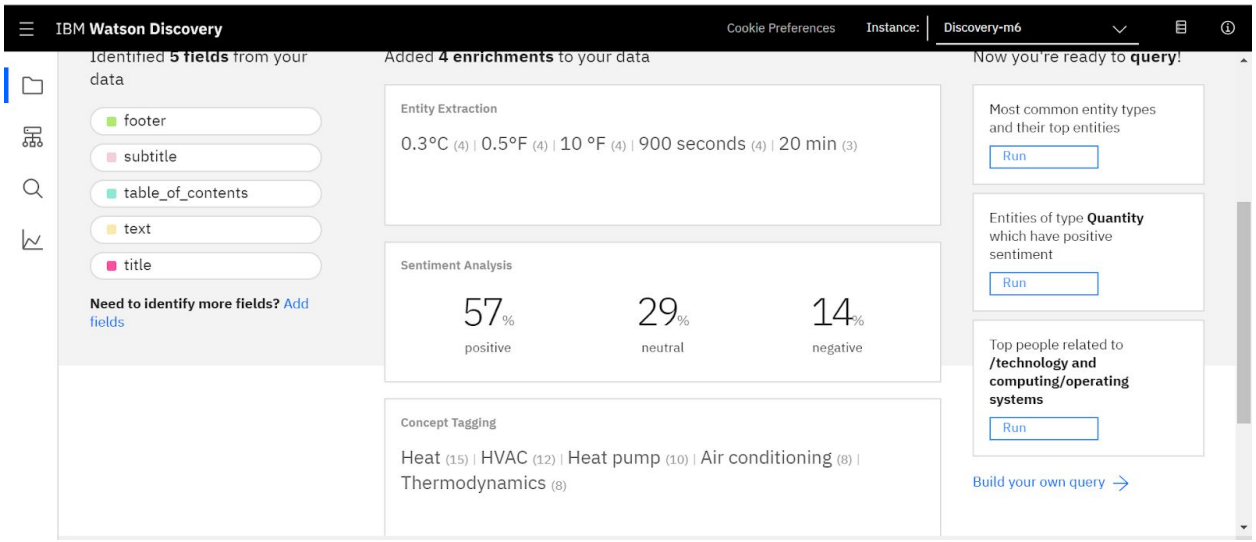
[4] is the list of labels you can assign to the page text.

Click [5] to submit the page to Discovery.

Click [6] when you have completed the annotation process.

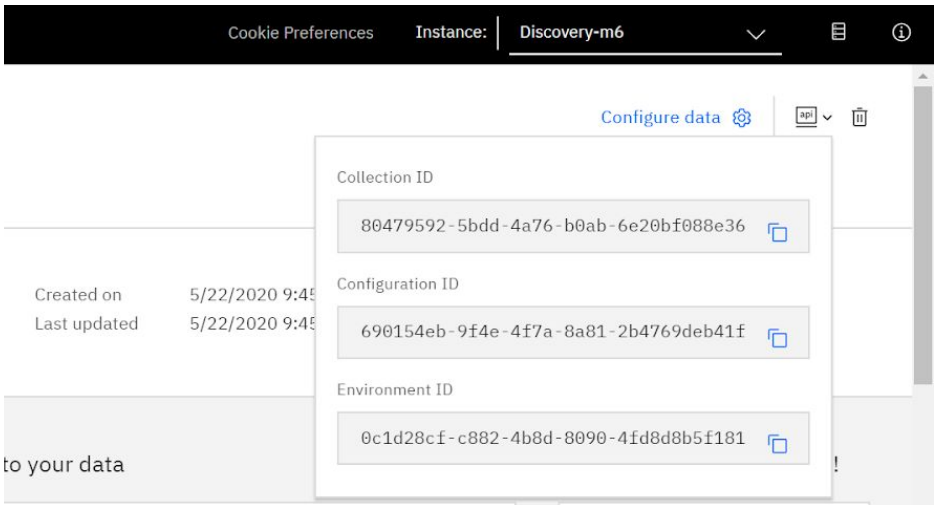
As you go though the annotations one page at a time, Discovery is learning and should start automatically updating the upcoming pages. Once you get to a page that is already correctly annotated, you can stop, or simply click Submit [5] to

acknowledge it is correct. The more pages you annotate, the better the model will be trained.



