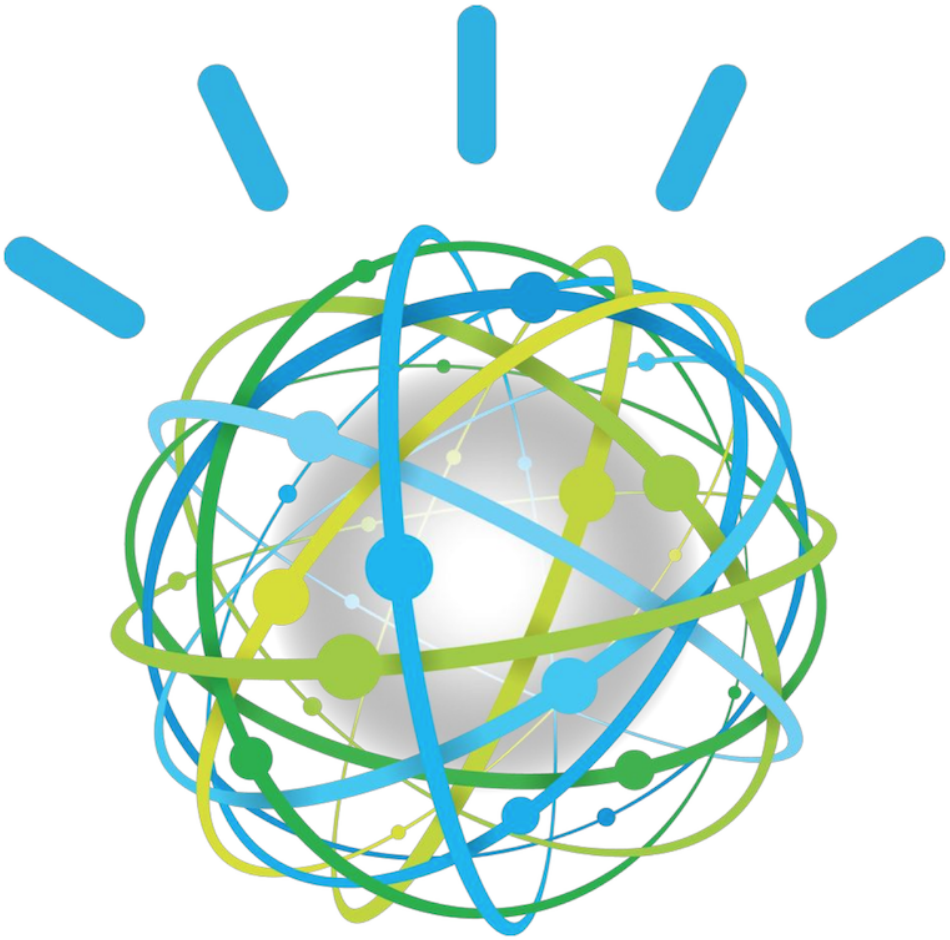
# IBM Watson Solutions

# Business and Academic Partners



# Developing a Chatbot Using the IBM Watson Conversation Service

**Prepared by Armen Pischdotchian**

**Version 5.1 November 2016**

# Overview

What is Bluemix you ask? **Bluemix** is an implementation of IBM's Open Cloud Architecture, leveraging Cloud Foundry to enable developers to rapidly build, deploy, and manage their cloud applications, while tapping a growing ecosystem of available services and runtime frameworks. You can view a short introductory video here: **http://www.ibm.com/developerworks/cloud/library/cl-bluemix-dbarnes-ny/index.html**

Additionally, for our academic partners, there are no-charge 12-month licenses for faculty and no-charge 6-month licenses for students - all renewable and NO CREDIT CARD required!

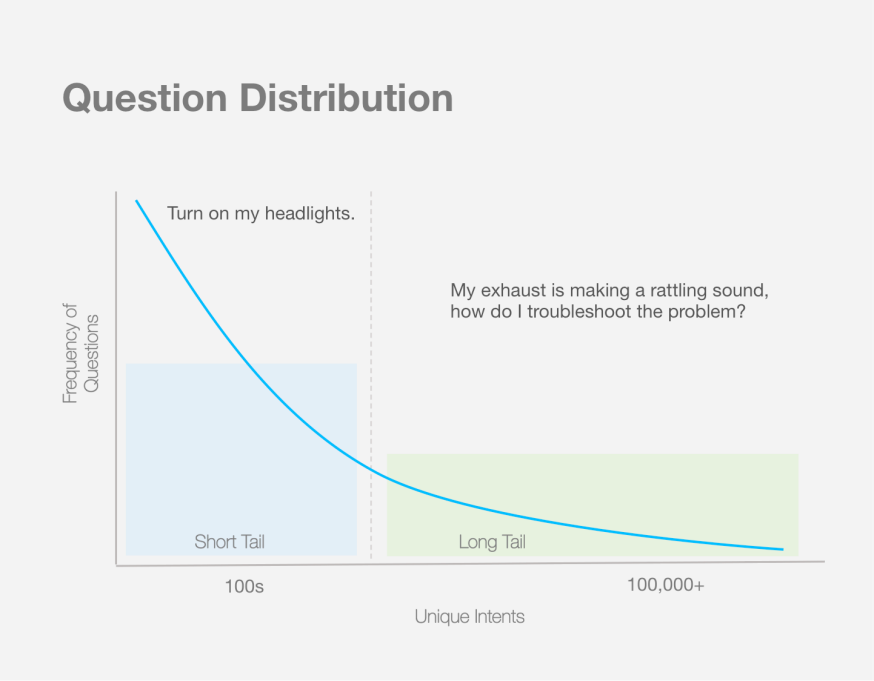
To get started, you will need to become an Academic Initiative member. Refer to this document for details:

http://it.husc.edu.vn/Media/TaiLieu/IBM_Academic_Initiative_for_Cloud_Process.pdf

The purpose of this guide is not to introduce you to Bluemix, that foundational knowledge is a prerequisite study on your part and you can obtain it from the links mentioned above. This guide is more of an instructional approach to working with the IBM Watson™ Conversation service where you can create virtual agents and bots that combine machine learning, natural language understanding, and integrated dialog tools to provide automated customer engagements. Watson Conversation provides an easy-to-use graphical environment to create natural conversation flows between your apps and your users. Creating your first conversation using the IBM Watson™ Conversation service entails the following steps:

1. Train Watson to understand your users' input with example utterances: Intents and Examples
2. Identify the terms that may vary in your users' input: Entities
3. Create the responses to your user's questions: Dialog Builder
4. Test and Improve

IBM Watson Conversation service is designed to answer the short tail of typical question distribution per below.



Consider the following scenario used in this guide: You are driving a cognitive enabled car. You ask in a natural way, the way you speak, for the car to do things for you, such as turn on wipers, play music and so forth. At one point, you ask the about the weather. In this workshop, you will connect the Conversation service with an external service from the Weather Company (http://api.wunderground.com/?MR=1) to inform you of real time actual weather in the exact location that you are sitting and performing this lab. The service obtains your location using the browser's geo-location capabilities.

It is strongly recommended that you watch this 14-minute video: https://youtu.be/ELwWhJGE2P8

At the end of this workshop, spend some time and consider what other services you can use to augment a better approach for bringing further cognition to your app; for example, Retrieve and Rank to extract information from specific documents (the long tail), or, you may want to include Speech to Text upfront and Text to Speech for the returned responses. Enjoy the cognitive journey you are about to undertake.

# Prerequisite

This section provides instructions to help you get started quickly with the IBM Watson™ Developer Cloud services using Node.js as your programming runtime environment. To make it easy to get up and running with a functional application that uses the REST Application Programming Interface (API) for any Watson service, IBM provides a Node.js package with wrappers that simplify application development. The package includes simple command-line example applications to let you experiment with any of the available services. Complete the following steps:

- **Obtain Bluemix credentials:**
  1. Direct your browser to the Bluemix home page: https://console.ng.bluemix.net/home/
  2. Click **Sign Up** on the top right. If you are affiliated with a university, use your edu email.
  3. Enter requested information: for **Org**, select the suggestions that are provided for you, for example, your email address; for **Space** name, you can also select the provided suggestions, such as dev; alternatively, you can specify your own values and click **Create Account**.
  4. Look for the email confirmation. You will have to login once again into Bluemix after clicking the link from the email.
- **Install the Node.js runtime:**

  The default installation includes both the runtime and package manager. Make sure to include the installed binaries on your PATH environment variable after installation (typically, the default installation locations that the installer selects does the inclusion).
  1. Direct your browser to the nodejs.org web site: https://nodejs.org
  2. Click **Downloads.**
  3. Select and install the installer (not the binary) appropriate for your operating system.
- **Install the cf command line**
  1. Direct your browser to a GitHub repository: https://github.com/cloudfoundry/cli/releases
  2. Download and install the most recent installer appropriate for your operating system.
  3. You may need to open Preferences → Security and Privacy → General tab (in Mac); unlock and change the Allow applications downloaded from **Anywhere**.

