IBM Watson Assistant-Node.js

Cognitive Solutions Application Development

IBM Global Business Partners

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Version 4.0 (Watson library V4.x)

Overview

The IBM Watson Developer Cloud (WDC) offers a variety of services for developing cognitive applications. Each Watson service provides a Representational State Transfer (REST) Application Programming Interface (API) for interacting with the service. Software Development Kits (SDKs) are also available and provide high-level wrappers for the underlying REST API. Using these SDKs will allow you to speed up and simplify the process of integrating cognitive services into your applications.

The <u>Watson Assistant</u> (formerly Conversation) service combines a number of cognitive techniques to help you build and train a bot - defining intents and entities and crafting dialog to simulate conversation. The system can then be further refined with supplementary technologies to make the system more human-like or to give it a higher chance of returning the right answer. Watson Assistant allows you to deploy a range of bots via many channels, from simple, narrowly focused bots to much more sophisticated, full-blown virtual agents across mobile devices, messaging platforms like Slack, or even through a physical robot.

Examples of where Watson Assistant could be used include:

- Add a chat bot to your website that automatically responds to customers' questions
- Build messaging platform chat bots that interact instantly with channel users
- Allow customers to control your mobile app using natural language virtual agents
- And more!

Objectives

- Learn how to provision a Watson Assistant service and utilize the web tool interface
- Learn how to train your chat bot to answer common questions
- Learn how to utilize the Watson Assistant service APIs in Node.js

Prerequisites

Before you start the exercises in this guide, you will need to complete the following prerequisite tasks:

- Guide Getting Started with IBM Watson APIs & SDKs
- Create a IBM Cloud account

You need to have a workstation with the following programs installed:

- 1. Node.js
- 2. Express A Node.js framework
 - 1. npm install -g express-generator

Section 1: Create a Conversation Dialog in IBM Cloud

Create a Conversation Service in IBM Cloud

IBM Cloud offers services, or cloud extensions, that provide additional functionality that is ready to use by your application's running code.

You have two options for working with applications and services in IBM Cloud. You can use the IBM Cloud web user interface or the Cloud Foundry command-line interface. (See Lab 01 on how to use the Cloud Foundry CLI).

Note: In this lab we use the IBM Cloud web UI.

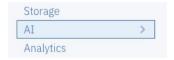
Step 1 In a web browser, navigate to the following URL

https://cloud.ibm.com.

- Step 2 Log in with your IBM Cloud credentials. This should be your IBMid.
- Step 3 You should start on your dashboard which shows a list of your applications and services. Scroll down to the All Services section and click **Create Resource**



Step 4 On the left, under Services, **click** on *AI* to filter the list and only show the cognitive services.



Step 5 Click on the Watson Assistant service.

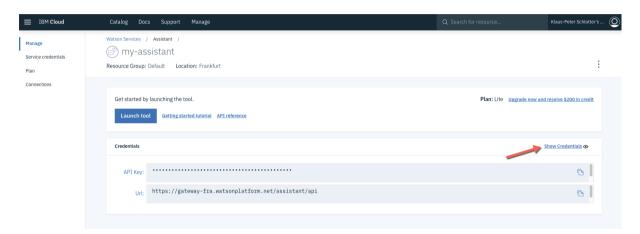


Step 6 Review the details for this service. At the top, there will be a description of the service. At the bottom, you can review the pricing plans. The Lite plan for this service provides no cost monthly allowances for workspaces, intents, and API calls. Enjoy your demo!

Step 7 Enter the information for your service, then click create

| Field | Color property |
|-----------------------------------|---------------------------|
| Service name | my-assistant |
| Selected Plan | Lite |
| Chose a region/location to deploy | <yourregion></yourregion> |
| Select a resource group | Default |

Step 8 IBM Cloud has created a new service instance.



In the Credentials section click Show Credentials . You should see the API Key for your service. Later in this exercise, you will enter this value into a JSON configuration file for your Node.js application. Feel free to copy them to your clipboard, to a text file, or just return to this section of the IBM Cloud web interface when the credentials are needed.

Create a Watson Assistant Skill

Before using the Assistant instance, you will need to train it with the intents, entities, and/or dialog nodes relevant to your application's use case. You will create these items in a Skill in the following steps. A Skill is a container for the artifacts that define the behavior of your service instance.

The resulting Skill is also available as JSON backup file on GitHub. In a Terminal you can download it with the following command:

wget https://raw.githubusercontent.com/iic-dach/csadConversation/
lab3 csadConversation/Lab3 skill-CSAD-Demo.json

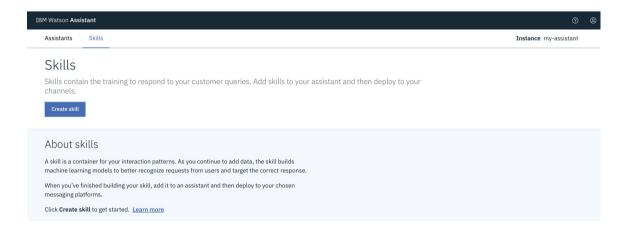
On the *Add Dialog Skill* page, on the *Import skill* tab you can import this JSON file..

Step 10 In this guide, you will build a <u>Conversation simple app</u> to demonstrate the Natural Language Processing capabilities of IBM Watson in a simple chat interface. You will also learn how to identify a user's intent and then perform an action from a third-party application.

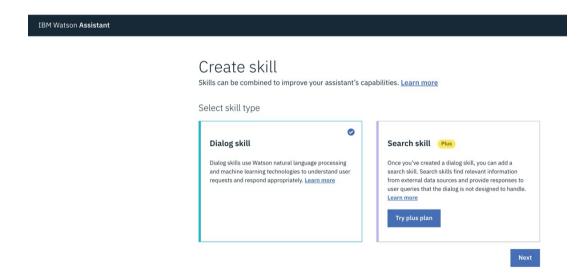
Step 11 Click the Launch tool button.

Launch Watson Assistant

- **Step 12** The IBM Watson Assistant opens on the *Assistants* tab.
- Step 13 Open the Skills tab. Here you can create new Skills.



- Step 14 First, you will need to create a new workspace. Workspaces enable you to maintain separate intents, user examples, entities, and dialogs for each application. Click Create skill
- Step 15 On the Create skill page select Dialog skill and click Next



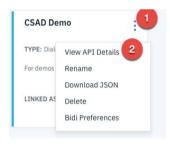
Step 16 On the *Create Dialog Skill* page, on the *Create skill* tab, **enter** the following values and click Create dialog skill .

| Field | Value | |
|-------------|------------------------------------|--|
| Name | CSAD Demo | |
| Description | For demos only | |
| Language | We use English(U.S.) for this demo | |

Step 17 Once the Skill has been created, you will be redirected to it. However, before proceeding, you will need to know how to identify the Skill so that it can be referenced by future applications. At the top, **click** Skills.



Step 18 On the tile for your new Skill, click Options → View API Details.



Step 19 Locate the Workspace ID. You will need this value in future steps when creating a JSON configuration file for your demo application. Feel free to copy the value or just return to this section of the Conversation tooling web interface when the ID is needed.

| Skill Details | |
|--|--------------|
| Skill name: CSAD Demo | |
| Skill ID: c657cea8-1699 | |
| Workspace ID: dfa3674 | |
| Skill URL: https://gateway-fra.watsonplatform.net/assistant/api/v1/workspaces/c657cea8 | 5099/message |
| | |
| Service Credentials | |
| Credentials name: auto-generated-apikey-e184di | |
| Username: apikey | |
| Password: RKp4sJnzQvwWOp_Js | |

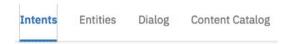
Step 20 In the upper right corner of this page, click X.

Step 21 Click on the Skill tile to be taken back to the new Skill.

Create Intents

Before using the new conversation, you will need to train it with the intents, entities, and/or dialog nodes relevant to your application's use case. An intent is the purpose or goal of a user's input.

