

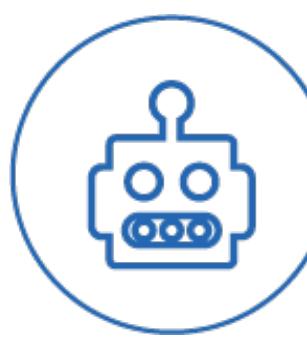
The Watson Rover Project

Build and Installation Instructions for Technology Demonstrator

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Note: This is more of a guide rather than a detailed installation manual. The intention is to provide pointers that will help the reader accelerate Rover build and installation. It assumes that the reader is familiar with necessary technologies and has pre-requisite skills and knowledge to build a Rover.

Installation Steps



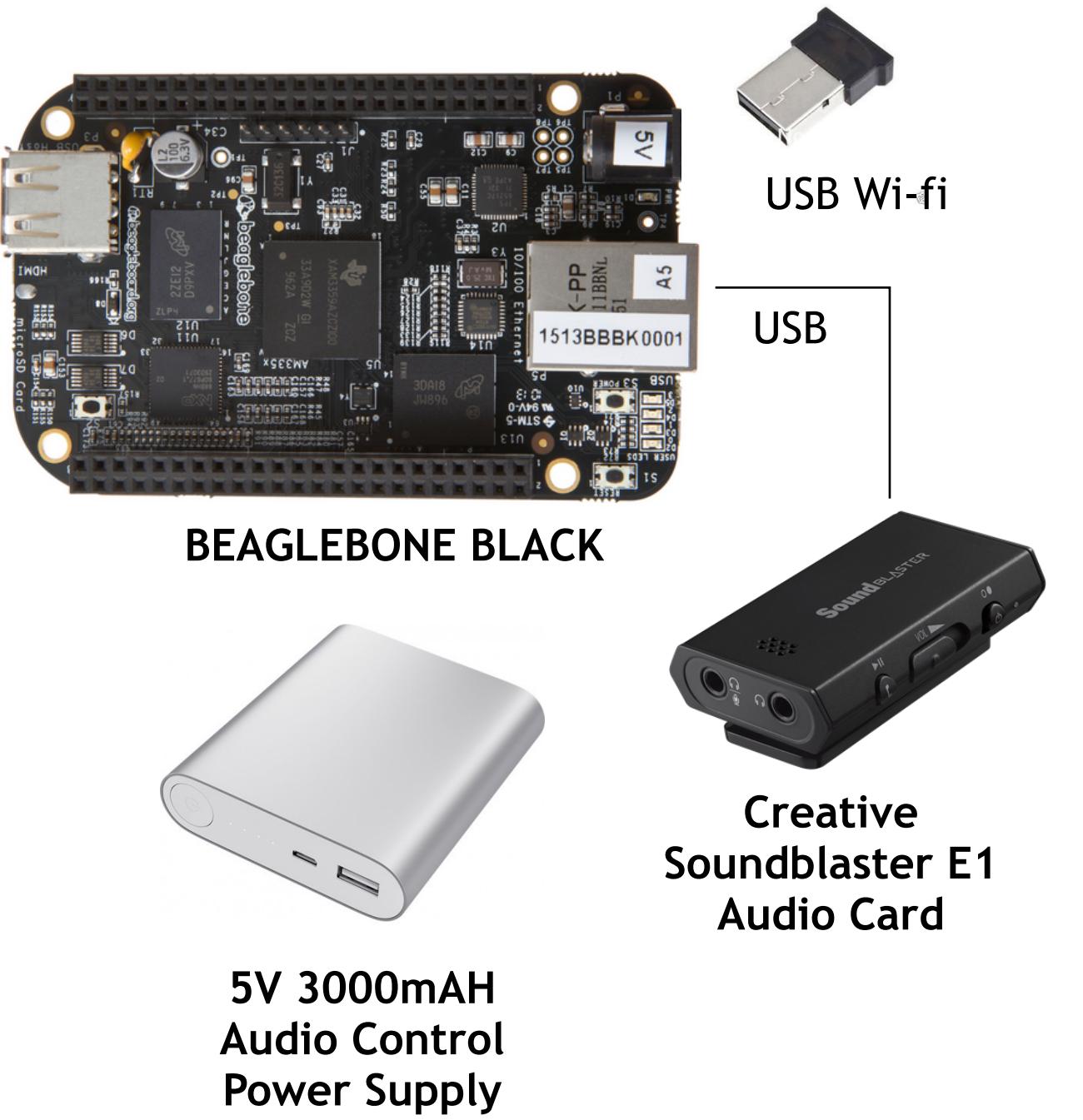
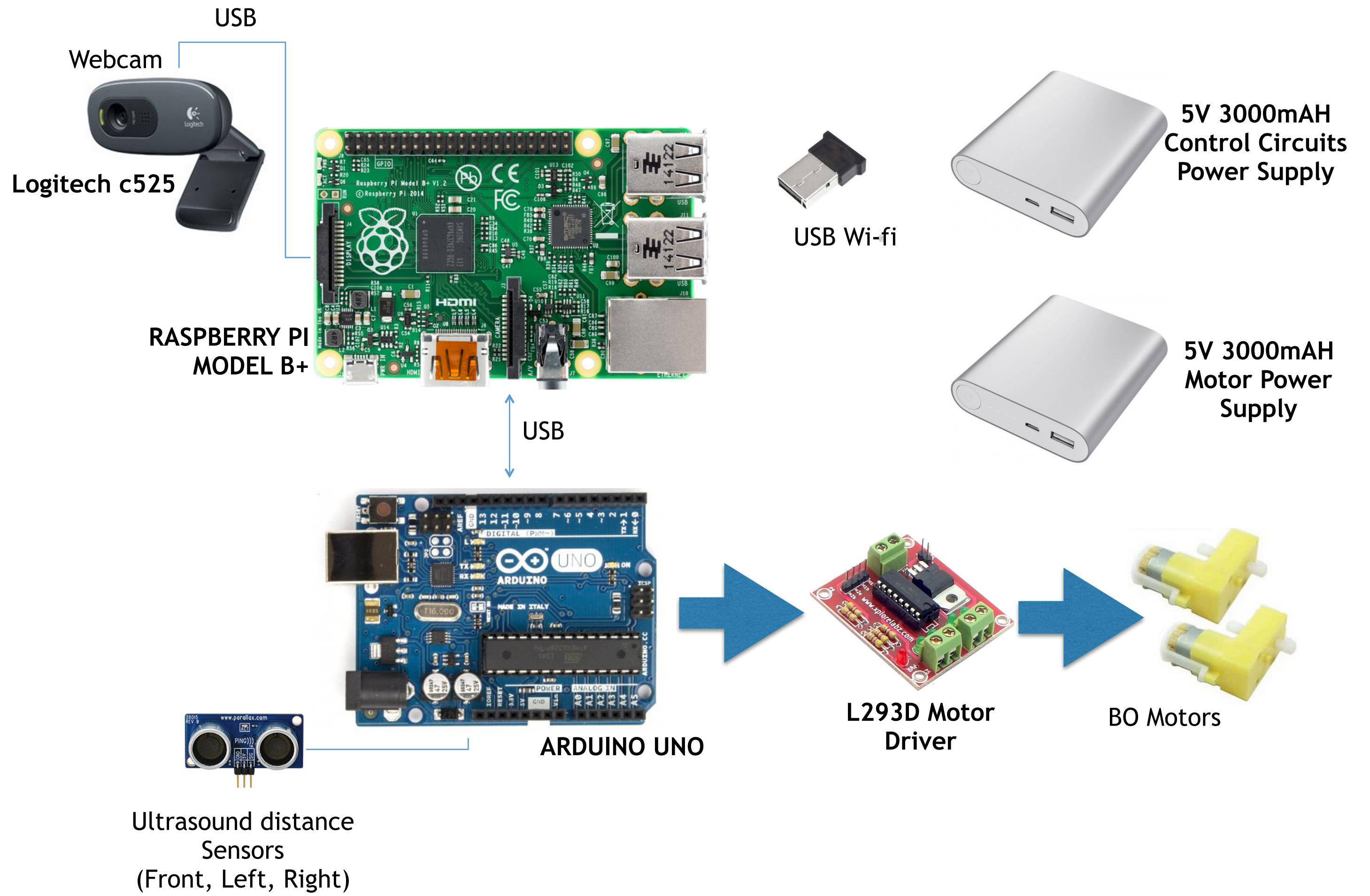
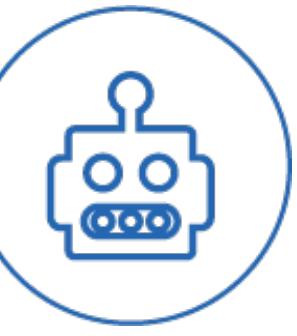
Watson + GBS
Cognitive Challenge



