

SMART REMOTE PARENTAL CONTROL



By

Usama Razzaq

01-132162-046

Muhammad Hussain Bangash

01-132162-040

Supervised by

Dr. Khalid Javed

**Department of Computer Engineering
Bahria University Islamabad.**

2020

SMART REMOTE PARENTAL CONTROL

By

Usama Razzaq

01-132162-046

Muhammad Hussain Bangash

01-132162-040



Supervised by

Dr. Khalid Javed

Submitted to the department of computer engineering in the
partial fulfillment of the requirements for the degree of
Bachelors in Computer Engineering.

**Department of Computer Engineering
Bahria University Islamabad.**

2020

CERTIFICATE



Bahria University Islamabad
Department of Computer Engineering

Dated: **15-07-2020**

CERTIFICATE

We accept the work contained in the report titled “**Smart Remote Parental Control**” as a confirmation to the required standard for the partial fulfillment the degree of Bachelor of Computer Engineering.

A handwritten signature in blue ink, appearing to read "Waleed Manzoor".

Mr. Waleed Manzoor
Project Coordinator
Date: **15-07-2020**

A handwritten signature in blue ink, appearing to read "Khalid Javed".

Dr. Khalid Javed
Supervisor

Date: **15-07-2020**

A handwritten signature in blue ink, appearing to read "Khalid Javed".

Dr. Khalid Javed
Internal Examiner

Date: **15-07-2020**

A handwritten signature in blue ink, appearing to read "Mir Yasir Umair".

Dr. Mir Yasir Umair
External Examiner

Date: **15-07-2020**

A handwritten signature in blue ink, appearing to read "Khalid Javed".

Head of Department (CE)

Date: **15-07-2020**

UNDERTAKING

We certify that research work titled “*Smart Remote Parental Control*” is our own work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged / referred.

Usama Razzaq (47168)

Muhammad Hussain Bangash (47162)

DEDICATION

We dedicate this project to Allah Almighty, we dedicate to our supervisor Dr Khalid Javed, who encourage us to choose this project and help us throughout the whole project and dissertation. We also dedicate this work to our parents, brothers they have encouraged us all the way.

Last but not the least, we dedicate this thesis to our friends who support us and delighted us when we exhausted and tired of the work which helps us to stay motivated.

ACKNOWLEDGEMENTS

First, we would like to thank Allah Almighty then we would like to express our sincere thanks to our supervisor Dr. Khalid Javed. His idea for project, contribution and guidance led us to show our effort. It was used to make the job as original as possible. Thanks to him, our research and knowledge in this area have expanded. His guidance helped us in thesis and throughout the whole project. We could not have imagined such a good mentor who beside the project, encourages us to avail the better opportunities. We would like to thank all fellows who continuously encourages us all the time. Last but not the least, we are also thankful and grateful to our families who support us through every thick and thin problems. Our sincere gratitude to all.

ABSTRACT

The internet has changed the world of communication and information sharing, so control over such technology should be absolute. The management of traffic on routers and to keep record of history of surfing the Internet has become difficult over the years especially with Wi-Fi is giving near to no control over its usage. To be able to know what is happening in the life of one's child, parents need something to look after them. The Internet is a place where anyone can access every information they want, it can lead to suicide, an interest in violent activities etc. Internet has a lot of influence on today's generation, it can mold a young mind to be a good or bad influence on the society. To prevent such situations the internet activities should be monitored and analyzed. Our project will provide parents with a system which contains an embedded system connected to the router and an application through which parents can monitor their child surfing over internet to identify their psychological state. They can restrict their child from specific websites and can give the limited time internet access.

Keywords:

Internet Traffic Monitoring, Wi-Fi Controlling Apps, Networking, Parental Control

TABLE OF CONTENTS

CERTIFICATE	iii
UNDERTAKING	iv
DEDICATION	v
ACKNOWLEDGEMENTS	vi
ABSTRACT	vii
LIST OF FIGURES	x
CHAPTER 1 INTRODUCTION	1
1.1 Parental control	2
1.2 Internet Monitoring.....	2
1.3 Problem Statement	3
1.4 Objectives:	3
CHAPTER 2 LITERATURE REVIEW	5
2.1 SSL and TLS.....	5
2.2 URL Filtering.....	5
2.3 Database.....	5
2.4 Related Work	6
2.5 Proposed Solution	7
CHAPTER 3 DESIGN & METHODOLOGY	8
3.1 System Proposed:.....	8
3.2 Existing System:	8
3.3 Specifications:.....	8
3.4 Methodology	9
3.5 Implementation on Raspberry Pi 3:	10
3.6 Specifications of Raspberry pi:	11
3.7 Setting up Raspberry Pi 3	12
3.8 Raspberry Pi 3 as a Router.....	12
3.9 Speed of Router.....	13
3.10 IP Addresses and Mac Address of Connected Devices	13
3.11 Wireshark:.....	14
3.12 Monitoring Internet Traffic on Router	15
3.12.1 HTTP Protocol Packets:.....	16
3.12.2 Individual User Destination Ip:.....	17
3.13 Firebase Database:	18
3.14 Customized Android Application Implementation:	19
3.14.1 Mobile Application:	19

3.14.2	Graphical User Interface (GUI):	19
3.15	System functionality:	25
3.15.1	Hardware setup:	26
3.15.2	Application Installation:.....	27
3.15.3	Hardware and Application Integration:.....	27
3.15.4	Getting Raw Data:.....	27
3.15.5	Process Data:.....	28
3.15.6	Show Result:	28
CHAPTER 4 RESULT & DISCUSSION		29
4.1	Database Tables	29
4.1.1	History Table	29
4.1.2	Login Table	29
4.1.3	Connected Devices Table.....	30
4.2	App Results.....	30
4.2.1	Connected Devices on App:.....	31
4.2.2	History of Device:.....	31
4.2.3	Restrict Websites and Time Usage:	32
CHAPTER 5 CONCLUSION.....		34
CHAPTER 6 FUTURE WORK		35
REFERENCES.....		36

LIST OF FIGURES

<i>Figure Number</i>	<i>Page</i>
Figure 3-1 Design	10
Figure 3-2 Raspberry pi 3 [11].....	11
Figure 3-3 Raspberry Pi Setup.....	12
Figure 3-4 Raspberry Pi 3 Routers Signals.....	13
Figure 3-5 Speed Test.....	13
Figure 3-6 Ip and Mac Addresses of connected Devices.....	14
Figure 3-7 Wireshark packet information [14]	15
Figure 3-8 Internet Traffic on Router	16
Figure 3-9 HTTP Protocol Data.....	17
Figure 3-10 Individual User Destination Ip	18
Figure 3-11 Splash Screen	20
Figure 3-12 Login Screen	21
Figure 3-13 Signup Screen.....	22
Figure 3-14 Home Screen	23
Figure 3-15 Connected Users Screen.....	24
Figure 3-16 View History Screen	25
Figure 3-17 System overview	26
Figure 3-18 Hardware Setup.....	27
Figure 3-19 Application Installation.....	27
Figure 3-20 Hardware and software connection.....	27
Figure 3-21 Get raw data	28
Figure 3-22 Process data.....	28
Figure 3-23 Results	28
Figure 4-1 History Table.....	29
Figure 4-2 Login Table	30
Figure 4-3 Connected Devices Table.....	30
Figure 4-4 History on App.....	32
Figure 4-5 Template Validation Period	32
Figure 4-6 Restrict Time and Block Websites	33
Figure 4-7 Templates applied on Devices	33

CHAPTER 1

1

INTRODUCTION

Since the earliest ages of communication research, the aspect of reducing negative media effects on children have been always the first priority of a parent. Researchers started using the term parental mediation as to refer to parent's active role in guiding and managing the children's experiences with the media. Now with the introduction of the World Wide Web the world's information has shrunk down to a 5 inches device that can provide any necessary or unnecessary information to anyone who has access to a stable internet connection and a smart phone. The invention of mobile devices like cell phones, laptops, tablets etc. has led to internet not being a thing that was only available to certain people it has become more of a necessity then a privilege. Now the internet is flooded with pages and content that is not in the best interest to the minds of children as they do not know the difference between right and wrong. A child mind is a fragile thing it can be influenced very easily, and it leads to depression and anxiety that is caused by overuse of internet and not paying attention to what is happening around you [5]. Young people are the ultimate victims as they are born into a culture where everything is directly or indirectly connected to the internet some way or the other. You want to go shopping go to amazon, Ali Baba or daraz or other online shopping platforms. You want friends make them online, the introduction of Facebook and other social media platforms like Instagram and snapchat, these platforms provide connections that are far away but because of this the young generation has forgotten or they don't even know how to bond with people through having a conversation, the generation that is growing up in this technological world needs to be kept in check and it is a parents duty to make sure there children are not dealt a bad hand. The content available on the internet is just a click away and not every information is appropriate for a child, it may contain violence, adult sites, and cyber bullying this information should only be available to adults of age 18 plus. Parents use cell phones to avoid their children like giving them phone will make them keep quiet. This excessive use of internet games and internet surfing in youngsters have hindered their creative side, the kids of today have no creativity or imagination of their own they are so influenced by

the videos and games, which have limited their availability of creative thoughts and imagination. It has become very difficult to monitor and limit usage of mobile devices and internet in children now a days. The limitation to the imagination of a child is not the only problem related to the use of internet, children today have less to no social skills required to survive in the outside world. They become more passive and act more aggressively they lose confidence in themselves that cause depression and mental illness, we are seeing increase in deaths due to depression, we are seeing increase in deaths due to suicide, all in teenagers [8]. We have seen a school shooting in which the attacker claimed to have been influenced by a shooting game. This type of violence and dangerous content should not be available to a kid before he reaches an age of 18 or above. The existing solutions and parental control apps only give information to the parent about what the child is using and surfing, it does not reduce or limit access to the apps and usage of those apps or websites. To limit access and the usage of internet to minors is a major concern that will be addressed, and a possible solution will be presented.