- **Download OS appropriate code-friendly editing tool:**
    - If you are using a PC, we recommend using **Notepad ++**
    - If you are using Mac, we recommend **Sublime Text**
- **Obtain the Weather Company API**

You must have geo-location for your browser enabled. If you had turned it off, use the following steps to enable geo-locations services:

For Mac users go to this link: https://support.apple.com/en-us/HT204690

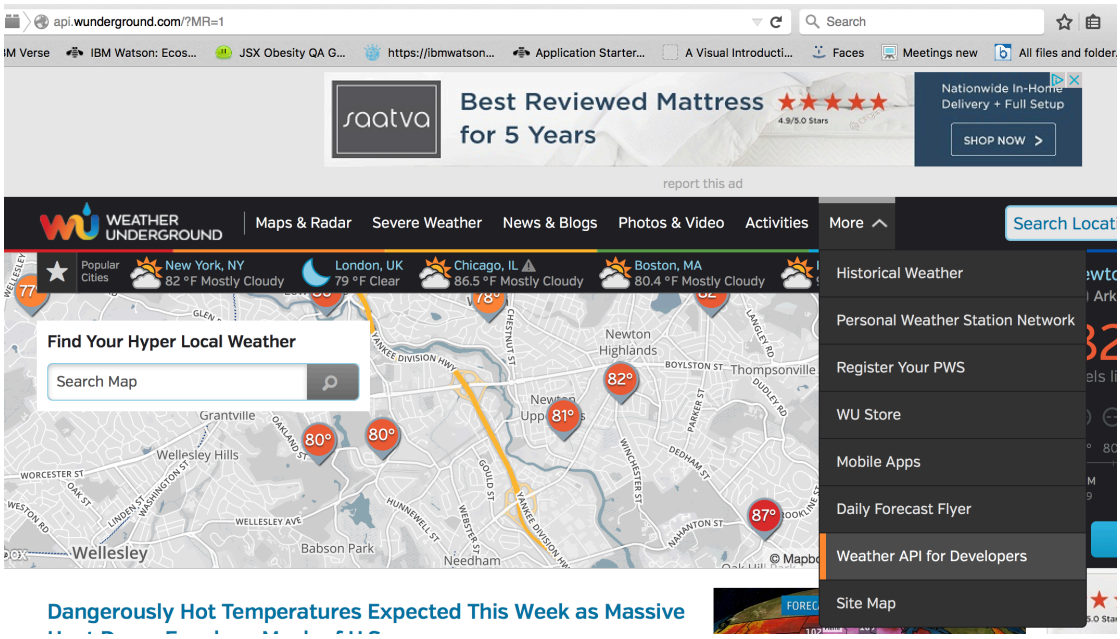
For Firefox browser complete these steps:

1. Navigate to the site to that you want to enable the service
2. Go to the *Tools* menu, then select *Page Info*
3. Select the *Permissions* tab
4. Change the setting for *Share Location*

The following desktop browsers support the W3C Geolocation API:

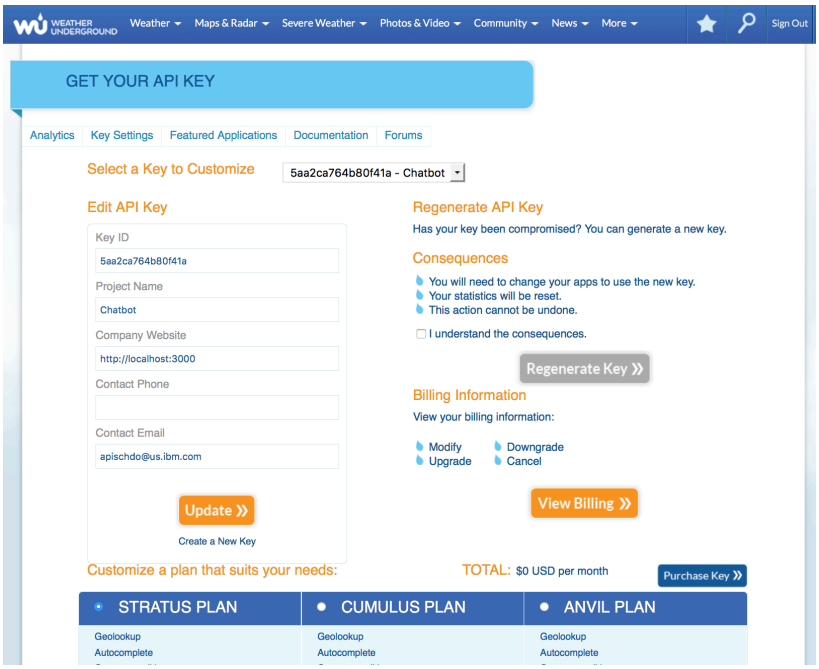
- Firefox 3.5+
- Chrome 5.0+
- Safari 5.0+
- Opera 10.60+
- Internet Explorer 9.0+

1. Point your browser to the following site: http://api.wunderground.com/
2. Create an account and sign in.
3. From the **More** pull down menu, click **Weather API for Developers**.




4. Follow the on screen instructions to obtain the key. All fields must be filled.
5. Select any plan (default is STRATUS PLAN) and click **Purchase Key** (no cost).

6. Below is an example from my experience (use http://localhost:3000 for the purposes of this lab). You need your own key, which appears under the **Key Settings** tab. Refer to your email for verification.




- **Extract the ConversationMaster_expedited.zip package from Github**

  This package contains basic code that you will need to build your app.

  1. Direct your browser to a GitHub repository (no need to sign up): https://github.com/
  2. Search for **bluemix-workshop**.
  3. Scroll down and select: apischdo/*Bluemix-workshop*-assets
  4. Download just the **ConversationMaster_expedited.zip** package.
  5. Extract the contents of the **ConversationMaster_expedited.zip** file in a temporary location on your local system.

# Overview

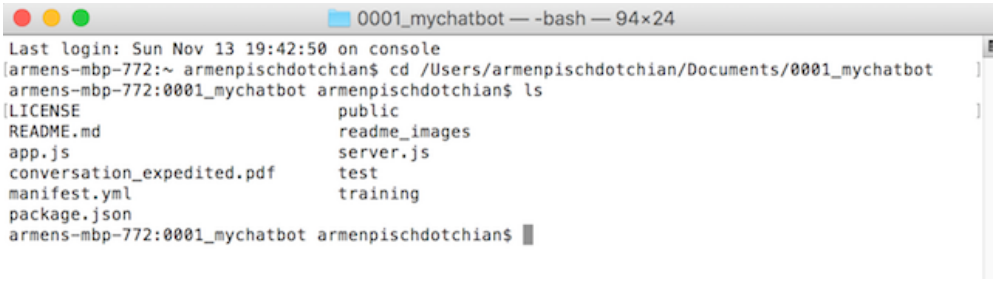
This table summarizes the steps that you need to complete to stand up an instance of the Watson Conversation service and integrate it an eternal service.

| Step | Where do I go? | What do I do? |
|---|---|---|
| 1 | Github:<br>https://github.com/apischdo/Bluemix-workshop-assets | Download the **ConversationMaster_expedited.zip** (you can also download everything that you see there). Alternatively, can also use the following command from a command prompt or your terminal:<br>`git clone https://github.com/apischdo/Bluemix-workshop-assets.git` |
| 2 | Your machine, the terminal window | Run the command `npm install` from the same directory where you extracted or cloned the package |
| 3 | Bluemix | Create a Conversation service and launch the tooling |
| 4 | Conversation service tooling | Import the `car_workspace.js` file |
| 6 | Your machine: create a new system internal file | This `.env` file will contain the conversation ID and the username/password for the Conversation service |
| 7 | Your machine, the terminal window | From the same directory, run the `node server.js` command |
| 8 | Your machine: use the provided weather.js file | Update the conversation.js and the app.js files. You include the API from the Weather Company in this step. |
| 9 | Your machine | From the same directory, run the `node server.js` command to reflect your changes. |
| 10 | Bluemix: | Create a "placeholder" app in Bluemix, connect it to your existing conversation service, add custom credentials and download the Starter Kit. This action will serve two purposes:<br>• You will use the resulting manifest.yml file in your local app<br>• You can now see and use the commands to upload your app to Bluemix that will include the new manifest.yml file. |
| 11 | Your machine | Run the commands that you see in Bluemix on your local system to upload the file. This will replace the "placeholder" app that you created earlier. |
| 12 | Bluemix | View your app in Bluemix and test it. |

