Functional Specification

Project Title: Squid proxy and Android app for safe browsing

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1. Introduction

1.1 Overview

Our project will allow users to control all devices' internet access on their network, especially parents who are looking for a way to monitor their young kids' internet activity as the internet is not a safe place for young children who have unsupervised access. The idea came from our own personal experience from growing up on the internet and also statistics from reports we read. In particular one report [2] which said 8,032 nine year olds in Ireland were interviewed and it was found nearly all had access to the internet and 53% of them had unrestricted and unsupervised access. It would allow users to sign in to an android application and filter out websites that they would not like visited on their network through the use of a squid proxy [4] on a raspberry pi, which will contain a file of all sites that the user would like to have blocked and will be updated via jsch [1] which will allow us to connect to a sshd server on the pi and use port forwarding to connect to the pi outside of its local network. We will also offer users the ability to set usage limits on certain devices' access to the internet and a reward system to grant additional time on the internet as well as being able to view all devices connected to the proxy all on an easy to use ui.

1.2 Business Context

This product is possible to be made available on the android marketplace and offered as a one time purchase or a monthly subscription however the only issue we would run across is supplying the raspberry pi to the user. We would have to find whether or not user’s would be able to receive a raspberry pi that has the necessary files for the project to work and if with instructions they would be able to set it up. This may prove difficult as we would need a large supply of raspberry pis and as our target market is parents the set up of the pis would have to be simple enough so that a not so tech savvy parent would be able to do it.

1.3 Glossary

2. General Description

2.1 Product / System Functions

Our system is a proxy that will allow users to block certain websites from their network and also set usage limits to certain devices connected on the network. Our project will use a raspberry pi to host the proxy and hold files on blocked websites and information on users. The app will be an android application written in java that will allow the user to update the blocked websites file on the pi and also set usage limits to devices connected to the proxy. The admin which will ideally be a parent will have a username and password stored in a local database on the pi and the app itself and encrypted in java [3]. Users will connect to the pi using java jsch which will connect them to a sshd server on the pi. Port forwarding will also be used to allow users to connect to the pi from outside the network