1.1 Parental control:

Parents caring for their children is a natural phenomenon and as the humanity is evolving and technology is taking over everyday life parents have to be very careful with their children protection. The digital world has a lot of positive impact on the younger generation but there is also the negative aspect of the internet from which a young mind should be kept away [8]. Technologies have been launched that helps parents to keep track of their children activities, these technologies are referred to as parental controls. Parental controls are now available in form of applications or built in setting of home Wi-Fi routers.

1.2 Internet Monitoring:

Parents always wants to influence their children lives in some way, but they are unable to because mostly they lack information and data to study and influence their lives accordingly [10]. In this digital world all parents' needs are to monitor their children online activities and they can get almost any information they want [3]. To allow the

use of internet to a certain extent and limit its use where they feel that it might be harmful for them. Many of the children are often influenced by the online world very easily, they start comparing themselves with others which causes depression, overthinking and anxiety this might lead to an act that is harmful for them [8]. So to keep the younger generation in check parental control technology was introduced where parents can decide what's best for their children

1.3 Problem Statement:

Technology have evolved to level where absolute control of any device is inevitable. Same goes for the internet, the internet has changed the world of communication and information sharing, so control over such technology should be absolute. The management of traffic on routers and to keep record of history of surfing the internet has become difficult over years especially with Wi-Fi is giving near to no control over its usage. To be able to know what is happening in the life of one's child, parents need something to look after them. There have been research conducted since the 1960s to determine the effect of media such as television, mobile phones, video games, internet etc. on the society and especially on children, as children are easily influenced at early age so exposure to violence and content that might lead to some unwanted outcome should be kept in check [4]. Now the internet with the global reach it provides and the access of almost every information online is a worry that has led to many researchers to research on the effects it may cause. To prevent such children being under the influence of internet to commit crimes, suicide or act violently this app will provide the parents to keep watch over the activities of their children, as some might argue that this would be act of violation of the children privacy this argument is and should be neglected when the kids life is on stake. This system will provide and help overcome these problems and provide better future for young generations.

1.4 Objectives:

The system that is designed is to achieve the following goals and objectives.

1. To monitor activity of users connected to a Wi-Fi router in home, office or any other public place.

2. To maintain a database of the user's history and perform detailed analysis.
3. To restrict the users from certain websites which maybe hazardous for them.
4. Limit Internet access of certain users based on the detailed analysis for a specific duration of time.

CHAPTER 2

2

LITERATURE REVIEW

In this chapter we will be discussing the previous work done related to our project, this section is important as many answers regarding our project can be found while literature review is done. Our project is hardware and software based so the previous work might help in how to take data from hardware and integrate the readings with the mobile application to show our results.

2.1 SSL and TLS

The internet is a world where the data and information is shared digitally and can be intercepted if not encrypted. The encryption helps keep data safe and can be send to anyone without any glitch [16]. The SSL (secure socket layer) protocol is used to encrypt the internet traffic same is done through TLS (transport layer security) but with more security. SSL was the protocol to be used for internet traffic encryption, but the first part was never released as it had major security flaws, TLS is an improved version of SSL that is now used for encryption [18].

2.2 URL Filtering

URL filtering as its name suggest is a filtering method that compares URL with the URL table or list to see the URL that is being requested by the user. URL filtering can be used to filter out websites that may provide violent, adult or harmful content to the user.

2.3 Database

A database is a data structure that stores organized information. Most databases contain multiple tables, which may each include several different fields. For example, a company database may include tables for products, employees, and financial records. Each of these tables would have different fields that are relevant to the information stored in the table [21]. There is different database available, but firebase and MySQL

are used most frequently. Firebase is a cloud base database unlike MySQL there is no schema, tables, rows and columns it is based on keys that should be unique for them to easily access.

2.4 Related Work

The internet is a tool that has become a part of our lives without us noticing, it has become a necessity and an essential part of our lives all around the world. Despite the advantages of internet and the widely understood merits of this amazing invention, every invention has its pros and cons. The internet is related to physical and psychological problems because of its misuse and overuse. One of the problems it causes is internet addiction. Now people usually ignore the fact that they are addicted to the internet, they feel anxiety, they become aggressive if they stay away from internet to long, and now research shows that this anxiety is caused because of excessive use of internet [2]. This internet addiction is a serious matter that has caused the young generation many problems it reduces their capability to act in public to deal in public, they lack social skills, they lack bonding with others, and they lack the behaviour to make friends because of using internet alone in their room. This addiction is caused by a chemical released in your brain when you receive a text, mail or a tweet, a snap etc. the chemical called dopamine is released, and dopamine is the same chemical that is released when gambling, eat delicious food dopamine plays a major role in motivating behaviour that cause people to get addicted. Now the same chemical is released when using social media, texting or tweeting that makes us feel good and leads to addiction. About 73% of people feel a panic attack when they cannot find their phone and they feel that anxiety until there phone is found. This addiction is the cause people now a days have low self-esteem, low self-confidence and depression that ultimately leads to suicide [2]. This mental and psychological issues caused by internet cannot be overlooked and ignored. Parents need to keep check on their children's and make decision that benefit both their child's mental and physical health. To solve this problem various parental control apps have been developed and with passing time the parental control apps have been improved a lot. But they still lack some features that

make it easy for the kids to bypass some of the restrictions and do as they please. Current apps are restricted to specific browsers or they cannot reduce usage of apps.

2.5 Proposed Solution

The existing studies and solutions are still incomplete and does not provide complete access to the parent to monitor children and limit their usage of internet, this study provides solution that will cater and address problems in current apps and overcome these limitations and provide a solution that will give full access and help maintain order in a family using smart parental control system.

It contains embedded system which sends data to application. Parent can monitor the activities of the child they can see what their children are watching on internet by analyzing their internet history through the mobile application. Parent can restrict their children from certain websites which maybe hazardous for them.

CHAPTER 3

3 DESIGN AND METHODOLOGY

3.1 System Proposed:

The system put forward by us will consist of both hardware and software sections, the mobile application will be connected with the hardware that consists of raspberry pi 3 and a Wi-Fi access point the data received from the raspberry pi 3 is used to show results on the android application.

The main figure of our system is the hardware as it collects data for the application. The android application will provide the user with different options that is to view internet history, to block websites, and to restrict internet usage time all these features will be available on the android application. The user will have to connect the raspberry pi 3 with his/her home Wi-Fi router with an Ethernet cable and connect the application with active internet that will give them the access they were hoping for.

3.2 Existing System:

The existing system only contains of software section that is dependent on application. Some are only web-based applications, and some are mobile based applications. These applications provide restricted access which is solved through our system. Some more disadvantages of existing system are:

- The applications that are only mobile based are to be installed and purchased on all the mobile phones that need to be monitored which is expensive.
- Limited features are offered.
- No real time database management that provides a child current state which may be harmful.

3.3 Specifications:

The required specification is divided into two categories practical requirements and Limitations.

To show how the system is practical and its functionality is described and how we make good use of the components provided and results achieved. The efficiency of software and hardware with the data provided is to be seen.

- User will set up the hardware and install the android application to establish connection between the hardware and android application.
- The hardware that consists of raspberry pi 3 will collect relevant data and make it user readable.
- The results are shown on the android application and features are introduced in the application.
- The user is able to view and monitor children internet activity.
- Content blocking will be available for the user.
- Restricting internet usage time.
- The user will also be able to view connected devices with the internet and use each feature individually on the connected devices.

3.4 Methodology

The main concept behind smart parental control is to make an embedded system which can communicate with the android application and can send data to the mobile application. Internet traffic will be captured through the embedded system and stored in a database in an organized manner which then transferred to the mobile application. Parent can monitor the activities of the child they can see what their children are watching on internet by analyzing their internet history through the mobile application. Parent can restrict their children from certain websites which maybe hazardous for them.

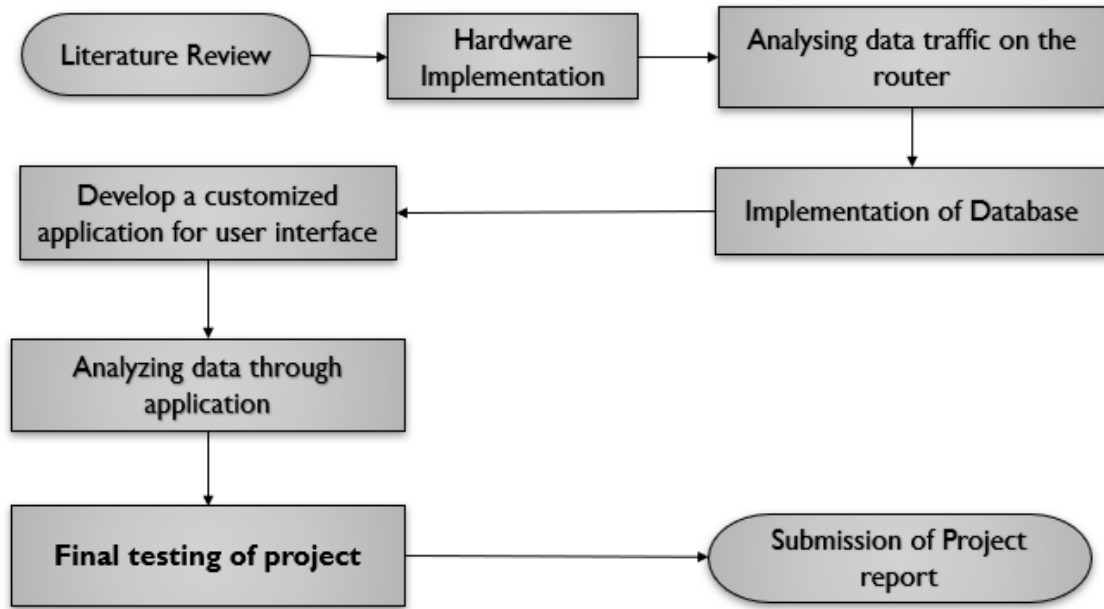


Figure 3.1 Design

After analyzing the routers present in the market, we will be able to know that in Pakistan routers do not provide the parental control like to maintain the history of the users so that parents will be able to know what their Childers are doing. Routers have their own encryptions which don't allow to see the internet traffic. Due to this we made own router using raspberry pi 3. We turned the raspberry pi 3 into a Wi-Fi Router.