# Using the Conversation service

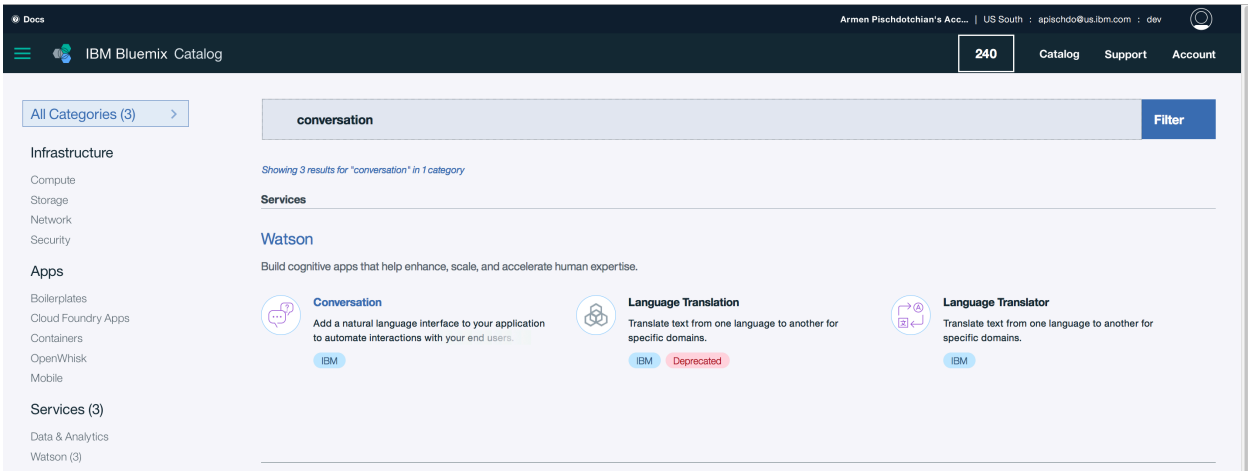
Let's begin our journey with a few good housekeeping practices:

1. Create a top-level directory on your system.
2. Download the code from the Github Repository: https://github.com/apischdo/Bluemix-workshop-assets/blob/master/ConversationMaster_expedited.zip
3. Extract the contents of the **ConversationMaster_expedited.zip**. If it auto extracted in your Downloads folder, then copy the extracted contents to your top-level directory that you created in Step 1.
4. Open a command window or a terminal and change directory (`cd`) to the working directory (in this example, I named my top directory 0001_mychatbot (you can pick your own directory name).

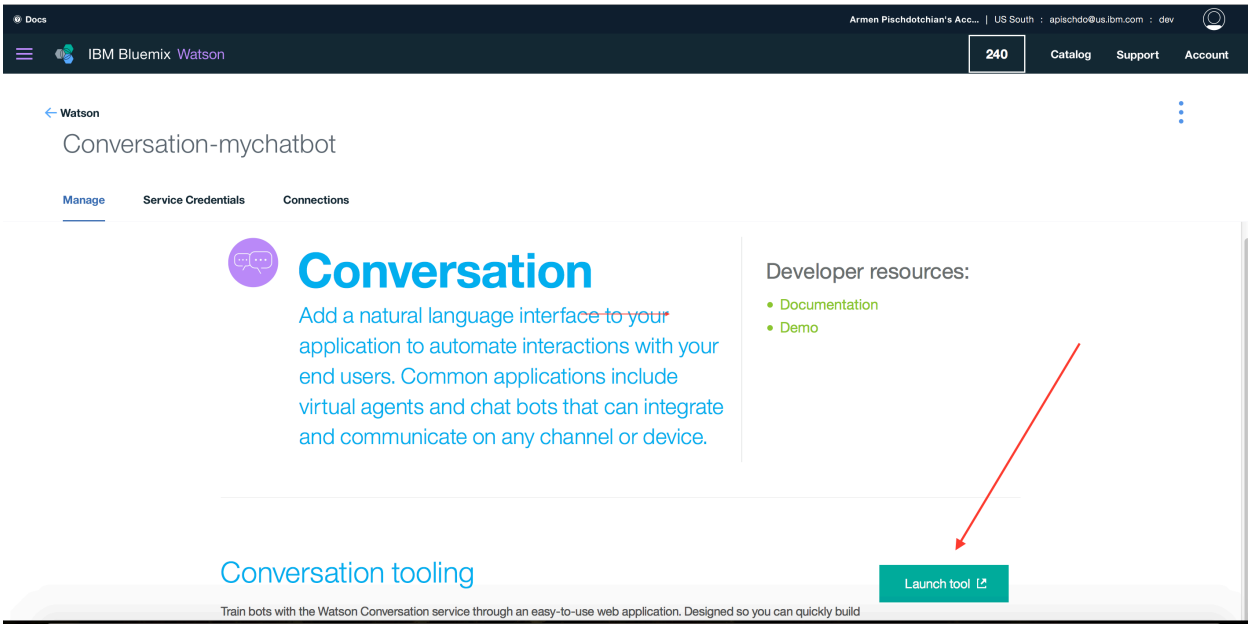



5. Press Enter and issue an `ls` (for Mac) or `dir` (for PC) command to ensure that all the artifacts that you extracted are visible. If you see the app.js, the main engine that does the interpreting, then you are working from the correct folder.
6. From the same terminal, run the node package manager (npm) to install dependencies that node.js relies on for further processing of the code. You might get some warning and one compile error message, ignore those; it has to do with version incompatibility. Notice that you have a new folder named node_modules.

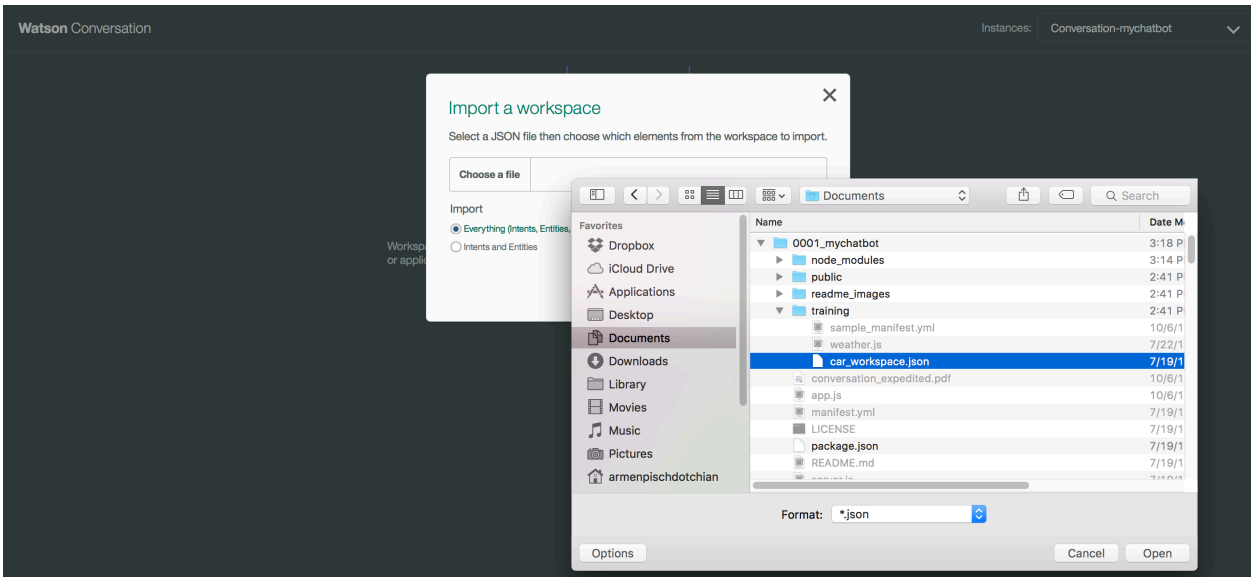
   ```
   npm install
   ```
7. Login into Bluemix: https://console.ng.bluemix.net
8. Click the **Catalog** tab.
9. Search for the **Conversation** service and click that tile.



10. Edit the Service name to something meaningful to you (for example: Conversation-mychatbot) and click **Create** (If you have just created your account and accessed it from the confirmation email, you may need to log into Bluemix once again, then you can see the Create button in the bottom right corner).




11. Click the **Launch Tool** button.
12. Login once again using the same credentials that you use to login Bluemix.
13. Click **Import**.
14. Navigate to the **training/car_workspace.json** file and click **Open** to import the file.



