

## Assignment 2 – Embedded System Application

Due Date: Week 9 Lab (Prior to Lab Time) - Weight: 20%

Late Penalty: 5% Per day including weekends

### Purpose:

The purpose of this assignment is to demonstrate understanding of how to build an IoT embedded system capable of communicating with an online web service.

Completion of this assignment demonstrates understanding of the following learning outcomes:

- Explain different mobile systems toolkits and development environments
- Integrate mobile applications with other systems, such as sensor network systems or web systems

### Task:

Your objective for this assignment is to team up with another student in your class to create a networked embedded system using the Raspberry Pi 3 development board with the following sensors via an I2C bus:

- Adafruit MPL3115A2 – Barometric Pressure / Altitude / Temperature Sensor
- Adafruit TCS3472 – RGB Color Sensor with IR filter and White LED

All the required hardware components to complete this assignment will be provided to you during your lab classes. In addition, you must also create an iOS application that will use the data received from the sensors to build a compelling user experience.

You will be required to demonstrate your assignment functioning in the Week 9 labs.

The assignment is broken up into three major components; the Raspberry Pi server, the iOS application and an online database

### Server Requirements:

- You must write a Python/NodeJS server to read in sensor data and communicate it with an online database
- You should provide services for storing & retrieving the current value of the sensors
- You should provide services for storing & retrieving historical data of the sensors
- Each of the sensors must be accessible via a breadboard connection (allows for solderless prototyping) and connected via an I2C bus directly to the Raspberry Pi 3.
  - o Sensor data can be read using appropriate libraries. These libraries will vary depending on chosen programming language

### Application Requirements:

- You must develop an iOS application which demonstrates that you are able to connect to the online database and access sensor data in real time.
- The application design is completely up to you
  - o However, you **MUST** provide the sensor data in a meaningful way
- Students aiming for a high grade should consider how display the information and provide it in a format that is most useful to users
  - o An example could be using the local temperature in conjunction with online weather services
  - o Another example using the colour sensor would be allowing the user to capture the colours and create a virtual palette of all colours captured.

### Online Database

- You must develop an online database to act as an intermediary between the Raspberry Pi server and the iOS application
- This database must be able to support providing real time updates to the iOS application.
- The format and database platform are entirely up to you. We recommend the use of Firebase

### Marking Criteria:

This assessment is worth 20% of your total marks for this unit. Your application will be assessed on the following criteria (100 Marks):

#### Server Design – 35 Marks

- Does the server successfully connect to the temperature sensor?
- Does the server successfully connect to the colour sensor?
- Does the server successfully connect to the online database?
- Does the server provide real-time updates to the database?
- Is there an appropriate offline storage of sensor data included?

#### Application Design – 35 Marks (10 for connection, 25 for usefulness)

- Does the application successfully connect to the online database?
- Is the application able to provide real-time updates?
- Does the application conform to Apple Design Guidelines?
- Does the application provide additional features to make the application useful?

#### Online Database – 30 Marks

- Does the online database provide a way to quickly retrieve the latest current temperature value?
- Does the online database provide a way to quickly retrieve the historical data of each of the sensors?
- Is the online database scalable for multiple sensor networks?

### Submission Requirements:

Students are required to submit the iOS Application AND IoT code via Moodle as a single archive (.ZIP). Please ensure that you test the project on another machine prior to final submission to ensure all files are included correctly. Students should ensure that the archive is named using the following convention [STUDENTNAME]-EmbeddedSystemApplication.

Students are expected to demonstrate their application functional within the Week 9 labs

Any code documentation comments must be written in English. Submissions will be accepted for 7 days after the due date. Any submissions beyond this point will not be accepted without prior consultation.

It is critical that you have cited and provided attribution for any external resource used to build your solution. Any external resources that you have used (such as YouTube video tutorials, StackOverflow solutions, etc.) must be cited within your application code. Failure to appropriate attribution or cite materials used to develop your application will be considered as plagiarism and will result in no marks being awarded for the assessment.

Students seeking extensions will have to follow the Special Consideration guidelines outlined here: <http://www.monash.edu.au/exams/special-consideration.html> (note: you will need to provide adequate documentation to support your claim for an extension).