3.5 Implementation on Raspberry Pi 3:

We have used raspberry pi as it is the cheapest microprocessor handling you control over any application you want to test. The raspberry pi is used for extracting the internet traffic and show connected users to the internet.

We will be using Raspbian operating system as it is free to use and requires a minimum of 8 GB SD card space to be installed. It can provide efficient use of the raspberry pi altogether. The GUI provides with programming scripts in many languages, browsing tools, integration with many other software's etc.

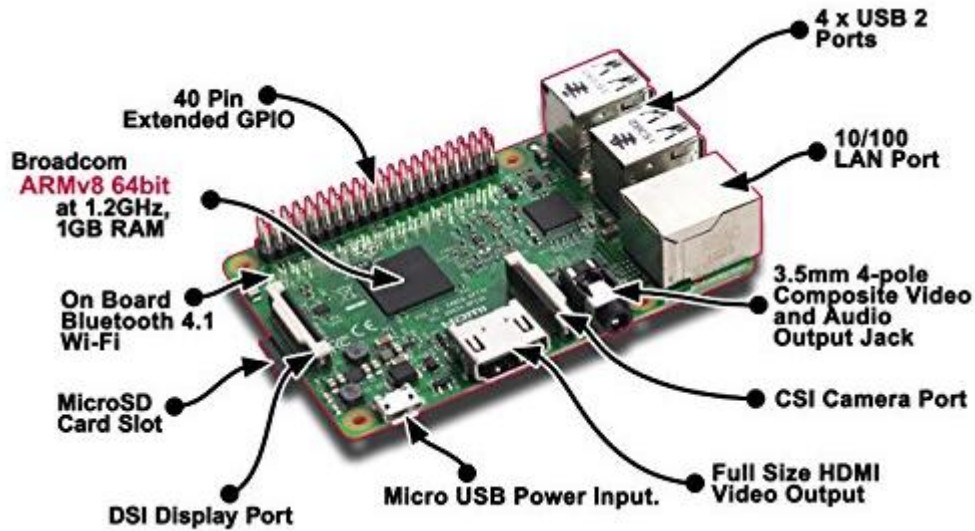


Figure 3.2 Raspberry pi 3 [11]

3.6 Specifications of Raspberry pi:

1. CPU: the raspberry pi uses the Broadcom BCM2837B0, Cortex-A53 64-bit SoC @ 1.4GHz.
2. Memory: the SDRAM has a maximum of 1 GB memory.
3. Wi-Fi module: IEEE 802.11 wireless LAN.
4. Bluetooth module consists of Bluetooth 4.2.
5. USB ports: there are four USB ports available that help connect devices like keyboard mouse etc.
6. Ethernet port: a standard Ethernet port is also available that helps connect to the internet.
7. GPIO pins: there are 40 GPIO pins available to receive or send signals from or to different devices like LEDs, buttons etc.
8. HDMI port: one HDMI port is available that is used to add a screen to the raspberry pi.
9. Audio and video: audio and video jack are available.
10. DSI and CSI helps in interfacing display and camera modules.
11. Micro SD card slot: SD card slot is available for installing operating system and act as a hard drive.

3.7 Setting up Raspberry Pi 3

Raspbian is installed on the raspberry pi 3 and necessarily peripherals like keyboard, mouse and HDMI cable of LCD was connected with the raspberry pi 3 for display. Ethernet Cable from the router was connected with the raspberry pi 3 to provide the internet.



Figure 3.3 Raspberry Pi Setup

3.8 Raspberry Pi 3 as a Router

Network manager is installed on raspberry pi 3. Network Manager is network service which helps to manage the devices and connections and tries to maintain active network connectivity when available. Removed the unneeded packages of dhcpd5. It is a stop network management package. Now from panel settings removed the wireless connection setting. Make a new connection with own SSID and password. Raspberry Pi 3 will be able to generate its own Wi-Fi signals.

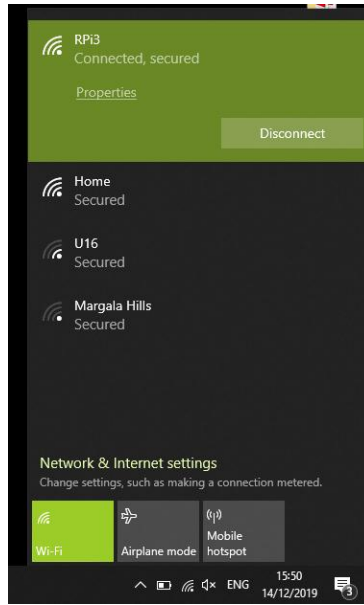


Figure 3.4 Raspberry Pi 3Routers Signals

3.9 Speed of Router

Raspberry Pi 3 router can give speed up to 100 Mbps depending on the speed of the internet is available. Ethernet connected to raspberry pi 3 router is of 10 Mbps and on speed test router is not reducing speed.

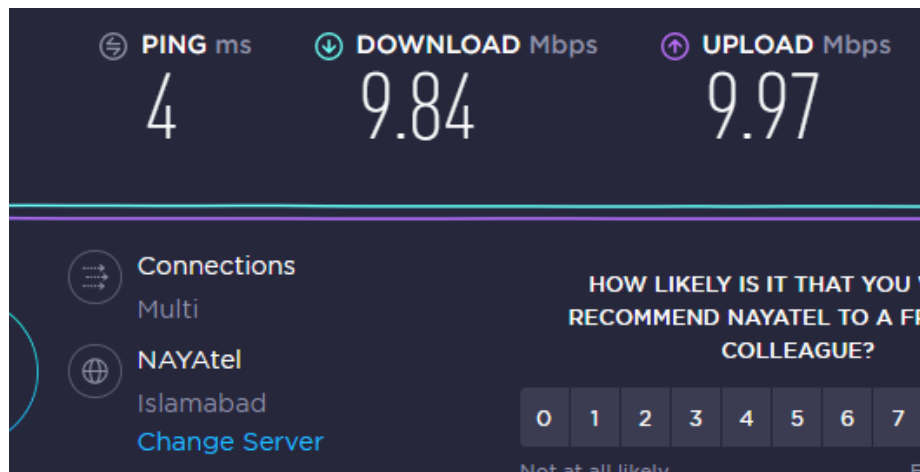


Figure 3.5 Speed Test

3.10 IP Addresses and Mac Address of Connected Devices

To see the Ip Addresses and mac address of the connected devices on the raspberry pi 3 router arp-scan is used. Arp-scan is performed on the router which sends packets to

connected hosts on local network. An ARP scan is performed on target hosts on the wlan0 local network, due to which all hosts connected to this network will be scanned and their IP address and MAC address will be shown.

```
pi@raspberrypi:~ $ sudo arp-scan --retry=8 --ignoredups -I wlan0 --localnet
Interface: wlan0, datalink type: EN10MB (Ethernet)
Starting arp-scan 1.9.5 with 256 hosts (https://github.com/royhills/arp-scan)
10.42.0.76      30:10:b3:12:e0:89      Liteon Technology Corporation
10.42.0.88      84:9f:b5:ee:17:4b      HUAWEI TECHNOLOGIES CO.,LTD
10.42.0.141     60:ab:67:b7:dc:5b      (Unknown)

3 packets received by filter, 0 packets dropped by kernel
Ending arp-scan 1.9.5: 256 hosts scanned in 26.879 seconds (9.52 hosts/sec). 3
ed
```

Figure 3.6 IP and Mac Addresses of connected Devices

3.11 Wireshark:

Wireshark is a network packet analyzer, which means that it can analyze network packets in detail. Network packet analyzers were expensive, but Wireshark is free, open source and one of the best network packet analyzers. It can perform some of the features listed below,

- It can be used to troubleshoot network problems.
- Security problems can be examined.
- Applications of network can be verified.
- Protocol implementation debugging is done through this software.
- It can also be used to learn network protocol internals.
- It captures live packet data.
- Detailed protocol information is displayed.

Wireshark can display packets from different network media types such as Ethernet, Bluetooth, and USB etc. Each media type packet information may be limited according to the hardware or the operating system. It is available in Windows and Linux operating systems.