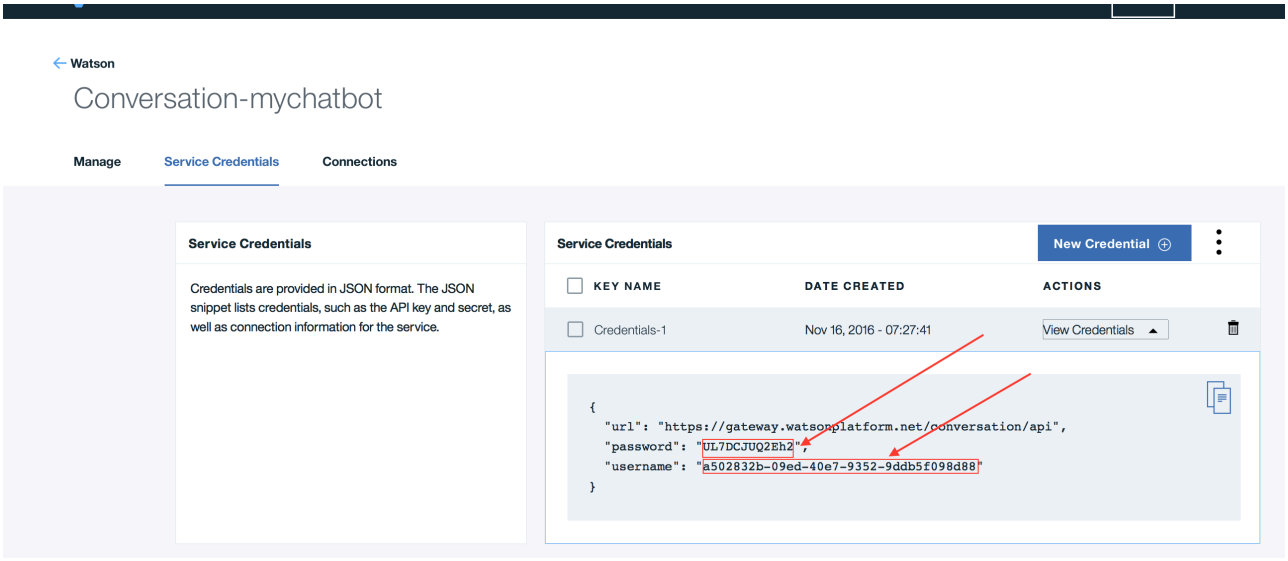

You must now provide three parameters to the code: conversation ID and the service credentials (username and password). Bear in mind that files that start with a dot "." are hidden system files, but with Sublime or Notepad++, by opening the folder, instead of just a file, you can see those hidden files. And if you just can't see internal files, then no worries just save the file and trust it is there.

15. In this example, select the top-level directory (0001_mychatbot) and open it with Sublime.
16. Open a new file with sublime and copy paste the below in that file; you may have to enter the line breaks after each equal sign so it appears as below in four separate lines:

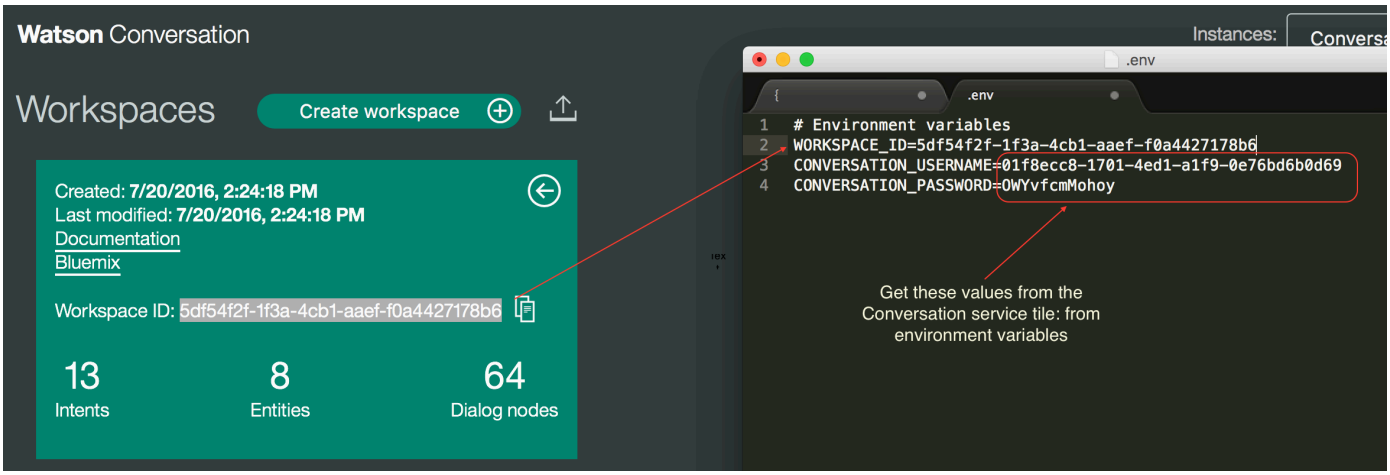
```
#environment variables
WORKSPACE_ID=
CONVERSATION_USERNAME=
CONVERSATION_PASSWORD=
```

You are now ready to populate the environment variables:

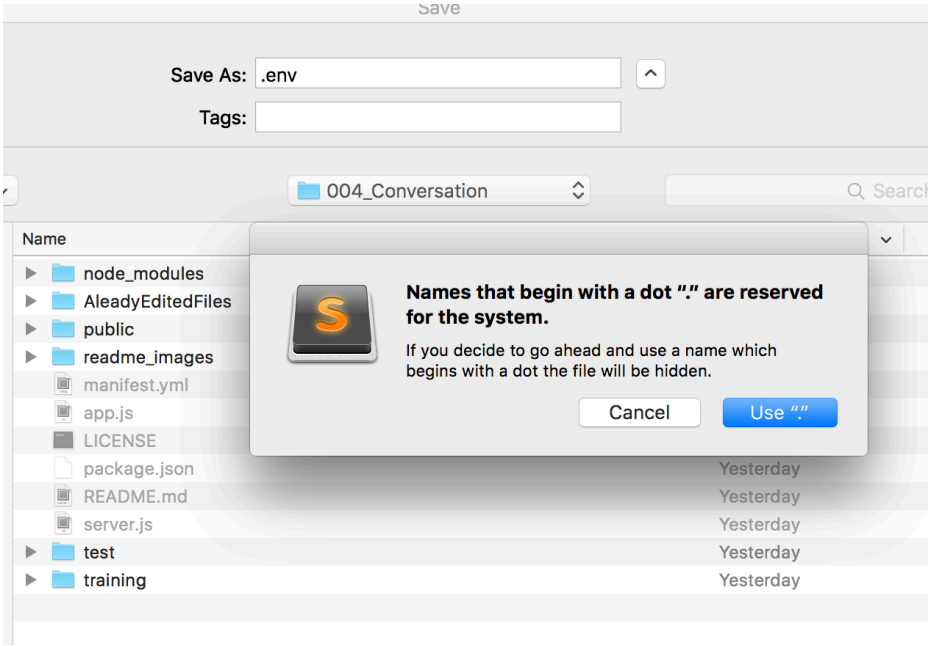
17. Obtain the workspace ID by clicking the three dots in Workspace box and then click **View Details**.
18. Go to the Conversation service on Bluemix, and obtain the username and password of the Conversation service from the **Service Credential** link and then click **View Credentials**.




19. Enter all three parameters in a new file in Sublime or Notepad ++.



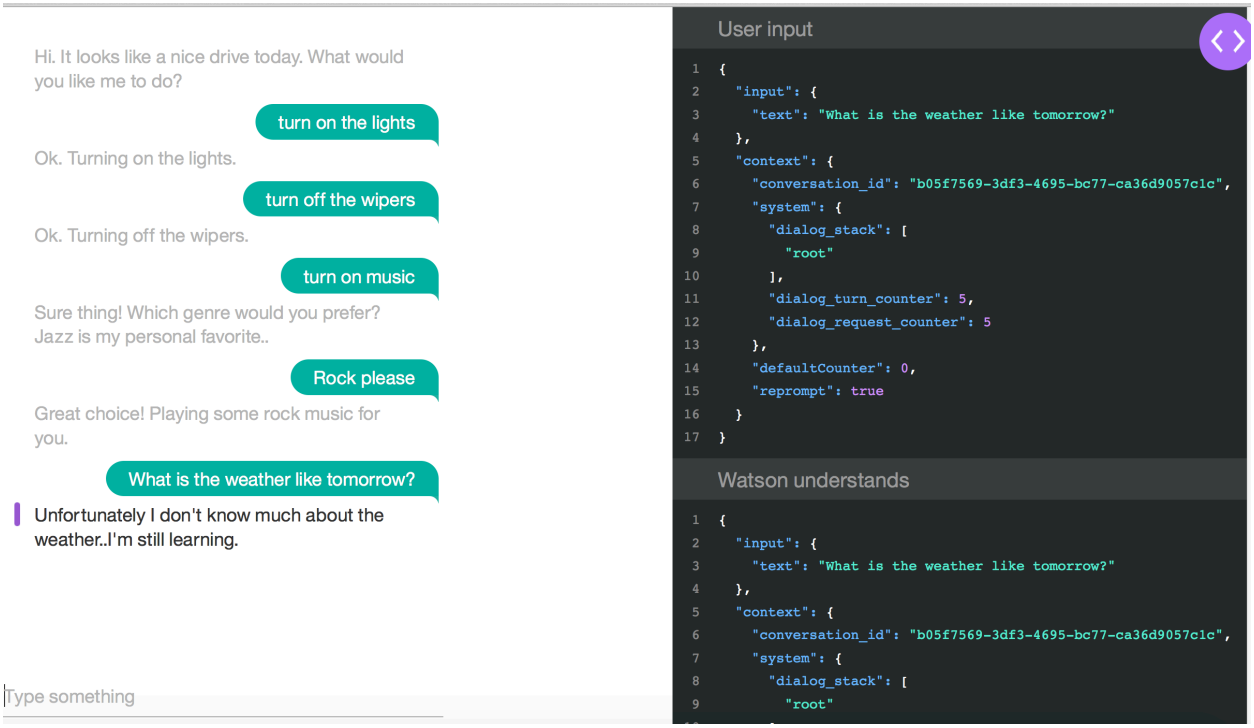
20. Save the file as **.env** (notice, there is a dot in front of the file name, this is a system internal file, typically hidden) and click **Use "."** Ensure that you save this file in the top-working directory where all other files, same level as app.js reside.