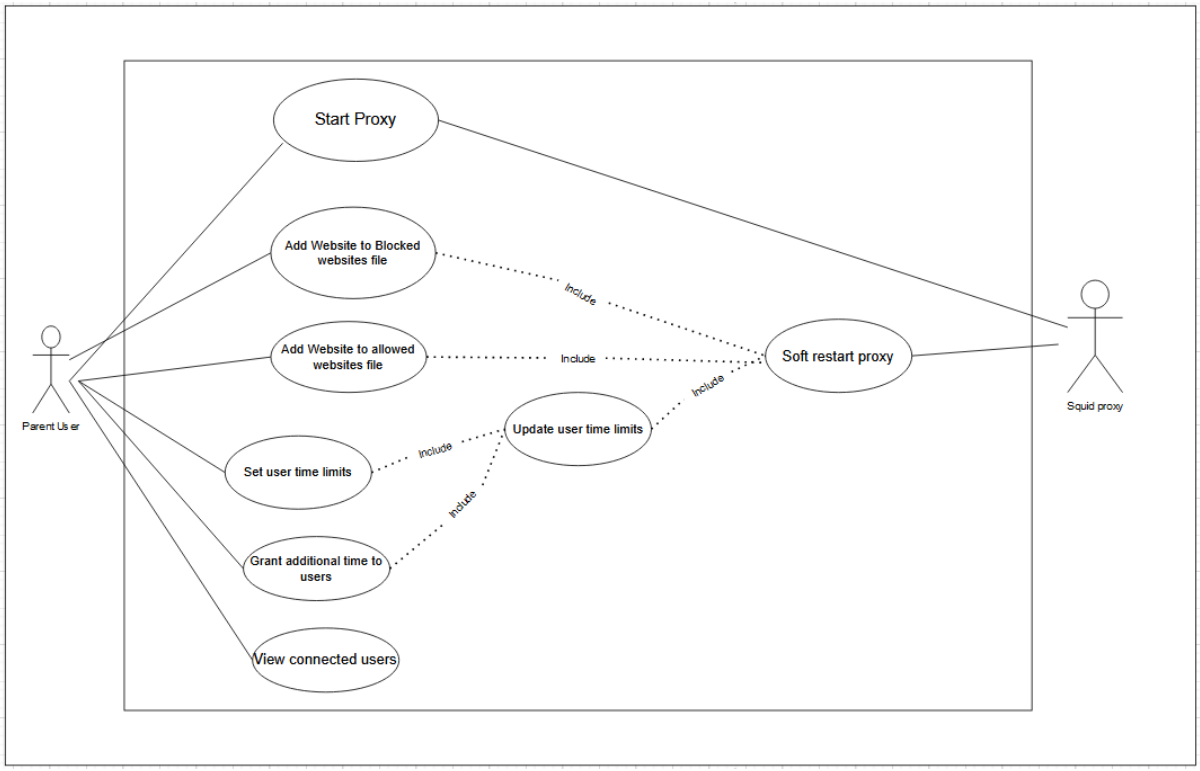
2.2 User Characteristics and Objectives

Users for our project would ideally be parents who are concerned about their children's internet usage. The internet has become an increasingly scary place with the massive world wide usage and many parents have little to no knowledge of what their children get up to when they are online. The app would have to have an interface that is tailored to parents who may not use a lot of technology. This would involve simple menus with clear headings and large easy to read fonts with appropriate spacing.

2.3 Operational Scenarios

The use case diagram below shows the requirements of the systems between the parent user who will have control over the proxy and what it allows and the squid proxy itself. First the parent will have to start the proxy which will be a hard boot and will take a few seconds before the proxy is up and running. Next the parent can add a website to the blocked websites list which means any device that is connected to the proxy will no longer have access to this website. A soft restart will follow which is quick and will update the blocked websites file on the proxy. Adding a website to the allowed websites file will work the same way as the blocked websites file as users will be able to select to use the proxy banning blacklisted websites or allowing only whitelisted files. The next function is to set user time limits, this is a specific amount of time that a device will be allowed access to the internet. This will then update a user's time limit and follow by a soft reset. A reward system is an additional feature that will allow users to add additional time to a device and again after the users time limits have been updated a soft restart is needed. Finally the parent user will have the ability to view all devices connected to the proxy.

Use Case diagram:



2.4 Constraints

UI Constraints

As this product is targeted towards parents the user interface has to be clear and easy to read. We have to assume that not all potential users are tech savvy

Time Constraints

There are a lot of new technologies and systems that we are not familiar with and it is important that we set enough time to learn what we need to use.

3. Functional Requirements

Requirement	Start the Server on the Pi
Description	We need to start the Squid server on the raspberry pi so we can use the proxy.
Criticality	This is a critical requirement because without it we cannot use the proxy.
Technical Issues	

Dependencies	None

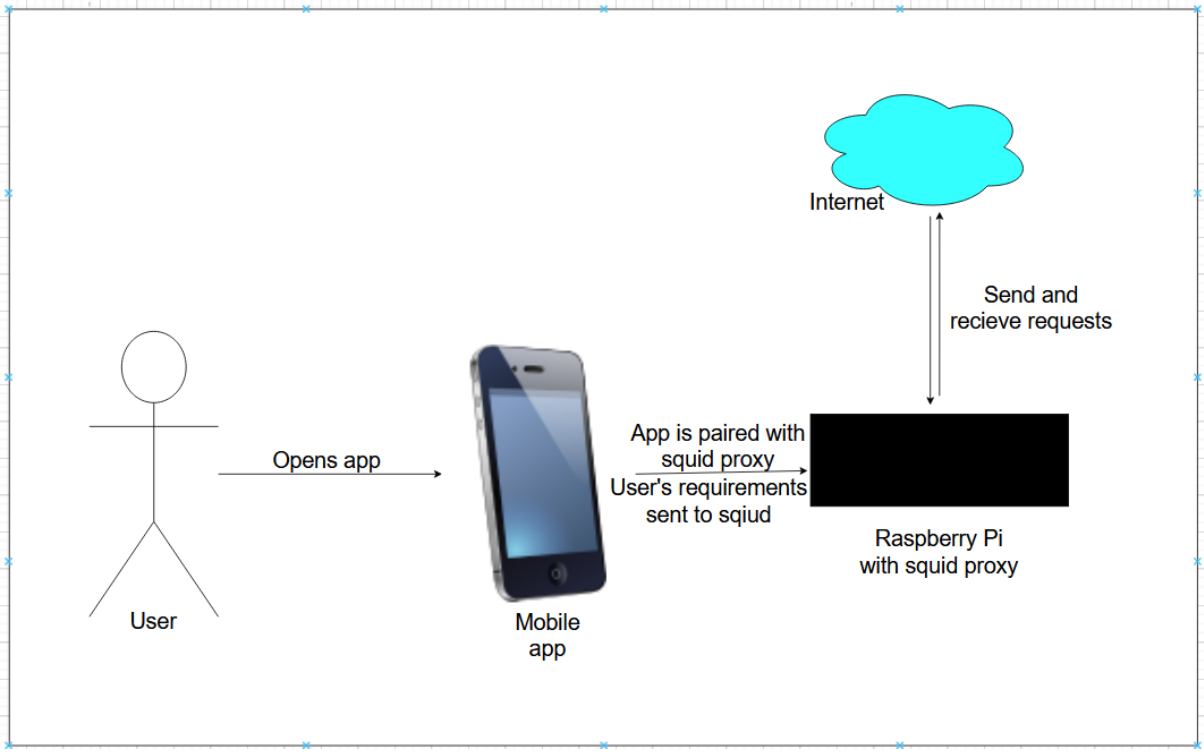
Requirement	View Devices Connected
Description	The devices that are connected to the proxy will be able to be seen on the app.
Criticality	This is critical to being able to set up profiles with different restrictions.
Technical Issues	Creating profiles for different devices with names and passwords.
Dependencies	The server must be running

