

# 3331 Assignment 1

## Overview

The nodes send packets over UDP so that each node can maintain a distance matrix of the nodes in the network. Apart from the distance matrix the nodes also maintain information about which nodes are still active by means of a blacklist.

## The Packet

each packet sent between nodes holds only the distance between two nodes. This is done to decrease the bandwidth requirement. The packet is an object of 6 bytes, it's attributes are the ids of the start and end node (2 chars) and the cost to send something between them (signed int), the cost attribute can also be used to relay information about node failures by using a negative value (this is expanded in the node failures section)

## Distance Vector

The distance vector is updated by following the following algorithm (which is run everytime a new packet is received)

- look for an entry where the end node is the start node of the packet (if no such node exists do nothing)
- look for an entry where the end node is the end node of the packet, if no entry exists create a new entry and set it's cost to the cost of the packet + the cost of the entry from above, it's next hop to the start node of the above entry, and it's end node to the end node of the packet
- if the entry does exist compare it's cost and the sum of the cost of the packet and the cost of the entry from step 1, if the new cost is favourable replace the old entry

It is assumed that the costs of the neighboring nodes (the ones known at startup) is already added to the distance vector

## Node Failures

failures are found by maintaining a heartbeat counter for each known neighbor (the ones known at startup). The counter is reset everytime a packet arrives from that node and incremented if no message was received during one listening cycle (see section on multithreading)

and cycles). A node is considered to be out of the network if the counter exceeds 50 (this value was chosen by trial and error). Once a failed node is found, it is added to the blacklist where it will never be removed. In the send cycle along with sending packets blacklist packets are also sent, these have the same format as regular packets, but the cost is a negative value and the end node is the node to be blacklisted. Broadcasting the blacklist packets allow the whole network to be made aware of the failure and thus change their distance vectors.

## Poisoned Reverse

This feature has not been implemented

## Multithreading and Cycles

The entire application is implemented as two threads, a sending thread and a listening thread. Since the same socket is used for listening and sending a mutex was used so that the cycles don't run at the same time. The Sending Cycle only runs every 5 seconds, while the listening cycle should run time the sending cycle doesn't run.

## Improvements

Currently when a node fails only information relating to that node is removed from the distance vector, but in reality the entries from the failed node's neighbor's should also be removed. The failed node's neighbors can be identified by looking at the from attribute of the blacklist packets.