**3D3 – Computer Networks**

**Project 2**

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**Implementation description**

● Files

* **my-router.cpp**: our main file
* **routerFunctions.cpp**: contains the router table class and helper functions for the router example generate DV and send DV
* **routerFunctionsh.cpp**: the implementation of DV.h

● Structures

* **RTentries**: each router maintains its own routing table implemented as an vector of strings structures. Each string contains the cost of the shortest path to a particular destination and the next hop along the shortest path.
* **Router Funcitons**: the wrapper class that contains all information that the current router holds. It includes its address, ID, routing table, and neighbor node structures.

● Routing Table

**Routing Tables (after convergence)**

**Note –** this table is for the Node A

|  |  |  |  |
| --- | --- | --- | --- |
| Packet Information | Node name | Distance vector | Node ID |
| A,0,XXXXX | A | 0 | XXXXX |
| B,3,10001 | B | 3 | 10001 |
| C,6,10001 | C | 6 | 10001 |
| D,8,10001 | D | 8 | 10001 |
| E,1,10005 | E | 1 | 10005 |
| F,4,10001 | F | 4 | 10001 |

● Packet Details

* A packet typically contains a header followed by a payload. Depending on the type of packet, some packets have empty payloads.
* **header**: We have different tpyes of headers. The P header is for data/ payload. The N header is for the “Are you alive“ packet. Y is the header which says “Yes I’m alive”.
* **payload**: we can specify what we want to carry in the payload for TYPE\_DATA packets through the argument to the “inject” script (./inject <message>).

● Packet Types

* **Data**: indicates that the packet contains data that should be forwarded to a

particular destination.

* **Advertisement**: contains a router’s distance vector, used to update neighboring

routers’ routing tables. This packet is sent to the router’s neighbors periodically.

● Other Details:

* For efficiency purposes, each router broadcasts its distance vector only if it receives a distance vector that changes its own routing table. Also, if a router does not get any advertisements from its neighbor for 5 seconds, that neighbor is rendered invalid.

**Difficulties**

● **Determining how a router receives and sends packets at the same time**: We have one thread that does a sender receiver loop for data vectors. The second thread checks if the neighbours are alive or dead.

● **Determining how to update a router’s routing table based on a received**

**advertisement**: We decided that each advertisement would contain the distance vector of the sender, and the receiver router would update its routing table by comparing its current shortest cost to each destination with the cost of the path to the destination going through the routing that sent the advertisement. This cost is simply the sum of the cost to reach the sender and the cost from the sender to the destination. Through this routing table updating scheme, we were able to see each routing table in the network converge to an

optimum set of routes. Essentially how Bellman-Ford works.

● **Having a router detect if a neighboring router is invalid**: A router performs detection by maintaining a timer for each of its neighboring routers. Every time the router receives an advertisement packet, the router resets the timer corresponding to the neighbor that delivered the packet. Because each valid neighboring router advertises periodically, the router detects that a neighbor has become invalid if it hasn’t sent any advertisements in a while.

● **Alerting the rest of the network that a router is invalid**: Our method for reacting to

detection of invalid routers is for every other router in the network to reset its routing table to its initial configuration (as loaded from the topology.txt file). This requires that the routers that detect the invalid router must broadcast to the rest of the network.