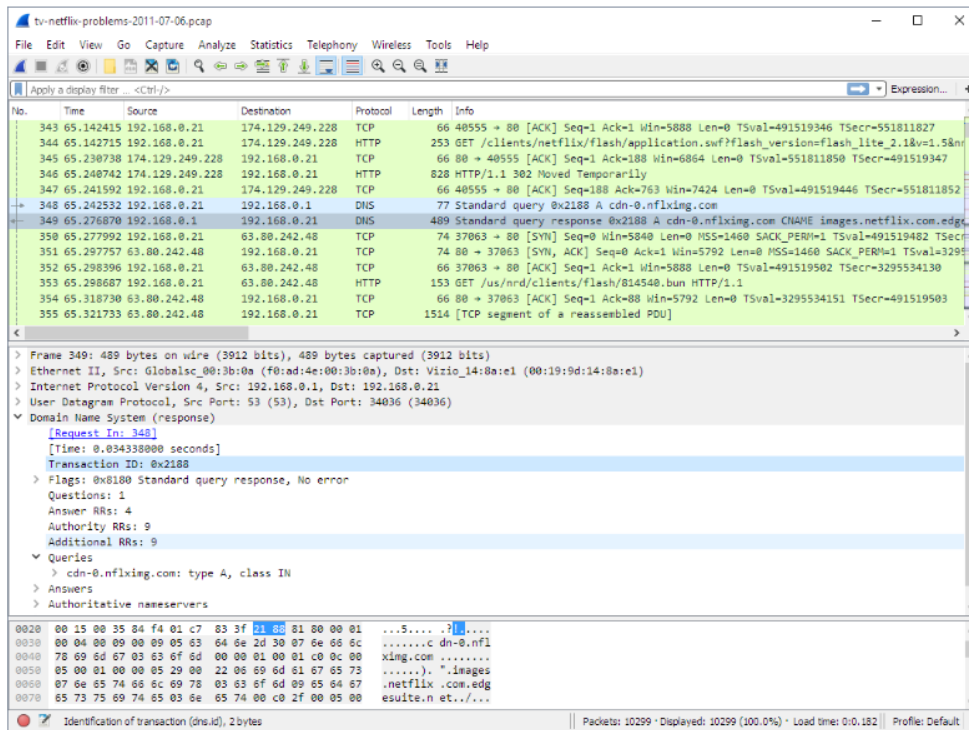


Figure 3.7 Wireshark packet information [14]

As it can be seen in the figure 3.7 that Wireshark provides a detail information about the packets it captures from source IP to destination IP, protocol used, time etc.

3.12 Monitoring Internet Traffic on Router

To monitor the internet traffic on router Wireshark is installed on raspberry pi 3. Using commands Wireshark is installed and a user will be added in Wireshark to active the Wireshark capture data. Wireshark shows different type of internet protocol traffic data. The data can be exported in different formats. Our data will be directly exported into excel sheet to easily enter data base.

No.	Time	Source	Destination	Protocol	Length	Info			
1	0	35.174.127	192.168.100	TLSv1.2	86	Application Data			
2	0.040646	192.168.100	35.174.127	TCP	54	56100 > 443 [ACK] Seq=1 Ack=33 Win=254 Len=0			
3	0.158809	192.168.100	35.174.127	TLSv1.2	228	Application Data			
4	0.429144	192.168.100	203.205.15	TCP	54	56377 > 80 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0			
5	0.431161	35.174.127	192.168.100	TCP	54	443 > 56100 [ACK] Seq=33 Ack=175 Win=757 Len=0			
6	1.906399	HuaweiTe	Broadcast	ARP	42	Who has 192.168.100.5? Tell 192.168.100.1			
7	40.15796	192.168.100	35.174.127	TLSv1.2	342	Application Data			
8	40.44347	35.174.127	192.168.100	TLSv1.2	379	Application Data			
9	40.44724	35.174.127	192.168.100	TCP	54	443 > 56100 [ACK] Seq=33 Ack=463 Win=759 Len=0			
10	40.4473	192.168.100	35.174.127	TCP	54	56100 > 443 [ACK] Seq=463 Ack=358 Win=259 Len=0			
11	48.86935	93.184.220	192.168.100	TCP	54	80 > 56387 [ACK] Seq=1 Ack=1 Win=288 Len=0			
12	48.86942	192.168.100	93.184.220	TCP	54	[TCP ACKed unseen segment] 56387 > 80 [ACK] Seq=1			
13	54.38922	HuaweiTe	Broadcast	ARP	42	Who has 192.168.100.200? Tell 192.168.100.1			
14	55.39459	HuaweiTe	Broadcast	ARP	42	Who has 192.168.100.200? Tell 192.168.100.1			
15	56.39594	HuaweiTe	Broadcast	ARP	42	Who has 192.168.100.200? Tell 192.168.100.1			
16	60.01389	35.174.127	192.168.100	TLSv1.2	86	Application Data			
17	60.05459	192.168.100	35.174.127	TCP	54	56100 > 443 [ACK] Seq=463 Ack=390 Win=259 Len=0			
18	61.14913	192.168.100	35.174.127	TLSv1.2	228	Application Data			
19	61.51427	35.174.127	192.168.100	TCP	54	443 > 56100 [ACK] Seq=390 Ack=637 Win=762 Len=0			

Figure 3.8 Internet Traffic on Router

3.12.1 HTTP Protocol Packets:

After getting the raw data from the Wireshark we have to separate all the http protocol packets from all the other packets. After Separating Http protocol packets of source and destination Internet Traffic have only http packets.

5518	225.278382	192.168.100.31	115.186.131.202	HTTP	366	GET /filestreamingservice/files/50561385-d06d-
5524	225.284753	115.186.131.202	192.168.100.31	HTTP	968	HTTP/1.1 200 OK
5534	225.348400	192.168.100.31	115.186.131.202	HTTP	471	GET /filestreamingservice/files/50561385-d06d-
5537	225.350127	192.168.100.31	115.186.131.201	HTTP	471	GET /filestreamingservice/files/50561385-d06d-
5539	225.353018	115.186.131.202	192.168.100.31	HTTP	1045	HTTP/1.1 206 Partial Content
5541	225.354402	115.186.131.201	192.168.100.31	HTTP	1045	HTTP/1.1 206 Partial Content
5542	225.360767	192.168.100.31	115.186.131.202	HTTP	483	GET /filestreamingservice/files/50561385-d06d-
6779	226.219019	192.168.100.31	115.186.131.202	HTTP	366	GET /filestreamingservice/files/384f381a-00de-
6796	226.225681	115.186.131.202	192.168.100.31	HTTP	431	HTTP/1.1 200 OK
6806	226.273980	192.168.100.31	115.186.131.202	HTTP	475	GET /filestreamingservice/files/384f381a-00de-
6809	226.277484	192.168.100.31	115.186.131.201	HTTP	475	GET /filestreamingservice/files/384f381a-00de-
6811	226.278704	115.186.131.202	192.168.100.31	HTTP	1076	HTTP/1.1 206 Partial Content
6812	226.279210	192.168.100.31	115.186.131.202	HTTP	491	GET /filestreamingservice/files/384f381a-00de-
6814	226.282234	115.186.131.201	192.168.100.31	HTTP	1076	HTTP/1.1 206 Partial Content
7294	226.365098	115.186.131.202	192.168.100.31	HTTP	1006	HTTP/1.1 206 Partial Content
7314	226.741043	192.168.100.31	115.186.131.202	HTTP	366	GET /filestreamingservice/files/5bfbb350-bc90-
7328	226.747125	115.186.131.202	192.168.100.31	HTTP	320	HTTP/1.1 200 OK
7336	226.762564	192.168.100.31	115.186.131.202	HTTP	473	GET /filestreamingservice/files/5bfbb350-bc90-
7339	226.764206	192.168.100.31	115.186.131.201	HTTP	473	GET /filestreamingservice/files/5bfbb350-bc90-
7341	226.767308	115.186.131.202	192.168.100.31	HTTP	1062	HTTP/1.1 206 Partial Content
7343	226.768112	192.168.100.31	115.186.131.202	HTTP	489	GET /filestreamingservice/files/5bfbb350-bc90-
7344	226.769288	115.186.131.201	192.168.100.31	HTTP	1062	HTTP/1.1 206 Partial Content
7345	226.769774	192.168.100.31	115.186.131.201	HTTP	489	GET /filestreamingservice/files/5bfbb350-bc90-
7927	226.868208	115.186.131.201	192.168.100.31	HTTP	1466	[TCP Fast Retransmission] HTTP/1.1 206 Partia
8601	227.270829	192.168.100.31	115.186.131.202	HTTP	366	GET /filestreamingservice/files/3da7f238-37a7-
8644	227.279458	115.186.131.202	192.168.100.31	HTTP	943	HTTP/1.1 200 OK
8725	227.297292	192.168.100.31	115.186.131.202	HTTP	471	GET /filestreamingservice/files/3da7f238-37a7-
8726	227.297354	192.168.100.31	115.186.131.201	HTTP	471	GET /filestreamingservice/files/3da7f238-37a7-
8733	227.302492	115.186.131.202	192.168.100.31	HTTP	1045	HTTP/1.1 206 Partial Content
8734	227.302569	115.186.131.201	192.168.100.31	HTTP	1045	HTTP/1.1 206 Partial Content
8735	227.303080	192.168.100.31	115.186.131.202	HTTP	483	GET /filestreamingservice/files/3da7f238-37a7-

Figure 3.9 HTTP Protocol Data

3.12.2 Individual User Destination Ip:

After getting the only HTTP Protocol Data we have separated the data of each user.

Now the source IP of the data is same for one user and its Destination IP only changes.