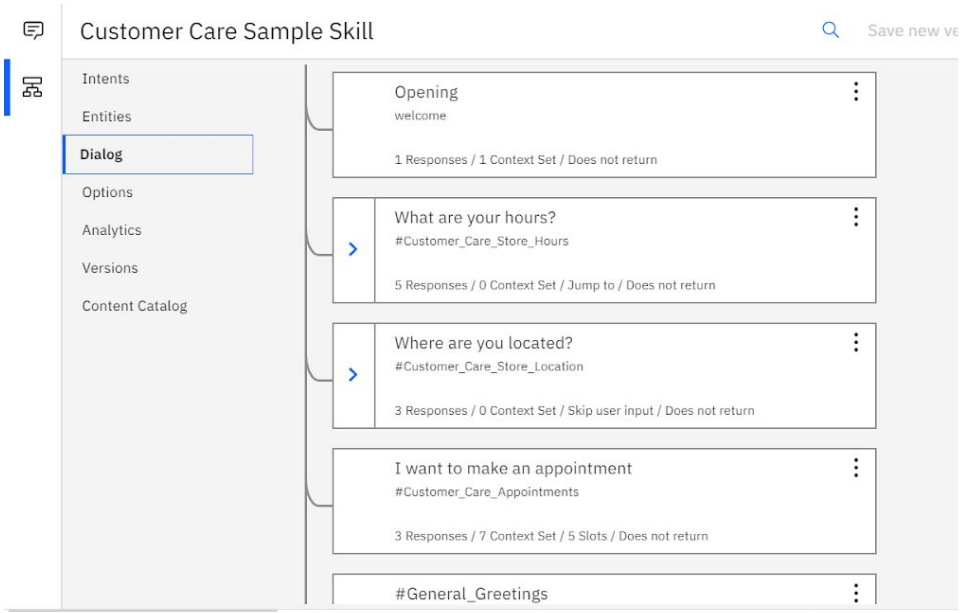
Data used from Watson Discovery

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



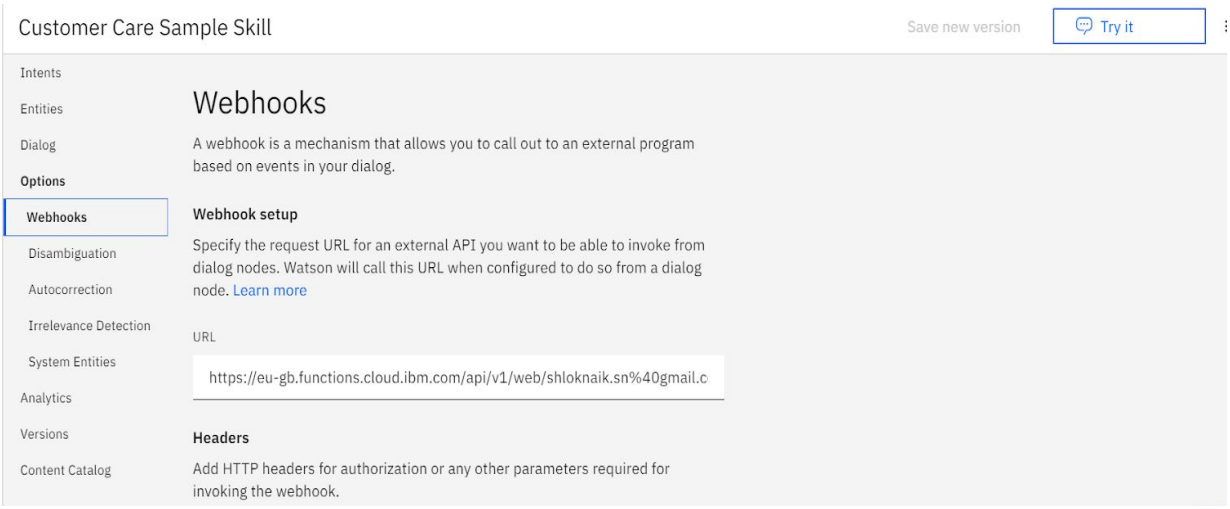
Dialog

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.

