

Assignment Specification

IoT Standards and Protocols

Context

- 100% of your overall mark!
 - Project ethos (1 overall project)
- For this assignment you are required to:
 - Propose a project.
 - Create a working project using networking/IoT standards & protocols.
 - Requires a "physical" aspect – sensors/devices(or simulated by request)
 - Present and communicate your work in a clear, correct manner.
- The project should incorporate the different layers (sensor, processing node, gateway, application) of an IoT/connected device architecture.
- Project will be assessed on its technical (e.g., features) content, complexity, applicability to domain and project communication/execution

Requirements

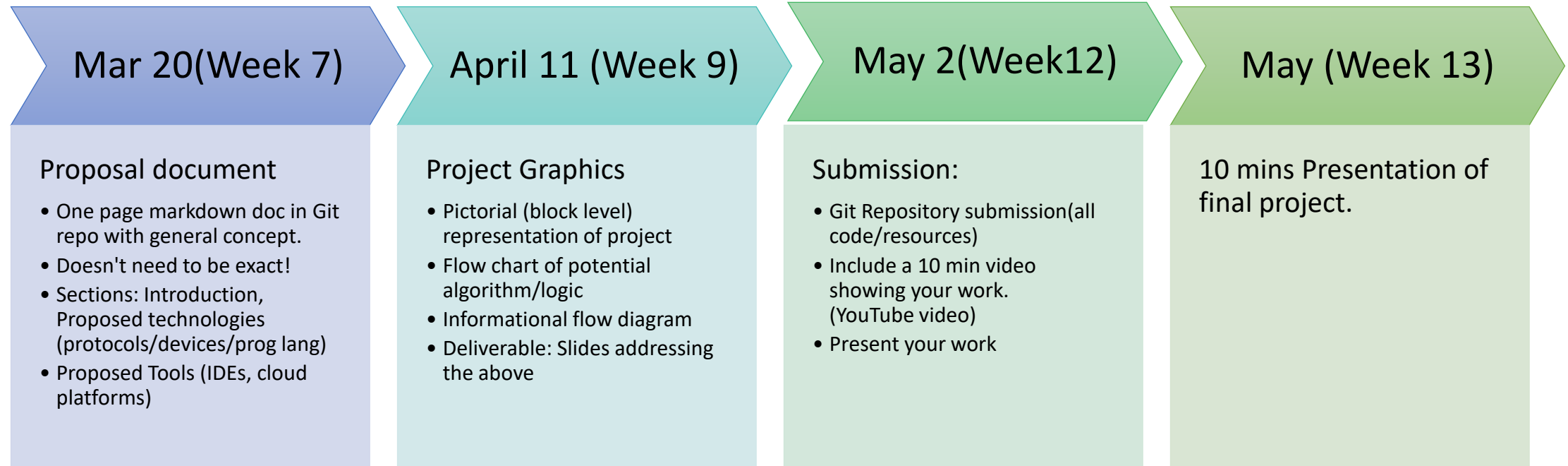
"Include the different layers (sensor, processing, gateway, application) in an IoT Project."

| | |
|---------------------|--|
| Design | Propose and design solutions (e.g. See attached work packages) |
| Apply | Apply suitable IoT protocols and standards. |
| Model/ implement | Model/implement a solution to your proposal Use the knowledge, skills and practices from other modules Should be scoped correctly – can't build a production standard solution in a few weeks! |
| Present/curate | Present/curate your project Create a short video that demonstrates the project. |

IoT Layers of your Project

- **Sensor Layer:** Collects real-time data from the environment.
- **Processing Node:** Raspberry Pi processes and transmits data.
- **Gateway Layer:** Data is relayed through an IoT hub/platform.
- **Application Layer:** Visualizes and actuates responses.

Timeline



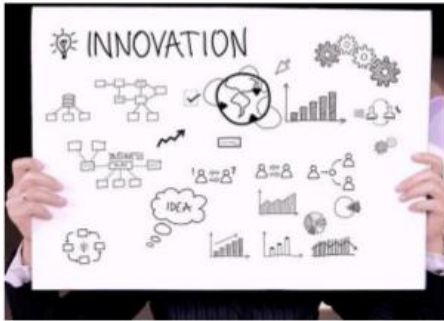


Assignment Requirements

Each team must **propose, design, and implement** an IoT-based solution that includes:

