Smart Museum

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The Problem

- The problem we where required to address was very general: help the museum to move its first steps through a transition into intelligent and efficient management of its resources using IoT.

Our Proposal

- We have proposed a solution that involves two strategic areas: museum’s asset preservation and energy efficiency.
- Our project aims to provide indoor environmental monitoring using low power consumption technologies (like LoRaWAN) to preserve art pieces and do not impact museum expenses.

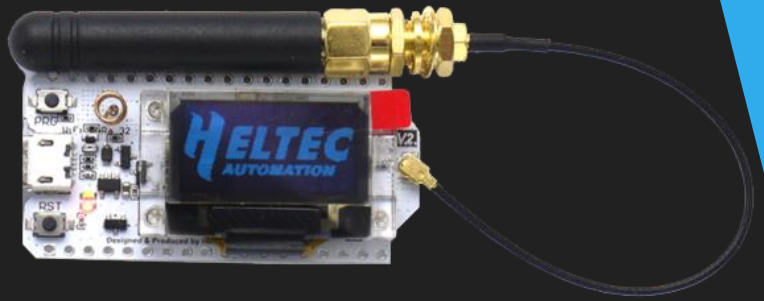
Existing Approaches

- Are all research projects and some of them are old ones (still using Excell to save data 😱).
- Focus on Monitoring (no actuator)
- No focus on energy efficiency
- Details in competitor analysis in the github repo (Evaluation.md)

A Closer Look

1. Temperature and humidity measurements simulation
2. Actuators (simulated with a simple led).
3. Possibility to send measures to the cloud with LoRaWAN using TheThingsNetwork infrastructure;
4. Possibility to switch to MQTT on-demand and have real-time monitoring and then switch back to LoRaWAN less frequent messages;
5. Free persistent storage;
6. Interactive web dashboard.
7. Adaptive transmission rates in real-time mode.

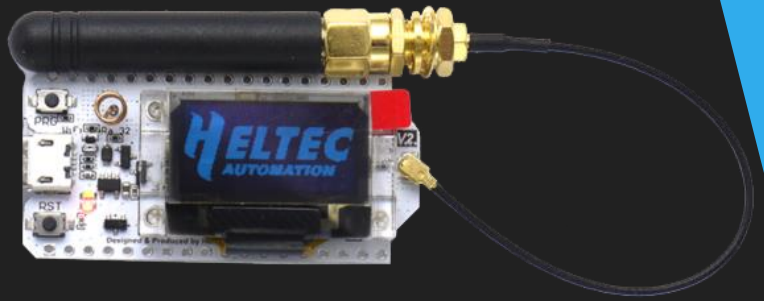
Hardware



- All in one Heltec board:
  - ESP32 microprocessor (dual-core 32-bit MCU + ULP core)
  - LoRa node chip SX1276/SX1278;
  - Onboard SH1.25-2 battery interface;
  - integrated lithium battery management system;
  - Integrated WiFi, LoRa, Bluetooth;
  - Onboard 0.96-inch 128*64 dot matrix OLED display;
    Integrated CP2102 USB to serial port chip