5518	225.278382	192.168.100.31	115.186.131.202	HTTP	366	GET	/filestreamingservice/files/50561385-d06d
5534	225.348400	192.168.100.31	115.186.131.202	HTTP	471	GET	/filestreamingservice/files/50561385-d06d
5537	225.350127	192.168.100.31	115.186.131.201	HTTP	471	GET	/filestreamingservice/files/50561385-d06d
5542	225.360767	192.168.100.31	115.186.131.202	HTTP	483	GET	/filestreamingservice/files/50561385-d06d
6779	226.219019	192.168.100.31	115.186.131.202	HTTP	366	GET	/filestreamingservice/files/384f381a-00de
6806	226.273980	192.168.100.31	115.186.131.202	HTTP	475	GET	/filestreamingservice/files/384f381a-00de
6809	226.277484	192.168.100.31	115.186.131.201	HTTP	475	GET	/filestreamingservice/files/384f381a-00de
6812	226.279210	192.168.100.31	115.186.131.202	HTTP	491	GET	/filestreamingservice/files/384f381a-00de
7314	226.741043	192.168.100.31	115.186.131.202	HTTP	366	GET	/filestreamingservice/files/5bfbb350-bc90
7336	226.762564	192.168.100.31	115.186.131.202	HTTP	473	GET	/filestreamingservice/files/5bfbb350-bc90
7339	226.764206	192.168.100.31	115.186.131.201	HTTP	473	GET	/filestreamingservice/files/5bfbb350-bc90
7343	226.768112	192.168.100.31	115.186.131.202	HTTP	489	GET	/filestreamingservice/files/5bfbb350-bc90
7345	226.769774	192.168.100.31	115.186.131.201	HTTP	489	GET	/filestreamingservice/files/5bfbb350-bc90
8601	227.270829	192.168.100.31	115.186.131.202	HTTP	366	GET	/filestreamingservice/files/3da7f238-37a7
8725	227.297292	192.168.100.31	115.186.131.202	HTTP	471	GET	/filestreamingservice/files/3da7f238-37a7
8726	227.297354	192.168.100.31	115.186.131.201	HTTP	471	GET	/filestreamingservice/files/3da7f238-37a7
8735	227.303080	192.168.100.31	115.186.131.202	HTTP	483	GET	/filestreamingservice/files/3da7f238-37a7
9663	227.896774	192.168.100.31	115.186.131.202	HTTP	491	GET	/filestreamingservice/files/384f381a-00de
10105	228.140576	192.168.100.31	115.186.131.202	HTTP	473	GET	/filestreamingservice/files/384f381a-00de
10112	228.142014	192.168.100.31	115.186.131.201	HTTP	473	GET	/filestreamingservice/files/384f381a-00de
10257	228.363187	192.168.100.31	115.186.131.201	HTTP	489	GET	/filestreamingservice/files/384f381a-00de
10952	228.680030	192.168.100.31	8.241.21.254	HTTP	475	GET	/filestreamingservice/files/5bfbb350-bc90
10956	228.682948	192.168.100.31	8.253.195.98	HTTP	475	GET	/filestreamingservice/files/5bfbb350-bc90
10963	228.720810	192.168.100.31	115.186.131.202	HTTP	473	GET	/filestreamingservice/files/5bfbb350-bc90
10967	228.725575	192.168.100.31	115.186.131.201	HTTP	473	GET	/filestreamingservice/files/5bfbb350-bc90
10982	228.728990	192.168.100.31	115.186.131.202	HTTP	489	GET	/filestreamingservice/files/5bfbb350-bc90
13047	230.248824	192.168.100.31	115.186.131.202	HTTP	475	GET	/filestreamingservice/files/384f381a-00de
13050	230.251180	192.168.100.31	115.186.131.201	HTTP	475	GET	/filestreamingservice/files/384f381a-00de
13055	230.262758	192.168.100.31	115.186.131.202	HTTP	491	GET	/filestreamingservice/files/384f381a-00de
13712	230.415995	192.168.100.31	115.186.131.202	HTTP	473	GET	/filestreamingservice/files/384f381a-00de
13716	230.422225	192.168.100.31	115.186.131.201	HTTP	473	GET	/filestreamingservice/files/384f381a-00de

Figure 3.10 Individual User Destination Ip

3.13 Firebase Database:

The Firebase database is a cloud-based database that lets the user share and store data in real time. Firebase real time database is beneficial for app development some of its benefits are listed below,

- It helps increase the speed of app development as the developers do not need to create REST API, so it reduces the duration to develop an app.
- Firebase database constantly monitors the database for any errors, if error occur it generates error reports for the user and use crash report SDKs to perform this task.
- It helps sync data in real time which means that an app does not need to check the database every 15 minutes to see any updates it can check the database if an entry in real time has been made.
- Firebase offers many free services which makes it perfect for small projects and helps company in their testing phase.

We have used firebase real time database as our project will collect internet history of the users in real time which will efficiently add data to our database.

3.14 Customized Android Application Implementation:

As smart phones have become common android applications are the best way to convey your ideas to almost everyone. For this project a mobile application is designed to provide user friendly interface and give user ease of access. The android application is developed on android studio IDE using Java programming language. The user will be able to monitor internet history using the app, block certain websites, and restrict internet usage for a certain duration of time.

3.14.1 Mobile Application:

The application consists of 3 main areas,

- Graphical user interface (GUI).
- Database
- Java programming language.

3.14.2 Graphical User Interface (GUI):

The GUI consists of different application layouts as follows,

Splash Screen:

When the application is on the logo is displayed on this screen for 1.5 seconds and then moves on to the login screen.



Figure 3.11 Splash Screen

Login Screen:

The login screen asks the user for respective credentials i.e. email and password to log in the application. If a user does not have an account, then a sign-up option is available which creates an account for the new user.

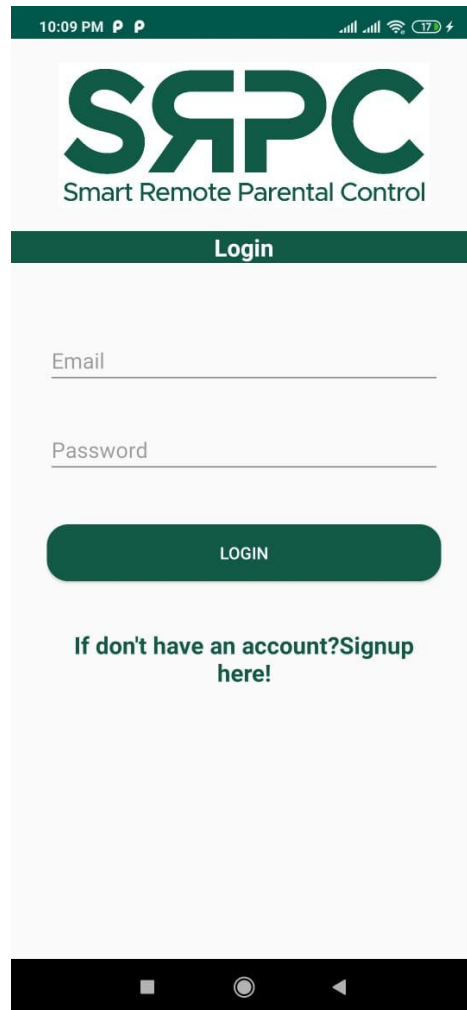


Figure 3.12 Login Screen

Sign up:

This screen asks the user to give information such as, name, email, mobile phone number and password. The account is created, and the user may log in with the given email and password.

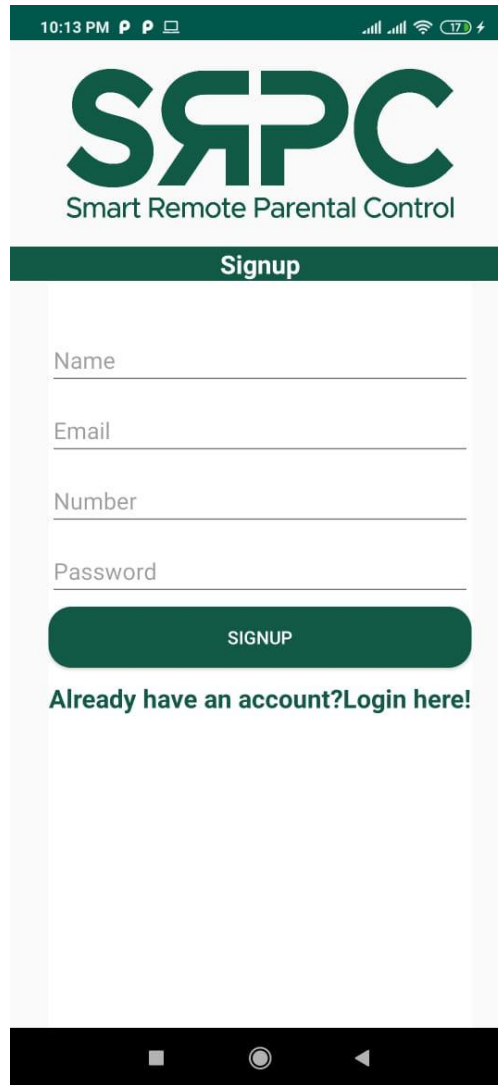


Figure 3.13 Signup Screen

Home screen:

Home screen provides user with different options such as view connected users, view history, restrict websites, and restrict time and logout. Each button leads to respective screens.

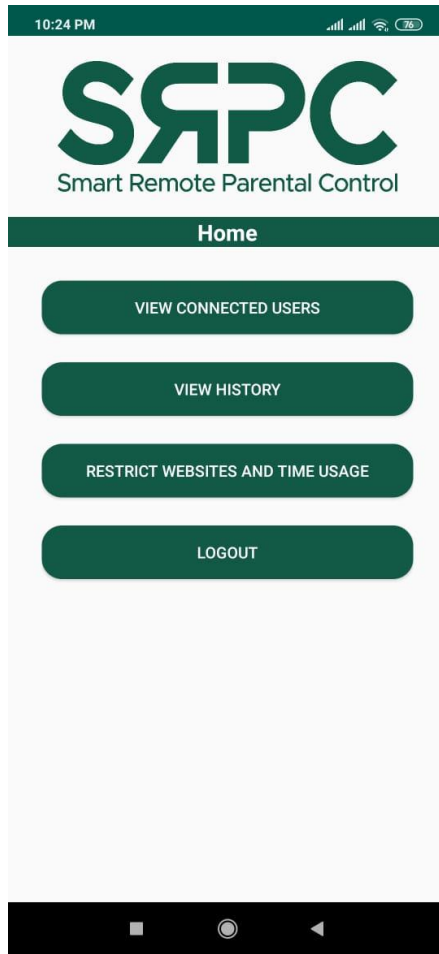


Figure 3.14 Home Screen

View connected users:

The screen will show connected users to the Wi-Fi access point as a list for the user to see.

