

# Project Requirements Document

SmartNet

## Team Members

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## Introduction

### Problem

Wi-Fi signal strength is very fickle and can vary from location to location within a building/residence. This leads to the emergence of dead spots, where the quality of the connection is significantly lower than advertised. ISP technicians need a way to determine where these dead spots are that they can place routers/extenders in optimal positions to minimize the spots' occurrences. There are Wi-Fi strength analyzers currently out there; however there are very few good mobile ones.

### Our Solution

SmartNetwork is a mobile Android application that helps ISP technicians and/or residential users strategically setup Wi-Fi routers for maximum coverage. Users can generate a heatmap that displays the signal strength from the router to any points in the building. In addition, there is a Wi-Fi speed analyzer and video stream analyzer which users can use to test the connection from wherever they are.

ISP technicians can also bring up the router's captive GUI portal through the app. This way, they don't have to go to the router's IP address to configure it.

The app also will push the location of the router onto the router itself, as well the heatmap data associated with that router. This will allow ISPs to pull that data from their routers to generate their own heatmaps for neighborhoods and communities.

## **Background**

When installing routers, it is beneficial to see the coverage from one part of a building compared to another. This way, a user can see where the weak and dead spots are and adjust the router accordingly, either by moving the router or installing mesh extenders. It would also be convenient if an individual can walk around the building to test WiFi coverage. SmartNetwork is an app that will allow you to do all these things. With a simple and easy-to-use interface, any technician and/or home user can easily generate Wifi Heatmaps and configure routers all from their Android device.

This app is a continuation of last year's Capstone project. The previous team had already implemented the Wi-Fi Speed Analyzer and a basic heatmap function. We will be building upon their code and adding new features. These include porting in a video stream analyzer, bringing up the router's captive GUI portal in the app, and pushing the router's pin onto the router.

The video stream analyzer is a single C file provided by SmartRG. It will listen in on video streams and output JSON data about the quality of the streams, including metrics such as packet loss and error rate. The app will visualize this data by graphing the relevant metrics that measure network quality, such as the aforementioned metrics.