21. You are now ready to edit the app.js file. Open the **app.js** file.
22. Include the API key from the Weather Company in line 165:
    var key =//"enter API key from wunderground here";
    Ensure to remove the comment forward slashes ( / / ) ; you need the double quotes and the semicolon at the end.
23. Save the **app.js** file.
24. Go back to the terminal window and run the following command:

```
Node server.js
```

25. Open a new browser tab and enter **localhost:3000** in the URL field and run a conversation similar to what you see in the screen capture below:

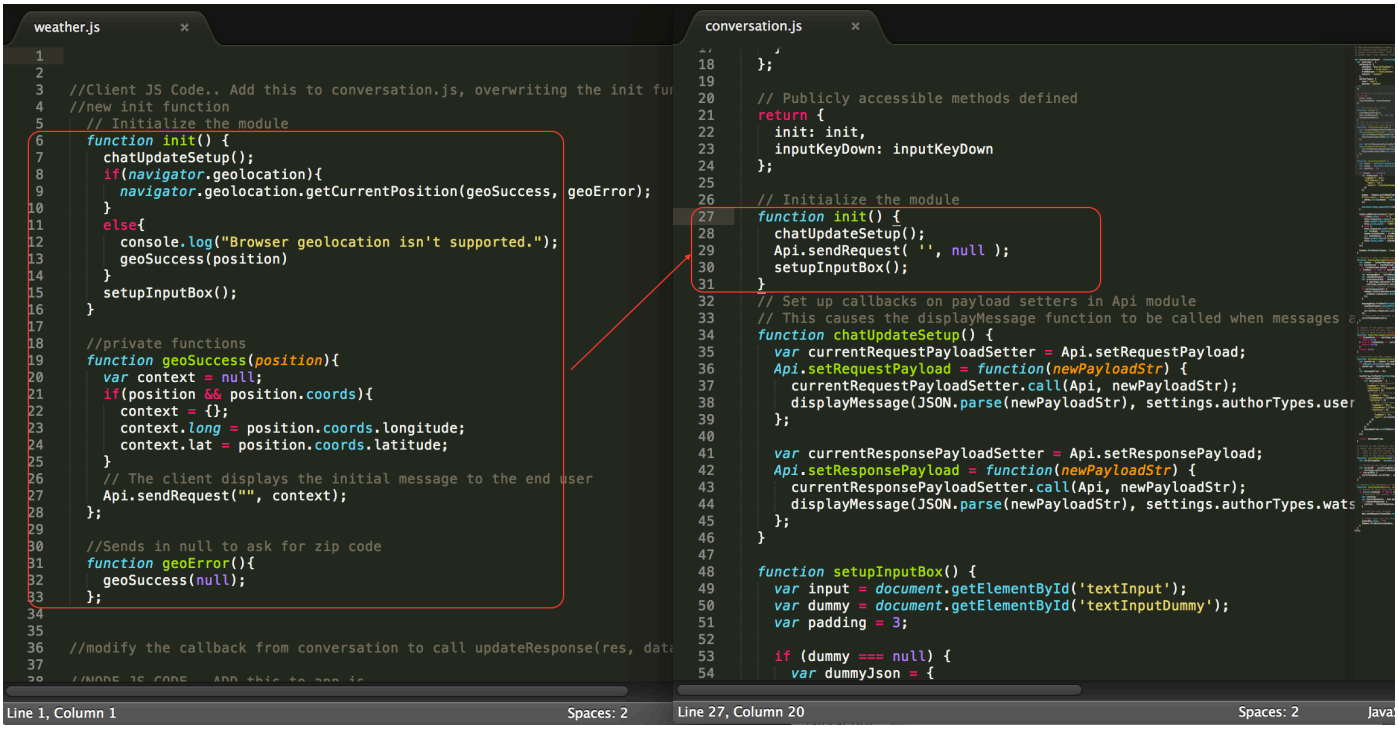



Notice that you have some work to do for the service to tell you how the weather is for your location, actual forecast exactly where you are sitting right now.

# Binding the Conversation service with an external API

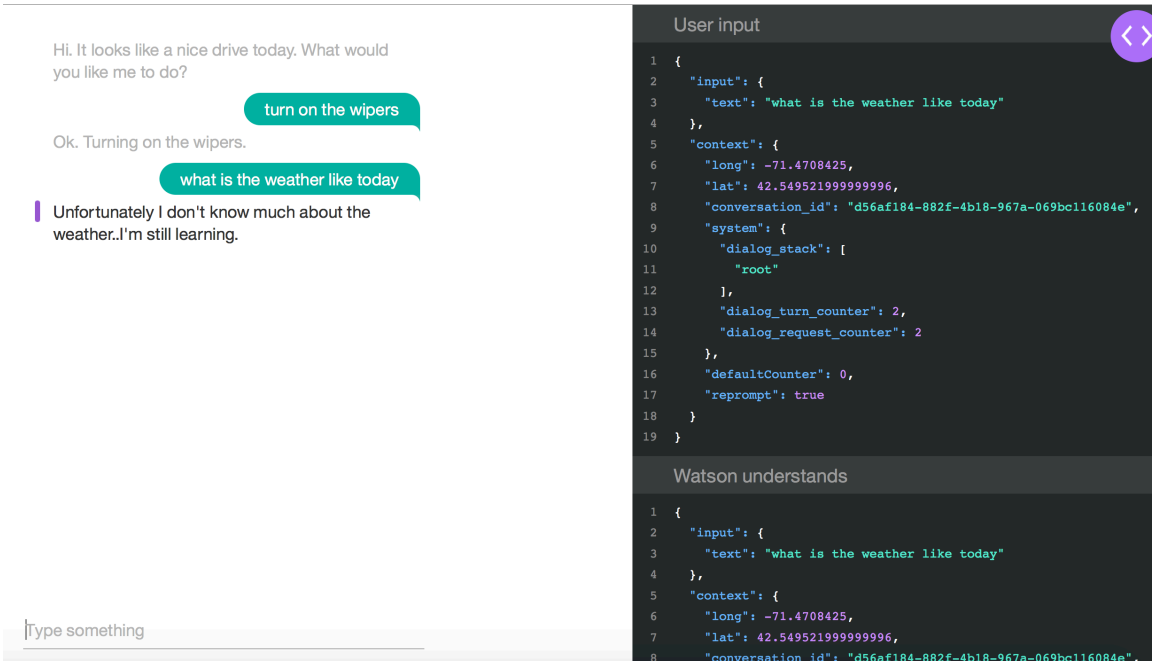
For this next section you are going to use the geo-location capabilities of your browser to check the actual weather forecast and for that you will need to include the API key from the Weather Company web site that you obtained from the Pre-requisites section.

1. From your top-level directory navigate to the **training** folder and open the **weather.js** file and position it to the left of your screen.
2. Navigate to the **public/js/conversation.js** folder and open the **conversation.js** file and position it to the right of your screen; just like the image below, you want them side-by-side.
3. Copy the init() function (lines 6 through 33) from the **weather.js** file *replacing* the init() function in the **conversation.js** file, *over writing* lines 27 through 31.
4. Save the **conversation.js** file and close it.




5. Run the `node server.js` command again and if need be, (Ctrl+C) to end the current terminal session.

6. Ask the following questions:
    - Turn on my wipers
    - What is the weather like today?



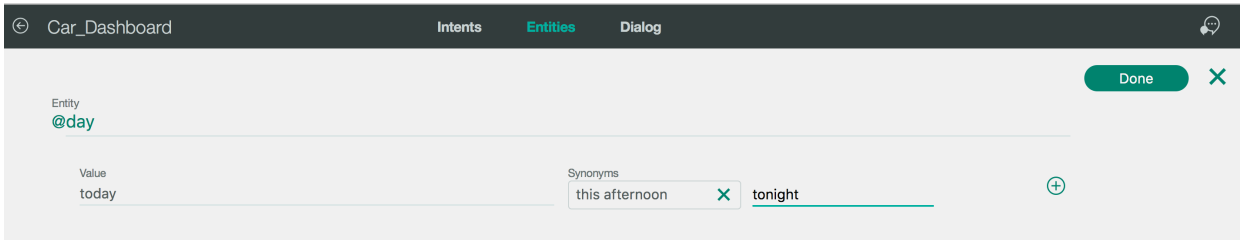

Notice that it understands the concept of weather, but the app cannot fetch that data at this point.

