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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEER



## **Application Based Internet of Things Report - LAB 5**

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## Content

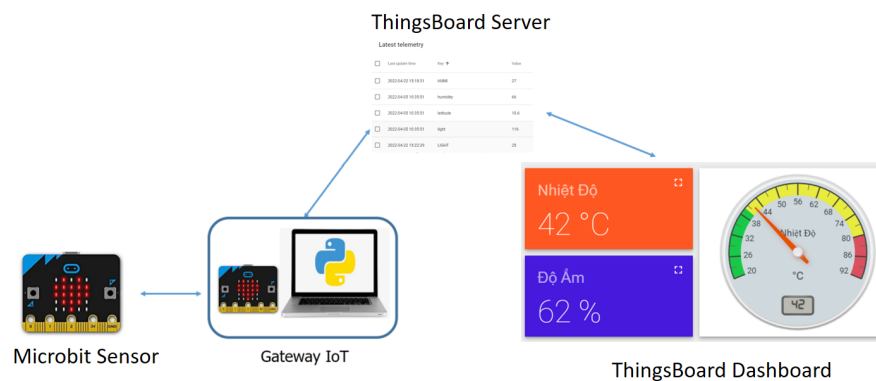
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# 1 Introduction

In this lab, students are supposed to implement an advanced feature for your IoT Gateway. Proposed options are described in following subsections.

## 1.1 Stop and Wait Protocol

Every communications in an IoT application should follow the Stop and Wait protocol. However, because of the Thingsboard server, some connections are impossible to apply this protocol, such as the connection between the python gateway and the Thingsboard server.



Hình 1: *Structure of the wireless sensor network*

However, there are 2 connections can be improved by the Stop and Wait, which are the connection between the main Microbit and the Python gateway (connected by serial) and the wireless communications between the Microbit sensors and the main Microbit. Students can improve one of them.

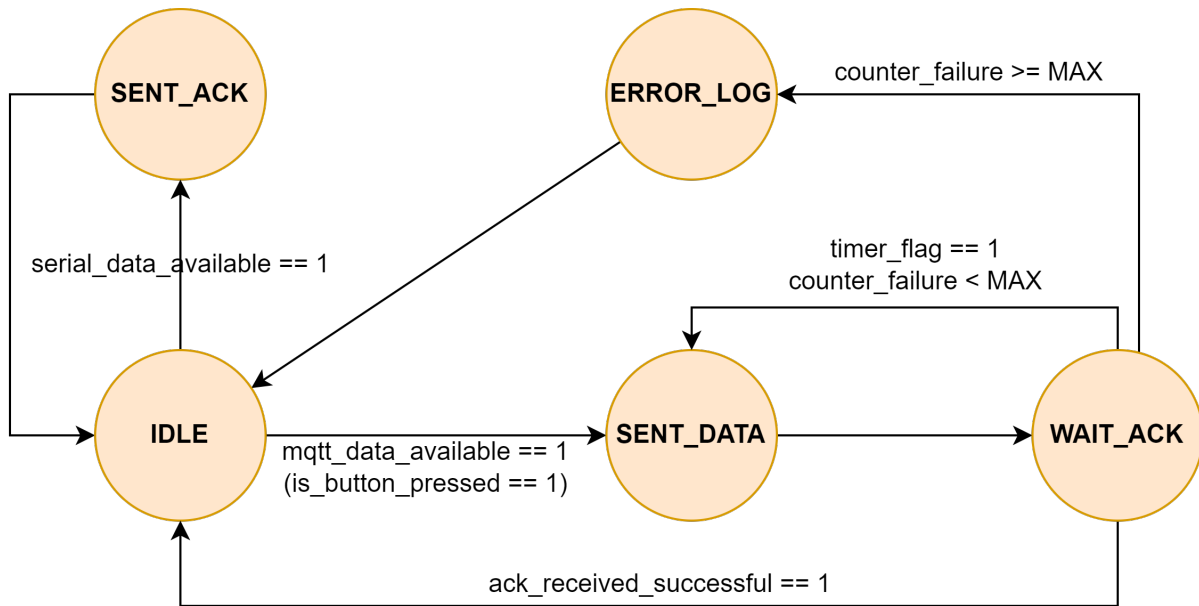
## 1.2 Simple AI Inference

A PC webcam can be used as an advanced sensor in your system. A simple AI model can be implemented at the gateway and the detected results are uploaded to Thingsboard server, then displayed on the Dashboard.

A reference for simple AI manual can be found in the link following (focus on the first 3 chapters):

[https://drive.google.com/file/d/1d-VG1M5m\\_jFh9WkA38kg6v0o8zmF85v5/view](https://drive.google.com/file/d/1d-VG1M5m_jFh9WkA38kg6v0o8zmF85v5/view)

## 2 Report: Implement Stop and Wait Protocol



Hình 2: *Stop and Wait State Machine*

Figure 2 illustrates the finite state machine of Stop and Wait protocol refer to the lecture manual. Both the main Microbit and Python gateway run the same FSM and be able to communicate bi-directionally. The Stop and Wait protocol based on 2 features:

1. Sending data requires waiting for responded acknowledgement (ACK).
2. If fail to receive acknowledgement, retransmitting data is performed.

The main Microbit sends temperature data to the gateway whenever the button A is pressed, then the gateway forward it to Thingboard dashboard. The Python gateway received MQTT controlled message from switches on Thingsboard server and forward it to the main Microbit to show an icon on the LED matrix. The main difference between FSM run on main Microbit and the one run on Python gateway is that the transition from IDLE state to **SEND\_DATA** state is when the button is pressed on main Microbit and when Python gateway received data from Thingsboard server via MQTT.

Link to Github repository:

<https://github.com/thanhnguyen2612/iot-lab/tree/master/lab5>

Link to MakeCode implementation of main Microbit:

[https://makecode.microbit.org/\\_MPTM5uf0x7Y2](https://makecode.microbit.org/_MPTM5uf0x7Y2)



Hình 3: MakeCode snapshot of main Microbit implementation