## **Assumptions**

- Routers are up and running
- Android device is connected to Wi-Fi

## **Goals and Objectives**

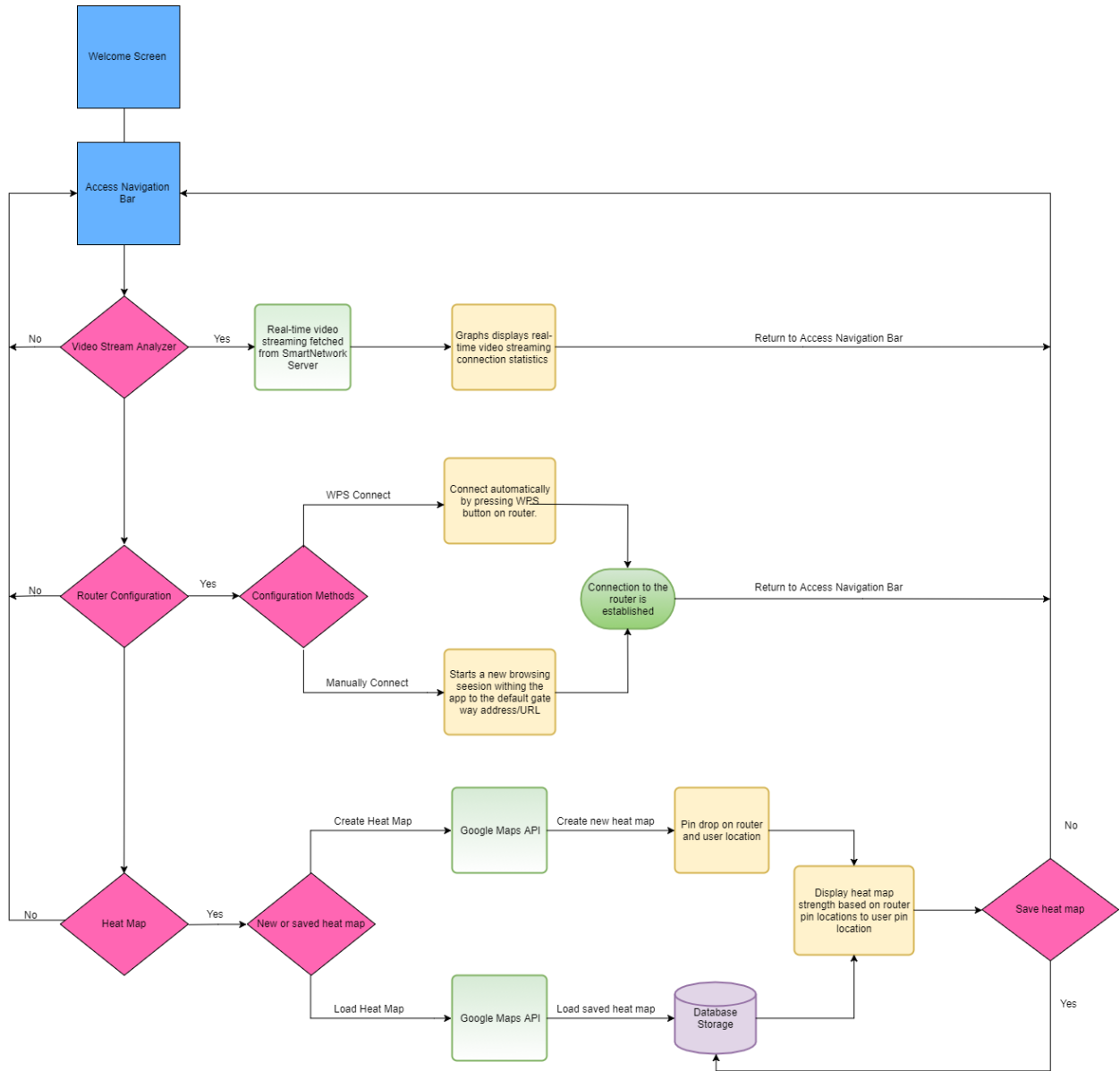
### **Base Goals**

- Port the VSA file onto Android
- Get the data from the VSA and visualize it into a real-time graph
- Get the router's captive GUI page and display it in the app
- Push the location of the router onto the router itself
- Create a training video for the app

### **Stretch Goals**

- Improve the heatmap so that whenever two test pins are dropped, the heatmaps will automatically merge together
- Based on heatmap, have the app determine the optimal spots to place mesh extenders

# System Architecture Overview



# Requirements

## Functional

- Allow easy access to ISP GUI portal to configure and connect router.
- Drop pins in locations of your router(s).
- Create a heat map of your wifi signal strength
- Run a Video Stream Analyzer and view the data outputted in an easy to read graph format.
- Perform a speed test directly with the router to determine wifi speeds.

## Nonfunctional

- Application should be intuitive and easy to use.
- Graphs should be well formatted and easy to read and analyze.
- Graphs should be updated in real time.
- Process Network data in real time

## User Types

- **Router Technician:** A person who is installing, updating, and maintaining routers in a customer's home.
- **Private User:** A person, not a router technician, who would like to personally analyze and maintain their routers.

## User Stories / Use Cases

- As a technician, I want to look at the VSA graph that records packets lost during video streaming so that I can determine if our IPS video streaming connection is acceptable to our customers.
  - Acceptance Test: After the test is complete, there should be a graph and analytics page displaying packet information.
- As a technician, I will make use of the Video Stream Analyzer feature to get a better insight of what areas of the house receive poor Wifi reception during video streaming.
  - Acceptance Test: Upon pressing the VSA Graphs button, an activity with different graphs should pop up and display different wifi signal metrics.

- As a technician, the Video Stream Analyzer feature will help me know where repeaters are needed in order to have better Wifi signal throughout the house.
  - Acceptance Test: Upon running the video stream analyzer, I should get a graph with relevant data relating to wifi signal strength at locations.
- As a customer and technician, I will use an already existing web application embedded into the app in order to configure router settings with ease.
  - Acceptance Test: Upon pressing a button designed to take the user to a web page, a web page with the designated IP address should be opened and loaded.
- As a technician, I can navigate to the GUI portal option in order to setup the router along with all of its configurations such as custom password, and SSID.
  - Acceptance Test: Upon opening the GUI portal, navigation throughout the portal should be as if the page is loaded through an internet browser.
- As a user, I can click on the “WPS Router” button and it will take to me to a page that allows me to configure my router’s SSID.
  - Acceptance Test: Upon pressing the button, a web view with the website should open within the app.
- As a user, I can press the back button built in the app and it will allow me to conveniently go back to me previous page activity.
  - Acceptance Test: Upon pressing the back button, the activity should return to the previous activity.
- As a user, I can create a heatmap of the wifi strength of my house, so that I can see how signal strength varies throughout my house.
  - Acceptance Test: After all points have been tested, a fully connected heat map should be displayed over the map.
- As a user, I can drop a location pin on my router, so that I know where it is in the house.
  - Acceptance Test: After a pin drop, router icon should be present in the location the user dropped the pin.
- As a user, I can run a speedtest on my wifi that interacts directly with my router, so that I can get a good idea of the speeds I am getting.
  - Acceptance Test: After a test. The wifi speed should be displayed, similarly to other speed tests, such as [speedtest.net](https://www.speedtest.net)

## Prototyping Code/Tests

- [Android App](#) Private Repo, Active Development.
- [Android App](#) Public Repo, may be out of date, and missing more sensitive code.
- [Backend Database](#)

## Metrics

- Ease of use: Technicians and users should be able to use the app without any training and easily maintain routers.
- Speed: Processing must be in real time as to not miss data.

## Appendices

### Technologies Used:

- MongoDB
- NodeJS
- Android (SDK & NDK)
- Google Maps API
- Google Heat Map API
- GraphView library (will display in graphs data from VSA)
- VSA (C code that will output video stream statistics in the form of JSON)

## Meeting Documents

[Google Drive Folder](#)