

# Project Report

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## Introduction:

The purpose of this project was to implement a program which simulates a router and is able to determine the least path to all other routers connected in the network even when they are not directly connected to said router. Each program instance represents a router. The router is assigned a name, port number and a configuration file to determine its direct neighbors. The router is able to both send and receive packets simultaneously. This is done through multi threading, where the client and server functions are run in separate threads.

The actual least path to all other routers is calculated by the bellman-ford algorithm. Each router periodically sends packets to their neighbors which contain information about the neighbors of all their neighbors. Upon receiving these packets, the bellman-ford executes to determine the least path to all known routers in the network. When the distance matrix is updated the router again sends the updated cost to its neighbors and so on. In this way eventually all routers reach equilibrium with the distance matrix the same in all routers.

## What is implemented:

- The program takes arguments from the command line. These arguments are routerid (name), port number and the configuration file name.
- The program parses through the configuration file and inserts the information present in it into a data structure defined.
- The program successfully initiates separate threads for the server, client and bellman-ford functions in the code.
- The client and server functions are able to send and receive distance vector packets to and from their neighbors.
- The program is able to determine if a neighbor is down using a timeout functionality.
- The program is able to receive updates from the user via a separate interface program which sends the update connections by using ports of the routers.
- The bellman-ford algorithm executes using the cost matrix data structure in the program and shows the least path of some routers.

## What is not implemented/correct:

- The program has no 'trigger' functionality. That is, the bellman-ford algorithm does not execute immediately upon receiving a packet, and a packet is not immediately sent when the least cost is updated. Rather we have implemented that all these tasks are performed after a specified time interval.
- Due the lack of trigger functionality, split horizon algorithm also cannot be implemented since the infinite loop problem does not arise when a time interval approach is taken.
- As mentioned above only some of the least paths are correct. It can be deduced that the least requiring more than two hops are not showing correctly.
- When a router is shut off, timeout functionality is performed correctly, however for some reason not all routers are able to display the cost to the shut off router as infinite and consequently are unable to determine the correct least path.