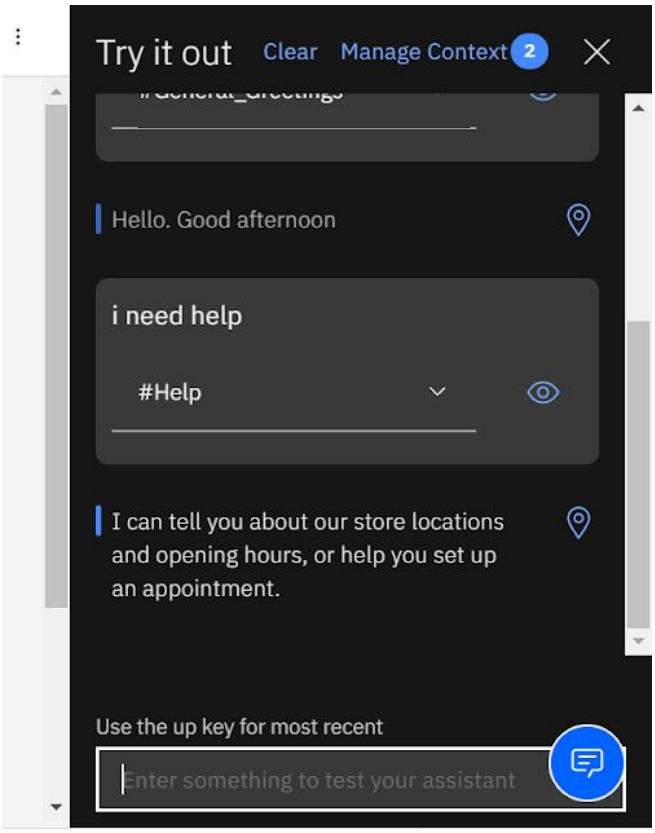


Webhooks:

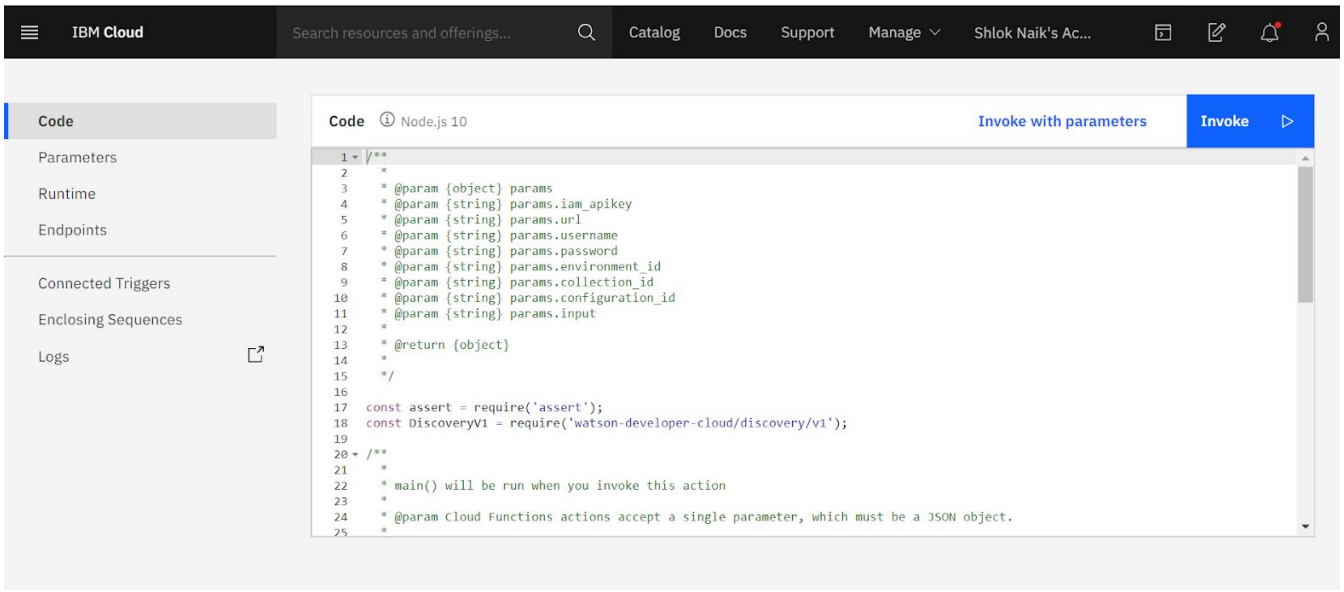
Set up access to our WebHook for the IBM Cloud Functions action you created in Step #4.



