DASHBOARD WITH NODE-RED

INTERNET OF THINGS

Time: 60 mins

Introduction

In this class, the students will learn to create a dashboard on Node-RED and display the sensor readings using data from an MQTT broker.

New Commands Introduced

- No new commands introduced

Vocabulary

- **Node-RED** is a programming tool for wiring together hardware devices, APIs, and online services.
- **Node.js** is an open-source, cross-platform JavaScript runtime environment. It is used to create server-side web applications.
- A **dashboard** visually presents data in a centralized location.

Learning Objectives

Student/s should be able to:

- ***Recall*** how data is sent to the MQTT broker.
- ***Explain*** the features of Node-RED.
- ***Demonstrate*** the creation of dashboard on Node-RED.

Activities

1. **Class Narrative:** *(3 mins)*
    - Brief the student/s that the next challenge is to display the data from the sensor on the dashboard.
2. **Concept Introduction Activity:** *(4 mins)*
    - Let the student/s undertake the explore-activity to observe how the data is displayed on the dashboard.
    - Inform the student/s about the various tools used for visualizing sensor data.
    - Share some interesting features of Node-RED.
        - Visual Programming Interface

It provides a browser-based editor that makes it easy to wire together flows that can be deployed in a single-click.

- Integration with IoT

  The light-weight runtime is built on Node.js

- Shareability

  The flows created in Node-RED are stored using JSON which can be easily imported and exported.

- Real-Time Data Visualisation

  The data received can be visualized as and when it happens.

- Extensibility

  It can be easily extended to add custom functionality.

- Using the slides, explain that the student/s will learn:
  - to explore Node-RED
  - to access MQTT data from Node-RED
  - to display data on dashboard

3. **Activity 1: Explore Node-RED** *(16 mins)*

   Student Activity: *(8 mins)*

- Introduce student/s to Node-RED and its features.
- Guide the student/s to download Node.js from node.js website and install it. Then, install Node-RED module.

  Teacher Activity: *(3 mins)*

- Demonstrate how to display the dashboard on Node-RED.

  Student Activity: *(5 mins)*

- Guide the student/s to launch Node-RED, add a dashboard pallet, add and configure widget, and display on the dashboard.

4. **Activity 2: Access MQTT Data From Node-RED** *(10 mins)*

   Teacher Activity: *(4 mins)*

- Inform the student/s that the data from MQTT broker would be accessed on Node-RED using topic name.
- Demonstrate how to access MQTT data on Node-RED.

  Student Activity: *(6 mins)*

- Guide the student/s to access MQTT data on Node-RED by connecting to MQTT broker and displaying the payload.

5. **Activity 3: Display Data on Dashboard (***15 mins)*

   Teacher Activity: *(7 mins)*

- Demonstrate how to display data on Node-RED dashboard.

  Student Activity: *(8 mins)*

- Guide the students to display the data on the dashboard by configuring charts and gauges, and deploying them.

6. **Introduce the Post class project:** *(2 min)*
   - Create a dashboard for the room climate control system.
7. **Test and Summarize the class learnings:** *(5 mins)*
   - Check for understanding through quizzes and summarize learning after respective activities.
   - Summarize the overall class learning towards the end of the class.
8. **Additional activities:**
   - Encourage the student/s to customize the gauge to a color of choice.
   - Encourage the student/s to display both temperature and humidity on one chart.
9. **State the Next Class Objective:** *(1 min)*
   - In the next class, student/s will learn how to monitor the light exposure to the cargo and display it on the dashboard.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Dashboard with Node-RED	https://s3-whjr-curriculum-uploads.whjr.online/799c9d29-6096-49e5-8726-0073465fbd4d.html
Explore Activity	Dashboard with Node-RED	https://s3.amazonaws.com/media-p.slides/uploads/1525749/images/11088891/C140_activity.gif
Student Activity 1.1	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS-BP
Teacher Reference: Student Activity 1.1 Solution	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Teacher Activity 1	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-TAS-BP
Teacher Reference: Teacher Activity 1 Solution	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-TAS
Student Activity 1.2	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS-BP
Teacher Reference: Student Activity 1.2 Solution	Explore Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Teacher Activity 2	Access MQTT Data From Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-TAS-BP
Teacher Reference: Teacher Activity 2 Solution	Access MQTT Data From Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-TAS
Student Activity 2	Access MQTT Data From Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS-BP
Teacher Reference: Student Activity 2 Solution	Access MQTT Data From Node-RED	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Teacher Activity 3	Display Data on Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-TAS-BP
Teacher Reference: Teacher Activity 3 Solution	Display Data on Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-TAS
Student Activity 3	Display Data on Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-SAS-BP
Teacher Reference: Student Activity 3 Solution	Display Data on Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Student's Additional Activity 1	Customize the Gauge	https://github.com/Tynker-IOT/TNK-M18-C140-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Customize the Gauge	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Student's Additional Activity 2	Combine the Charts	https://github.com/Tynker-IOT/TNK-M1

		8-C140-SAS-BP
Teacher Reference: Student's Additional Activity 2 Solution	Combine the Charts	https://github.com/Tynker-IOT/TNK-M18-C140-SAS
Post Class Project	Room Climate Control - Create Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-PCP
Teacher Reference: Post Class Project Solution	Room Climate Control - Create Dashboard	https://github.com/Tynker-IOT/TNK-M18-C140-PCP-BP