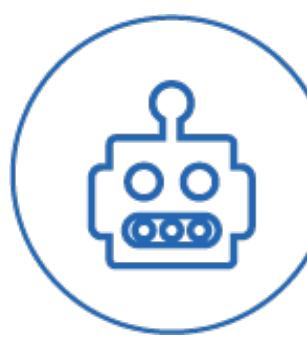
Step #	Step description
Step 1	Build Rover Hardware
Step 2	Setup Raspberry Pi
Step 3	Setup Beaglebone Black
Step 4	Setup Bluemix Platform
Step 5	Register Raspberry Pi and Beaglebone in Bluemix IOT foundation
Step 6	Configure MQTT topics and interconnect
Step 7	Install Application code
Step 8	Start Application

Rover Hardware Setup

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Raspberry Pi Setup



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Component

Installation Instructions

Operating System

<https://www.raspberrypi.org/documentation/installation/installing-images/>

Arduino Software and Driver

<http://razzpisampler.oreilly.com/ch10.html>

Node.js

http://elinux.org/Node.js_on_RPi

Node-Red

<http://nodered.org/docs/hardware/raspberrypi.html>

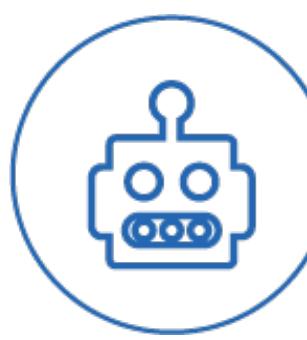
OpenCV libraries

<http://www.pyimagesearch.com/2015/02/23/install-opencv-and-python-on-your-raspberry-pi-2-and-b/>

Tesseract OCR

<https://www.raspberrypi.org/forums/viewtopic.php?t=45645>

Beaglebone Setup



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Component

Installation Instructions

Operating System

http://elinux.org/Beagleboard:Ubuntu_On_BeagleBone_Black

Node.js

<http://www.armhf.com/node-js-for-the-beaglebone-black/>

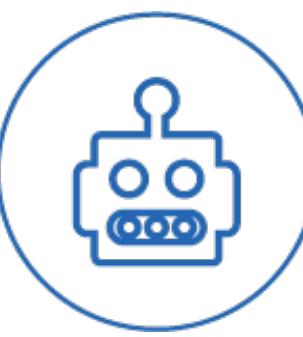
Node-Red

<http://nodered.org/docs/hardware/beagleboneblack.html>

Audio libraries

http://elinux.org/BBB_Audio_Cape_RevB_Getting_Started

Bluemix Setup and Device Registration



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Component

Core Application - Create using
IOT boiler plate

Installation Instructions

The screenshot shows the IBM Bluemix Catalog interface. The top navigation bar includes links for DASHBOARD, SOLUTIONS, CATALOG (which is underlined in green), PRICING, DOCS, and COMMUNITY. A search bar at the top right contains the placeholder text "Type here to search". On the left, a sidebar lists categories: Watson, Mobile, DevOps, Web and Application, Integration, Data Management, Big Data, and Security. The main content area is titled "Starters // Choose a package of sample code and services, or start from scratch". It features a section for "Boilerplates" with three options: "Internet of Things Foundation Starter" (highlighted with a red circle), "Java Cache Web Starter", and "Java Cloudant Web Starter".

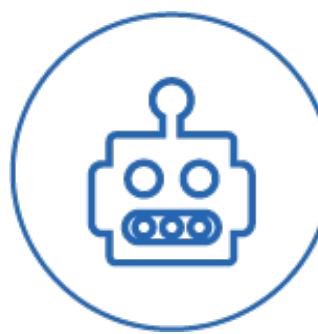
Register Raspberry Pi and
Beaglebone in IOT foundation

<https://npwvlf.internetofthings.ibmcloud.com/dashboard/#/devices?page=1>

Additional Node.js application for
Audio Control and VR

The screenshot shows the IBM Bluemix Catalog interface, similar to the previous one but with different content. The top navigation bar and sidebar are identical. The main content area is titled "Runtimes" and features two options: "Liberty for Java™" and "SDK for Node.js™" (highlighted with a red circle). Below the runtimes, there is a sub-section titled "Run an app in the language of your choice".