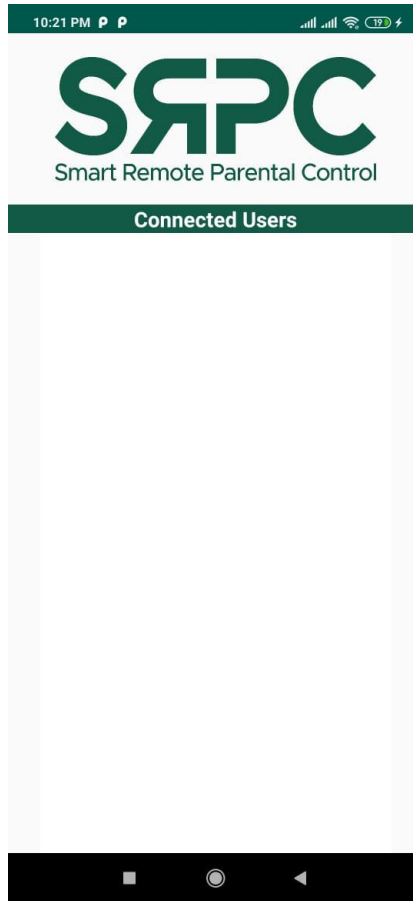


Figure 3.15 Connected Users Screen

View History:

This screen will show the users the history of connected devices individually as a scroll view.

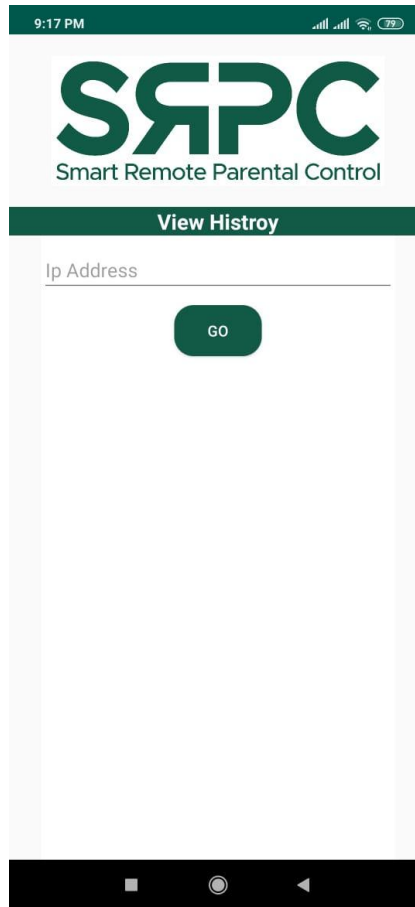


Figure 3.16 View History Screen

Restrict Websites and Time Usage:

If the user wants to restrict certain websites to be accessed by other user, the restrict websites screen will provide the solution. Some parents feel that their child is using more internet then spending time with his family so the restrict time feature will help the user to set a curfew time for the other users as they will not be able to access internet if the given time is over.

3.15 System functionality:

The consistent flow of the task performed by our system and how the user will interact and use the system is shown in the figure below.

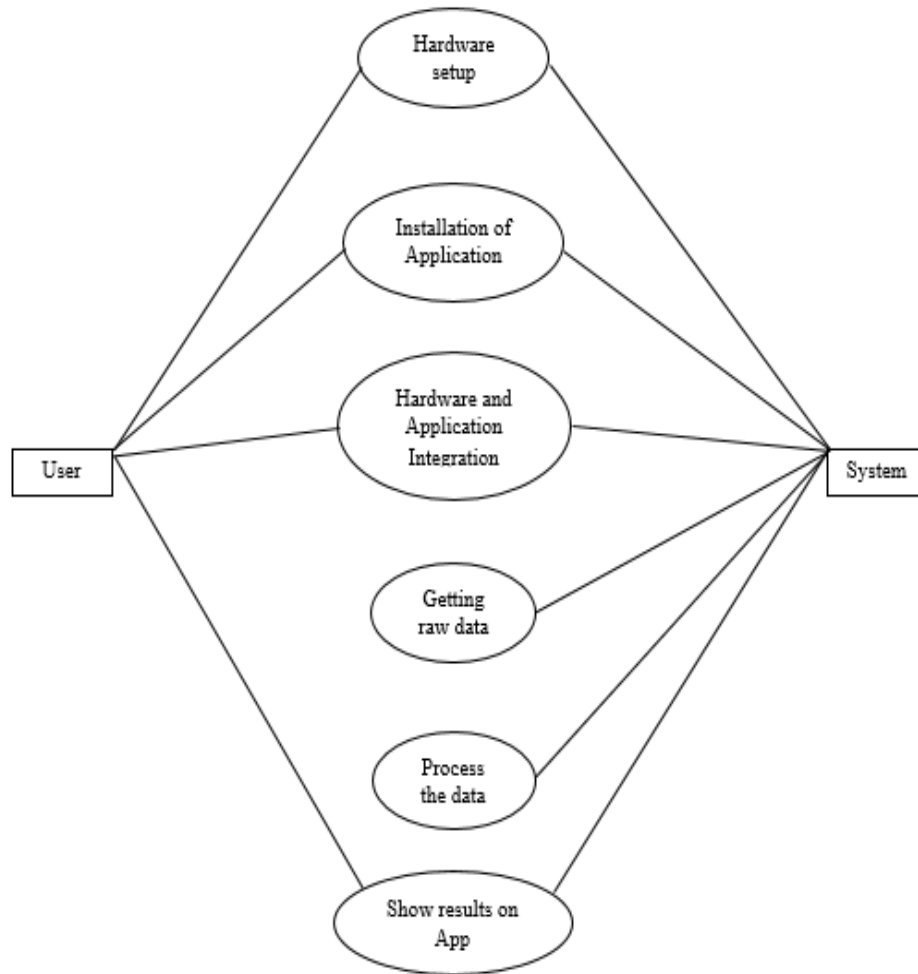


Figure 3.17 System overview

The system overview in the figure 3.17 shows the proposed system, the system will get raw data and after processing the data it will show the results on the customized android application.

3.15.1 Hardware setup

The first step in the system is to setup the hardware, the hardware will be the medium between the system and the user to get relevant data and results. The hardware consists of raspberry pi that will be used to get the data from the devices and internet history from the browsers. Figure shows the individual flow of the system.



Figure 3.18 Hardware Setup

3.15.2 Application Installation

The user to access the data received through the hardware will have to install the application through which he will be able use the features and view the data that is displayed. The application will give the user internet history and access to features such as blocking a website limiting the usage time etc.



Figure 3.19 Application Installation

3.15.3 Hardware and Application Integration

The hardware and software connection will be developed through the Wi-Fi as a medium, the application will be connected to the same Wi-Fi as the hardware to achieve the connectivity required.

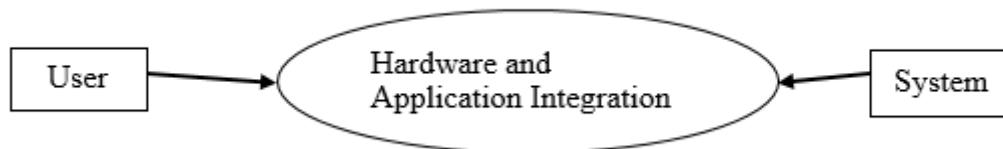


Figure 3.20 Hardware and software connection

3.15.4 Getting Raw Data

The system will get the raw data from the raspberry pi such as the IP and mac addresses from the devices connected to the Wi-Fi and the internet history from the browser.



Figure 3.21 Get raw data

3.15.5 Process Data

After getting the raw data the system will process that data to make it user readable and the refined data will be shown to the user on the application.

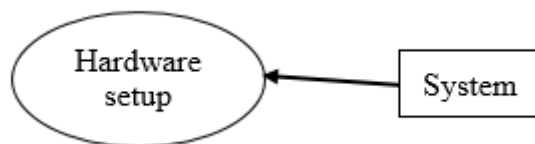


Figure 3.22 Process data

3.15.6 Show Result

The user will be able to see all the desired results on the customized application. The process data will be available for the user.



Figure 3.23 Results

CHAPTER 4

4

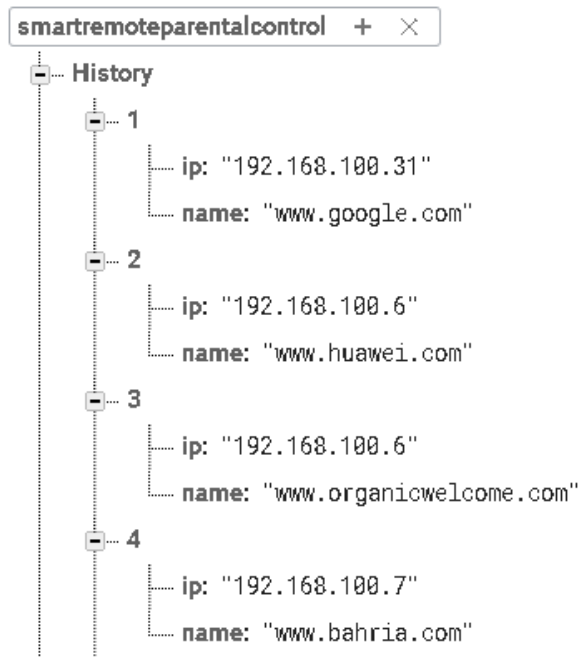
RESULT AND DISCUSSION

4.1 Database Tables

Database contains three different type of table to store the data.

