Project Report (Data Structures)

Network

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Implementation:

Network

The Network class consists of the main graph, router and machines. It is associated with the Router and Machine classes. When the initiate() function is called the class, using the csv file provided, creates a graph in accordance with it for the network.

Routers and Machines

When the Network is initiated, after populating the graph, it populates the routers and machines in accordance with the vertices provided. It then populates the routing tables for each router.

Routing Table

There are two implementations of the routing table. If LinkedList is picked, it creates routing tables using linked lists and if SplayTree is picked, it creates routing tables using splay trees. Routing table contain the destination and the next best router

Message

The message class contains the class members of the message that is sent, received or passed from one router to another including id, priority, source, destination and updates the trace as the message moves along the routers and machines.

Routing of Messages

One or multiple messages can be sent at a time using the network from one machine to another. The sent message is first sent to the router. The network inserts the message in the outgoing queue of the machine through which the message is being sent. The message is then forwarded to the incoming queue of the next best routers until it reaches the destination machine to which the message is sent. This process is done with latency using multithreading.

Multithreading

Three detached threads run simultaneously. One to forward the message from incoming queue of a router to its outgoing queue. Second thread runs to forward the message from a machine/router's outgoing queue to the next best router/destination machine's incoming queue. The second thread has an interrupt-based mechanism that adds a delay of 2 seconds before forwarding the message to the next incoming queue. The third thread checks whether all incoming & outgoing queues of all routers & machines are empty. If they are, it terminates the simulation.

Other features

The network also supports other features:
1. Adding/removing a device from the network
2. Changing the weight of a path in the network
3. Printing (tracing) a path in the network

Command Line Input

The user can access the network using the following command line inputs:

- exit (to exit the program)
- send msg file.txt
- send msg MessageID:Priority:Machine1:Machine2:Payload
- change RT Device add/remove file.txt
- change RT Device add/remove newDevice
- printPath Device1/* to Device2/*
- change edge file.csv
- change edge Device1,Device2,Weight