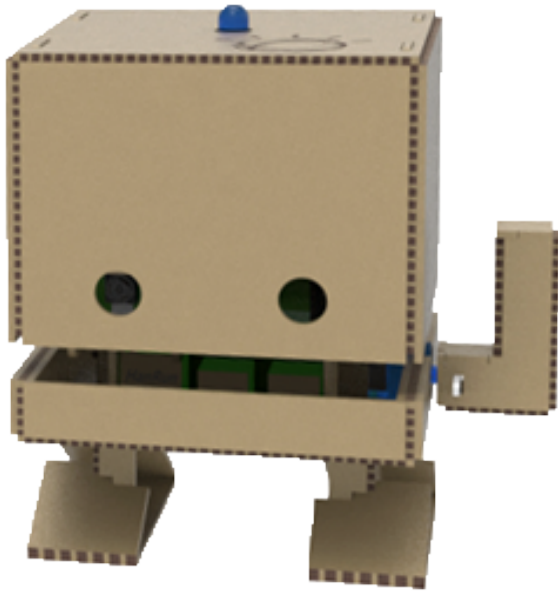


# TJBot Sees Objects and Speaks

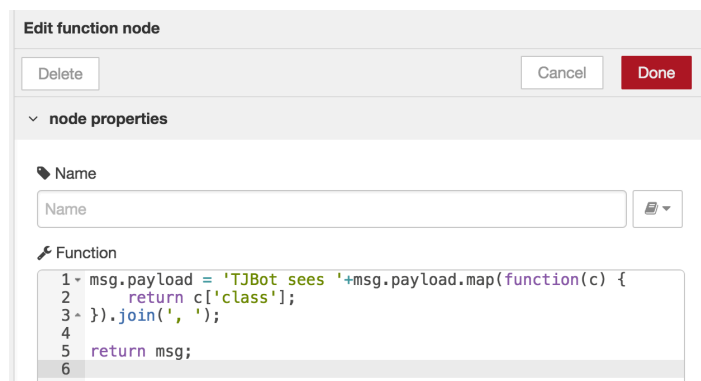
## TJBot Nodes in Node-RED

Author: JeanCarl Bisson | [jbisson@us.ibm.com](mailto:jbisson@us.ibm.com) | [@dothewww](https://twitter.com/dothewww)



*Train TJBot to take a picture using the Raspberry Pi camera, classify the image using the Watson Visual Recognition service, and then speak a list of the objects seen using the Watson Text to Speech service.*

*Use the function node to construct a list for TJBot to speak.*




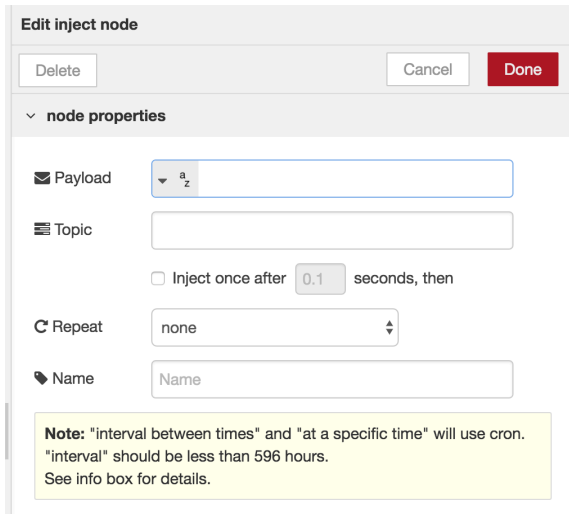
A digital copy of this lab and completed flow can be found at:  
<http://ibm.biz/node-red-tjbot-say-what-i-see>




# Train TJBOT to See Objects and Speak

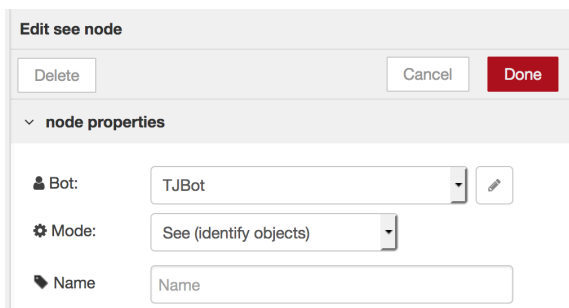
In this lab, we'll use the see and speak nodes to train TJBOT to recognize objects and speak what is seen. You will need a Raspberry Pi camera and speaker connected to the TJBOT for this lab.

