



NTNU – Trondheim
Norwegian University of
Science and Technology

iPhone Application for Controlling Wireless Access Point

Xiao Chen

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Responsible professor: Bjørn J. Villa, ITEM
Supervisor: Poul E Heegaard, ITEM

Norwegian University of Science and Technology
Department of Telematics

Abstract

Since internet has become essential part of people daily life, the requirements for accessing internet in both public and residential area are growing magnificently. Then the new issue about how to share and manager the internet environment in both public and residential area become important to the users. This project will implement a prototype iPhone Operation System (IOS) application as service manager client to work with improved existing Wifi hot-spot system which is provided by Raspberry Pi (RPI) and remote central management server.

The main idea about this project is to make a system which can provide internet access allocation and internet filtering controls in wireless network. This project is based on previous student master project, that means this project will use same device and resources which used in that master project. To set up existing access control system made by previous master project, most of the references are taken from the master report[Coo13b] written by Torgeir Pedersen Cook.

This report will include the improved internet access control system and IOS administrator application. The improved access control system now will have the function to block the access request device to connect into wireless network for blocking client user purpose. Moreover, the central management server will have better security login mechanism and sending E-mail notification mechanism. The application contains basic administrate access control function like approve access request and block access request from the client user. And also it will have real-time updating access request list and some security communication mechanism.

This prototype has been tested on test RPI device and test wireless network environment.

This report will also discuss the usability of this prototype in the commercial market and better improvement on the basic working mechanism of the access control system.

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Contents

List of Figures	vii
List of Tables	ix
List of Algorithms	xi
1 Introduction	1
1.1 Motivation	1
1.2 Related Work	1
1.3 Scope	3
1.4 Report Structure	4
2 Raspberry Pi Setting	5
3 Central Management Server Improvement	7
4 Mobile Application Development	9
5 System Testing	11
6 Future Work	13
References	15

List of Figures

1.1	Kickstarter Project: Meet Circle	2
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List of Tables

List of Algorithms

Chapter 1

Introduction

1.1 Motivation

Based on existing access control system, it is quite promising idea about making normal user have control of the residential area internet access control by using smart filtering, informing and time management. Since the smart phone with the mobile internet access functionality released, more and more sociology research, for instance the paper form Jim McGuigan[McG05], show that there are many weakness of over using mobile phone and internet. The idea of this project is to meet the need of the people who would like to control the daily use of the internet and manager other people access right to some specific wireless network.

Nowadays people are using smart phone to do as much task as they can, because smart phone is easy to carry with and smart phone is the only necessary access people need to have the tons of internet information. Then the requirement of using smart phone to control the existing daily life system such as wireless router, switch and other electronic devices are growing rapidly. This prototype project is to fill the missing part of the previous project to connect the access control system to IOS devices. There are static article[Pro13a] shows that Android has 81.0 percent smartphone share in the third quarter of 2013 and IOS has 12.9 percent, these two mobile operating system shared most mobile operating system in the world. This project will focus on the IOS application to work with the improved access control system. It will make the whole system become more user friendly for normal user to choose different mobile operating system to administrate the system.

1.2 Related Work

There are many security software can do internet control in the market. Such as Norton Family application[Fam13], K9 web Protection[Pro13b], OpenDNS[Sol13] and etc. Most of them can provide block web sites, time restrictions, easy log reports of internet activity and etc. But these kind of software need to install in every access



Figure 1.1: Kickstarter Project: Meet Circle

device in the network. And also it could be uninstalled and broken by accident. They are more like voluntarily joining the internet control policy, which is used greatly on parent and children case but no more other normal cases.

There is a kickstarter[Cir13a] project which has the similar idea as this prototype project. The product name is 'Circle'[Cir13b]. Circle is a device1.1, managed by an IOS app, that enables user to choose how you and your family spend time online by using advanced filtering, time management systems and informing to answer the where, why, and how of your network's internet activity. Although it is just a start-up project, its concept and prototype device are quite promising in the promote video on the kickstarter. The main and unique functionalities Circle has are time management capabilities, device and application notifications, safe, pause and bedtime modes and cost effective for the system.

The prototype of this report is using RPI as the same function as Circle's wireless router. And this prototype system has server side back-end to store client and administrator user database. There are android and IOS applications both work with the internet control system in this project.

At application side, the prototype application of this report will have the same administrator function to approve and block the client internet access request through http request.

