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An Exploration of the Feasibility of Recording and Validating Classroom Attendance Using a Portable RFID/NFC Reader

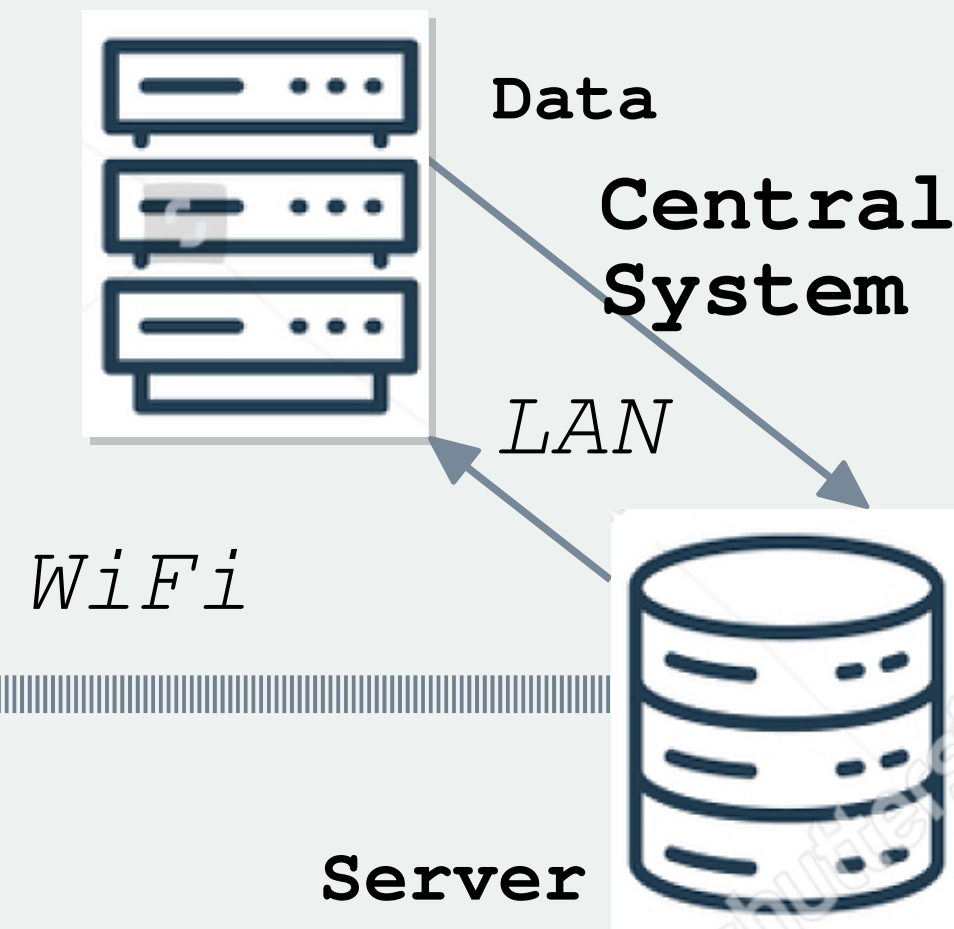
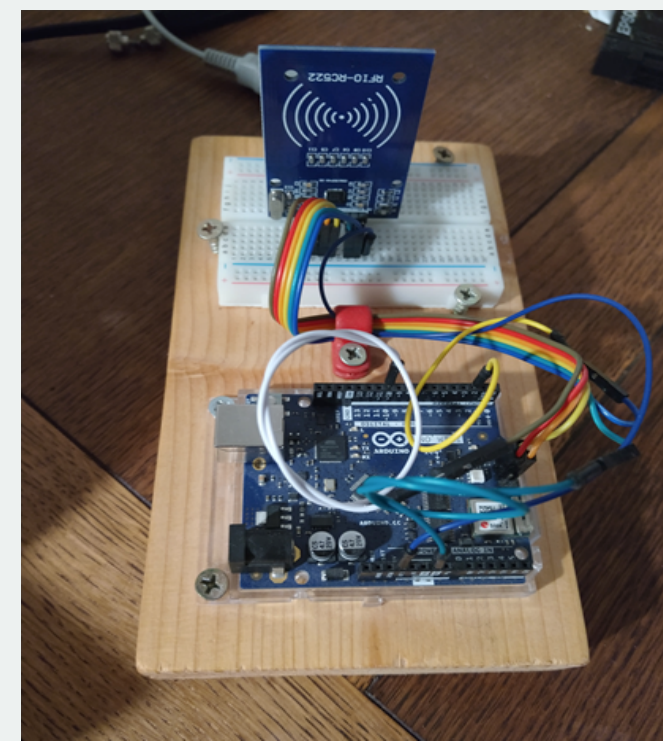
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Project Summary

This project investigated the question: Can taking classroom attendance be made quicker and easier through the use of a system incorporating:

- One or more portable RFID Readers
- A central server connecting with the institution's digital attendance record storage

Prototype Reader
Portable



Success Criteria		Hypothesis
1	Pass a message wirelessly from a portable reader to server	1
2	Pass a message wirelessly from a portable server to reader	1
3	Server retrieve a card ID from a portable reader	1
4	Server send confirmation to reader of successful read	1
5	Server record read info to text file	1
6	Server validate card id is in text file	1
7	Server notify reader that the card id is valid in text file	1
8	Server check card id is in a simplified database	1
9	Server notify reader that the card id is valid in database	1
10	System perform as per criteria 1-9 for two clients, functioning independently and concurrently; server handling with no apparent delay, data loss nor data corruption	2

Aims

To test two hypotheses:

1. Wireless and RFID/NFC technology can be deployed to automate the Validation and recording of attendance at a specified time and location.
2. Attendance can be validated and recorded using a portable RFID/NFC card reader in multiple locations concurrently and independently.