4.1.1 History Table

History Table in database contains all the internet traffic coming from different devices connected to router. Table contains the IP address and URL of websites.



smartremoteparentalcontrol + X	
History	
1	ip: "192.168.100.31" name: "www.google.com"
2	ip: "192.168.100.6" name: "www.huawei.com"
3	ip: "192.168.100.6" name: "www.organicwelcome.com"
4	ip: "192.168.100.7" name: "www.bahria.com"

Figure 4.1 History Table

4.1.2 Login Table

Login table contains the information of the people who sign up in the app, it stores Email ID, Name, Password and Phone Number of the User.

Login	
1	email: "admin@gmail.com" name: "Admin" <input type="text"/> password: "abcd" phnNum: 3205030434
2	email: "hussainbangash306@gmail.com" name: "Hussain" password: "bangash78" phnNum: 3313355523

Figure 4.2 Login Table

4.1.3 Connected Devices Table

This table contains the information about the connected devices with the router, it contains Ip Address, Mac Address and Device name of the different connected Devices.

1	ipt: "192.168.100.31" mact: "f4:b7:e2:2f:4d:27" namet: "Desktop-4CHBIP0"
2	ipt: "192.168.100.6" mact: "60:ab:67:b7:dc:5b" namet: "Note 8 Pro"
3	ipt: "192.168.100.7" mact: "ec:1f:72:db:d7:ef" namet: "Galaxy S6 edge"

Figure 4.3 Connected Devices Table

4.2 App Results

All the data accessed from the Smart Remote Parental Control Application.

4.2.1 Connected Devices on App

On app all the connected Devices are shown in the form of recycler view. Their IP Address, Mac Address and Device name will be shown in recycler View.

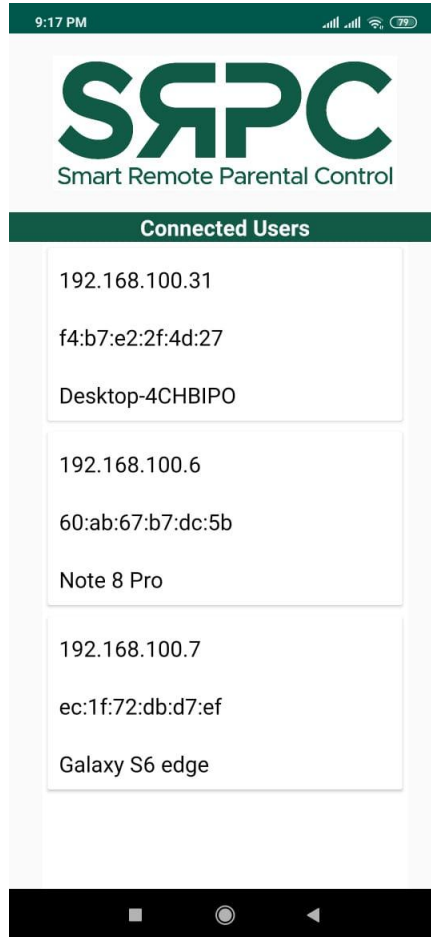


Figure 4.4 Connected Devices on app

4.2.2 History of Device

User must enter the IP Address of the device of which he wants to see history and press GO button. App will display the all the history of that IP address.

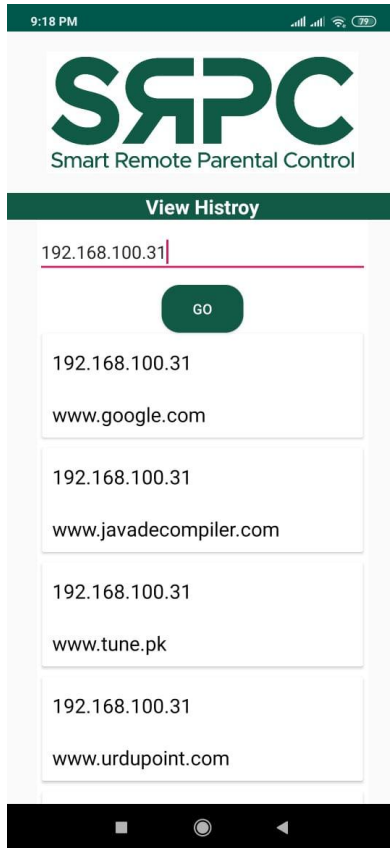


Figure 4.5 History on App

4.2.3 Restrict Websites and Time Usage

Template Validation Period:

Parents can set a template for children's which implies from its validation date till its expiry date.

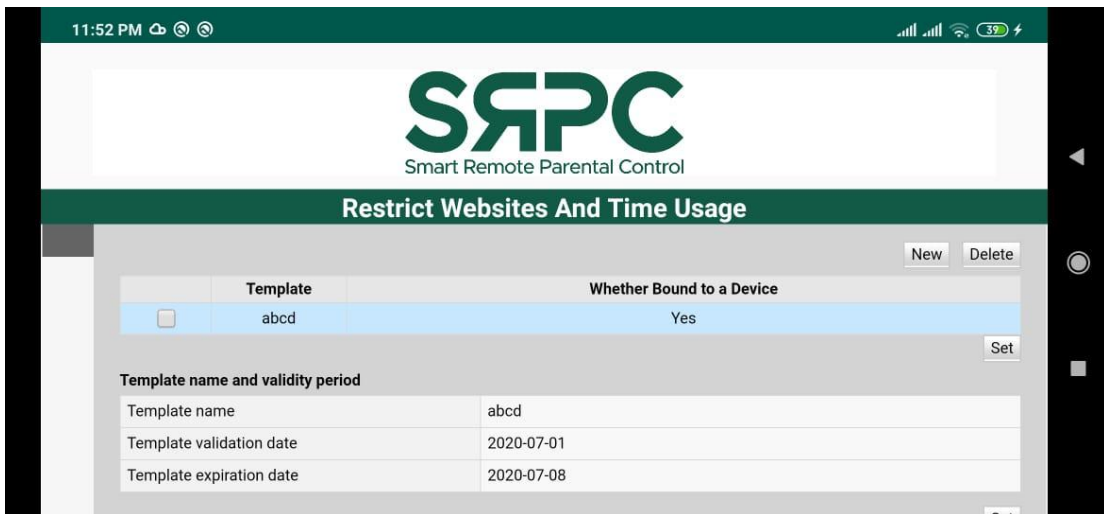


Figure 4.6 Template Validation Period

Allowed Network Surfing Period and Block Websites:

Parents can set the internet surfing period for their children's and can set the days when that period is applicable. Parents can block prohibited websites which are not good for their children's.

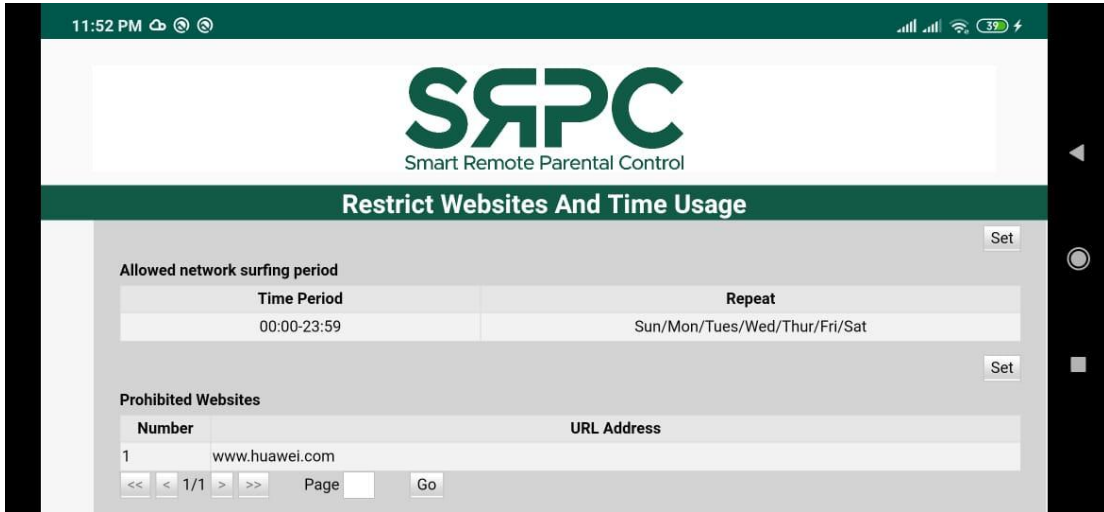


Figure 4.7 Restrict Time and Block Websites

Template on Devices:

Parents can make multiple templates which can apply on selected devices and can be applied to all devices connected to the router.