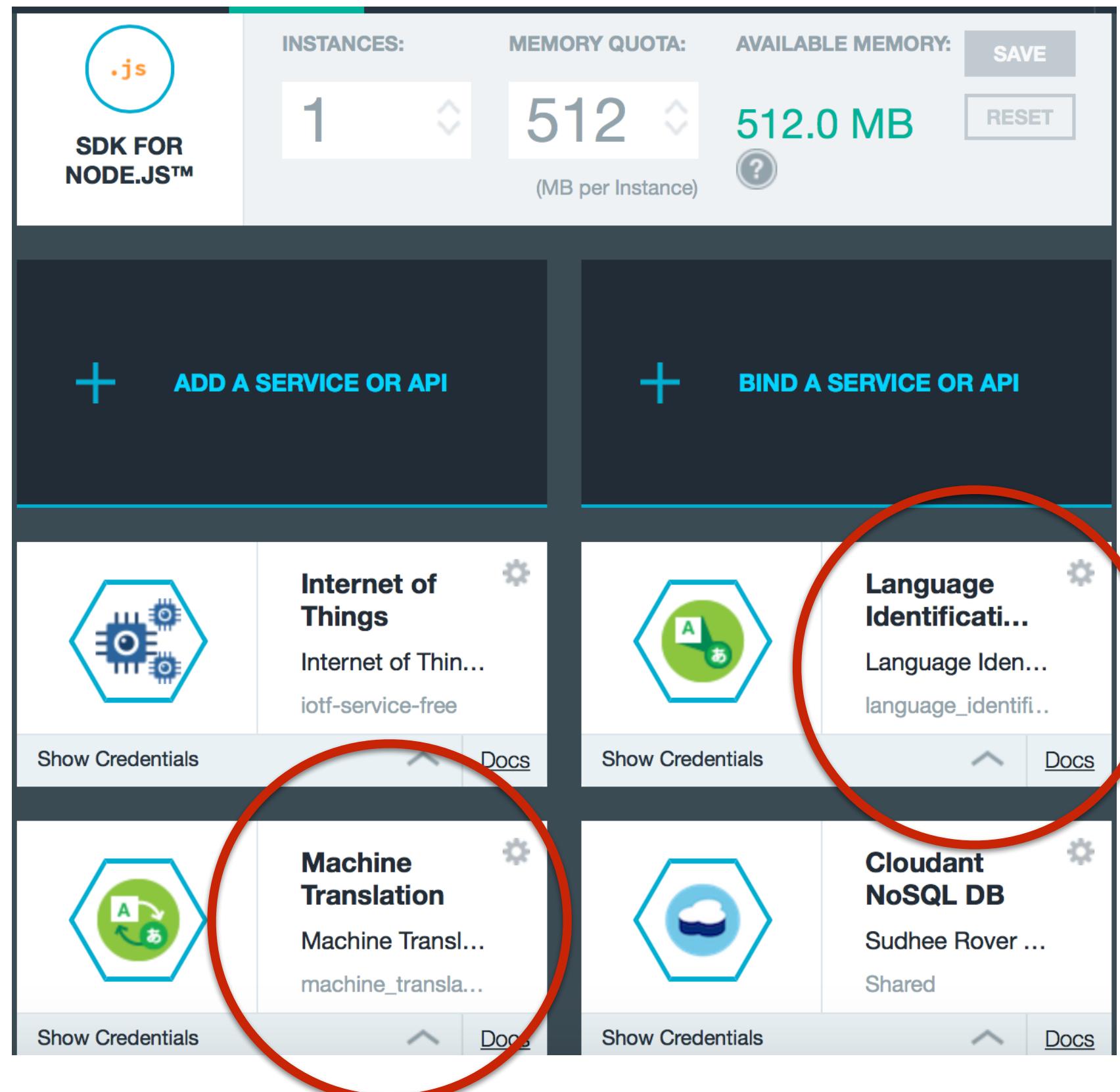
Bluemix Setup - Add Watson Services



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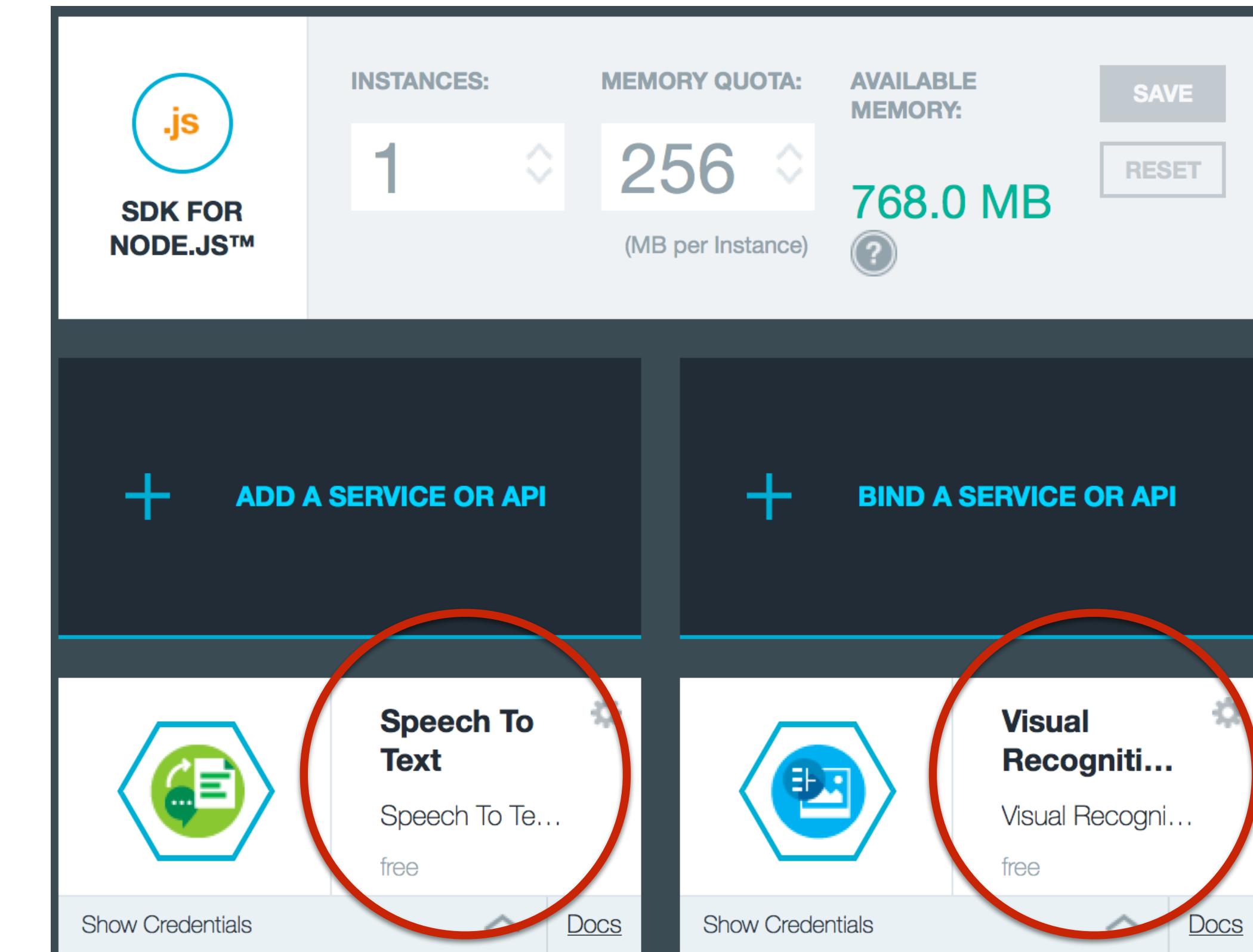


Core Application - IOT Boilerplate



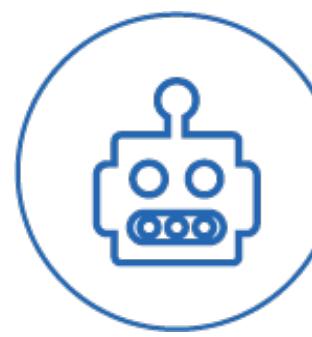
The screenshot shows the Bluemix dashboard for the Core Application. At the top, it displays configuration for a Node.js application with 1 instance and 512 MB memory quota. Below the configuration, there are sections for "ADD A SERVICE OR API" and "BIND A SERVICE OR API". The main service catalog lists several Watson services, each with a "Show Credentials" button and a "Docs" link. Two services are circled with red circles: "Machine Translation" and "Language Identification".

Additional Application - node.js



The screenshot shows the Bluemix dashboard for an additional node.js application. It has similar configuration at the top (1 instance, 256 MB memory quota). Below the configuration, there are sections for "ADD A SERVICE OR API" and "BIND A SERVICE OR API". The service catalog lists Watson services, with "Speech To Text" and "Visual Recognition" circled with red circles.

