COMP3331 Assignment report
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Introduction

The goal of this assignment is to implement the link state protocol and generate the shortest path from a router to all others router in the network, this assignment is done by python.

APPROCH

The steps of implement the LSR protocol are listed as follows:

1. Initialising a single router
2. Sending a packet that contains necessary information (thread 1)
3. Listening to the packet from other routers (thread 2)
4. Using Dijkstra algorithm to calculating shortest path (thread 3)

Graph data structure is used to represent the network topology.

Broadcasting

A packet is dictionary that contains link-state information, for example, router A send to B: { 'name' : A, 'neighID' : B, 'cost' : 6.5, 'seq' : (a random number), 'dead' : [ ] }
A router will keep broadcasting every second before it dies.

Rebroadcasting

The mechanism that used to reduce unnecessary broadcasts is give each packet a unique sequence number, each router will have a list that contains all sequence numbers it has received, the router will not send the packet which already has a sequence number in the list. Also, the router would not rebroadcast a packet that has a 'name' of itself.

The rebroadcasting will happen as soon as the receiver received a packet.

Node failures

The steps for detecting node failures are:

1. Each router maintains a list called lastReceived which stores the last received time for all other routers.
2. The receiver will update the last received time for a node when it receives the packet that comes from that node.
3. A node with timestamp that is three seconds before current time will be seen as unreachable, this will be checked by a for loop in the listening thread.
4. The dead node is one of the neighbours of the receiver, it will be added into a set called 'deadNeighbours' which will be sent to other routers via packet.
5. Receiver will check the 'deadNeighbours' set it received is empty or not, and update the graph is has correspond to any dead node.

For dead node join back, it will be removed from 'deadNeighbours' set, and being added into the graph, therefore being counted into the link-state computations.

Dijkstra

The idea for Dijkstra algorithm comes from the pseudocode in the COMP2521 lecture slide.
http://www.cse.unsw.edu.au/~cs2521/19T1/lecs/week05a/slides.html#s36 (page 36)

Possible extension and Improvement

One of the possible improvements can be using linear sequence number instead of randomly, so that we can use the successive sequence number to detect a node is alive or not, and do not need to implement the time out mechanism.