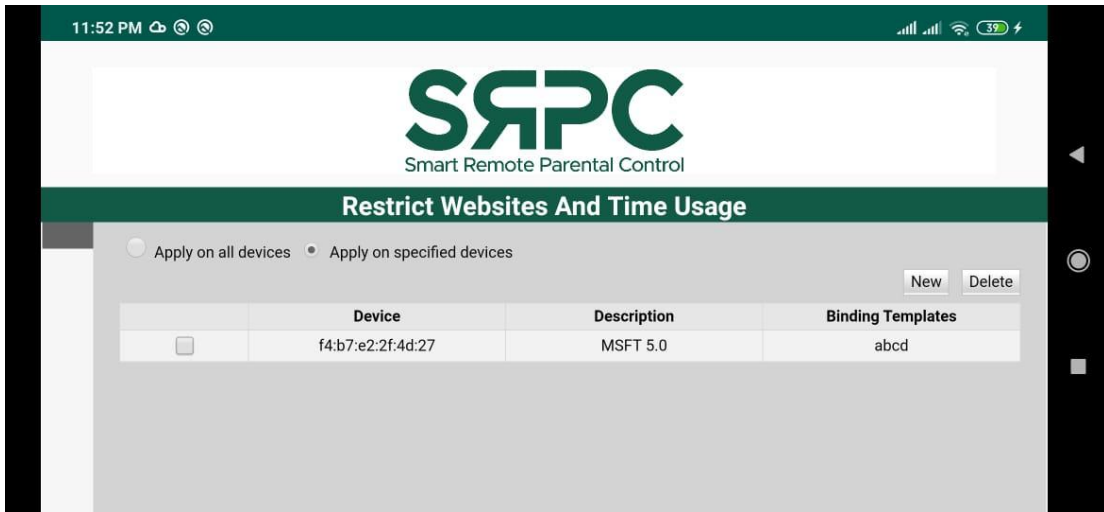


Figure 4.8 Templates applied on Devices

CHAPTER 5

5

CONCLUSION

We have implemented smart parental control system using both hardware (Raspberry Pi 3 and Wi-Fi router) and software (Java in android studio and python scripts) using internet monitoring techniques and android application. Our hardware section consists of raspberry pi which acts as a Wi-Fi access point. User's smartphones will be connected with the access point that will help us route the internet traffic through the raspberry pi, now the raspberry pi will have python scripts that will capture the internet traffic through Wireshark and we will analyze the data captured and use that data in our android application. We used Firebase real time database to store internet traffic and other data and applied queries accordingly. By using raspberry pi as access point, we were able to identify the users connected to it by using ARP-scan. ARP-scan helps find the Ip address assigned to the device by the access point, the device name and the device mac address. After getting the Ip addresses we can view the history of that user through that Ip address.

Android studio is used to develop customized android application for our system so that the user can easily access all the features intended for them. The android application will help the users view connected users with the Wi-Fi access point, view history of those connected devices, will be able to block any websites that the user desires and apply time limit on internet usage. This will give an insight to the parents about what their children are doing and be able to protect them from things that are harmful for them.

CHAPTER 6

6

FUTURE WORK

Smart remote parental control is designed to give parent the control that they have always thought of, so that they can save their children from the unstable and chaotic digital world. The system designed can be intensely improved and we will discuss some of the improvements below.

The system gives the user four features, they can view their children internet history from which they can identify what they are thinking and block websites that can be harmful for them. They can also set internet usage time which will limit the usage of the internet for the children and the user will be able to see the connected users to the Wi-Fi. The improvements that can be added to the system in the future are, machine learning and artificial intelligence can be added to the system so that the android application can give recommendations and predictions according to the dataset that is provided. The machine learning techniques will help the users choose recommendation given by the system with more ease and save their time to apply conditions themselves. With artificial intelligence and machine learning the system will be able to predict the children use of internet and how to stop harmful use of internet can be recommended accordingly. Machine learning can also be used to check users psychological state based on the internet history and other activities on their cell phones. By adding the supervision of apps and images in the system in the future, artificial intelligence techniques will help user to monitor the psychological state of the user, so that any unfortunate events can be avoided.

REFERENCES

- [1] Ad-Free, G. and Pi, R., 2020. *How To Setup A Raspberry Pi Network Scanner*. [online] Pi My Life Up. Available at: <<https://pimylifeup.com/raspberry-pi-network-scanner/>> [Accessed 2 July 2020].
- [2] Haynes, T., 2020. *Dopamine, Smartphones & You: A Battle For Your Time - Science In The News*. [online] Science in the News. Available at: <<http://sitn.hms.harvard.edu/flash/2018/dopamine-smartphones-battle-time/>> [Accessed 2 July 2020].
- [3] Gallego, F., Malamud, O. and Pop-Eleches, C., 2020. *PARENTAL MONITORING AND CHILDREN'S INTERNET USE: THE ROLE OF INFORMATION, CONTROL, AND CUES*. [online] Nber.org. Available at: <<https://www.nber.org/papers/w23982.pdf>> [Accessed 2 July 2020].
- [4] Bandyopadhyay, S., Kindra, G. and Sharp, L., 2001. *Is Television Advertising Good For Children? Areas Of Concern And Policy Implications*. [online] https://www.researchgate.net/publication/267221173_Is_Television_Advertising_Good_for_Children_Areas_of_Concern_and_Policy_Implications. Available at: <https://www.researchgate.net/publication/267221173_Is_Television_Advertising_Good_for_Children_Areas_of_Concern_and_Policy_Implications> [Accessed 2 July 2020].
- [5] Clark, L., 2011. *Parental Mediation Theory For The Digital Age*. *Communication Theory* 21(2011): 323-343. [online] Academia.edu. Available at: <https://www.academia.edu/2587641/Parental_mediation_theory_for_the_digital_age._Communication_Theory_21_2011_323-343> [Accessed 2 July 2020].
- [6] Bhat, S. and Kawa, M., 2015. *A Study Of Internet Addiction And Depression Among University Students*. [online] Available at: <https://www.researchgate.net/publication/283539042_A_Study_of_Internet_Addiction_and_Depression_among_University_Students> [Accessed 2 July 2020].
- [7] Conway, M., 2016. *Determining The Role Of The Internet In Violent Extremism And Terrorism: Six Suggestions For Progressing Research*. [online] Taylor & Francis. Available at:

- <<https://www.tandfonline.com/doi/full/10.1080/1057610X.2016.1157408?src=recsys>> [Accessed 2 July 2020].
- [8] Huesmann, L., 2007. *The Impact Of Electronic Media Violence: Scientific Theory And Research*. [online] Available at <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2704015/>> [Accessed 2 July 2020].
- [9] Zaman, B. and Nouwen, M., 2016. *Parental Controls: Advice for Parents, Researchers And Industry*. [online] Available at: <https://www.researchgate.net/publication/301775592_Parental_controls_advice_for_parents_researchers_and_industry> [Accessed 2 July 2020].
- [10] Gallego, F., Malamud, O. and Pop-Eleches, C., 2018. *Parental Monitoring And Children's Internet Use: The Role Of Information, Control, And Cues*. [online] Povertyactionlab.org. Available at: <https://www.povertyactionlab.org/sites/default/files/research-paper/ParentalMonitoring_Jan2018.pdf> [Accessed 2 July 2020].
- [11] Amazon.in. 2020. [online] Available at: <<https://www.amazon.in/Vilros-Raspberry-Basic-Starter-Kit-Clear/dp/B01D92SSX6>> [Accessed 2 July 2020].
- [12] Static.raspberrypi.org. 2020. [online] Available at: <<https://static.raspberrypi.org/files/product-briefs/Raspberry-Pi-Model-Bplus-Product-Brief.pdf>> [Accessed 2 July 2020].
- [13] WhatIs.com. 2019. *What Is Wireshark? - Definition From Whatis.Com*. [online] Available at: <<https://whatis.techtarget.com/definition/Wireshark#:~:text=Wireshark%20is%20an%20open%20source,network%20protocol%20analyzer%20or%20sniffer.&text=This%20information%20can%20be%20useful,troubleshooting%20network%20security%20device%20issues.>> [Accessed 2 July 2020].
- [14] Wireshark.org. 2020. *Chapter 1. Introduction*. [online] Available at: <https://www.wireshark.org/docs/wsug_html_chunked/ChapterIntroduction.html> [Accessed 2 July 2020].
- [15] Webspiders.com. 2020. *5 Benefits Of Using Firebase For App Development / Web Spiders Official Blog*. [online] Available at:

- <<https://www.webspiders.com/blog/5-benefits-of-using-firebase-for-app-development/#:~:text=Every%20time%20changes%20are%20made,Firestore%20Storage%2C%20and%20Test%20Lab.>> [Accessed 2 July 2020].
- [16] Zscaler. 2018. *What Is SSL Decryption? | Definition & Core Concepts*. [online] Available at: <<https://www.zscaler.com/resources/security-terms-glossary/what-is-ssl-decryption>> [Accessed 2 July 2020].
- [17] F5.com. 2019. *SSL Decryption | F5*. [online] Available at: <<https://www.f5.com/services/resources/glossary/ssl-decryption#:~:text=SSL%20Decryption%2C%20also%20referred%20to,from%20users%20to%20the%20internet.>> [Accessed 2 July 2020].
- [18] GlobalSign GMO Internet, Inc. 2020. *SSL Vs TLS - What's The Difference?* [online] Available at: <<https://www.globalsign.com/en/blog/ssl-vs-tls-difference>> [Accessed 2 July 2020].
- [19] Help.stonesoft.com. 2020. *URL Filtering And How It Works*. [online] Available at: <<https://help.stonesoft.com/onlinehelp/StoneGate/SMC/6.2.0/GUID-84699F72-0B00-4504-851F-66A805E3C71A.html#:~:text=URL%20filtering%20compares%20the%20URLs,%2C%20or%20not%20work%2Drelated.>> [Accessed 2 July 2020].
- [20] Ltd., A., 2020. *Firebase Vs Mysql Comparison | Augurs Technologies*. [online] Augurs Technologies. Available at: <<https://www.augurs.in/firebase-vs-mysql/#:~:text=Whereas%20MySQL%20databases%20use%20tables,where%20the%20data%20is%20stored.&text=FireBase%20It's%20a%20cloud%20service,stored%2Fprocessed%20in%20a%20cloud.>> [Accessed 2 July 2020].
- [21] Techterms.com. 2020. *Database Definition*. [online] Available at: <<https://techterms.com/definition/database>> [Accessed 2 July 2020].