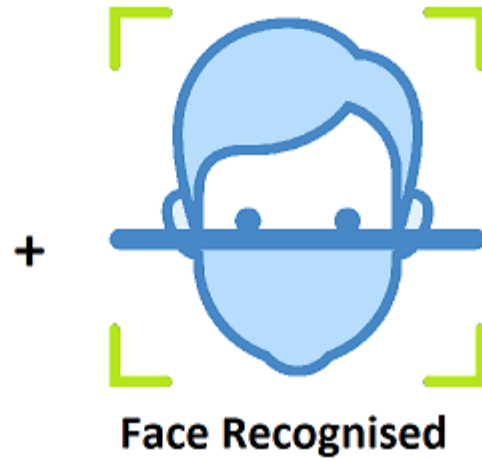
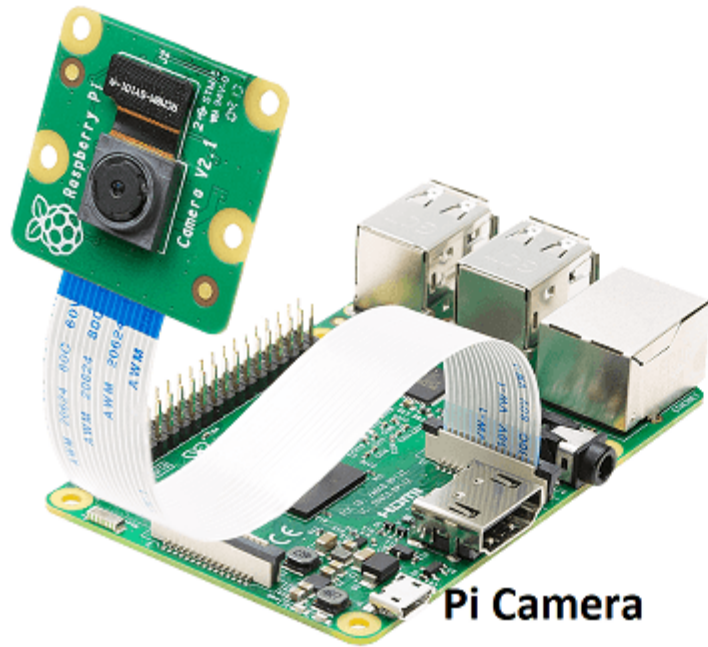
| Requirement | Description | Weight |
|--------------------------------------|---|--------|
| IoT Device Connection | <ul style="list-style-type: none">- Set up a Raspberry Pi 4/Device with an Azure IoT Hub.- Configure MQTT communication or Azure SDK-based messaging.- Verify data transmission | 10% |
| Sensor Data Collection | <ul style="list-style-type: none">- Choose at least two sensors for monitoring (e.g., <i>temperature, motion, light, etc.</i>).- Write a Python script to collect real-time data and store it locally.- Ensure data is timestamped | 15% |
| Telemetry Transmission to IoT Hub | <ul style="list-style-type: none">- Format sensor readings as JSON.- Implement secure data transmission with MQTT or HTTP to Azure IoT Hub.- Apply error handling and retry mechanisms. | 15% |
| Data Visualisation | <ul style="list-style-type: none">- Use Azure Time Series Insights or Power BI to visualise sensor trends.- Display key parameters (e.g., <i>temperature history, motion activity</i>).- Ensure real-time updates are reflected on the dashboard. | 15% |
| Data Processing & Actuation | <ul style="list-style-type: none">- Implement an automated response based on sensor readings.- Use Azure Functions to analyse data and trigger actuations (e.g., <i>turning on a fan, sending an emergency alert</i>).- If applicable, integrate Custom Vision AI for real-time decision-making (e.g., <i>recognising falls, detecting abnormal medication intake</i>). | 30% |
| Project Presentation & Documentation | <ul style="list-style-type: none">- Submit a report with:- System architecture diagrams.- Code snippets and explanations.- Screenshots of dashboards and telemetry data.- Challenges faced and solutions implemented.- Deliver a 5-minute demo video showcasing the project. | 15% |

Other Considerations



- "Permissionless Innovation"!
 - You don't have to limit yourself to module technologies. You can integrate other devices/ systems
 - We used Python but you can use any other programming languages/ frameworks if you want. (Remember, the RPi can run Node/Java/JavaScript)
- Have a look at other IoT project examples for inspiration.
- It's OK to "simulate sensors"
 - You can simulate data (e.g. GPS location.)

Possible Concept: Home Monitoring/Ambient/Assisted Living



Device unlocked

ProjectGraphic