You are now ready to incorporate these changes in the dialog structure.

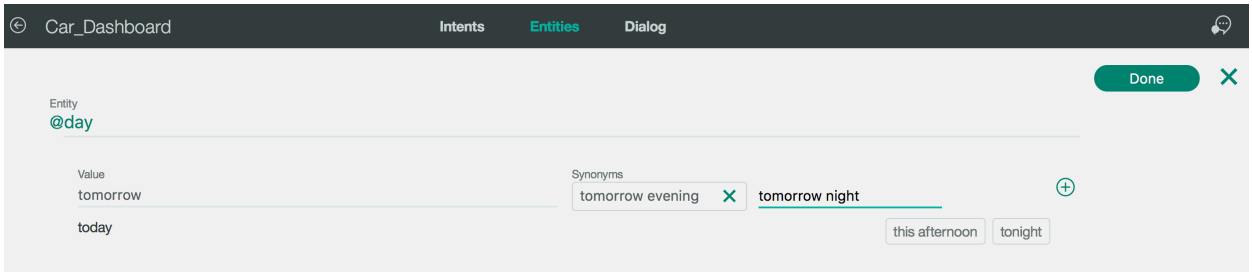
# Updating Dialog

Working with Intents, Entities and Dialog is covered in a separate workshop that elaborates on all facets of creating a robust dialog, for the purposes of this lab, you will edit the Entities and the Dialog.

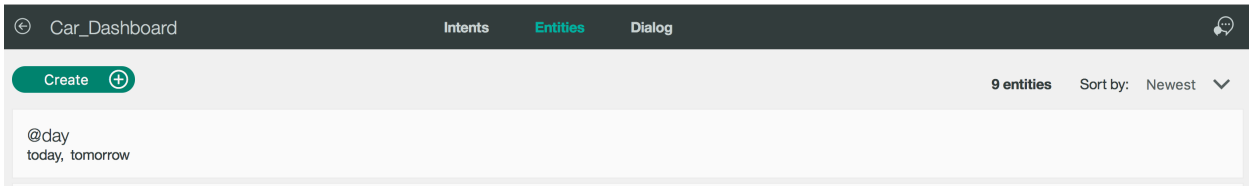
1. Go to the **Car_Dashboard** conversation and click the **Entity** tab.
2. Click **Create new+** and add an *Entity* of **day** (case matters, use lower case).
3. Add the value of **today** for the Entity of day (case matters, use lower case).
4. Add synonyms such as **this afternoon** and **tonight** (case does not matter here, pick your own synonyms).




5. Click the plus sign and add another entity *value* of **tomorrow** (case matters, use lower case).
6. Add synonyms such as **tomorrow evening** and **tomorrow night**.

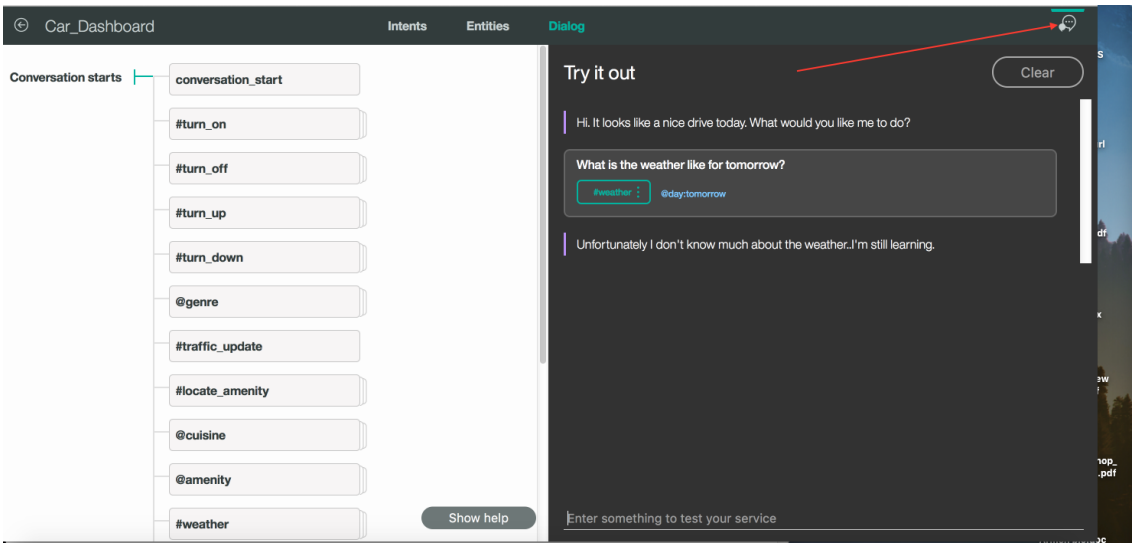



7. Click **Create** (or Done…the UI may have changed).
8. Note, # sign signifies Intent and @ sign signifies Entity. The end result looks like the image below:

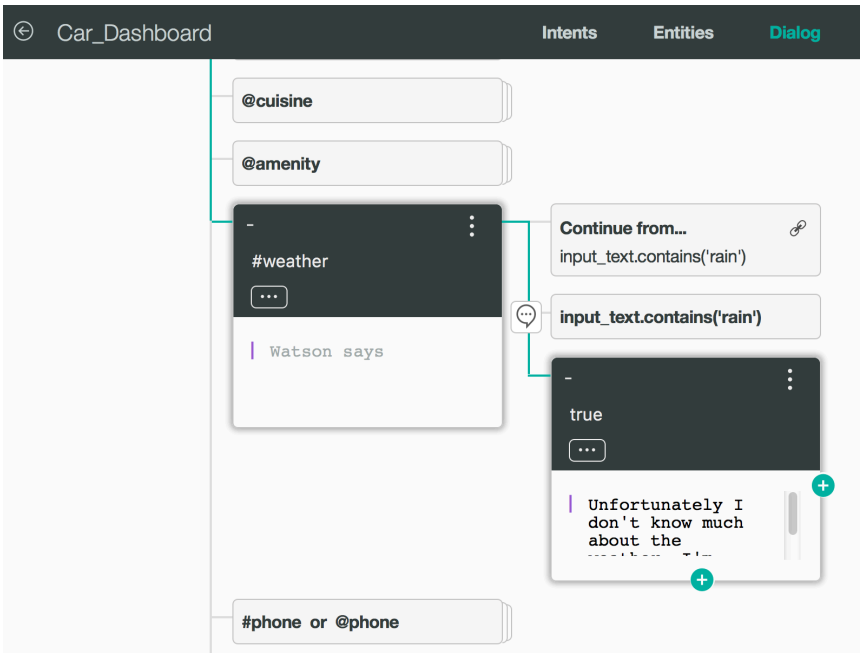



9. Let's update the Dialog flow. Click the **Dialog** tab.

10. Click the chat icon to the top right corner of the page and do a trial run and ask the system “how is the weather tomorrow?” The result should appear as below:




11. Close the chat window and click the #weather Dialog node and expand the tree, notice where the chat got it’s response!



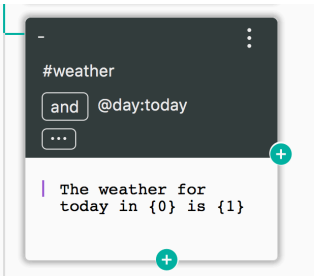

12. Click the three dots in the #weather node and delete the **#weather** node.

13. Click the amenity node (or any node) and then click the plus sign in the bottom of the node, to add sibling Dialog node (if it goes across, it is a child node). Nodes that are siblings (they are stacked on top of each other), are new conversations. Nodes that traverse across across are child nodes (pertain to the same conversation) and are conditioned on the parent node.

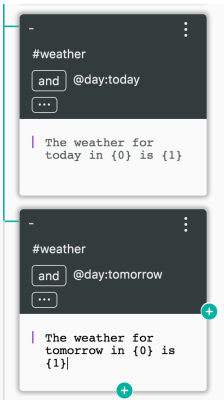
14. Type and then select the **#weather** for Intent.
15. Click the plus sign *inside the green* node and specify the condition of **@day:today**
16. Add the dialog:
    `The weather for today in {0} is {1}`

    *(Type the syntax, don't copy/paste it from here).*

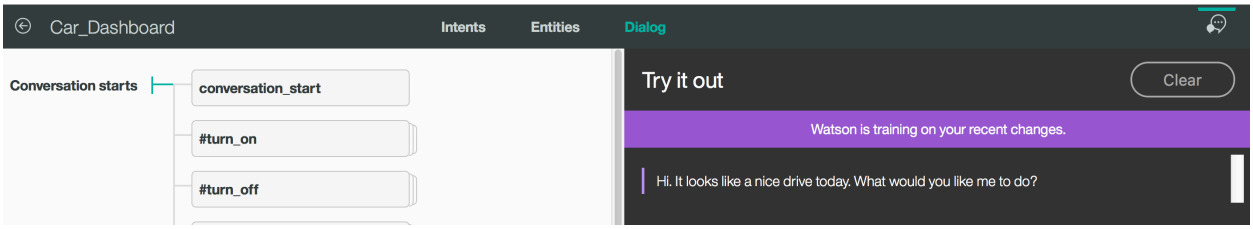
    There is the concept of conditions, if the condition is true then the dialog code gets executed.




