

Server Room Environmental Monitoring



B.Sc. (Honours) in Instrument Engineering

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Background and Motivation

Server Room

Servers are the backbone of the modern information age. High powered computers built to store, process and manage network data.

- Any unexpected downtime can have wide ranging repercussions.
- Servers usually housed in purpose built space.
- Environmental factors inside the room are tightly controlled.



Abstract

This project delivers a high-reliability, low-maintenance solution to the problem of monitoring these various performance critical environmental factors inside a server room in addition to allowing real time remote monitoring and alerts of conditions inside the room.

	Temp	Humid	Max T Δ
Intel R200	10-35°C	50-90% RH	10°C/h

End users will have access to a range of data available through a variety of methods:

- Temperature
- Temperature rate of change (ΔT)
- Humidity
- Motion detection

Project Goals

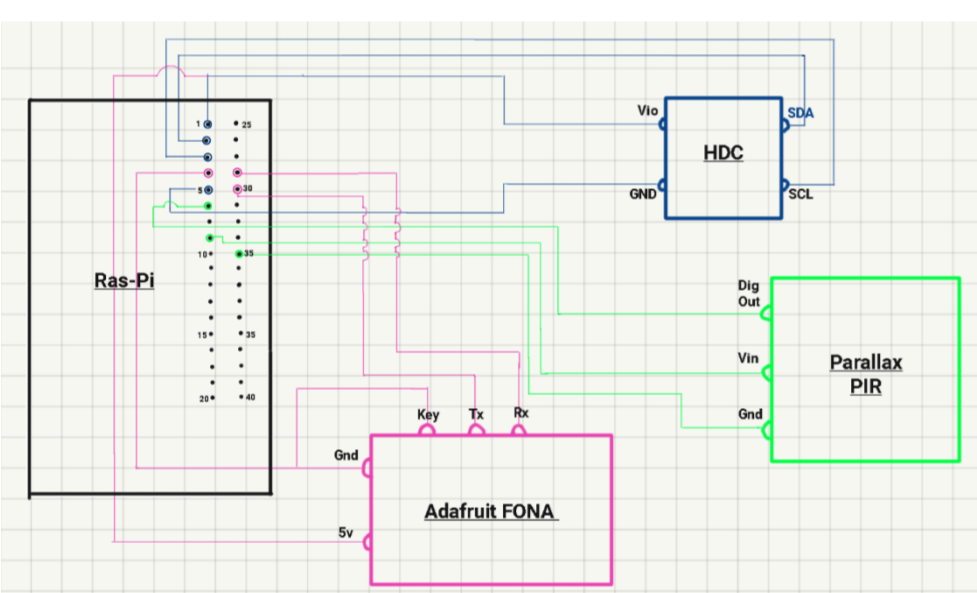
- Design a monitoring solution that can operate continuously and reliably without human interaction
- Install a range of sensors to monitor critical environmental factors
- Collect and store measured values
- Implement alert conditions to trigger when parameters exceed limits
- Facilitate remote access to all the data gathered
- Develop an out-of-band communication method to ensure reliable reporting.

Equipment

- Raspberry Pi Model 4 B
- Raspberry Pi Heatsink protective case + 2x fans
- HDC1000 click (Temp/humid)
- Parallax PIR Motion Sensor
- Adafruit FONA sim800L GSM module
- Webcam

Project Plan and Implementation

Design of system



- Using Ras-Pi GPIO pins to power and communicate all modules
- Modules use different protocols to communicate with controller. This project will use I2C, UART and digital.

Software Interface

Project was programmed using Python IDE, this code drives the operation of all sensors and modules.

It handles:

- Conversion of raw data from sensors, to measured parameters, and subsequent data handling and storage
- Specifications of Alert conditions that will trigger notifications of environment conditions inside the room – SMS is sent to any numbers that should respond to alert
- Streaming data to specified locations in order for users to access and analyse.

Data Streaming



- Events collected are streamed live to the Initial State website to be made available to anyone who needs them.
- The data can also be accessed using a discord server created to communicate data

Scan QR code to view live data



Added value

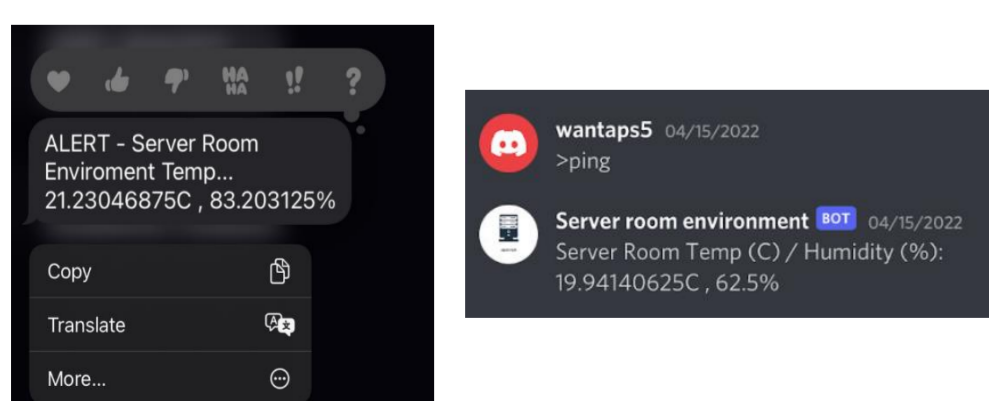
- The Ras-Pi was configured to allow headless access to the device. This will ease further integrations once in place as well as simplifying alert specification changes.
- Using the data collected by the temperature sensor a rolling ΔT was calculated, another environmental specification for servers.
- Discord server offers a powerful communication space in the event of a crisis, giving all IT staff access to the same data for coordination.