Requirement	Block website
Description	This is the ability to add a website to the list of restricted websites so that it gets blocked.
Criticality	This is the main function of our program as such it is essential to the functionality.
Technical Issues	Must ensure it restricts access on all types of browsers.
Dependencies	The server must be running and must be able to view devices connected so changes can be made for that user.

Requirement	Set Time Limit
Description	Setting a time limit for how long a user is allowed access to the internet.
Criticality	This is less critical to the functionality as it is just an additional feature.
Technical Issues	The server will need to do a soft reset when the time limit is changed.
Dependencies	The server must be running.

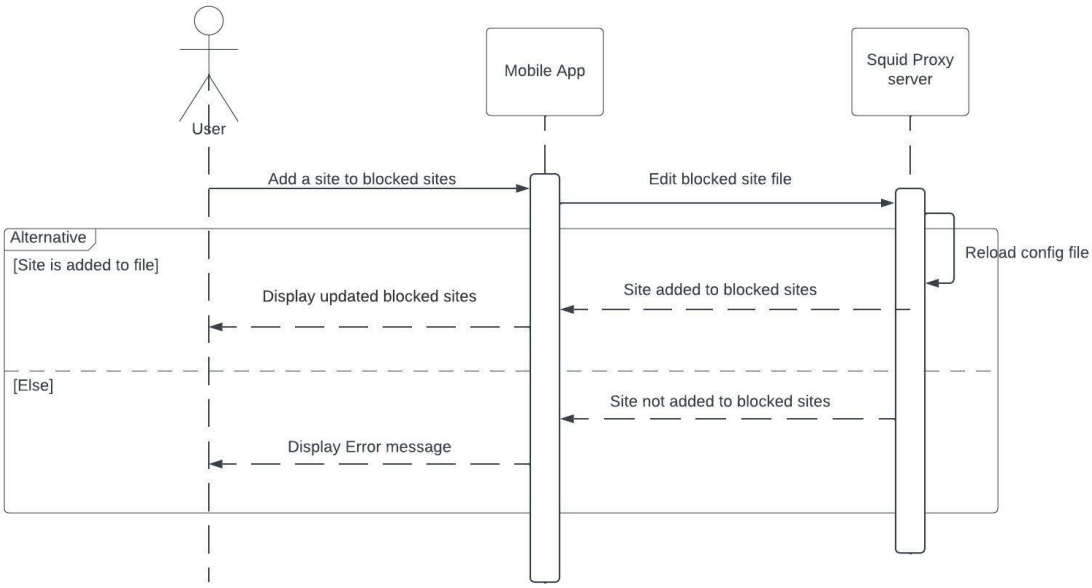
4. System Architecture

The system architecture can be seen below and has three main components, the user, the mobile application and the raspberry pi. The user will open the app which is already paired to the ip on the squid proxy. Any settings selected by the user on the mobile application will be sent to the raspberry pi which will update the files on the squid proxy. After all updates the raspberry pi will then soft restart itself to reconfigure to these settings. Any requests sent and data received from the internet will go through the squid proxy and ensure it conforms to the configuration settings.



