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CSE 3231 Final Project

The program provided in the package is a simulation of the Bellman Ford algorithm with an output of Djikstra's algorithm at every change in the router graph state. In a networking environment, in order for a router to send a packet from one router to another efficiently, a shortest path algorithm must be used.

The program was written using GoLang, which is a high performance server side language created by Google. GoLang was built to be run on multiple threads, and while the program provided only uses a single core for ease of readability it would be very easy to incorporate multiple threads. This makes GoLang a great choice for implementation of networking protocols. GoLang also provides many networking libraries to send and receive packets, since this is a simulation these features were not taken into consideration for the implementation but would be taken advantage of in a real networking environment.

To run the program you will first need to install GoLang which is available here. After installing GoLang you will need to enter the terminal in the main directory inside of the package. After entering this directory you can run the program using the command "go run . <relative-path-to-input-file>". After running the program each node will have an output file generated for distance vector (which uses a modified Bellman Ford algorithm) and shortest path (using Djikstra's algorithm). The output file for each node is named "topology_DV_<source>.txt" (for distance vector) and "topology_SPF_<source>.txt" (for shortest path).

The two group members involved in this project were Curtis Jones and Xander Lockard. Curtis Jones's main focus was on the design of the two main algorithms Bellman Ford and Djikstra, while Xander's focus was on the simulation and the underlying features needed to run the simulation within the algorithms. After the algorithms were designed by Curtis, Xander worked to implement them into the simulation loop inside of the program.

The main algorithm driving the program is Bellman Ford which is a dynamic algorithm used to find shortest paths across a graph. In the program Bellman Ford is implemented by using an edge list which modifies the costs on the routing table. The routing table is the primary data structure used in the program which consists of a 3 dimensional integer array to find the costs of each path at any given time. The array has 3 axes x,y, and z where x is the current time of the simulation, y is the source node of the vector, and z is the destination. The value at the routing table(x,y,z) is the cost of the distance vector at time x, from source y, to destination z.

Some key takeaways from this exercise were understanding the difference between Bellman Ford and Djikstra's algorithm, understanding of route calculations using a distance vector, and the potential implementation of networking protocols. The program also served as an exercise in order to learn the programming language GoLang. Ultimately, this project served as a great introduction to network programming, and while it was a simulation it did a great job showcasing the capabilities of routers using distance vectors.