Install Application Code



Component

Installation Instructions

Download code from Github

On RasPi:

```
$ cd /home/pi
$ git clone https://github.com/ssudheen/watson-Rover.git
$ mv Watson-Rover Watson
$ mv Watson/RasPi/* Watson/
```

FTP all contents of Watson/Bbone to Beaglebone

Install Arduino Code

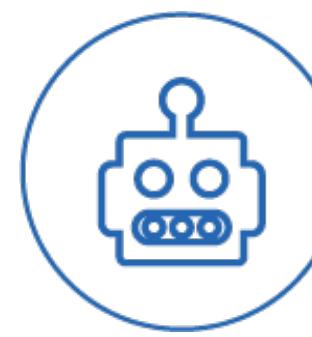
- Open Arduino IDE on Raspberry Pi
- Open Arduino code under /home/pi/Watson/Arduino/
- Build and Upload

Install Navigation Code

On RasPi:

```
$ cd /home/pi/watson/Navigation
$ cmake .
$ make
$ mv CMakeLists.txt CMakeLists_1.txt
$ mv CMakeLists_2.txt CMakeLists.txt
$ cmake .
$ make
$ chmod +x search_patternv0.1 search_pattern_close_v0.1 search_target.sh
```

Install Application Code (continued)

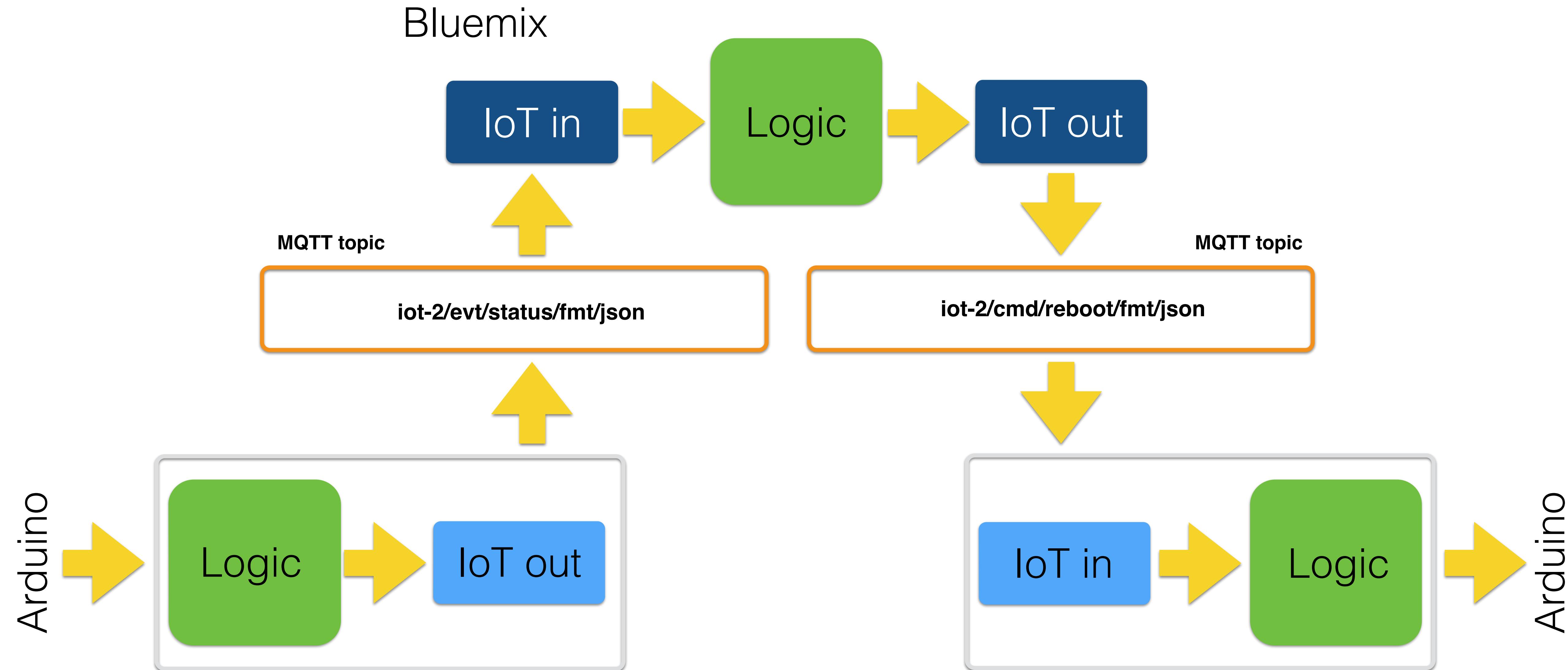
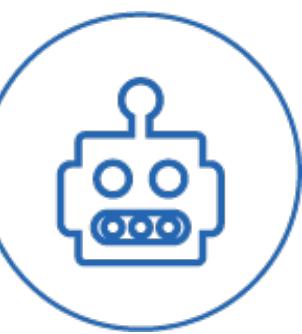