Step 22 First, you will need to define some intents to help control the flow of your dialog. An <u>intent</u> is the purpose or goal of a user's input. In other words, Watson will use natural language processing to recognize the intent of the user's question/statement to help it select the corresponding dialog branch for your automated conversation. If not already there, **click** the *Intents* tab at the top of your workspace.

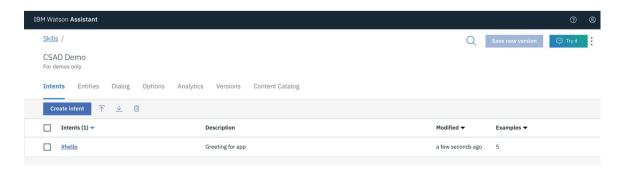


| Field | Value |
|-------------|------------------|
| Intent name | hello |
| Description | Greeting for app |

Step 24 The user examples are phrases that will help Watson recognize the new intent. (Enter multiple examples by **pressing** "Enter" or by **clicking** the Add example). When finished, **click**
at the top of the page.

| Field | Value |
|--------------|---------------------------------------|
| User example | Good morning Greetings Hello Hi Howdy |

Step 25 You should see your new intent listed on the Intents page. The number you see will indicate the total number of user examples that exist for that intent.



Step 26 Repeat the previous steps to create a new *intent* that helps the user end the conversation.

| Field | Value | |
|--------------|---|--|
| Intent name | goodbye | |
| Description | Goodbye | |
| User example | Bye Goodbye Farewell I am leaving See you later | |

Step 27 Repeat the previous steps to create a new *intent* that helps the user ask for help. In the programming section of this guide, you will learn how to identify the user's intent (in a third-party application) so that you can perform the requested action.

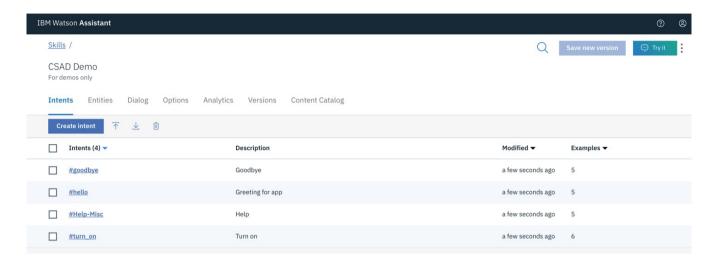
| Field | Value | |
|--------------|---|--|
| Intent name | Help-Misc | |
| Description | Help | |
| User example | I have a request I would like some assistance I need information I have a problem I need help | |

Step 28 Repeat the previous steps to create a new *intent* that helps the user issue commands to turn on a device. In this example, you will assume the user is interacting with a home/business automation system. The purpose of this intent is to show you (in the next section) how to associate *entities* with an intent when building your dialog tree. Additionally, this intent demonstrates that the Conversation service can be used for more than just chat bots. It can be used to provide a natural language interface to any type of system!

| Field | Value | |
|--------------|--|--|
| Intent name | turn_on | |
| Description | Turn on | |
| User example | Arm the security system Lock the doors I need lights Turn on the lights Start recording headlights | |

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Step 29 At this point, you have defined some intents for the application along with the example utterances that will help train Watson to recognize and control the conversation flow.



Create entities

Before using the new Assistant, you will need to train it with the intents, entities, and/or dialog nodes relevant to your application's use case. An entity is the portion of the user's input that you can use to provide a different response or action to an intent.

- Next, you will need to create some *entities*. An *entity* is the portion of the user's input that you can use to provide a different response or action to an *intent*. These entities can be used to help clarify a user's questions/phrases. You should only create *entities* for things that matter and might alter the way a bot responds to an *intent*. If not already there, **click** the *Entities* tab at the top of your Skill.

Click Add value . When finished, click ← at the top of the page.

| Field | Value | Synonym |
|-------------|-----------------|--------------|
| Entity name | device | |
| Value | security system | alarm |
| | lights | bulb, lamp |
| | doors | locks, gates |
| | radio | car radio |

Step 32 You should see your new *entity* listed on the *Entities* page.

| Entity (2) ▼ | Values | Modified ▼ |
|--------------|---------------------------------------|-----------------|
| @device | doors, security system, radio, lights | a few seconds a |

Step 33 Repeat the previous steps to create the following new *entity* for **lights** controlled by the system.

| Field | Value | Synonym |
|-------------|---------------|---------------------------------------|
| Entity name | lights | |
| Value | fog lamp | fog light |
| | high beam | full beam, main beam, brights |
| | low beam | headlights, passing lights, dim light |
| | rear fog lamp | rear fog light |

Step 34 Repeat the previous steps to create the following new *entity* to request the current time.

Note: You can get the time by using one of the predefined system entities. In this exercise, go ahead and enter it manually so it can be used to demonstrate future concepts.

| Field | Value | Synonym |
|-------------|-------|-----------------------------|
| Entity name | help | |
| Value | time | clock, hour, minute, second |

- Step 35 At this point, you have defined *intents* and the associated *entities* to help Watson determine the appropriate response to a user's natural language input. Your application will be able to:
 - Respond to a request to turn on specific devices
 - If a user turns on lights, provide additional choices for light locations

Create dialogs

Before using the new conversation, you will need to train it with the intents, entities, and/or dialog nodes relevant to your application's use case. A dialog uses the intent and entity that have been identified, plus context from the application, to interact with the user and provide a response.

- Step 36 Next, you will need to create some *dialogs*. A <u>dialog</u> is a conversational set of nodes that are contained in a workspace. Together, each set of nodes creates the overall dialog tree. Every branch on this tree is a different part of the conversation that can be had with a user. If not already there, **click** the *Dialog* tab at the top of your Skill.
- **Step 37** Review the documentation for creating <u>dialog nodes</u> and for defining conditions.

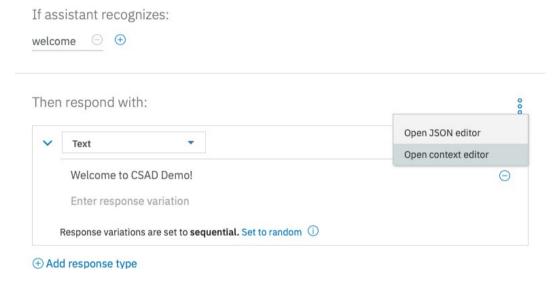
Step 38 On the Dialog tab, **click**Create dialog

Two default nodes will be created for you named *Welcome* and *Anything* else. The *Welcome* node is the starting point for this application's conversation. That is, if an API query is made without a context defined, this node will be returned. The *Anything else* node will be used if the user input does not match any of the defined nodes.

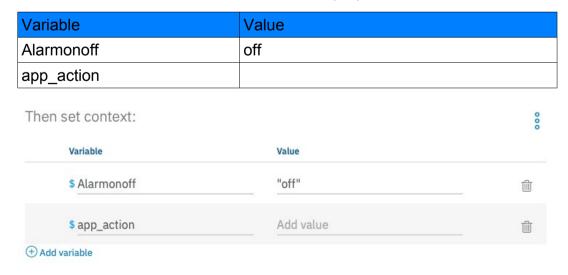
Step 39 Click on the Welcome node to update the following properties

| Field | Value |
|--------------------|---------------------------------|
| Name | Welcome (should be the default) |
| If bot recognizes: | welcome (should be the default) |
| Then respond with: | Welcome to the CSAD Demo! |

Step 40 Click then click Open context editor.



Step 41 Add two variables and click \times to close the properties view of the node.



Step 42 Expand the *Anything else* node and review it's default values. Close the view by clicking \times .

