

STRATH NAME

DOCTORAL THESIS

Thesis Title

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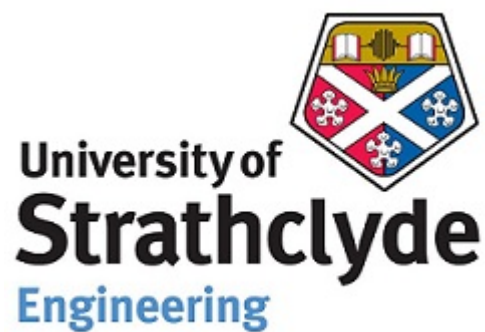
Greg

*A thesis submitted in fulfillment of the requirements
for the degree of Doctor of Philosophy*

in the

Research Group Name
Department or School Name

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Declaration of Authorship

I, John SMITH, declare that this thesis titled, “Thesis Title” and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
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- I have acknowledged all main sources of help.
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STRATH NAME

Abstract

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Doctor of Philosophy

Thesis Title

by John SMITH

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above the title too...

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Chapter 1

Introduction

The Internet of Things or IoT is the concept of a huge network of physical objects connected and communicating to themselves and to the world wide web. Devices can include domestic appliances, buildings, cars. As it becomes a rapidly growing concept with over 50 million devices expected to be connected to the web by 2020, (need ref) the security of the transmissions of these devices is becoming a more and more pressing issue. IoT's main benefits are the remote control of devices and appliances, for the device to have the ability to send information about it's state, such as a vending machine reporting that it has run out of a certain item, and to allow the machines to be more automated and to work with other machines, like a home hub device that can turn on the lights and central heating when an occupant is arriving home, with the lights and heating not being connected to each other but to the central hub.

However IoT will be ultimately be useless if it is unsecure. IoT is an emerging field but there have already been some high profile security disasters. Ranging from relatively less serious problems such as some "hackers" been able to glean important wifi information from your internet connected lights[1] to very concerning, potentially fatal security breaches like someone gaining unauthorised access to your car and assuming control. There have been three examples of this with a Jeep Cherokee, Toyota Prius and Tesla. The hackers were able to control the accelerator, door locks and brakes, among other things. This highlights a very real problem that will only become more important. Too often security is an afterthought but it really needs to be built into products from the offset.

Within the last three years there have been three high profile security breaches on commercial cars, one on a Cherokee Jeep **jeephack** a Toyota Prius **priushack** and a tesla **teslahack**

With that in mind the subject of this report is the secure transmission of a users private home temperature data. If they have a system that monitors the temperature of all the rooms, that data can be used to figure out when they are likely to be home or not. So, using an Arduino Due as the base station that talks to the temperature sensors throughout the house, it takes the sensor data signs then encrypts it and sends it using an Ethernet Shield to a remote server.

Chapter 2

Background

This chapter will briefly explain the cryptologys used to make the application secure and what kind of attacks this can protect against.

2.1 Public Key

2.2 Signature

2.3 Authenticated Encryption

Chapter 3

Design

3.1 IoT Platform

The basic concept of this platform is an Arduino Due that takes the current temperature of the room from a DS1820 temperature sensor. Then that data is signed and encrypted with TweetNaCL before being transmitted, using an Ethernet Shield, across to an SQL server. A web application takes the SQL data decrypts, checks the signature is valid then displays on a website.

graphic here pls

Why was the Due chosen, 32 bit?

DS1820 is a low cost temperature sensor that is very accurate, 12 bits of precision? and is also low power. It can scavenge power from the data with the arduino and thus does not need its own power source.

For testing purposes the Ethernet Shield was used as it is much cheaper than a WiFi shield but ultimately completes the same job. The shield is a simple way to connect arduinos to the internet. The shield used was the second revision, R2 and has a W500 ethernet controller.

What are some of the options for the base station, Due/MSP430? And for the internet connection Ethernet?WiFi shield?

3.2 Server Side

PHP, Java? Externally hosted?

3.3 NaCl

Chapter 4

Strength Of Security

4.1 SubSection

4.2 Other SubSection

Chapter 5

Results

5.1 Power Consumption!

5.2 Other SubSection

Chapter 6

Critical Evaluation

6.1 SubSection

6.2 Other SubSection

Chapter 7

Conclusion

7.1 SubSection

7.2 Other SubSection

Appendix A

Appendix Title Here

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Bibliography

- [1] Leslie Lamport, *LaTeX: a document preparation system*, Addison Wesley, Massachusetts, 2nd edition, 1994.