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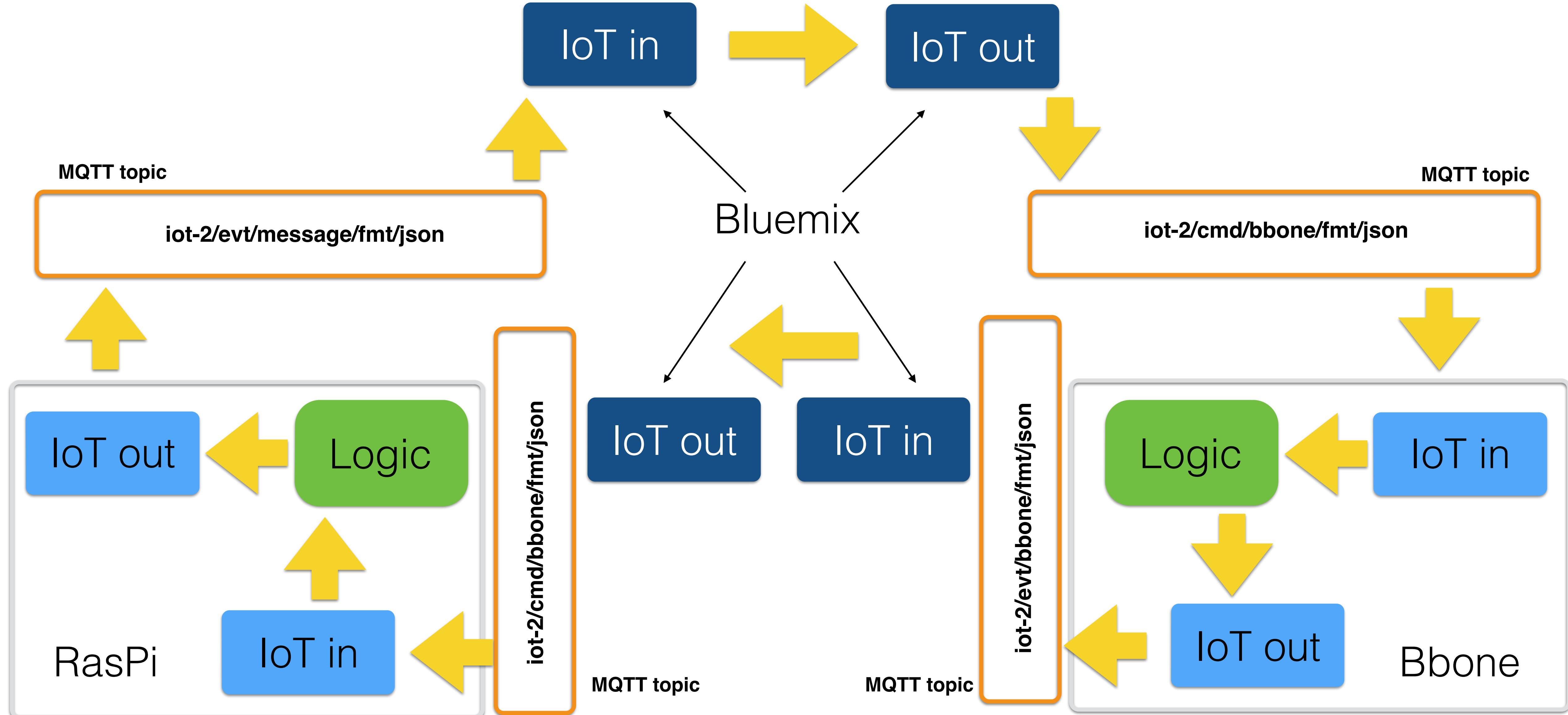


Component	Installation Instructions
Install OCR Code	<p>On RasPi:</p> <pre>\$ cd /home/pi/watson/OCR \$ chmod +x *</pre>
Install VR Code	<p>On RasPi:</p> <pre>\$ cd /home/pi/watson/VR \$ cmake . \$ make \$ chmod +x *</pre>
Import Node-Red	<ul style="list-style-type: none">• Import Node-Red code/settings in RasPi (/home/pi/Watson/Node-Red/) and Bbone (/home/pi/Watson/Bbone/Node-Red/)• Import Node-Red code/settings in Bluemix main application (IOT boilerplate) - /home/pi/Watson/Bmix/bmix_nred.tar.gz
Install Audio Control Code	TBD

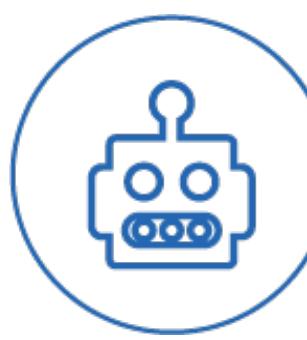
MQTT Setup - Part One - Main Flow (ARD-RasPi-BMix-RasPi-ARD)