For the notification function of the system, the project of this report has the similar idea with another kickstarter project 'NINJA SPHERE'[oYE13]. The idea of NINJA SPHERE is to make the next generation control of your environment with accurate in-home location data and a gesture control interface. Although the project of this report will not cover the advanced way to control the environment of the residential area only the internet access control of the residential area, the idea is

still the same to use mobile application to communicate with the other device and even get notification from other device in the same wireless network area.

The notification of the client request in this project will be sent as notification E-mail. It makes the administrator get updated request information from the internet access control system.

1.3 Scope

The first part of this project will be using the RPI device and the code script from previous student master project report[Coo13b] and previous student Github repository[Coo13a] to set up the internet access control system working. Because the RPI device and Secure Digital (SD) card got from the previous student are without any code and configuration, they should be configured with the reference of previous student master project report.

The second part of this project will be setting up the central management server on the test domain 'apc.item.ntnu.no'(129.241.200.170) from Telematics (ITEM) department of Norwegian University of Science and Technology (NTNU). The work of this report will cover some security concern improvement and some new notification mechanism implement on the remote central management server. And the database structure of the system stored on the remote server would be changed according to the new functionality of the improved internet access control system.

The third part of this project will be implementation of the IOS application intended for end-user to manage and control clients' internet access. The application would be implemented under the IOS 7 Software Development Kit (SDK) and Xcode[Xco13] 5.0 Integrated Development Environment (IDE) on the Macintosh Operating System (MAC OS) 10.8.5 working environment. Since there will be some changes for the central management server, then the android application need to be modified to work with the new back-end server. The changes will be made under Android Development Tools (ADT)[Plu13] 22.3.0 IDE. These two platform application will be tested against central management server and RPI device to make sure all the basic administrator function working well.

The fourth part of this project will be research about how to make the current internet control system more safe and how to implement more advanced internet control function in the current internet control system. The research would be based on articles and some demo testing script using in the current working internet control system.

1.4 Report Structure

In the RPI Setting chapter the main content about the progress to set up RPI internet access control will be presented. Some related modification for previous master project would be mentioned in the chapter. And some background research would be including in this chapter to analyze the performance of the current internet access control system

In the Central Management Server Improvement chapter would have some detail improved code snippet to be discussed why the previous prototype project need to be improved in this way. And it will show database structure changes on the back-end server as well.

In the Mobile Application Development chapter, it will present the basic working process of the application development for this prototype project and some test case to work with the other system components in this internet access control system. The main content of this chapter would be about IOS application development, but also it will have some modification explanation for android application.

In the System Testing chapter, it will show the feedback and analysis from the testing of the prototype project. The analysis will have some future improvement suggestion for later work since there are not enough time to implement the solution to some testing cases.

In the Future Work chapter, it will present some better solution for current project to do the internet access control which can not be implement within such short period of this project working time. And there will some exploring point for the project based on the research of the technical articles.

Chapter 2

Raspberry Pi Setting

Chapter 3

Central Management Server Improvement

Chapter 4

Mobile Application Development

Chapter 5

System Testing

Chapter 6

Future Work

References

- [Cir13a] Kickstarter-Meet Circle. <http://www.kickstarter.com/projects/304157069/meet-circle>, 2013.
- [Cir13b] Meet Circle. <http://meetcircle.co/>, 2013.
- [Coo13a] Github-Torgeir Pedersen Cook. <https://github.com/torgeircook>, 2013.
- [Coo13b] Torgeir Pedersen Cook. Internet control for residential users. diploma thesis, Norwegian University of Science and Technology, September 2013.
- [Fam13] Norton Family. <https://onlinefamily.norton.com/familysafety/loginstart.fs>, 2013.
- [McG05] Jim McGuigan. Towards a sociology of the mobile phone. *Human Technology*, 1(1):45–57, 2005.
- [oYE13] NINJA SPHERE: Next Generation Control of Your Environment. <http://www.kickstarter.com/projects/ninja/ninja-sphere-next-generation-control-of-your-envir?ref=users>, 2013.
- [Plu13] ADT Plugin. <http://developer.android.com/tools/sdk/eclipse-adt.html>, 2013.
- [Pro13a] Emil Protalinski. Idc: Android hit 81.0% smartphone share in q3 2013, ios fell to 12.9%, windows phone took 3.6%, blackberry at 1.7%, 2013.
- [Pro13b] K9 Web Protection. <http://www1.k9webprotection.com/>, 2013.
- [Sol13] OpenDNS Parental Control Solutions. <http://www.opendns.com/home-solutions/parental-controls/>, 2013.
- [Xco13] Xcode. <https://developer.apple.com/technologies/tools/>, 2013.