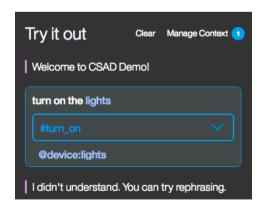
| Field | Value | |
|--|---|--|
| Name | Anything else (should be the default) | |
| If bot recognizes: | anything_else (should be the default) | |
| Then respond with: | I didn't understand. You can try rephrasing Can you reword your statement? I'm not understanding. I didn't get your meaning. (all should be default) | |
| Response variations are sequential.* (Set to random) | | |

^{*} Sequential means 1st response presented at first hit of anything_else node, and so on. Random means any of the responses is presented randomly.

- Now it's time to test the conversation.
 In the upper right corner, click Try it
- Step 44 A test user interface will immediately launch and, based on the *Welcome* node, provides a greeting to the end user. (You may see a message that Watson is being trained.)



Step 45 Since you have not yet defined any other dialog nodes (associated with your *intents* and *entities*), everything typed by the user will get routed to the *Anything else* node. F.e **type** "turn on the lights".



Although we have defined this phrase in intents and entities, the system does recognize them because we have not yet defined a node to catch them the bot does not yet understand (anything else node).

- Step 46 Did you notice the drop-down menu that appeared for your invalid input? You can optionally assign this phrase to an existing intent (or verify the correct intent was used). You can use this functionality in the future to keep Watson trained on new user inputs and to ensure the correct response is returned. Cool! For now, just proceed to the next step.
- Step 47 Click X in the top right corner to close the chat pane. Proceed to the next section.

Build your CSAD Assistant dialog

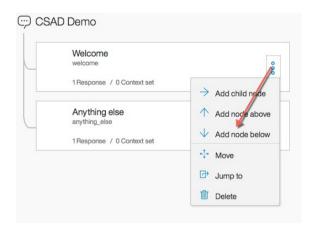
In this section, you will continue building your demo bot utilizing the intents, entities, and dialog nodes that you created in previous steps. You will do this entirely with the web interface (no programming or text/XML file hacking required!)

You should create a dialog branch for each of the intents you identified as well as the start and end of the conversation. Determining the most efficient order in which to check conditions is an important skill in building dialog trees. If you find a branch is becoming very complex, check the conditions to see whether you can simplify your dialog by reordering them.

Note: It's often best to process the most specific conditions first.

Step 49 Click the menu § on the Welcome node and then click Add node below.

In this step you are creating a new branch in your dialog tree that represents an alternative conversation.



Step 50 In this new node, enter the following values. By setting the condition to an *intent*, you are indicating that this node will be triggered by any input that matches the specified *intent*. Then **click** × to close the dialog.

| Field | Value |
|--------------------|----------------------------|
| Name this node | Hello |
| If bot recognizes: | #hello |
| Then respond with: | Hi! What can I do for you? |

Step 51 Click the menu \S on the *Hello* node and then click *Add node below*, with the following values. Then click \times to close the dialog.

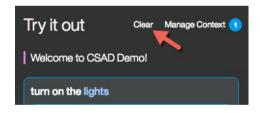
| Field | Value |
|--------------------|-------------------------|
| Name this node | Goodbye |
| If bot recognizes: | #goodbye |
| Then respond with: | Until our next meeting. |

Step 52 Using the same steps (Step 40 ff) as before, test the conversation by typing the following chat line(s):

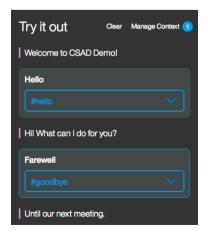
Hello

Farewell

You can clear previous tests by clicking **Clear** at the top of the dialog.



You should see the appropriate result:



Step 53 Next, you should create a new node below Hello (Add node below) for the #turn_on intent. As you'll recall, you have multiple devices that you might want to turn on. In earlier steps, you documented these devices using a new @device entity. This dialog branch will require multiple nodes to represent each of those devices. In this new node, enter the following values. In this example, the dialog branch will need additional information to determine which device needs to be turned on. So, leave the "Responses" field blank. Click × to close.

| Field | Value |
|---------------------------------|----------|
| Name this node | Turn on |
| If bot recognizes: | #turn_on |
| Then respond with: | |
| In the Context Editor (click :) | |
| app_action | on |

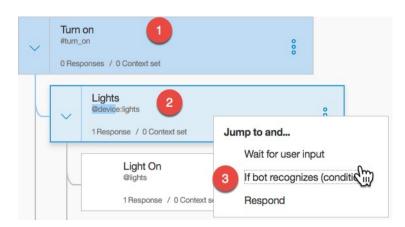
- Step 54 Click the menu § on the Turn On node and click Add child node.
- Step 55 In this new node, enter the following values. In this example, the only way this node will be reached is if the user specifies the @device entity "lights" (or one of its synonyms). Then click X to close the dialog.

| Field | Value |
|--------------------|--|
| Name this node | Lights |
| If bot recognizes: | @device:lights |
| Then respond with: | OK! Which light would you like to turn on? |

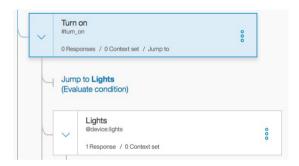
- Step 56 In this scenario, you want to automatically move from the *Turn On* node to the *Lights* node without waiting for additional user input.
 - a) Click the **Turn on** node and at the bottom **select** *Jump to* as the *And then* condition.



b) Now select the **Lights** node as the destination node.



c) If bot recognizes (condition) is lights.



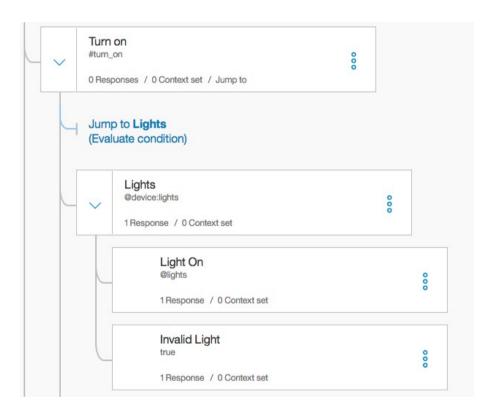
Step 57 At this point, Watson will ask you which lights to turn on. As you will recall, in earlier steps you created a @lights entity to define the available lights in the system. Click the menu § on the Lights node, click Add child node to create a node. In this new node, enter the following values. By setting the condition to an entity, you are indicating that this node will be triggered by any input that matches the specified entity.

| Field | Value |
|--------------------|-------------------------------|
| Name this node | Light On |
| If bot recognizes: | @lights |
| Then respond with: | OK! Turning on @lights light. |

Step 58 Next, you will want Watson to respond if it does not recognize a light, or entity, provided by the user. Click the menu $\frac{2}{5}$ on the Light On node and click Add node below to create a new peer node. In this new node, enter the following values.

| Field | Value |
|--------------------|--|
| Name this node | Invalid light |
| If bot recognizes: | true |
| Then respond with: | I'm sorry, I can only turn on some car related lights. |

Now your tree for the lights should look like the following:



You will need to add nodes to deal with the other devices that can be turned on. As you'll recall, you defined those devices with the **@device** *entity*. The **Turn On** node automatically jumps to the Lights node. So, **click** the menu on the Lights node and **click** *Add node below* to create a new peer node. **Enter** the following values.

| Field | Value |
|--------------------|---------|
| Name this node | Device |
| If bot recognizes: | @device |
| | |
| Then respond with: | |

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Step 60 On the Device node click and click Add a child node. Add the following values

| Field | Value |
|--------------------|---------------------|
| Name this node | Device On Off Check |
| If bot recognizes: | true |

Step 61 Click © Customize and enable Multiple responses. The click Apply

| Customize | "Device On O | ff Check" | |
|---|---|--|-----------|
| Customize node | Digressions | | |
| | | | |
| Slots (i) | | | off |
| Enable this to gath a user within a sing | , | rtual assistant needs to re | espond to |
| Promp | t for everything | | |
| prompt, | | eces of information in a sir them all at once and not I | _ |
| Multiple respon | ses (i) | | on |
| | sponses so that your virtuame input, based on other | al assistant can provide d r conditions. | ifferent |
| | | | |
| | | Cancel | Apply |