1. In the Node-RED editor running on the Raspberry Pi, drag an  node onto the canvas. Double click on the node and configure as shown below.

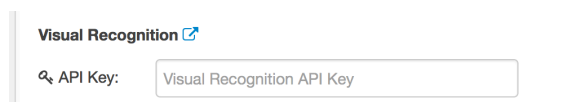


2. Add a  node as shown below. The see node has several modes: recognize text, recognize objects, and take a photo. Select **See (identify objects)** from the **Mode** dropdown menu.

The see node uses the Watson Visual Recognition service, which requires service credentials from IBM Cloud. Click on the pencil icon to the right of the **Bot** dropdown menu.



3. Click on the link icon next to the **Visual Recognition** heading to launch into the IBM Cloud console and create a Watson Visual Recognition service instance.



4. If you don't have an IBM account, sign up at [bluemix.net](https://bluemix.net). Sign into your account if prompted. Leave the service name as is and click **Create**.

The screenshot shows the IBM Cloud Visual Recognition service page. The header includes the IBM Cloud logo and navigation links: Catalog, Docs, Support, and Manage. The main content area is titled "Visual Recognition" and includes a description: "Find meaning in visual content! Analyze images for scenes, objects, faces, and other content. Choose a default model off the shelf, or create your own custom classifier. Develop smart applications that analyze the visual content of images or video frames to understand what is happening in a scene." Below this, there are tabs for "Lite" and "IBM". A "View Docs" link is present. On the left, there is a metadata section: AUTHOR (IBM), PUBLISHED (02/08/2018), TYPE (Service), and LOCATION (Sydney, United Kingdom, US South). The main section is titled "Features" and lists several models: General Model, Custom Model, Face Model, Food Model (Public Beta), Explicit Model (Public Beta), and Text Model (Private Beta\*). At the bottom, there are links for "Need Help? Contact IBM Cloud Sales" and "Estimate Monthly Cost Cost Calculator", along with a "Create" button.

5. Click on **Service Credentials** in the menu on the left. If there are no credentials in the list, click **New credential** and **Add** to create a set of credentials. Click on **View Credentials** to display the service credentials.

The screenshot shows the IBM Cloud Service Credentials page. The left sidebar has a menu with "Manage", "Service credentials" (highlighted), and "Connections". The main content area is titled "Service credentials" and includes a "New credential" button. Below this, there is a table with columns: KEY NAME, DATE CREATED, and ACTIONS. The table contains one entry: "Credentials-1" with a date of "Jul 22, 2017 - 06:22:02" and an action of "View credentials".

6. Copy the API key into the field back in the Node-RED editor under the **Visual Recognition** section.

```
{
  "url": "https://gateway-a.watsonplatform.net/visual-recognition",
  "note": "This is your previous free key. If you want a different key, you can create a new one by clicking on the 'New credential' button in the left sidebar.",
  "api_key": "g0h123kjf5h3m620n5h1175mrk54h32vc54ji543"
}
```

The screenshot shows the "Visual Recognition" section in the Node-RED editor. It includes a search icon and the text "API Key:" followed by a text input field containing a series of asterisks, representing a masked API key.

7. Enable the camera by ticking the checkbox labeled **Camera**.

speak > Edit tjb0t-config node


Delete Cancel Update

Gender: Male

Speak:

Listen:

Has ☐ Servo ☐ LED ☒ Camera ☐ Microphone ☐ Speaker

8. The see node produces a message with names of objects and colors in the photo analyzed, with the response being passed in the `msg.payload` property. Add a  node to loop through the results and concatenate them into a new message.

Edit function node

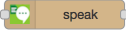
Delete Cancel Done

node properties

Name

Function

```
1 msg.payload = 'TJBot sees '+msg.payload.map(function(c) {  
2   return c['class'];  
3 }).join(', ');  
4  
5 return msg;  
6
```

9. Add a  node as shown below. The speak node uses the Watson Text to Speech service, which requires service credentials from IBM Cloud. Click on the pencil icon to the right of the **Bot** dropdown menu.