Objectives

Meeting the objectives set in the above Success criteria proves the hypotheses.

Methodology

A review of the relevant literature yielded similar projects for comparison to and improvement on the researchers initial concepts. It informed the architecture of the test system and the design of its software, as well as choice of technologies, both hardware and software. Feature Driven Development, adapted to solo working (success criteria as features), Kanban and Git for work-flow. Developed in C++ using JSON encoded RESTful HTTP requests/responses.

K. Finkenzeller, RFID handbook: fundamentals and applications in contactless smart cards, radio frequency identification and near-field communication. John Wiley & Sons, 2010.

Design

Client – A portable device built with a WiFi enabled development board - the Arduino WiFi Rev2, supporting an MFRC522 RFID tag reader module. A scanned card's ID is sent to the server via RESTful HTTP GET request.

Server – The card ID is validated against stored records. A valid student is marked attended and a response sent.

Implementation, Results & Conclusion

The implementation encountered problems unresolvable due to lack of time.

Consequently, there were too few results to prove the hypotheses correct.

This does not mean they are untrue, just that they're not yet shown to be.

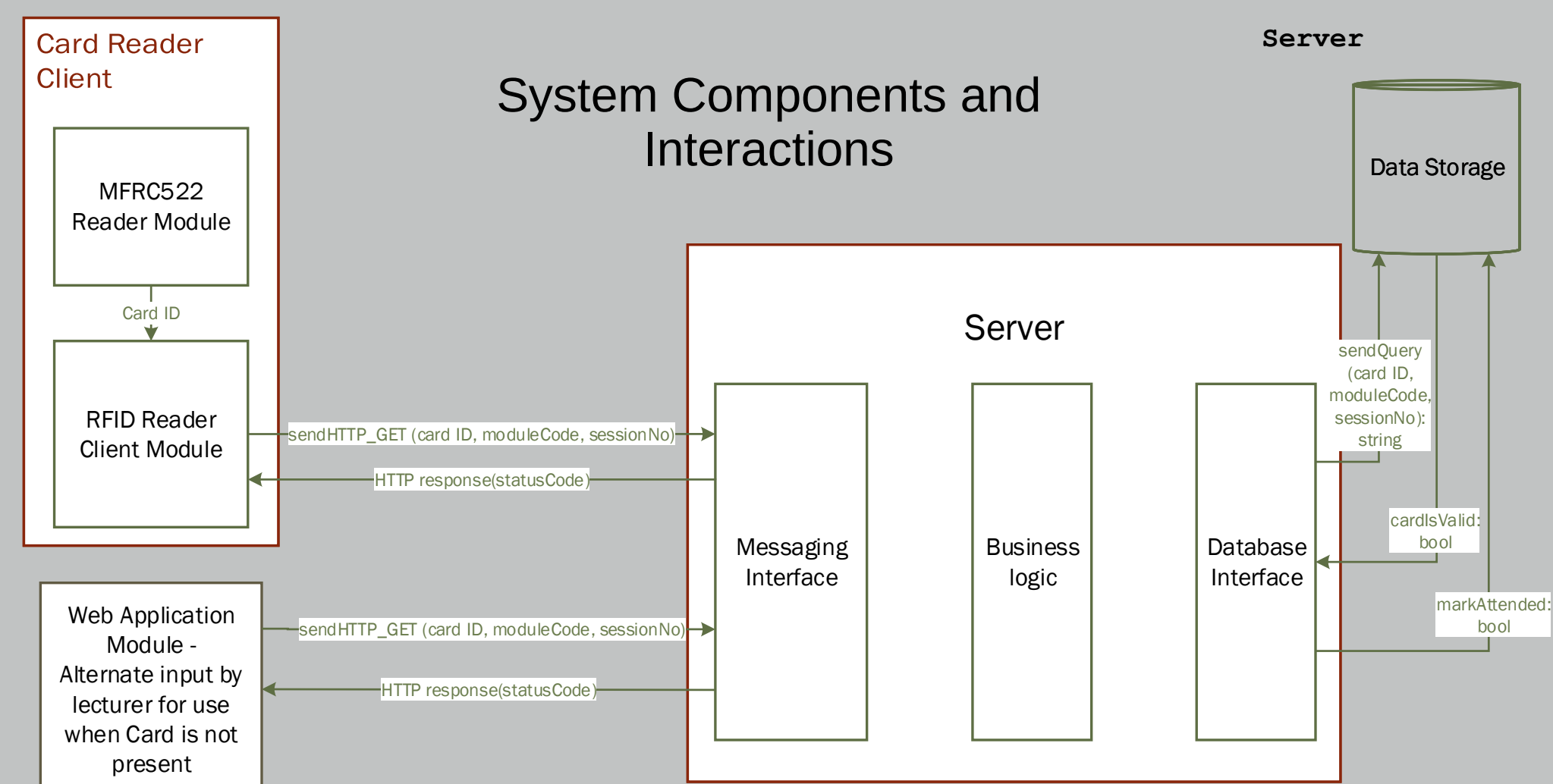
Future Work

Future work should focus first on completing the test system and properly testing the hypotheses. If they prove viable, Then the alternative client web app should be implemented. There is scope for implementing a more polished prototype which should have a battery powered client, with auditory success signals a display for messages and a case.

R. Fielding, 'Architectural styles and the design of network-based software architectures (doctoral thesis)', Irvine CA Dep. Comput. Sci. Univ. Calif. Irvine, 2000.

'Arduino Reference'. <https://www.arduino.cc/reference/en/language/functions/communication/serial/> (accessed Jul. 13, 2020).

System Components and Interactions



Sequence of System Execution