Step 62 Now add the following three answers in *Then respond with*: Use the to customize and enter the values interactively and **click** save. See the screenshots of each response:

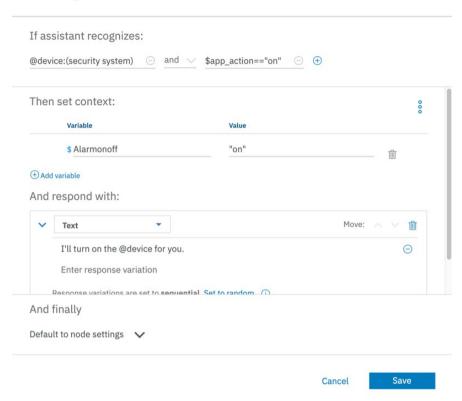
Configure response 1 If assistant recognizes: @device:(security system) (X) and \$app_action=="on" and \$Alarmonoff=="on" **(** \otimes Then respond with Text It looks like the @device is already on. Response variations are set to sequential. Set to random Learn more Add response type (+) If assistant recognizes:

@Device:(security system) AND \$app_action=="on" AND \$Alarmonoff=="on"

It looks like the @device is already on.

Then respond with:

Configure response 2



If assistant recognizes:

@Device:(security system) AND \$app_action=="on"

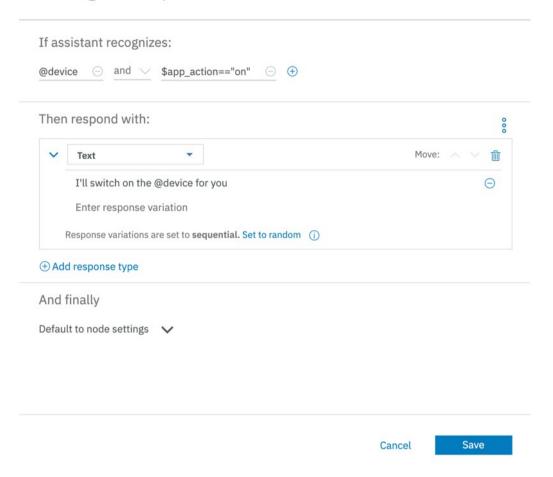
Then set context (open the context editor) \$Alarmonoff "on"

And respond with:

I'll turn on the @device for you.

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Configure response 3



If assistant recognizes:

@Device AND \$app_action=="on"

Then respond with:

I'll switch on the @device for you.

Step 63 Now click on the Device node and click Jump to, then select the Device On Off Check (If recognizes condition).



Step 64 Next, you will want Watson to respond if it does not recognize a device, or entity, provided by the user. Click the menu of the Device node and click Add node below to create another peer node with the following values:

| Field | Value |
|--------------------|---|
| Name this node | Invalid Device |
| If bot recognizes: | true |
| Then respond with: | I'm sorry, I don't know how to do that. I can turn on lights, radio, or security systems. |

Step 65 Using the same steps as before, test the conversation by **typing** the following chat line(s):

Hello

Arm the security system

Arm the security system

→ Should be already on

Turn on the lights

The headlights

Turn on the lights

fog lamp

Finally, you will want to enable the Conversation service to identify your #Help-Misc intent. You will make this a part of the overall "Help" system for the bot. This intent will be used in the upcoming programming exercises to show you how to perform specific application actions based on a detected intent and entity. Click the menu on the Turn On node and click Add node below to create a new peer node. Enter the following values.

| Field | Value |
|--------------------|---------------------|
| Name this node | Help |
| If bot recognizes: | #Help-Misc |
| Then respond with: | How can I help you? |

Step 67 Click *Add child node* on the menu of the Help node. In this new node, enter the following values. In this example, the only way this node will be reached is if the user specifies the @help:time *entity* (or one of its synonyms).

Note: You will provide your own custom response to the query in the programming exercises.

| Field | Value |
|--------------------|---|
| Name this node | Time |
| If bot recognizes: | @help:time |
| The respond with: | The time will be provided by the server created later in this tutorial. |

Step 68 Click *Add node below* on the menu of the *Time* node. In this new node, enter the following values. By setting the condition to an entity, you are indicating that this node will be triggered by any input that matches the specified entity.

| Field | Value |
|--------------------|---|
| Name this node | Additional Help |
| If bot recognizes: | true |
| Then respond with: | I'm sorry, I can't help with that. For additional help, please call 555-2368. |

Step 69 Click on the Help node and select Jump to. Click the Time node and select Jump to and... Wait for user input.



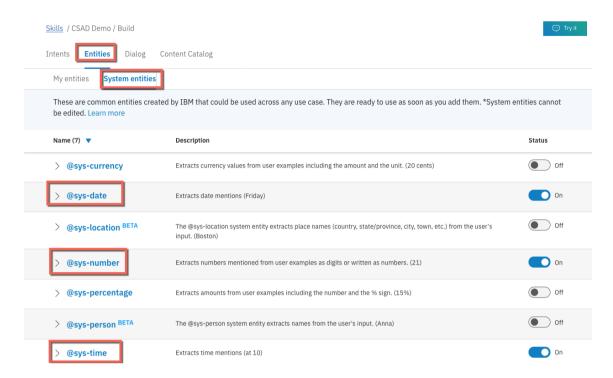
- Step 70 This is already an epic conversation, but feel free to experiment with more functionality:
 - · Define entities for additional devices and lights
 - · Add more synonyms for entities
 - · Add new intents, such as #turn off to turn off devices
- Step 71 (Optional) Add a slots dialog to book a table in a restaurant
 - a) Add an Intent with the following values (see Step 21 ff):

| Field | Value |
|--------------|---|
| Intent name | book_table |
| Description | Book a table in one of the restaurants |
| User example | l'd like to make a reservation I want to reserve a table for dinner Can 3 of us get a table for lunch? Do you have openings for next Wednesday at 7? Is there availability for 4 on Tuesday night? I'd like to come in for brunch tomorrow Can I reserve a table? |

b) Add an Entity for Locations (See Step 29 ff)

| Field | Value | Synonym |
|-------------|--------------|------------|
| Entity name | locations | |
| Value | First Street | first, 1st |
| Value | Main Street | Main |

c) Enable the System entities @sys-date, @sys-number, @sys-time

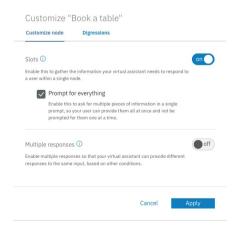


d) Add a dialog node for #book_table (Step 48 ff)

Click the menu son the *Turn On* node and click *Add node below* to create a new peer node. Enter the following values.

| Field | Value |
|--------------------|--------------|
| Name this node | Book a Table |
| If bot recognizes: | #book_table |

- e) Click © Customize at the top of dialog node definition panel.
- f) Enable Slots and select Prompt for everything. The click Apply



Now you can enter the slots (Then check for:)

Add slot for more lines.

| Check for | Save it as | If not present ask |
|-------------|-------------|--|
| @locations | \$locations | Which store you want to got to? First or Main? |
| @sys-date | \$date | What day you want to come in? |
| @sys-time | \$time | What time did you want to arrive? |
| @sys-number | \$number | How many people in your party? |

In the field If no slots are prefilled, ask this first: enter

I need some more information to continue. I will need the location, date, time, and number of people

In the field *Then respond with*: enter i)

Great, I have a table of \$number people, on \$date at \$time at our \$locations store.

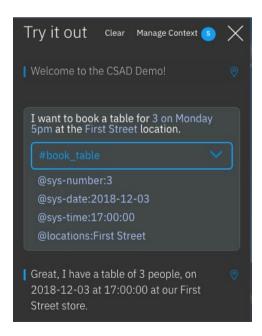
You can try (see Step 40 ff) this with a view sample inputs. Always Clear i)

I want to book a table for 3 on Monday 5pm at the First Street location.

