CSE-460: Internet of Things(IoT) Laboratory

4th year 2nd Semester

Assignment 01: IoT Devices and Applications

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5 Popular IoT Devices

Table 1: Five popular IoT devices with their Name, Specifications, Setup, and Project.

SL	Device Name	Specifications	Setup	Project
1.	**Raspberry Pi 4 Model B**	➔ Quad-core ARM ➔ Cortex-A72 processor ➔ 2/4/8 GB RAM ➔ Bluetooth 5.0 ➔ Gigabit Ethernet ➔ 2 × USB 3.0 ports ➔ 2 × USB 2.0 ports ➔ HDMI ➔ GPIO header	1. Download and install an IDE like Thonny or VS Code on Raspberry Pi OS. 2. Connect to the Pi via SSH.	Home automation system using sensors to control lights or temperature.
2.	**ESP8266**	➔ 32-bit MCU ➔ Wi-Fi connectivity ➔ GPIO pins ➔ ADC, SPI, I2C ➔ UART	1. Install ESP8266 board in Arduino IDE by adding the board's URL in Preferences 2. Installing the ESP8266 core.	Weather station that sends data to a cloud service for analysis and visualization.
3.	**ESP32**	➔ Dual-core MCU ➔ Wi-Fi/Bluetooth connectivity ➔ GPIO pins ➔ ADC ➔ SPI ➔ I2C ➔ UART, CAN	1. Install ESP32 board in Arduino IDE by adding the board's URL in Preferences. 2. Install the ESP32 core.	Smart door lock controlled through a mobile app.
4.	**Particle Photon**	➔ ARM Cortex M3 MCU ➔ Wi-Fi connectivity ➔ GPIO pins ➔ Cloud integration	1. Use Particle Workbench to develop code for the Photon.	Motion-triggered security camera that uploads images to the cloud.
5.	**BeagleBone Black**	➔ AM335x ARM Cortex-A8 processor ➔ 512 MB RAM ➔ micro HDMI ➔ USB ports ➔ GPIO	1. Use Cloud9 IDE provided by BeagleBone, accessible through a web browser.	Automated irrigation system based on soil moisture levels.

5 Popular IoT Cloud Services

Table 2: Five popular IoT cloud services with their Name, Features, Configuration, and Integrated Project from Table 1.

SL	Cloud Service Name	Features	Configuration	Integrated Project
1.	**AWS IoT Core**	➔ Device management ➔ Secure device connectivity ➔ Data processing and integration with other AWS services.	1. Create a Thing in AWS IoT Core. 2. Generate certificates. 3. Configure the IoT device to connect to the AWS IoT Core endpoint.	Use AWS IoT Core to collect sensor data from Raspberry Pi and store it in AWS DynamoDB for analysis. Example
2.	**Arduino IoT Cloud**	➔ Device registry ➔ MQTT/HTTP connectivity ➔ Integration with other Google Cloud services like Pub/Sub and BigQuery.	1. Create a device registry 2. Register devices 3. Configure the device to connect to Google Cloud IoT Core. Link	Use Arduino Cloud IoT Core to receive data from ESP8266 and trigger notifications or actions based on the received data. Example
3.	**Microsoft Azure IoT Hub**	➔ Device management ➔ Bi-directional communication ➔ Cloud-to-device messaging ➔ Integration with Azure services.	1. Create an IoT Hub 2. Register devices 3. Configure device authentication. Link	Utilize Azure IoT Hub to receive data from Particle Photon and trigger Azure Functions for specific events. Example

SL	Cloud Service Name	Features	Configuration	Integrated Project
4.	**IBM Watson IoT**	➔ Device management ➔ Real-time data analysis ➔ Secure connectivity ➔ Integration with AI and analytics services.	1. Create an IoT Platform 2. Define devices 3. Set up device connectivity. Link Connection with ESP32	Use IBM Watson IoT to analyze data from ESP32 and trigger Watson Machine Learning models for predictive maintenance. Example
5.	**Blynk**	➔ Mobile app-based IoT control ➔ Customizable dashboards ➔ Support for various IoT devices.	1. Install the Blynk app 2. Create a project 3. Add widgets to control or monitor devices. Installation	Develop a mobile app interface using Blynk to control the BeagleBone Black-based irrigation system remotely. Example

Please click on the links associated for further explanations.

Comparison among the Cloud Services

Table 3: Topicwise comparison among the five cloud services based on their features.

Topic	AWS IoT Core	Arduino IoT Cloud	Microsoft Azure IoT Hub	IBM Watson IoT	Blynk
Usability	Lower	Higher	Medium	Lowest	Highest
Easy Configuration	Lower	Highest	Medium	Lowest	Higher
Cost	Higher	Lower	Medium	Highest	Lowest
Popularity	Highest	Lower	Higher	Lowest	Medium