

# Network Routing Optimization Report

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## Introduction

This project aims to model a computer network using graphs, as well as related data structures, to serve as both a learning tool and a simplified version of modern networking tools. Objectives include delving into basics of computer networking as well as creating a platform for expanding application features w.r.t. networking tools.

## Solution

The project fulfilled project requirements by implementing a graph through the `Graph.java` class, as well as a Greedy Algorithm in the form of Dijkstra's. Additional data structures were also implemented in the form of Priority Queues, Sets, and B-Trees. Figure 1 shows an overview of the project.

## Challenges

Challenges faced included implementing the B-Tree in such a way that it meshed together with the project. While B-Trees allow for better sorting and disk storage, hence its use in database systems, it isn't as efficient for small data sets such as local networks. Since most networks are yet to adopt IPv6, there is also the limitation on maximal network devices. Therefore, in a networking project, it would require the scale of enterprise level networks or larger networks to pay out in advantages.

## Analysis

Figure 2. shows the example used to depict the project's functionality.

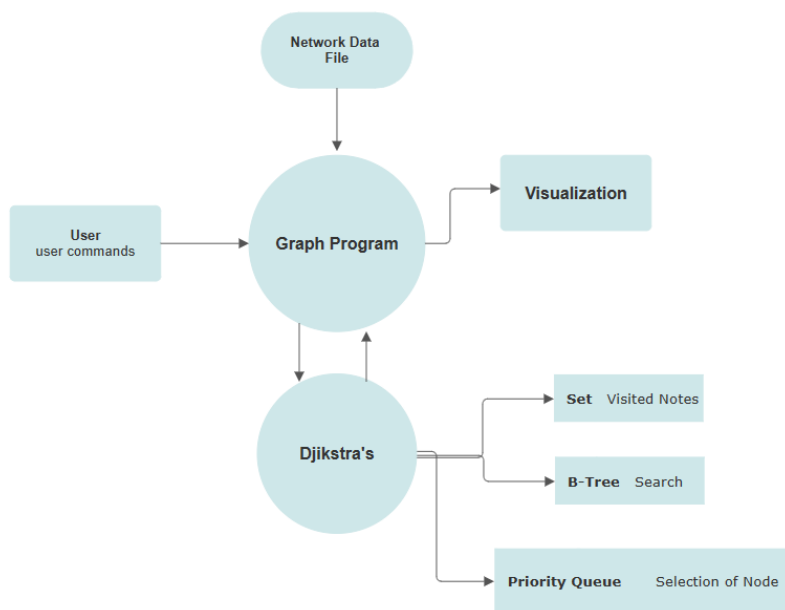


Figure 1: Flow Chart of Program

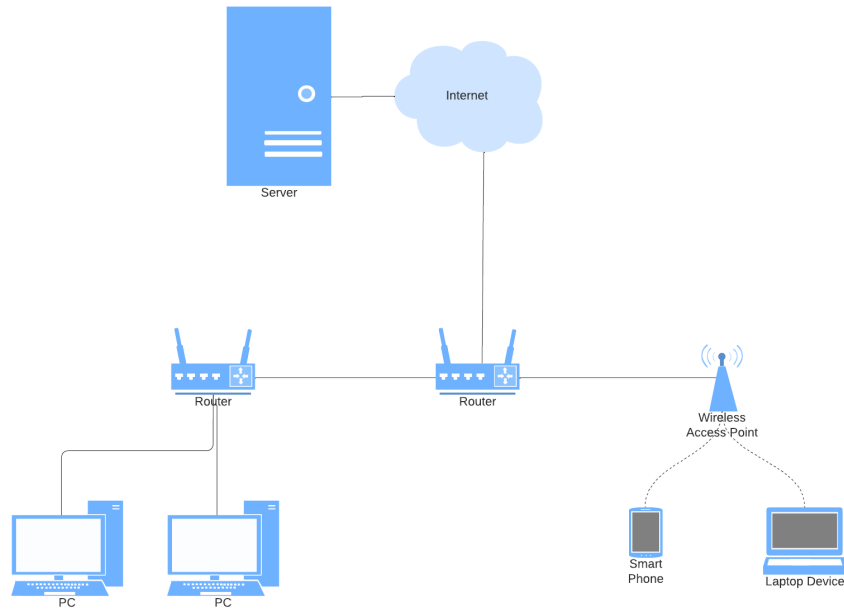


Figure 2: Example Diagram

## Algorithms

**Dijkstra's Algorithm:** Implement Dijkstra's algorithm to find the shortest path between two devices in the network. Consider the edge weights as metrics like latency, bandwidth, or a combination of factors.

## Data Structures

**Sets:** Used to keep track of visited nodes during path calculation.

**B-Tree:** for optimizing search operations or managing information associated with devices.

**Priority Queue for Optimization:** used to optimize the selection of the next node during the shortest path calculation. This enhances the efficiency of Dijkstra's algorithm.

## **Impact**

Although content surrounding network protocols and routing are free to access online, like Cisco Networking Academy, there are very few resources for implementing Java-based programs with regards to computer networks. As a result of this project,

## **Conclusion**

The project was a great venture into an iteration of Java-implemented networking tools. The network optimizer also served as a learning tool to further users' understandings on their local network, while maintaining an ability to expand in its set of features. While it can serve as an educational tool, limitations still exist in its current features set, but accomplishes project necessities.