I want to book a table

I want a table for 3 please

The result should look something like this:



Section 2: Backend Integration with Cloud Functions (When Optional Step 70 has been done!)

In section 4 we will build a node.js server task to use the Watson Assistant skill built in Section 1. Watson Assistant also allows to call Cloud Functions (serverless computing) from within the context of a node definition.

To show such an integration we store the restaurant table booking dialog result (Step 71) in a Cloudant database using a Cloud Function. This can be achieved without programming.

Step 72 In a terminal create a Cloudant service with the following command:

```
ibmcloud resource service-instance-create workshopDb cloudantnosqldb lite <your region> -p '{"legacyCredentials": true}'
valid regions: eu-gb, eu-de, us-south, etc
```

Note: Legacy credentials provide a password attribute for default behaviour. If you have an existing Cloudant service without legacy credentials see Step 85

Step 73 Create a Cloud Foundry alias of your Cloudant services

```
ibmcloud resource service-alias-create cfworkshopdb --instance-name workshopDb

[kpsMBP-5:~ kps$ ibmcloud resource service-alias-create cfworkshopdb --instance-name workshopDb

Creating alias cfworkshopdb of service instance workshopDb from resource group workshop into space dev_gb...

OK

Service alias cfworkshopdb was successfully created.

1D: crn:v1:bluemix:public:cloudantnosqldb:eu-gb:s

65130013e:resource-alias:695a5881-8877-431c-bc3d-762d952059d3

Name: cfworkshopdb

State

Service Instance: workshopDb

Space: workshopDb

dev_gb

Tags:

kpsMBP-5:~ kps$
```

Step 74 Create Credentials for this service with the following command

```
ibmcloud cf create-service-key cfworkshopdb workshopkey

kpsMBP-5:~ kps$ ibmcloud cf create-service-key cfworkshopdb workshopkey
Invoking 'cf create-service-key cfworkshopdb workshopkey'...

Creating service key workshopkey for service instance cfworkshopdb as kpsi

OK
```

Step 75 In the cloud console open the Dashboard of your Cloudant service



- Step 76 At to top click Create Database . Enter a name f.e. reservations and click Create
- Step 77 In a Terminal install the IBM Cloud Functions CLI plugin

ibmcloud plugin install Cloud-Functions -r bluemix

Step 78 With the following command you can automatically create Cloud Functions from certain IBM Services such as Cloudant, Weather Service, Watson Services to name a view.

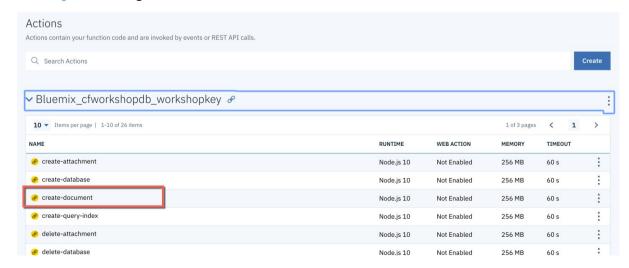
ibmcloud wsk package refresh

[kpsMBP-5:~ kps\$ ibmcloud wsk package refresh
'_' refreshed successfully
created bindings:
Bluemix_cfworkshopdb_workshopkey
updated bindings:
deleted bindings:
Bluemix_workshopDb_workshopkey

Step 79 In your cloud console goto Functions. Then **click** Actions in the left menu. You should see the functions that the previous command has created from some deployed services.

Note: Make sure you have selected your ORG and SPACE at the top that you have a connection to from the Command Line Interface.

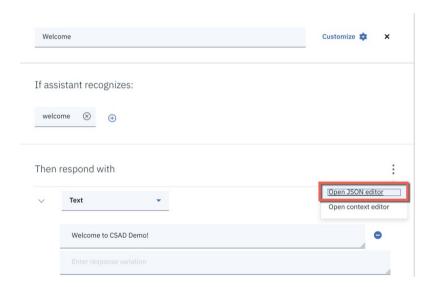
Step 80 We are interested in the *create-document* function of the Cloudant service. Click $\stackrel{\circ}{\circ} \rightarrow$ Manage Action



Step 81 Select *Endpoints* and **copy** the *URL* and the *API-KEY* for later use in our Assistant Skill. (click API-KEY to get the value).



Step 82 In your Assistant Skill **open** the *Welcome* node and the *Open JSON editor*. Replace the content with the following:

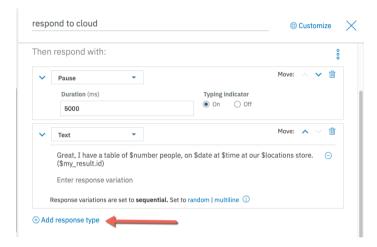


There is a <u>lab03_codesnippets.txt</u> file that contains all the code snippets of this lab section.

```
"context": {
    "private": {
        "my_credentials": {
            "api_key": "<yourCloudFunctionsAPIKey>"
        }
    },
    "Alarmonoff": "off",
    "app_action": ""
},
"output": {
    "text": {
        "values": [
            "Welcome to the CSAD Demo!"
        ],
        "selection_policy": "sequential"
    }
}
```

Step 83 Click on the Book a table node and select Add child node.

| Field | Value |
|--|--|
| Name this node | Respond to cloud |
| If bot recognizes: | true |
| Then respond with (Pause) | 5000 |
| Then respond with (Text) (click + to add an response type) | Great, I have a table of \$number people, on \$date at \$time at our \$locations store. (\$my_result.id) |
| And finally | Wait for user input |



Step 84 Click § on the Book a table node and select Jump to (recognizes condition). Select the Respond to cloud node.



Step 85 Open the Book a table node and on Open JSON editor and replace the content with the following:

```
"output": {
   "text": {
      "values": [],
      "selection policy": "sequential"
  },
  "actions": [
    {
        "name": "/kpschxxxx.com dev gb/actions/Bluemix kps-cloudin-
troDb newkey/create-document",
     "type": "server",
      "parameters": {
        "doc": {
          "date": "$date",
         "time": "$time",
         "number": "$number",
          "locations": "$locations"
        "dbname": "reservations"
      },
      "credentials": "$private.my credentials",
      "result variable": "$my result"
  ]
}
```

Actions name is the part of the URL from Step 80 after .../namespaces.

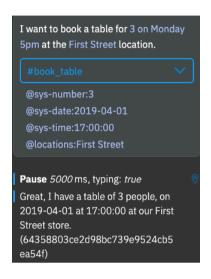
Note: In case you do not have legacy credentials, containing *password* and *port*, for your Cloudant service add the following two paramters from your Cloudant credentials to the code above:

```
"dbname": "reservations",
"iamApiKey": "<apikey from your Cloudant credentials>",
"url": "<url from your Cloudant credentials>"
```

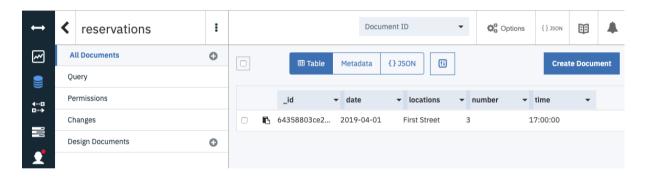
Step 86 Try the dialog with the following sentence:

I want to book a table for 3 on Monday 5pm at the First Street location.

An you should see a result like this:

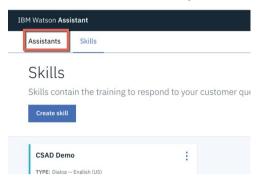


Step 87 Go back to your Cloudant dashboard. There you should see the document that was created.