Edit speak node

Delete Cancel Done

node properties

Bot: TJBot

Mode: Speak

Name

10. Click on the link icon next to the **Text to Speech** heading to launch into the IBM Cloud console and create a Watson Text to Speech service instance.

Text to Speech [🔗](#)

Username: Text to Speech Username

Password: Text to Speech Password

11. Leave the service name as is and click **Create**.

IBM Cloud

Text to Speech

The Text to Speech service processes text and natural language to generate synthesized audio output complete with appropriate cadence and intonation. It is available in several voices:

Service name: Text to Speech-20

Choose a region/location to deploy in: US South

Choose an organization: tutorials

Choose a space: t1bot

Features

- English (US): 2 female voices, 1 male voice (Watson's voice from Jeopardy)
- English (UK): 1 female voice
- French: 1 female voice
- German: 1 female voice, 1 male voice
- Italian: 1 female voice
- Spanish (Castilian): 1 female voice, 1 male voice
- Spanish (North American): 1 female voice
- Portuguese (Brazil): 1 female voice

Need Help? [Contact IBM Cloud Sales](#)

Estimate Monthly Cost [Cost Calculator](#)

Create

12. Click on **Service Credentials** in the menu on the left. If there are no credentials in the list, click **New credential** and **Add** to create a set of credentials. Click on **View Credentials** to display the service credentials.

IBM Cloud

Getting started

Manage

Service credentials

Plan

Service credentials

New credential

10 Items per page | 1-1 of 1 items

1 of 1 pages

KEY NAME	DATE CREATED	ACTIONS
Credentials-1	Aug 2, 2017 - 12:34:49	View credentials

13. Copy the username and password into the fields back in the Node-RED editor under the **Text to Speech** section.

```
{
  "url": "https://stream.watsonplatform.net/text-to-speech/api",
  "username": "f8b532e1-4151-4993-92ee-89bc5a23890c",
  "password": "f4G1M3B5onrP"
}
```

#### Text to Speech

Username: f8b532e1-4151-4993-92ee-89bc5a23890c

Password: .....

14. Determine the Speaker Device ID by running the command `aplay -l` on the Raspberry Pi. In the example output shown below, the USB speaker attached is accessible on card 2, device 0.

```
$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: ALSA [bcm2835 ALSA], device 0: bcm2835 ALSA [bcm2835 ALSA]
  Subdevices: 7/8
  Subdevice #0: subdevice #0
  Subdevice #1: subdevice #1
  Subdevice #2: subdevice #2
  Subdevice #3: subdevice #3
  Subdevice #4: subdevice #4
  Subdevice #5: subdevice #5
  Subdevice #6: subdevice #6
  Subdevice #7: subdevice #7
card 0: ALSA [bcm2835 ALSA], device 1: bcm2835 ALSA [bcm2835 IEC958/HDMI]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: Device_1 [USB2.0 Device], device 0: USB Audio [USB Audio]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
$
```

In the TJBot configuration, enter the applicable speaker device ID, with the format `plughw:<card>,<device>`

Speaker

Device ID:

plughw:2,0

15. At the top of the configuration window, select **English (US dialect)** from the **Speak** dropdown menu. Enable the speaker by ticking the checkbox labeled **Speaker**.

The screenshot shows the 'speak > Edit tjbot-config node' window. At the top are 'Delete', 'Cancel', and 'Update' buttons. Below are three dropdown menus: 'Gender' (set to 'Male'), 'Speak' (set to 'English (US dialect)'), and 'Listen' (empty). At the bottom, there are checkboxes for 'Has' (unchecked), 'Servo' (unchecked), 'LED' (unchecked), 'Camera' (checked), 'Microphone' (unchecked), and 'Speaker' (checked).

16. Connect the nodes together as shown below.



17. Click on the **Deploy** button in the top-right corner of the Node-RED editor to save and deploy the changes.
18. Click on the tab to the left of the inject node to take a picture with TJBot's camera. When the photo is analyzed with the Watson Visual Recognition service, a message is constructed with the objects and colors recognized, and is spoken out via the speaker.

An example is:

TJBot sees earphone, person, face, people, maroon color