Results and Conclusion

Results

The completed project can now be left in place to reliably monitor and report on a range of the most critical environmental factors in the room.

This data can then be displayed and analysed by appropriate users at any time. Improving energy efficiency and allowing improved prediction of server health.



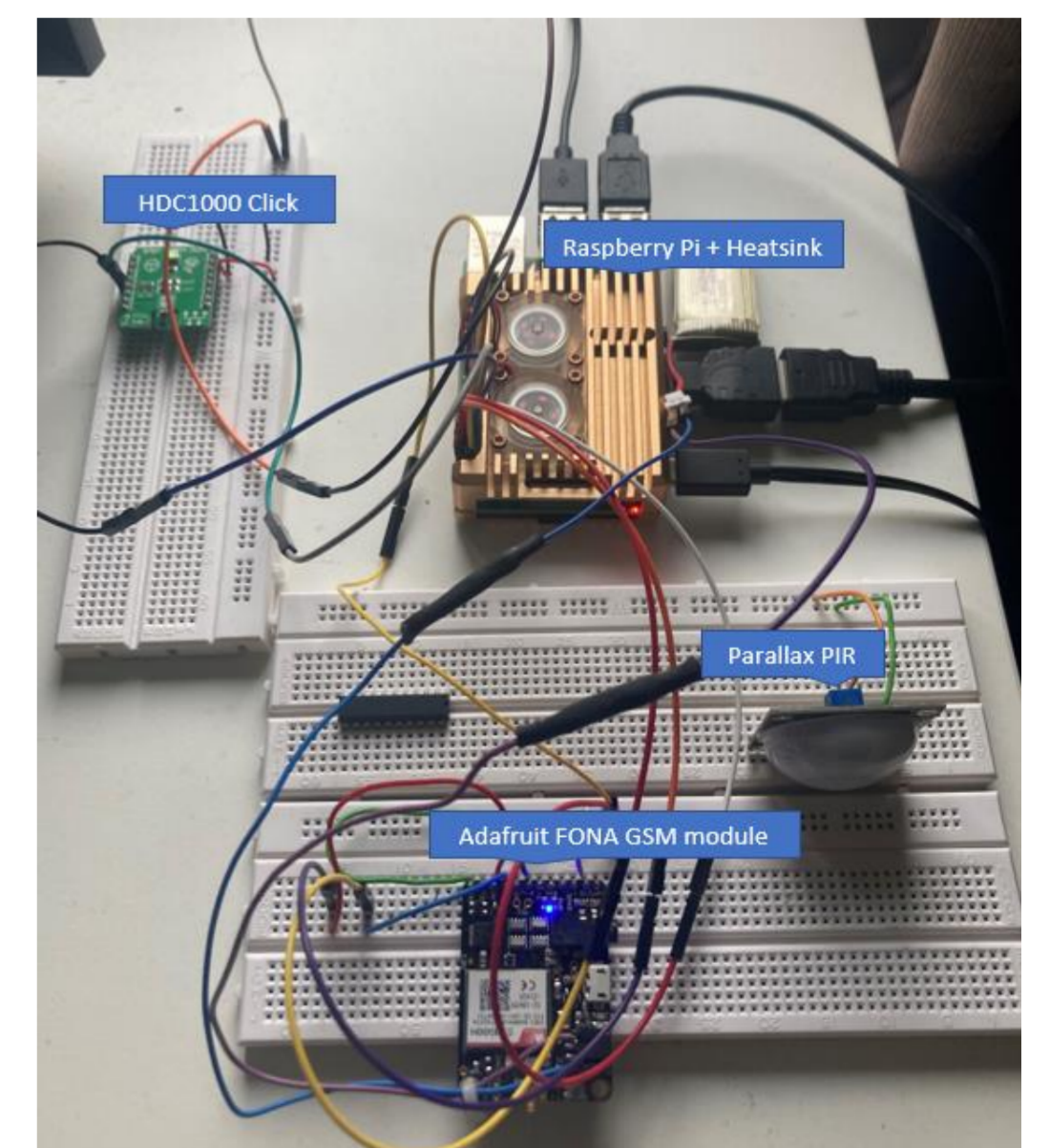
Future Work

- Smoke sensor to detect fire
- Twitter bot to periodically tweet data
- Query function for GSM module to request data values and system health.
- Redundant power supply for monitoring system.

Conclusion

All of the critical aims set out in the in the project brief were achieved, the prototype system could now be deployed in any server environment.

This project has provided a good groundwork to build on. With the functionality already provided a range of other features could be integrated into the system.



References

- [1] <https://www.intel.com/content/www/us/en/support.html>. [Accessed: 17- Feb- 2022],” [Online].
- [2] <https://support.initialstate.com/hc/en-us/categories/360000428291-Using-Initial-State>