Lab 3: Node-Red

Objectives:

- Setup Node-Red on Raspberry-Pi
- Develop a simple web dashboard for sensor data visualization on Raspberry-Pi

Equipment:

- Raspberry Pi 3 Model B
- Power Supply for Raspberry Pi (5V and 2.5A DC)
- Micro SD Card (Class 10)
- Micro SD Card Reader
- HDMI to VGA Converter
- Breadboard
- Jumper Wires
- An LED
- 330Ω Resistor
- A push button switch

Background:

Node-RED is a flow-based programming tool, original developed by IBM's Emerging Technology Services team and now a part of the JS Foundation. Invented by J. Paul Morrison in the 1970s, flow-based programming is a way of describing an application's behavior as a network of black-boxes, or "nodes" as they are called in Node-RED. Each node has a well-defined purpose; it is given some data, it does something with that data and then it passes that data on. The network is responsible for the flow of data between the nodes.

It is a model that lends itself very well to a visual representation and makes it more accessible to a wider range of users. If someone can break down a problem into discrete steps they can look at a flow and get a sense of what it is doing; without having to understand the individual lines of code within each node.

Node-RED consists of a Node.js-based runtime that you point a web browser at to access the flow editor. Within the browser you create your application by dragging nodes from your palette into a workspace and start to wire them together. With a single click, the application is deployed back to the runtime where it is run. The palette of nodes can be easily extended by installing new nodes created by the community and the flows you create can be easily shared as JSON files.

Source: nodered.org

Procedure:

1. Turn on your raspberry pi and connect it into a WIFI network.

2. Open a terminal window and type the following commands to install Node-Red **if Node-Red isn't preinstalled with your Raspbian installation**.
    a. **bash <(curl -sL https://raw.githubusercontent.com/node-red/raspbian-deb-package/master/resources/update-nodejs-and-nodered)**
    b. **Refer: https://nodered.org/docs/hardware/raspberrypi for further support regarding installation process.**

3. Identify the components related to Node-Red development environment in Figure 1.

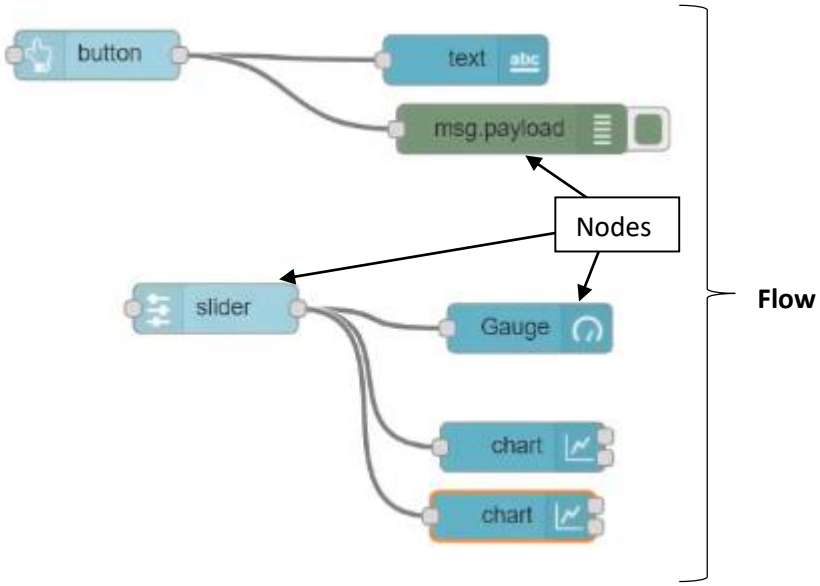


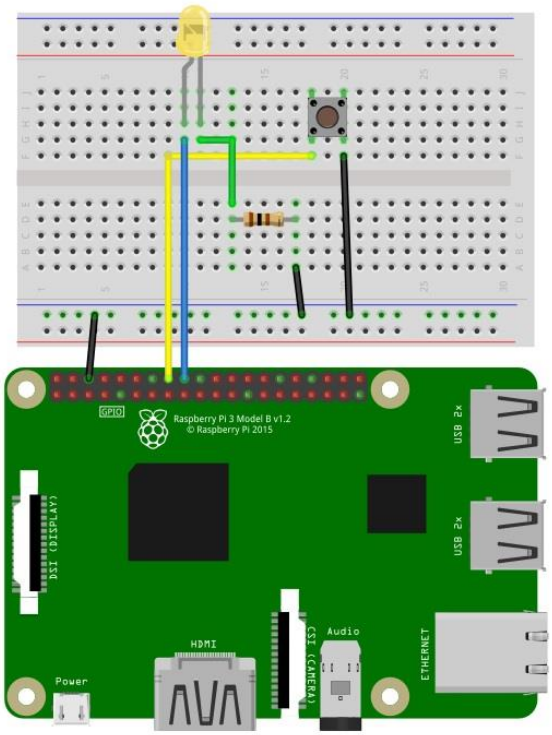
Figure 1

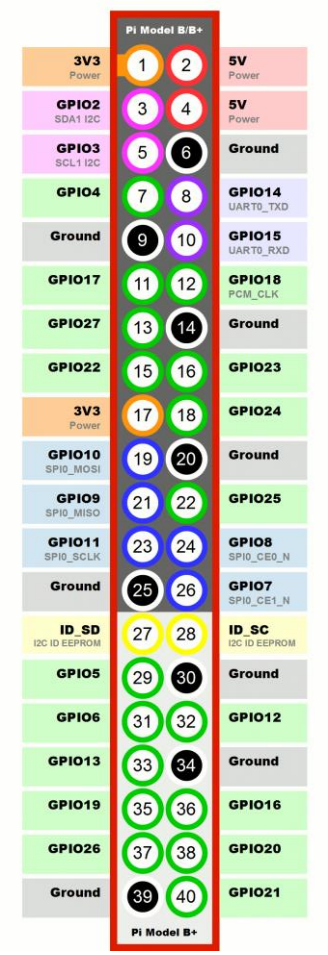
4. Implement a flow to print "hello world" using an inject node and a debug node.

5. Modify the flow to replace the Phrase "hello world" with the word "SLIIT".

6. Implement the flow given in Figure 1 such that the button press sends a text "Test Dashboard" when the button is pressed and the gauge and the charts display the input value of the slider.

7. Connect an LED and a push button to the raspberry pi as illustrated below.





8. Develop a flow which includes following functions such that input and output functionalities are implemented in two separate raspberry pi devices.
    a. Implement a dashboard with two buttons where the ON button press publishes the value “1” into a MQTT topic when pressed and the OFF button publishes the value “0” when pressed.
    b. Develop a python code to turn on the LED when the topic created in above step receives a “1” and turn off the LED otherwise.

9. Develop another flow which includes following functions such that input and output functionalities are implemented in two separate raspberry pi devices.
    a. Count the number of physical push button press events and publish the count into a MQTT topic.
    b. Implement a gauge which displays the physical button press count taking the count value through the MQTT topic created in previous step.