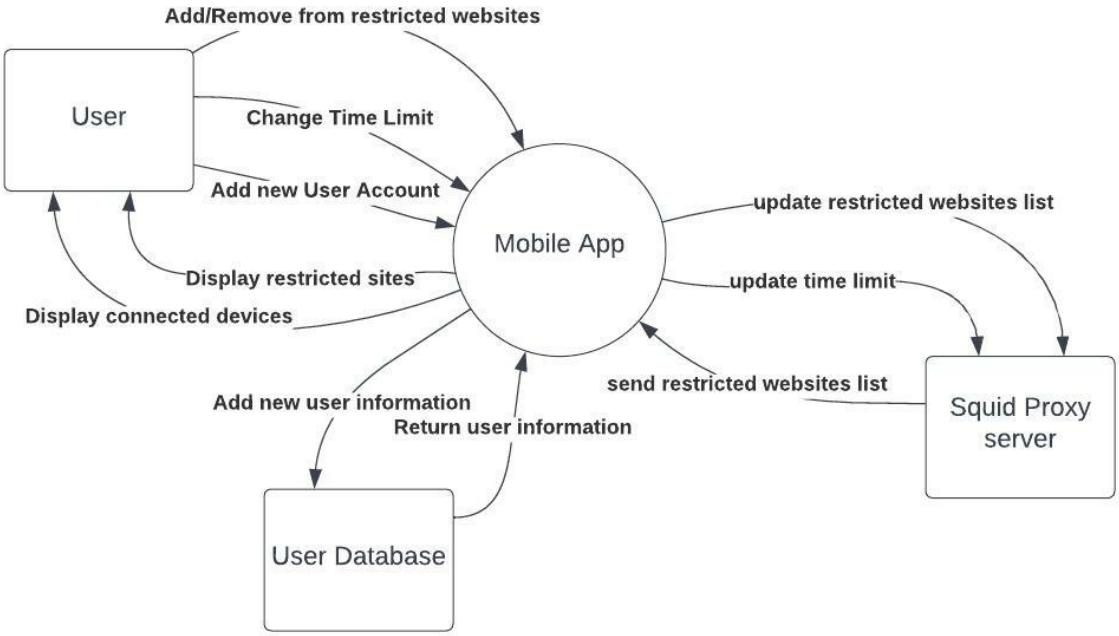
5. High-Level Design

Sequence Diagram



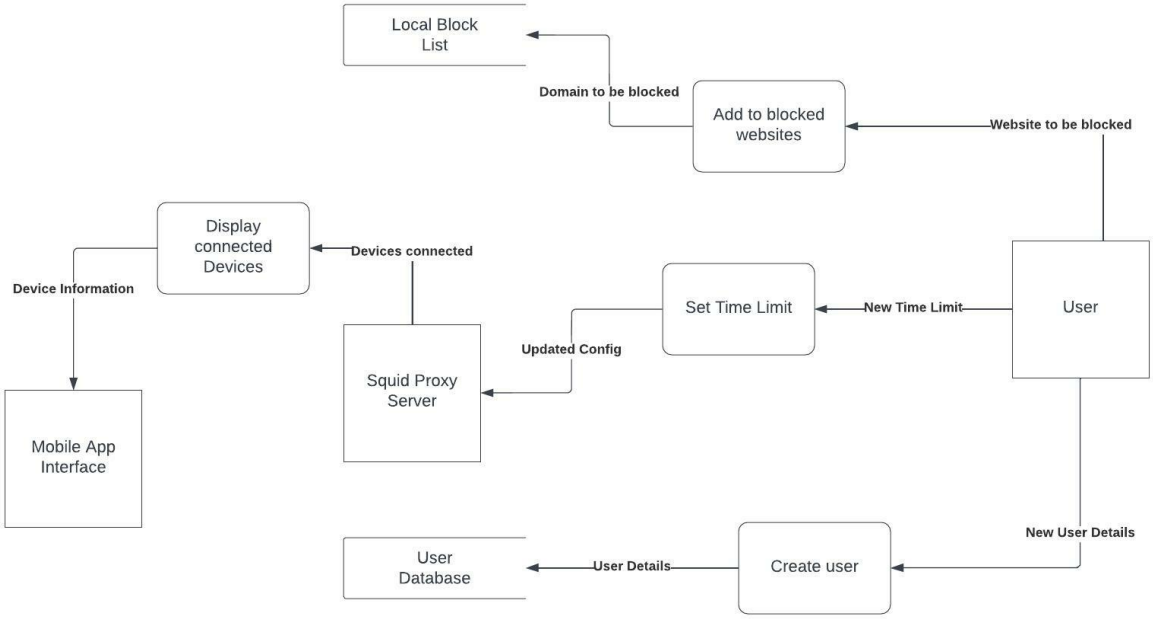
The above sequence diagram shows the sequence for adding a new blocked site using the app. The user types the url of the website they want to block on the app and the app sends this data to the squid proxy server where it gets added to the blocked sites file and then the config file is reloaded. This then updates the blocked sites on the app ui to show all the currency blocked sites.