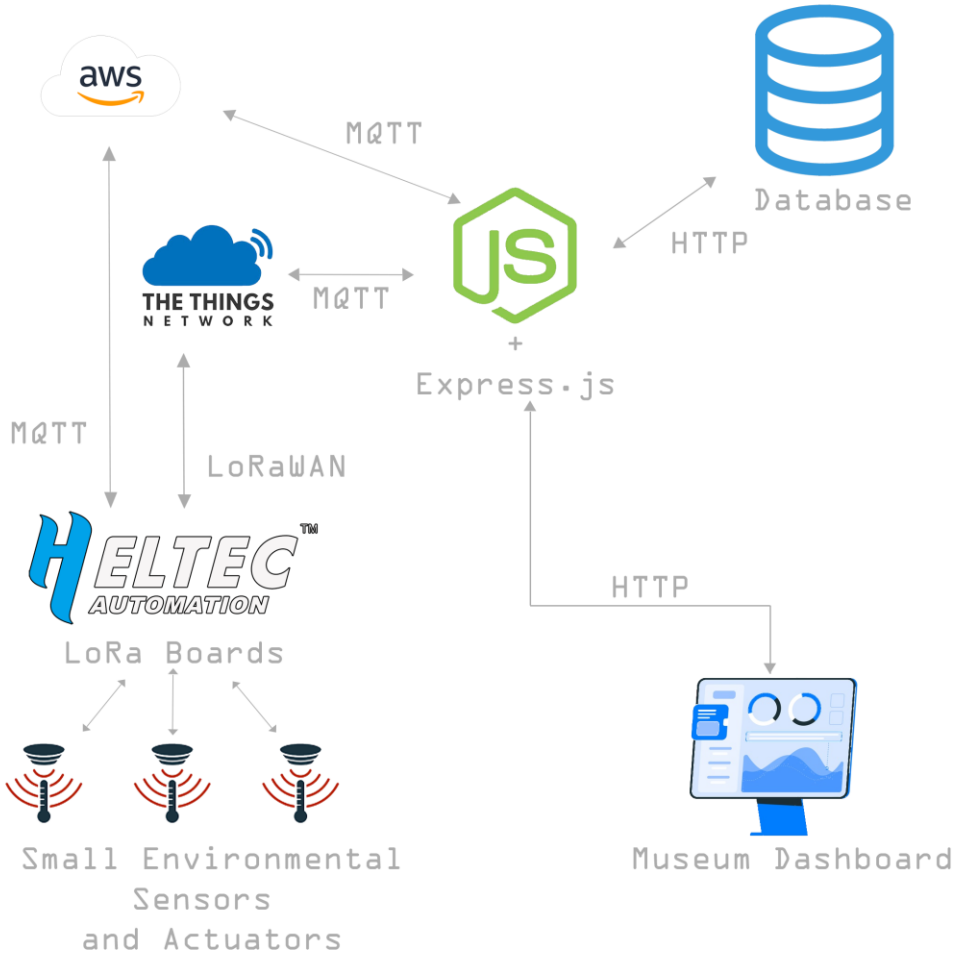
Hardware

- All in one Heltec board.
- Sensors and actuators are simulated.



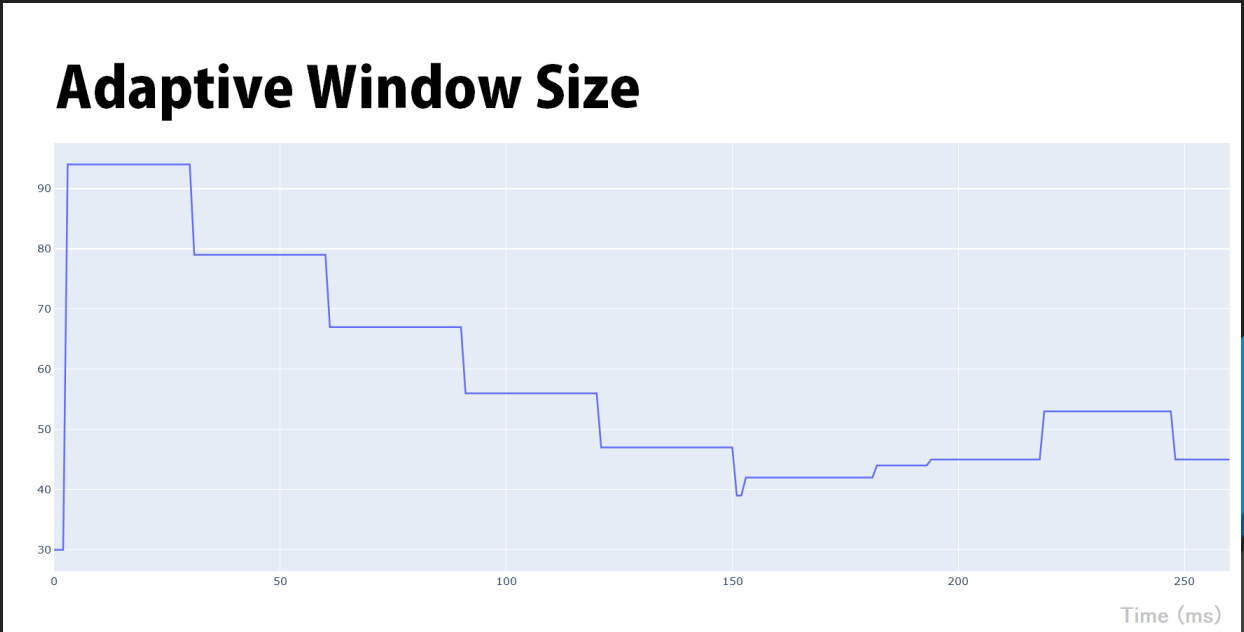
Architecture

- Multi cloud architecture:
  - Aws
  - TTN
  - Atlas



Evaluation

- Think-aloud evaluation for the UX with a positive feedback
- Realtime performances test:



Missing Evaluation

- Think aloud on effective users (Museum operators)
- API capacity
- Actuators threshold dynamic change

Future Development

- Allow to set threshold dynamically (no hard coding)
- Complete the dashboard
- Integrate real environmental sensors and actuators

Thank You For The Attention

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