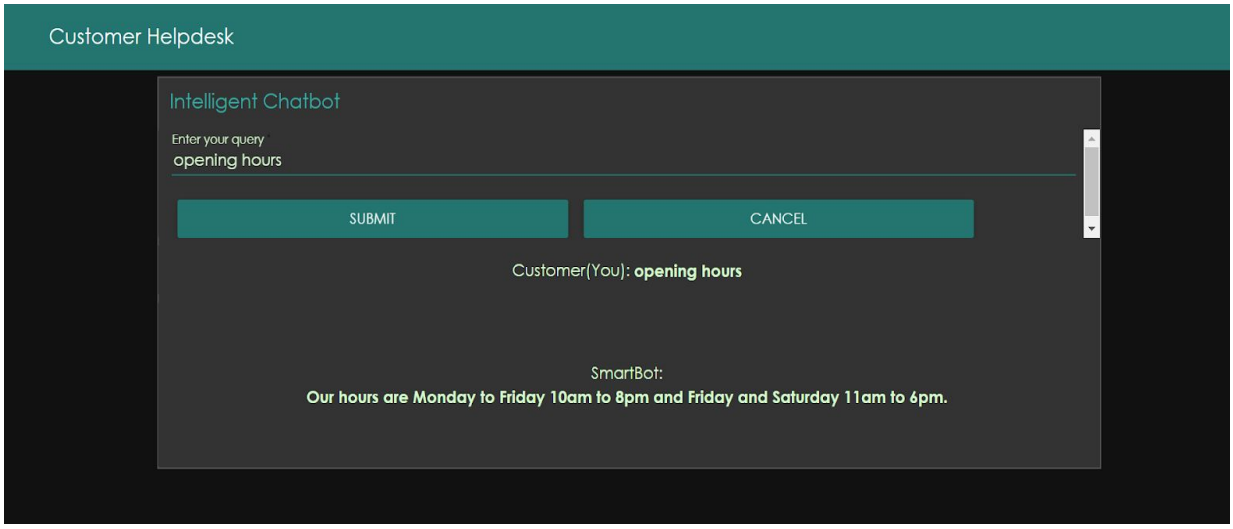
Trying the bot



CLOUD FUNCTIONS: ACTIONS



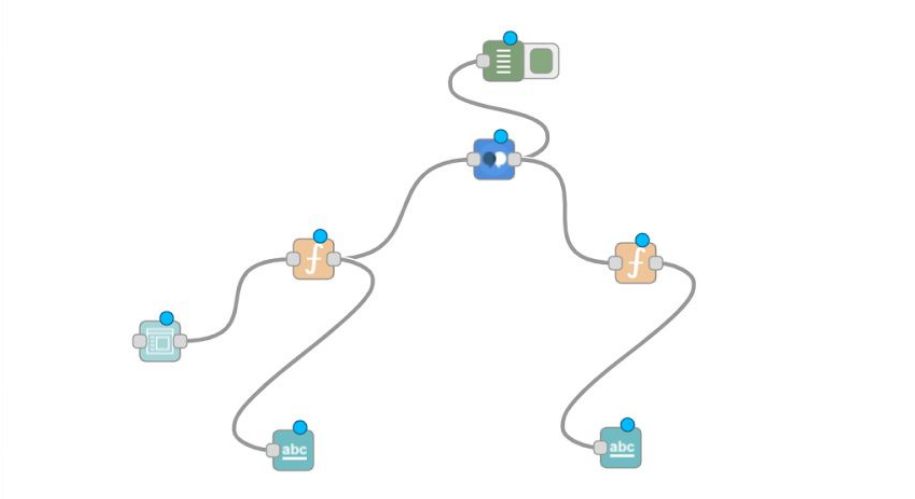
END PRODUCT:



FLOWCHART

Includes the following nodules:

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



RESULT AND CONCLUSION:

Finally our Node-RED dash board integrates all the components and displayed in the Dashboard UI by typing URL - https://intelligent-customer-help-desk-with-smart-document-understandin.eu-gb.mybluemix.net/ui/#!/0?socketid=W0ST97MmMTasriu1AAAA in browser

- Companies 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 at other works.

SOURCE CODE:

Discovery Function:

```
/**
 *
 * @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);
    });
  });
}
```

Cloud Functions(web hooks):


```
{
  "matching_results": 120,
  "passages": [],
  "results": [{
    "enriched_text": {
      "categories": [{
        "label": "/business and industrial/energy/renewable
energy/geothermal energy",
        "score": 0.953219
      }, {
        "label": "/business and industrial/energy/electricity",
        "score": 0.903506
      }, {
        "label": "/business and industrial/green solutions",
        "score": 0.791764
      }],
      "concepts": [{
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        "text": "Geothermal heat pump"
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```