17. Click the plus sign *underneath the dialog* node you just created and add another node: #weather
18. Add the condition of tomorrow: @day:tomorrow
19. Include the same script:
    `The weather for tomorrow in {0} is {1}`




If you have the chat open or if you open it right away, notice the message where it says **Watson is training on your recent changes**. It will become green and state that training has finished and disappears shortly thereafter.



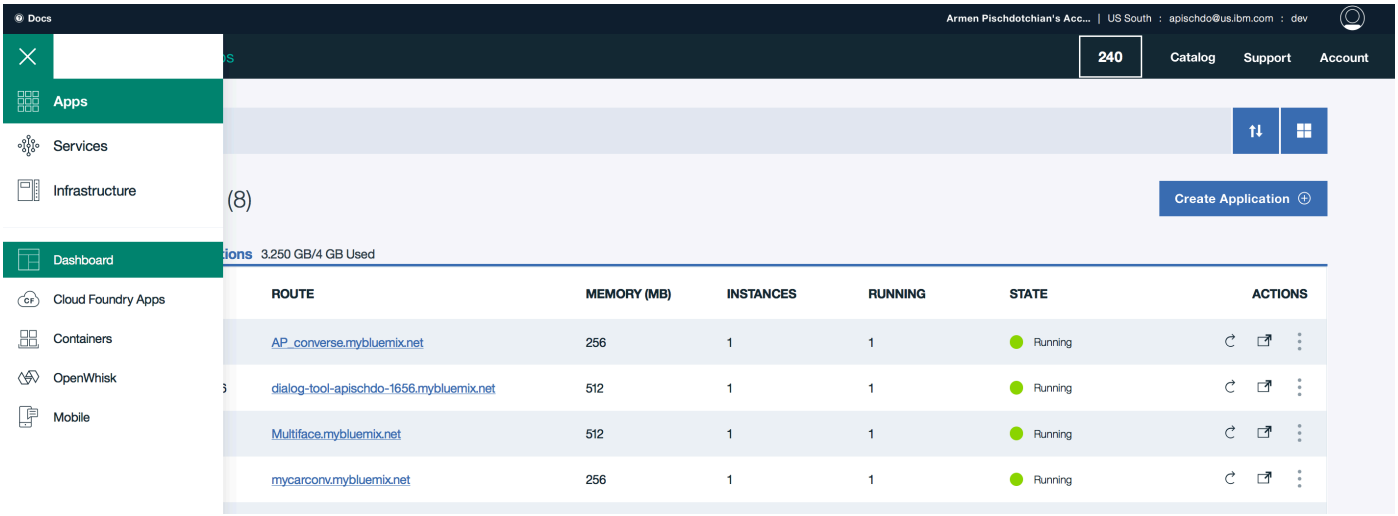

20. At this point, go back to your command console and run the `node server.js` command again (you may have to Control+C to stop the current process).
21. Ask the question: "How is the weather today?" and notice the correct weather forecast for your location.

But if you ask the same question from the Conversation service, it will give you the syntax answer: `The weather for tomorrow in {0} is {1}` and that is because the service on Bluemix does not know about your local app; not yet anyway. Your next step is to deploy your app to Bluemix.

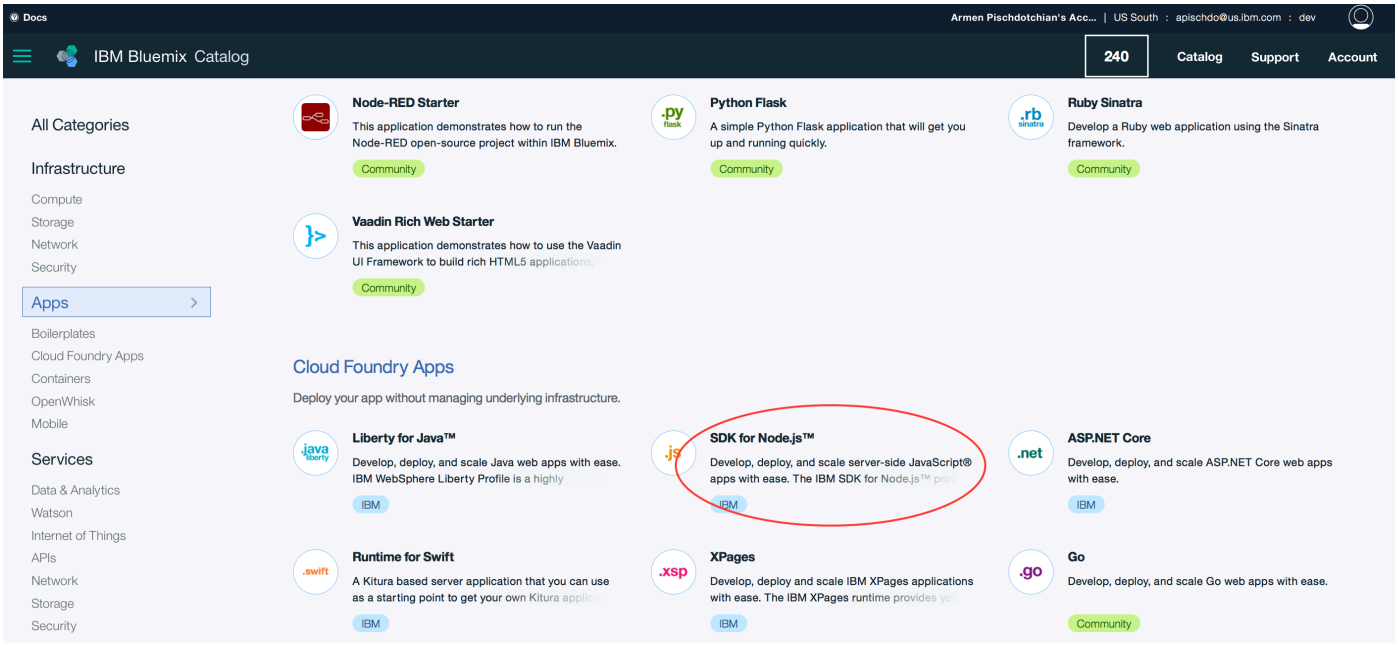
# Deploying your app to Bluemix

An easy way to deploy your app is by including an app name in the manifest.yml file and then using the cf push command to deploy the app onto Bluemix. However, this guide will make greater use of Bluemix capabilities in ensuring that you app is deployed properly.

1. Back to Bluemix, and click the Dashboard view from the left contents drop down link.

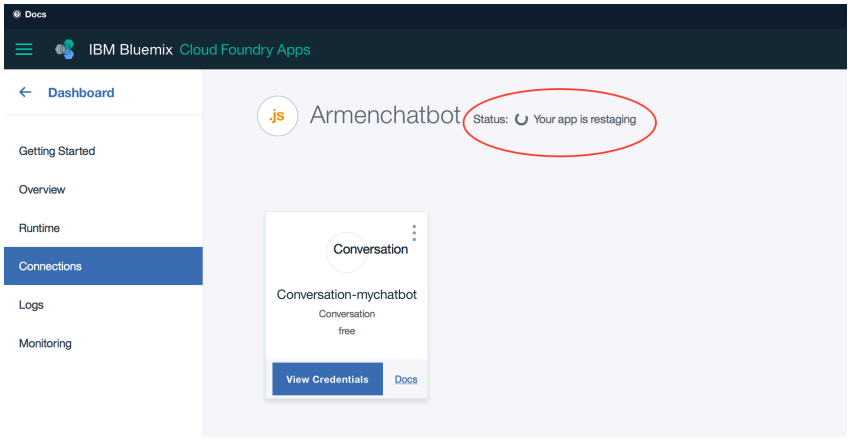



2. From the Dashboard view and click **Create Application** (you may have to scroll down a bit).
3. Scroll down and from the Cloud Foundry Apps, select the **SDK for Node.js**