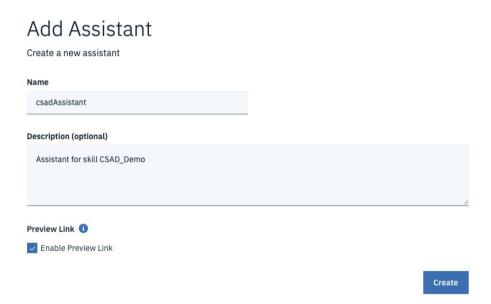


Create an Assistant from our Skill

IBM Watson Assistant has a V2 API that provides a session context and therefore the context has not to be passed with any client request.



Step 88 Click Create assistant to create a new Assistant, enter name and description then click Create assistant.

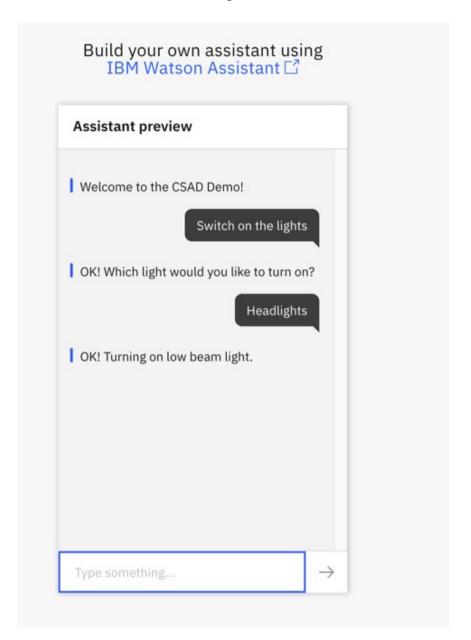


Step 89 Click Add dialog skill and select our CSAD Demo Skill. With the Integrations function you can now directly integrate this Assistant into Facebook, Slack and other applications.

This is out of scopt of this introductory demo!!

Step 90 Click Preview Link to make this Assistant available on the internet. Enter a name and click browser.

Step 91 It should look like the following:



Section 3: Test your Conversation using Postman (REST Client)

The Watson Services on IBM Cloud have a REST (Representational State Transfer) interface and therefore they can be easily tested with a REST client like Postman. You can find the API reference in the Documentation of each service.

Step 92 Postman is available as an application for MacOS, Windows, and Linux. https://www.getpostman.com



Step 93 In the <u>API reference</u> of the IBM Cloud Watson Assistant service you can find an overview of the available API calls. The basic command is to list the your workspaces.

In Postman add the following GET request:

Url: https://<host of your service>/assistant/api/v1/workspaces?version=2019-02-28

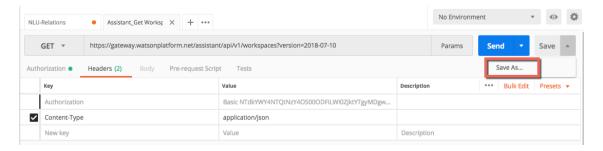
See your service credentials for the Url at your region. f.e. gateway-fra for Frankfurt.

Authorization Type: Basic Auth - Your credentials from Step 9

Note: The services in the IBM Cloud platform are currently transferred to an IAM authentication. So if your service was created with an **apikey** instead of **userid** and **password**, you specify the string **apikey** as userid and the **generated apikey** as password.

Headers: Content-Type: application/json

Note: You can save the request definition for further use by clicking **Save As.. Request Name**: Conv GetWorkspaces, **Collection**: Watson Services.



Step 94 The result should look similar to this:

```
Status: 200 OK Time: 299 ms
Body
      Cookies Headers (24)
                               Test Results
                                 ISON ▼
  Pretty
            Raw
                    Preview
    1 - {
             "workspaces": [
    3 -
                      "name": "CSAD Demo",
    4
                      "language": "en",
"description": ""
    5
    6
                      "workspace_id": "dfa36749,
                                                                        28b8c5bc",
                      "learning_opt_out": false
    8
    9
                 }
   10
             ],
   11 +
              'pagination": {
   12
                 "refresh_url": "/v1/workspaces?version=2018-09-20"
   13
   14
       }
```

Step 95 GET the information from our CSAD Demo workspace.

Url: <a href="https://<host of your service>/assistant/api/v1/workspaces/">https://<host of your service>/assistant/api/v1/workspaces/<YOUR workspaceid from Step18>?version=2019-02-28

Authorization: as in Step 93

Headers: as in Step 93

Your result should look like this:

```
Status: 200 OK Time: 236 ms Size: 1.15 KB
Body Cookies Headers (24) Test Results
   Pretty
                     Preview
1 - {
            "name": "CSAD Demo",
            "language": "en",
"description": ""
   3
   4
            "workspace_id": "dfa_
   5
                                                             De28b8c5bc".
            "learning_opt_out": false,
   6
            "status": "Available"
   8
       }
```

Step 96 Send (POST request) an initial message to start our conversation

Url: https://<host of your service>/assistant/api/v1/workspaces/<YOUR workspaceid from Step19>/message?version=2019-02-28

Authorization: as in Step 93

Headers: as in Step 93

Body: (raw)

Your result should look like this:

```
Body
       Cookies
                 Headers (16)
                 Preview JSON V 5
 Pretty
1 - {
           "intents": [],
"entities": [],
   3
           "input": {
   4 -
                "text":
  5
                                               Initializes the Dialog
   6
           "output": {
    "text": [
   8-
  9
                    "Welcome to CSAD Demo!"
  10
  11 -
                "nodes_visited": [
  12
                    "Welcome"
  13
               ],
"log_messages": []
  14
  15
  16 -
            context": {
                                                  This context has to be copied
  17
                "conversation_id": "",
                                                    into the input of the next
                "system": {
  18 -
                                                          iteration!
  19 -
                     "dialog_stack": [
  20 -
                        {
                             "dialog_node": "root"
  21
  22
                    ],
"dialog_turn_counter": 1,
  23
  24
  25
                    "dialog_request_counter": 1,
  26 -
                    "_node_output_map": {
  27 -
                         "Welcome": [
  28
                             0
  29
  30
  31
                     'branch_exited": true,
                    "branch_exited_reason": "completed"
  32
  33
               3
  34
           }
  35 }
```

III Watson Services Workshop

Step 97 POST a request for #turn on

Url: as in Step 93

Authorization: as in Step 93

Headers: as in Step 93

Body: (raw) → Context from Step 96 Output.

Note: The context object is the memory of your conversation. For any further request always use the context object of the previous response. This enables the multi-session capability of the Watson Assistant service.

The output should look like this:

```
"intents": [
                     "intent": "turn_on",
                                                                                     #turn_on detected
                      "confidence": 1
           ],
"entities": [
"entity": "device",
"location": [
                                                                                   @device:lights detected
                        18
                     ],
"value": "lights",
"confidence": 1
          ],
"input": {
    "text": "turn on the lights"
          },
"output": {
    "generic": [
                     "response_type": "text",
   "text": "OK! Which light you like to turn on?"
               ],
"text": [
"OK! Which light you like to turn on?"
               ],
"nodes_visited": [
"node_3_1534150110498",
"node_4_1534150197844"
                                                                     A previous API version returned the node names "Turn on" and
                                                                          "Lights". This means because lights where detected it automatically jumps to this node from "Turn on".
                ],
"log_messages": []
                                                                     Infos about the dialog nodes you get with the GET request on .../dialog_nodes
          },
"context": {
    "conversation_id": "",
    ". f
                "system": {
    "dialog_stack": [
                                "dialog_node": "node_4_1534150197844"
                    The dialog counter increased.
                          1
```

With the following GET request in Postman

https://<your service host>/assistant/api/v1/workspaces/<your workspaceid>/dialog_nodes? version=2019-02-28

You can get the details of all the dialog nodes.

Step 98 You can proceed testing the service with other API calls.

