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 it 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

Mar 20(Week 7)

Proposal document

- One page markdown doc in Git repo with general concept.
- Doesn't need to be exact!
- Sections: Introduction, Proposed technologies (protocols/devices/prog lang)
- Proposed Tools (IDEs, cloud platforms)

April 11 (Week 9)

Project Graphics

- Pictorial (block level) representation of project
- Flow chart of potential algorithm/logic
- Informational flow diagram
- Deliverable: Slides addressing the above

May 2(Week12)

Submission:

- Git Repository submission(all code/resources)
- Include a 10 min video showing your work. (YouTube video)
- Present your work

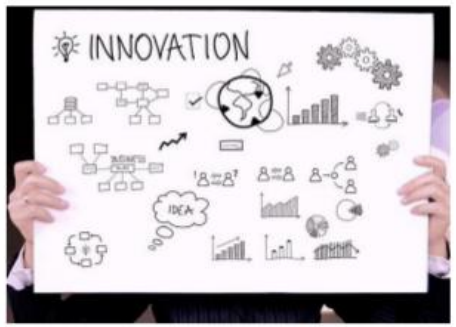
May (Week 13)

10 mins Presentation of final project.

📌 Assignment Requirements

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

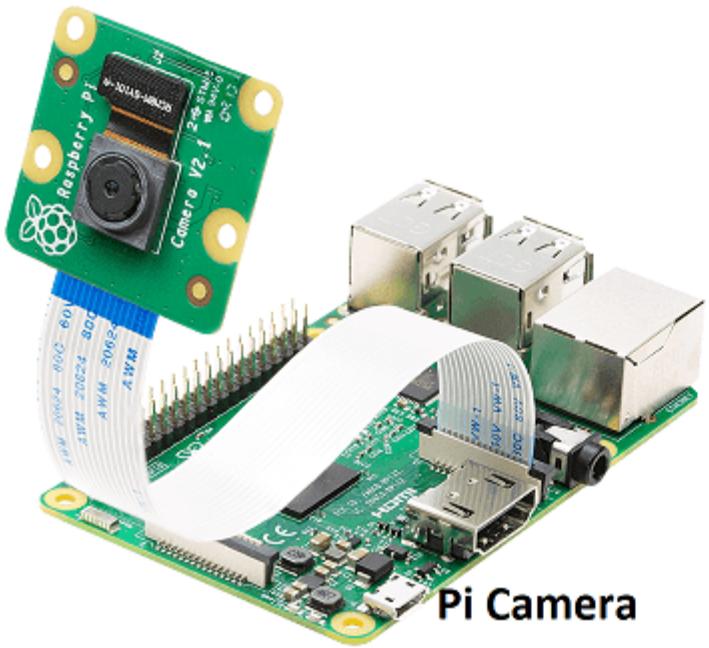
Requirement	Description	Weight
IoT Device Connection	- Set up a **Raspberry Pi 4/Device** with an **Azure IoT Hub**. - Configure **MQTT communication** or **Azure SDK-based messaging**. - Verify **data transmission**	**10%**
Sensor Data Collection	- Choose at least **two sensors** for monitoring *(e.g., temperature, motion, light, etc.)*. - Write a **Python script** to collect **real-time data** and store it **locally**. - Ensure **data is timestamped**	**15%**
Telemetry Transmission to IoT Hub	- 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	- Use **Azure Time Series Insights** or **Power BI** to **visualise sensor trends**. - Display key parameters *(e.g., temperature history, motion activity)*. - Ensure **real-time updates** are reflected on the dashboard.	**15%**
Data Processing & Actuation	- Implement an **automated response** based on sensor readings. - Use **Azure Functions** to **analyse data** and trigger actuations *(e.g., turning on a fan, sending an emergency alert)*. - If applicable, integrate **Custom Vision AI** for real-time decision-making *(e.g., recognising falls, detecting abnormal medication intake)*.	**30%**
Project Presentation & Documentation	- 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



Pi Camera

+

Face Recognised

==>

Device unlocked

ProjectGraphic