MQTT Setup - Part Two - Voice Control Flow (RasPi-BMix-Bbone-BMix-RasPi)



Start Application



Steps

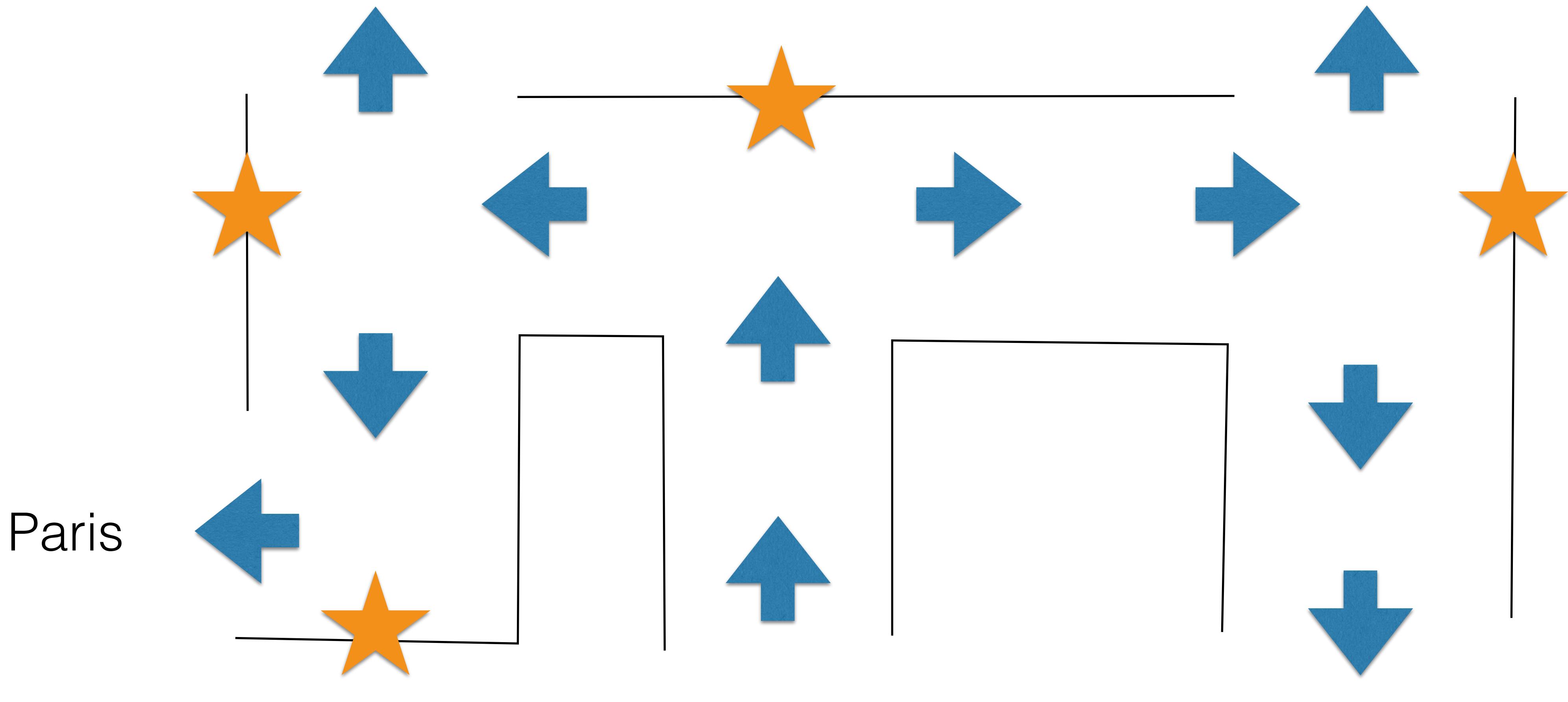
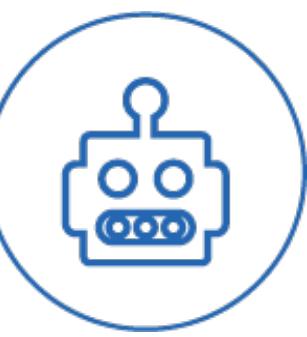
Start Node-Red on RasPi

Start Node-Red on Beaglebone Black

Hard reset Arduino

Monitor Node-Red Debug messages

Maze Design



Multi-lingual Instruction or
Landmark visual