Section 4: Create a Node.js Express application

Node.js is an open-source, cross-platform runtime environment for developing server-side web applications using JavaScript. Node.js has an event-driven architecture capable of asynchronous I/O utilizing callbacks. Express is a minimal and flexible Node.js web application framework that provides a robust set of features to develop web and mobile applications. It's ability to facilitate rapid development of Node based web applications makes it the de facto framework for Node.js.

The completed lab can be cloned or downloaded from

qit clone -b lab3 csadConversation https://github.com/iic-dach/csadConversation.git

There is a <u>lab03_codesnippets.txt</u> file that contains all the code snippets of this lab section.

Running the application locally

Server part – node.js

Step 99 In a Terminal window create a folder for your project f.e. csadConversation

Step 100 Move into this folder and execute the following command

```
npm init
```

Specify a *name*, *description* and *author* when prompted, keep the other *defaults*. The result should be similar to the following in *package.json*:

```
"name": "csadconversation",
"version": "1.0.0",
"description": "A simple Watson Assistant example",
"main": "app.js",
"scripts": {
    "start": "node app.js",
    "test": "echo \"Error: no test specified\" && exit 1"
},
"engines": {
    "node": "^10.15.0",
    "npm": "^6.4.1"
},
"author": "Klaus-Peter Schlotter",
"license": "ISC"
}
```

Step 101 Adjust the package ison file with the **blue** content (see above):

- Step 102 Open your project folder in Visual Studio code or you can start Visual Studio Code with the command "code". "from within the project folder. In the menu select View → Integrated Terminal
- Step 103 In the *Intergrated Terminal* or another terminal execute the following commands to install the additional node modules needed for our project

```
npm install --save express ejs morgan body-parser ibm-watson@4
```

Note: The code described here is only compatible with Version **4.x** of the **ibm-watson** library.

The modules will be stored in the node_modules folder and your package.json file should now have a dependencies section.

Step 104 Create *config.js* in the project root folder and enter your service credentials.

You can create files and folders for your project in the Visual Studio Code



Explorer on the left.

```
var config = {
                                                   var config = {
  watson:
                                                    watson: {
    assistant: {
                                                       assistant: {
      username: "<yourServiceUsername>",
password: "<yourServicePassword>",
                                                         iam_apikey: "<yourApiKey>",
version: "2019-02-28",
      version: "2019-02-28",
                                                         url: "yourServiceUrl",
      url: "yourServiceUrl",
                                                          workspace id: "<yourWorkspaceId>"
      workspace id: "<yourWorkspaceId>"
                                                    }
                                                   };
                                                  module.exports = config;
module.exports = config;
```

Depending on your service, use *username/password* or *apikey*.

Step 105 In the project folder create an app.js file.

Step 106 In app.js enter the following code to import the dependencies and instantiate the variables. **Save** and **close** the file.

```
const path = require('path');
const express = require('express');
const bodyParser = require('body-parser');
const logger = require('morgan');
const app = express();
app.use(bodyParser.json({ limit: '1mb'}));
app.use(express.static(path.join(__dirname, 'public')));
app.use(logger('dev'));
const port = process.env.PORT || 3000;
app.set('view engine', 'ejs');
app.set('views', 'views');
const watsonRoutes = require('./routes/watson');
app.use (watsonRoutes);
app.use(function (requst, response) {
 response.status(404).render("404");
});
app.listen(port, () => {
  console.log('Express app started on port ' + port);
})
```

Basic node.js setup with bodyParser for json format and the definitions of ejs as the template engine.

Step 107 In the project *root* create a *folder* named *routes* and in there create a *file* named *watson.js* with the following content: → (routes/watson.js). Save and close the file.

```
const express = require('express');
const watsonController = require('../controllers/watson');
const router = express.Router();
router.get('/', watsonController.getIndex);
router.post('/', watsonController.postMessage);
module.exports = router;
```

The router defines the urls we accept from the web with an appropriate function called that is defined in the controller file. Actually the getIndex() renders the Index page and postMessage() is a pure api function just returning json.

Step 108 In the project *root* create a *folder* named *controllers* and in there create a *file* named *watson.js* with the following content: → (controllers/watson.js)

```
const AssistantV1 = require('ibm-watson/assistant/v1');
const config = require('../config');
const watsonAssistant = new AssistantV1(config.watson.assistant);
exports.getIndex = (req, res, next) => {
 res.render('index');
exports.postMessage = (req, res, next) => {
 console.log('Text:' + req.body.input);
 const parameters = {
   'input': req.body.input,
   'context': req.body.context,
   'workspace id': config.watson.assistant.workspace id
 };
 assistantMessage(parameters)
   .then(response => {
     console.log(JSON.stringify(response, null, 2));
     res.json(response);
   .catch(err => {
     console.log('error:', err);
   });
// convert assistant.message() to Promise
assistantMessage = (params) => {
 return new Promise((resolve, reject) => {
   watsonAssistant.message(params, (err, res) => {
     if (err) {
       reject(err);
     } else {
       resolve(res);
   })
 });
```

getIndex() just returns the compiled index.ejs, see next steps, to the client. All client logic is defined as AJAX functions in the public/js/scripts.js file.

The postMessage() function just returns the information from the Assistant service to the client (see the console log), without any interaction. Our help request for the time will not be answered.

AssistantMessage() converts the watsonAssistant.message() to a Promise to get .then() .catch() processing instead of nested if() ... else().

Step 109 In the root folder **create** a folder named *views*.

Note: The **ejs** view engine controls the layout with code indent. For a correct layout you have to adjust this manually or copy the code from the <u>code snippets</u> file.

Step 110 In the views folder create a header.ejs file with the following content:

Step 111 In the views folder create a footer.ejs file with the following content:

```
<small>IBM Ecosystem Advocacy Group - 2019</small>
</div>
</body>
</html>
```

Step 112 In the views folder create a 404.ejs file with the following content:

```
<% include header %>
<h2>404! Page not found.</h2>
<% include footer %>
```

Step 113 In the view folder create an index.ejs file with the following content:

```
<% include header %>
>
<div class="row">
 <div class="col-md-3"></div>
 <div class="input-group col-md-6">
   <input type="text" id="text" name="text" class="form-control" placeholder="Enter</pre>
text sent to Watson">
   <span class="input-group-btn">
     <button class="btn btn-primary" onclick="sendMessage()" >Send/button>
 </div>
</div>
<div class="row">
 <div class="col-md-3"></div>
 <div class="col-md-6 mt-2">
   <div><b>Conversation History:</b></div>
   <div id="history" class="form-control col text-left" ></div>
</div>
<% include footer %>
```

Step 114 To add some styling to the webpage and additional javascripts **add a folder** named *public* to the project root folder.

In app.js this folder was defined to be static and is therefore available to the rendered html page.

Step 115 In this *public* folder **add** the following two folders:

```
stylesheets \rightarrow public/stylesheets \rightarrow public/js
```

Step 116 In the stylesheets folder add a file styles.css with the following content:

```
body {
  padding: 50px;
  font: 14px "Lucida Grande", Helvetica, Arial, sans-serif;
}

a {
  color: #00B7FF;
}

.form-control {
  margin-right: 5px;
}
```

Step 117 In the js folder add a file scripts.js with the following content:

```
var context = {};
function updateChatLog(user, message) {
 if (message) {
   var div = document.createElement("div");
   div.innerHTML = "<b>" + user + "</b>: " + message;
   document.getElementById("history").appendChild(div);
   document.getElementById("text").value = "";
 }
function sendMessage() {
 var text = document.getElementById("text").value;
 updateChatLog("You", text);
 var payload = {};
 if (text) {
   payload.input = {"text": text};
 if (context) {
   payload.context = context;
 } ;
 var xhr = new XMLHttpRequest();
 xhr.onreadystatechange = function() {
   if (xhr.readyState == 4) {
     if (xhr.status == 200) {
       var json = JSON.parse(xhr.responseText);
       context = json.context;
       updateChatLog("Watson", json.output.text);
   }
 xhr.open("POST", "./", true);
 xhr.setRequestHeader("Content-type", "application/json");
 xhr.send(JSON.stringify(payload));
function init() {
  document.getElementById("text").addEventListener("keydown", function(e)
{
   if (!e) {
     var e = window.event;
   if (e.keyCode == 13) {
     sendMessage();
 }, false);
 sendMessage();
```

Step 118 Save all files.