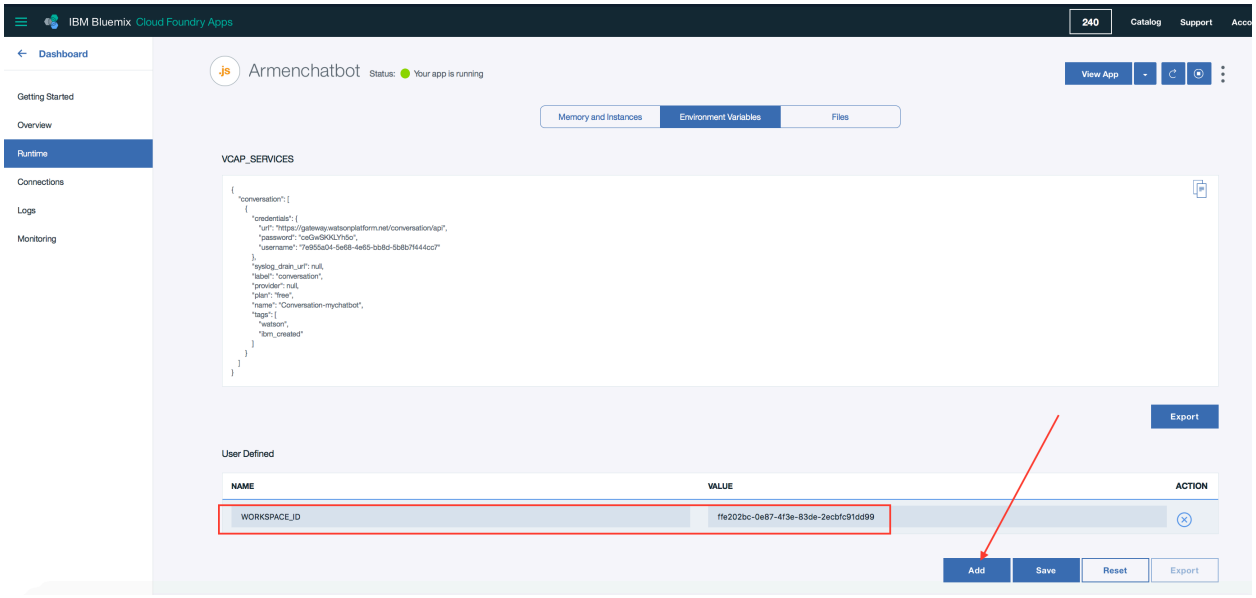

4. Specify a unique name, you may have to include your name, for example, I used Armenchatbot.
5. Click **Connections** link from the left panel.
6. Click **Existing** and find the very Conversation service that you created earlier in this lab (for example: mychatbot)

7. Click **Connect** and then click **Restage**. Allow enough time for the restaging to complete.




8. Click the **Runtime** link in the left panel.
9. Click **Environment Variables** (it takes a minute or two for the VCAP service to appear; no worries if you don't see them right away; you are ready to include the user-defined variables, which is your WORKSPACE_ID.

```
  WORKSPACE_ID          01f8ecc8-1701-4ed1-a1f9-0e76bd6b0d69
(use your ID number from the Car_Dashboard workspace……the details view).
```

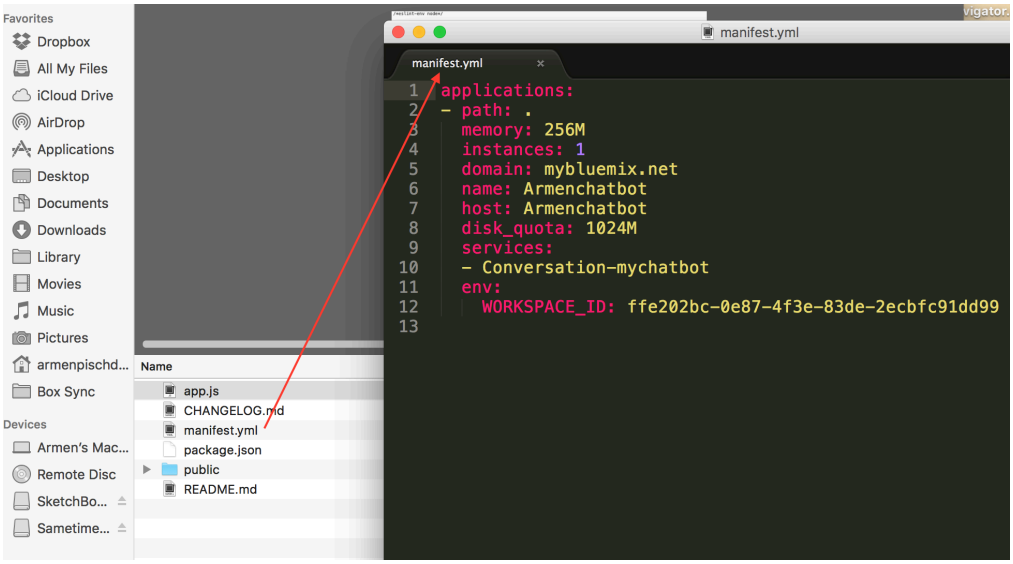



10. Click **Save**.
11. Click the **Getting Started** link from the left panel.

The reason you created a dummy file is two fold: The Starter Code, which you will download in the next step contains the manifest file that you will replace with the manifest.yml file in your working directory. It has the proper URL and all the credentials that you need; the second reason, is so you can see the commands needed to upload your app (with the new manifest.yml file) to Bluemix. You can copy/paste the commands that appear in the Getting Started page, except replace bluemix in the command line, with cf. We did not use the bluemix plugin, we used the cf (Cloud Foundry) plugin.

12. Click **DOWNLOAD STARTER CODE**.
13. Extract the contents of the downloaded code in a temporary location.

14. Copy the **manifest.yml** file that has an app name and the user defined variable value, replacing the **manifest.yml** file in your working directory. Alternatively, you could have just changed the Manifest file with app name and the custom env variable, but it's good to see where and how it's generated.

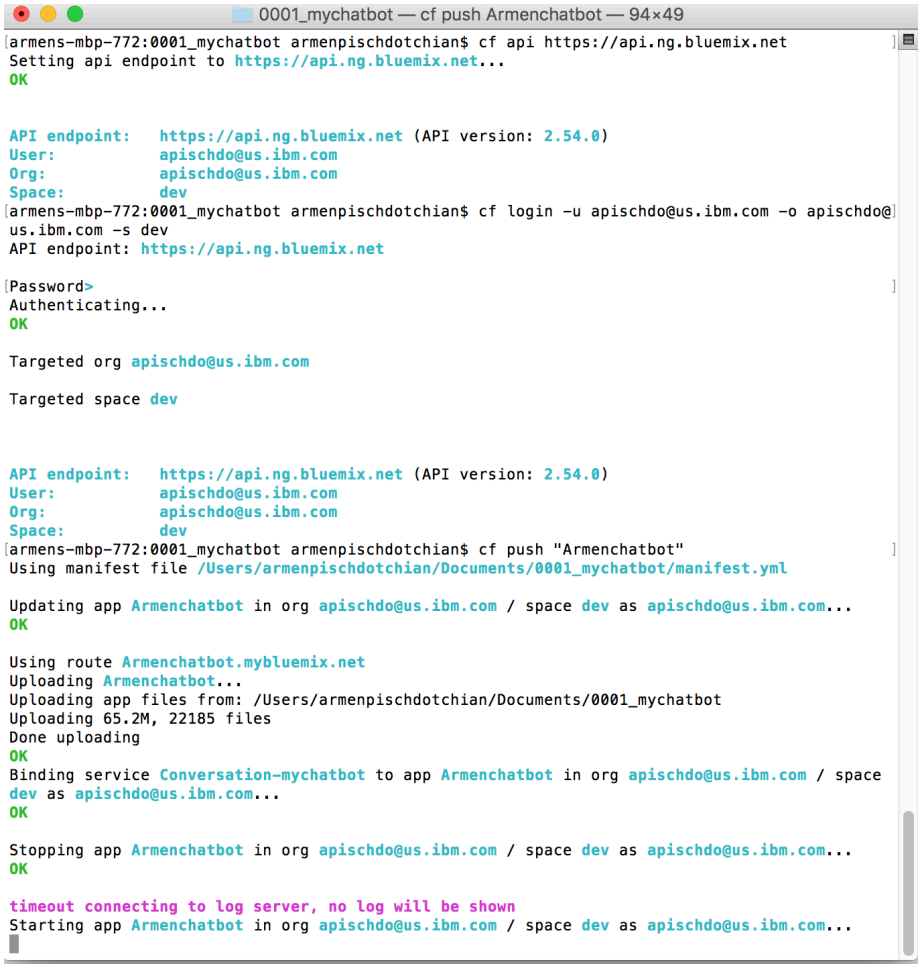



15. Start from Step 4 onward from the **Getting Started** page on Bluemix and you perform these in the same terminal or Command prompt where the app.js and the server.js files reside (start with `cf` not bluemix)

```
% cf api https://api.ng.bluemix.net
% cf login -u apischdo@us.ibm.com -o apischdo@us.ibm.com -s dev
% cf push "Armenchatbot"
```

The above is just an example of my credentials and settings. Yours would have your email address, org name and space name. When logging in, use the same Bluemix password when you created the account.

16. Allow enough time for the app to upload and restage. This takes a few minutes. Watch the console.




17. From within your application click **View App** (you may need to Restart the app again from Bluemix).
18. Accept geo-location sharing request.
19. Ask away some typical car questions and then hit it with the weather questions.

Congratulations, you just deployed a chatbot onto Bluemix.