```
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      "text": "HVAC"
     }],
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      }
     }
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     "author": ["nashib"],
     "file_type": "pdf",
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    },
    "id": "3a5efee70d8cc9d70e2b94d22c15e2d1_8",
    "result_metadata": {
     "confidence": 0,
     "score": 1
    },
    "segment_metadata": {
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     "parent_id": "3a5efee70d8cc9d70e2b94d22c15e2d1",
     "total_segments": 120
    },
    "subtitle": ["Heat Pumps"],
    "text": "If you have a heat pump installed: 1. Select the heat pump menu. 2.
Select Air to Air or Geothermal depending on the type of your heat pump
system 3. 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 configuration menu."
  }, {
    "enriched_text": {
      "categories": [{
        "label": "/technology and computing/operating systems",
        "score": 0.77316
      }, {
        "label": "/technology and computing/internet technology",
        "score": 0.756819
      }, {
        "label": "/technology and computing/hardware/computer/portable computer",
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        "text": "World Wide Web"
      }, {
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        "text": "Jimmy Jam and Terry Lewis"
      }, {

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      "type": "Quantity"
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      "sentiment": {
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       "score": 0
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      "text": "24-hour",
      "type": "Quantity"
```

```
  }, {
    "count": 1,
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    "type": "Quantity"
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    "count": 1,
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    "sentiment": {
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      "score": 0
    },
    "text": "12 hr",
    "type": "Quantity"
  }, {
    "count": 1,
    "relevance": 0.01,
    "sentiment": {
      "label": "neutral",
      "score": 0
    },
    "text": "24 hr",
    "type": "Quantity"
  }],
  "sentiment": {
    "document": {
      "label": "neutral",
      "score": 0
    }
  }
},
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```

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    "author": ["nashib"],
    "file_type": "pdf",
    "filename": "ecobee3_UserGuide.pdf",
    "sha1": "d22e51d5b1c5e3bdfbd14575db5b468a6d4a30d2"
   },
   "id": "3a5efee70d8cc9d70e2b94d22c15e2d1_60",
   "result_metadata": {
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    "score": 1
   },
   "segment_metadata": {
    "id": "7e459ee5-1970-4597-9643-60f843b1c5b7",
    "parent_id": "3a5efee70d8cc9d70e2b94d22c15e2d1",
    "total_segments": 120
   },
   "subtitle": ["Date & Time"],
   "text": "You can configure the time to use a 12 or 24-hour format. Note: The current date and time are programmed during initial setup and automatically from the Internet. If you need to adjust the data and time, log in to your personalized web portal. On Thermostat: To adjust the time format: 1. Select Main Menu > Settings > Date & time 2. Select Time format. 3. Touch 12 hr or 24 hr. On Web: 1. Select Settings tile. 2. Select Time. 3. Select 12 Hour or 25 Hour."
  }, {
   "enriched_text": {
    "categories": [{
     "label": "/business and industrial/energy",
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    }, {
     "label": "/business and industrial/green solutions",
     "score": 0.764261
    }, {
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    }],
    "concepts": [{
```

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      "text": "Cooling tower"
    }, {
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      "relevance": 0.566163,
      "text": "Refrigeration"
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      "document": {
```

```
        "label": "positive",
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      }
    }
  },
  "extracted_metadata": {
    "author": ["nashib"],
    "file_type": "pdf",
    "filename": "ecobee3_UserGuide.pdf",
    "sha1": "d22e51d5b1c5e3bdfbd14575db5b468a6d4a30d2"
  },
  "id": "3a5efee70d8cc9d70e2b94d22c15e2d1_67",
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    "confidence": 0,
    "score": 1
  },
  "segment_metadata": {
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    "parent_id": "3a5efee70d8cc9d70e2b94d22c15e2d1",
    "total_segments": 120
  },
  "subtitle": ["Smart Recovery"],
  "text": "Smart recovery lets your ecobee3 learn how your heating and cooling system works, taking into account weather and historical operating performance so that your home reaches the scheduled set point at the time in which the change occurs (i.e. not afterwards). For example, if you wake up at 6:00 AM, you do not need to schedule your Home period to start at 5:30 AM. Smart Recovery will start the HVAC equipment to ensure that at 6:00 AM, the house is at your desired temperature. On Thermostat: 1. Select Main Menu > Settings > Preferences 2. Select Heating Smart Recovery or Cooling Smart Recovery. 3. Touch Enable or Disable. On Web: 1. Select Settings tile. 2. Select Preferences. 3. Select Smart Recover Heat Mode or Smart Recovery Cool Mode. 4. Select Enable or Disable."
 }],
 "retrieval_details": {
  "document_retrieval_strategy": "untrained"
```

},
"session_token": "1_x7Z1zEj1jS9UehJ2_8DRO1i2Dh"}

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