Test the application

Your demo application showcasing IBM Watson cognitive services is now ready! Take a deep breath and cross your fingers because it's time to test the application.

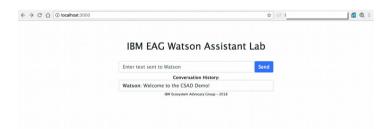
- Step 119 Return to the terminal/command window. If the server is still running, enter Ctrl-C to kill the application so that your latest code changes will be loaded.
- **Step 120** Test the application on your local workstation with the following command(s).

npm start

Step 121 In a web browser, navigate to the following URL. If necessary, refresh the existing page to pick up the changes.

http://localhost:3000/

Step 122 You should see your IBM Watson Conversation application running! Notice that your client application has already contacted Watson and initiated a new conversation. As you'll recall, you can review the server console to see the JSON returned by the Conversation service.



Step 123 Enter the following messages and observe Watson's responses in the Conversation History. The responses will be the same as those you saw earlier when performing tests in the Conversation tool web application. The difference this time is that you are using the API to embed this conversation into an external application!

Hello

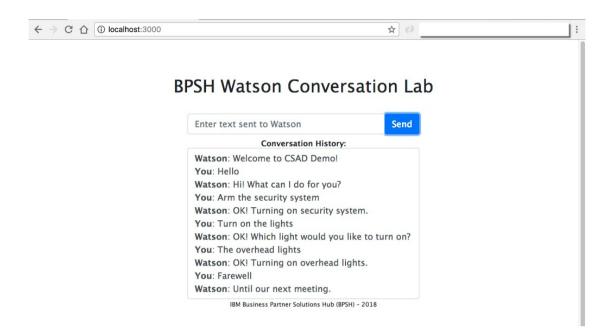
Arm the security system

Turn on the lights

The headlights

Farewell

Step 124 Feel free to experiment with other phrases to further explore the dialog branches that you created in earlier steps.



- Step 125 At this point, you should review the Node.js server console and the developer tools of the browser to see the full JSON object that was returned. There's more data there than we displayed in this demo ©
- Step 126 The node.js application we have created so far does nothing more than receiving user input, send it to the Watson Assistant service and return the received text to the user. In the next section and also in Lab 5, we can see how further backend integration can be achieved.

Process user input to detect intents and perform app actions

IBM Watson Assistant is a service that uses natural language processing to detect the intent of a user's input and return a response. In simple chat apps, the response returned from dialog nodes can be sufficient. However, in most cases, you will need to perform some actions based off the user input, such as query a database, update sales records, etc. To do this, you will need a proxy application that communicates with the end user, your backend systems, and the IBM Watson Conversation service. In this section, you will learn how to detect intents from user input.

- Step 127 The simple application (created in this guide) passes the user supplied input to the Watson Assistant service. Once Watson analyzes the input and returns a JSON response, that response is passed back to the client application. In this section, you will modify the code to detect specific intents so that you could perform various actions in your own system(s).
- Step 128 Locate the following file and open it with a text/code editor.

```
.../csadConversation/controllers/watson.js
```

Step 129 If you accurately followed the steps in this guide, lines 19 – 20 should contain the application logic that is executed after Watson returns a response. In the .then() block **Insert a blank line so that line 16 is now blank**. This will be the insertion point for your new code snippet. You should also **comment out line 17** since you will be using the server console to display updates from your custom app actions. Your code should now look as follows:

```
14
       assistantMessage(parameters)
15
       .then(response => {
16
17
             console.log(JSON.stringify(response, null, 2));
           res.json(response);
18
19
20
         .catch(err => {
         console.log('error:', err);
21
22
         });
23
```

Step 130 At line 16, enter the following code to identify the intent and entity returned by Watson and perform some custom actions. You will also update the JSON response object to include a new message that should be sent to the end user with your custom information.

```
if (!response.input.text) {
return res. json (response);
console.log("Detected input: " + response.input.text);
if (response.intents.length > 0) {
 var intent = response.intents[0];
 console.log("Detected intent: " + intent.intent);
 console.log("Confidence: " + intent.confidence);
if (response.entities.length > 0) {
 var entity = response.entities[0];
 console.log("Detected entity: " + entity.entity);
 console.log("Value: " + entity.value);
 if ((entity.entity === 'help') && (entity.value === 'time')) {
   var msg = 'The current time is ' + new
Date().toLocaleTimeString();
  console.log(msg);
   response.output.text = msq;
 }
```

Step 131 Refer to the following table for a description of the code:

| Lines | Description |
|---------|--|
| 16 – 17 | Return immediately when no input text |
| 19 | The user input that was passed to the Conversation service |
| 20 – 24 | If the Conversation service identified an intent from the input 23-25: Get the <i>intent</i> and print its name and confidence level. |
| 25 – 34 | If the Conversation service identified an entity from the input 28-30: Get the <i>entity</i> and print its name and value 31: Check for a specific entity so that your app can respond accordingly 32-33: Get and print the current system time 34: Modify the Watson output with your new custom app response |
| 36 | Send the modified JSON response to the client application |

- Step 132 On line 26, you obtain and print IBM Watson's confidence level. This value is intended to be an indicator of how well Watson was able to understand and respond to the user's current query. If this value is lower than you are comfortable with (let's say < 60%), you could abort the operation and ask the user for clarification. Watson will rarely provide an answer with a 100% confidence level.
- Step 133 Save and close the file.
- Step 134 Return to the terminal/command window. If the server is still running, enter Ctrl-C to kill the application so that your latest code changes will be loaded.

Step 135 Test the application on your local workstation with the following command(s).

npm start

Step 136 You should see some output indicating the application is running. In a web browser, navigate to the following URL. If necessary, refresh the existing page to pick up the changes.

http://localhost:3000/

Step 137 Test the application using the following inputs. After typing each line, review the results on the server console to see your custom app actions based off specific *intents* and *entities*.

Hello

I need some help.

What time is it?

Step 138 In the screenshots below, the custom application will output messages to the server console based off the returned intent. For example:

(Optional) Deploy the application to IBM Cloud

In this demo exercise, you have been working locally and running your Node.js server on your own workstation. You can very easily push your application to the IBM Cloud environment and make it publicly accessible to customers, partners, friends, and/or family!

Step 139 Create a manifest.yml file in the project folder with the following content: Under services use the name of you Conversation service created in Step 7. As name you should specify a unique name (or the random-route option below the name statement). Memory 256M if you use a Lite account

random-route: true

applications:

- name: csadConversation-xxx

path: .

buildpack: sdk-for-nodejs command: node app.js

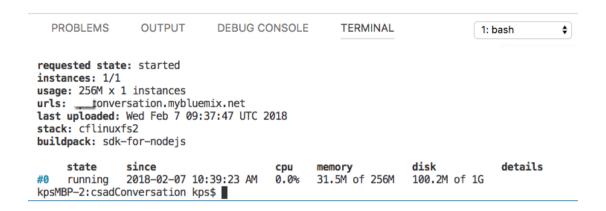
memory: 256M

Step 140 Save the manifest.yml file.

- **Step 141** Stop your running cloud applications that you do not exceed the memory limit of the IBM Cloud "Lite" account.
- Step 142 Make sure you are logged in to your IBM Cloud account. (See Workstation Setup document Step 9)
- Step 143 In a terminal windows in the project folder execute the command

ibmcloud app push

After completion you should see a message that the application is running on the IBM Cloud.



Step 144 You will also see the application in your IBM Cloud console.