Context Diagram



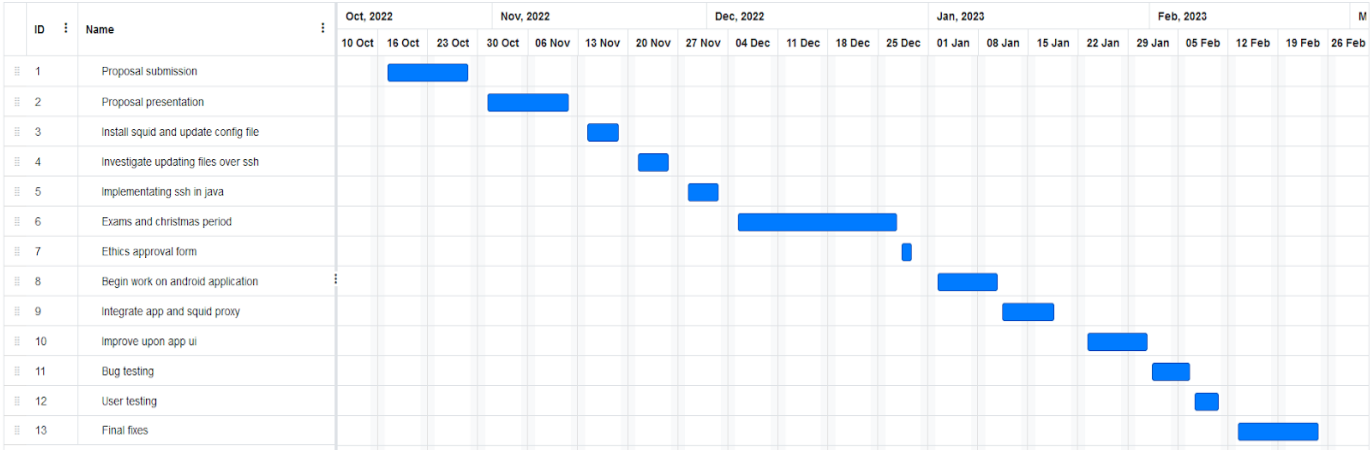
The context diagram shows the elements in the system and how they interact with each other. In our system the user our mobile app is controlled by the user who adds to or removes from restricted websites and changes time limits using the app which sends the changes to the squid proxy server. The app provides the user with information about what sites are restricted and what devices are connected from the squid proxy server.

Data Flow Diagram



This Data flow diagram provides a graphical representation of the flow of Data through our system.

6. Preliminary Schedule



Gaant chart showing our predicted time of delivery for every step

7. Appendices

[1] JSch which will be used for connecting to the ssh server on the pi - “JSch - Java Secure Channel.” *JCraft, Inc.*, http://www.jcraft.com/jsch/. Accessed December 2022.

[2] “Perception of income inequality among children.” *Growing Up in Ireland*, 16 June 2021, https://www.growingup.ie/pubs/Launch_Lives-of-9YOs.pdf Accessed November 2022.

[3] Encrypting in java -

“Java-Cryptography-Decrypting-Data.”*Tutorialspoint*, https://www.tutorialspoint.com/java_cryptography/java_cryptography_decrypting_data.htm. Accessed November 2022.

[4] What is squid - *squid : Optimising Web Delivery*, http://www.squid-cache.org/. Accessed November 2022.