MANIAC CHALLENGE

THE LIVE AND LET LIVE STRATEGY

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ABSTRACT

Mobile Ad-Hoc networks are certainly the most flexible computer networks that currently exist. They can be built anytime, anywhere, using any wireless-enabled devices and provide end-to-end connectivity. There are several requirements that a MANET has to fullfil. For a stable and functional network to exist, all nodes have to cooperate. The other factors include transfer speeds, power usage efectiveness or the adaptation to topology changes. This paper describes a solution for the Mobile Ad-hoc Networking Interoperability And Cooperation (MANIAC) Challenge which aims to study the tension between the desire of nodes to focus only on delivery of their team's packets (in order to preserve battery life and competitive advantage) and the need for nodes in a MANET to cooperate in order to permit the delivery of packets across the heterogeneous network.

1 KEY FACTORS

As the common API is used by all nodes in the MANIAC Challenge network, the compatibility issues should be minimal or none. Each team's goal is to implement a forwarding decision logic that would minimalize the data that each team has to process, while not affecting the networks normal operations, and preferrably forwarding its own data as fast as possible.

2 SOLUTION BACKGROUND

Our design is based on real life experience in networks with shared resources such as P2P networks or MESH networks where nodes prefer their own traffic and forward other node data in a limited manner. If there is no interesting traffic, they act as relays. By looking further into the network the idea is extended to build a minimal active neighbor topology. That is a topology where no host looses connectivity to the network, as well as the noninteresting traffic on own nodes is minimalized. As it is expected that other teams will act similarly and naturally prefer their own traffic, more than one route to destination will be used if possible to combine the speed of multiple links. The strategy is called Live and Let Live.

3 LIVE AND LET LIVE

The solution consists of two parts:

3.1 Minimal active neighbor topology calculation

To reduce the foreign traffic flow for own nodes, noninteresting traffic (destined for other teams) should be prevented from entering the devices at all. As the connectivity is to be kept, alternative route for the data to travel should coexist. If that is true, indirect change of the OLSR metric for own nodes in neighbors routing tables results in becoming a less preferred route for the foreign data. After manipulating the OLSR hello packets and OSI Layer 2 connections, neighbors that are able to reestablish an alternative connection thru some other nodes are determined and their communication with these nodes is blocked. If there is no path for the neighbor to deliver its data, own nodes provide the service.

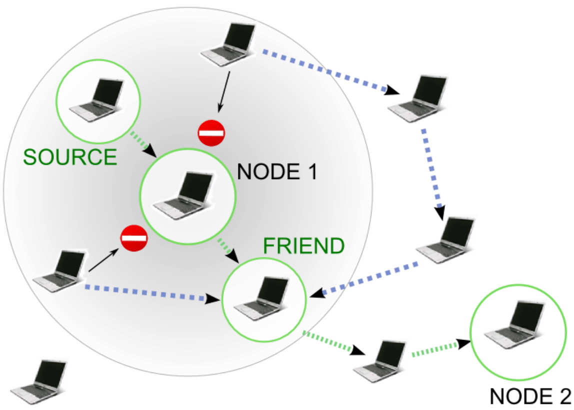

Figure 1

Figure 1 shows an example of the topology optimization for minimal flow thru the team nodes.

Data received from nodes located further than one hop is also reduced, as the metric artificialy rises. If there is any interesting traffic, e.g. traffic destined for the second team node, prefered next hop for the destination is found and it is added into so called friendly cache. All next hops that are important in the means of forwarding data are kept in the cache. This nodes are prefered and are not limited in any way as for their connectivity. This approach speed up own traffic in a full-duplex manner as well as it keeps a “friendly“ relationship with the neighbor node. That should prevent any limitations to be applied to the link at the neighbor node side for not providing a reliable and fast service.

Both team nodes use the same logic and strategy, keeping the lowest hop count between each other.

3.2 Forwarding logic

As the whole strategy is highly topology dependent, topology status is checked whenever a packet is received. If there is any change, the minimal active neighbor topology calculation algorithm is rerun. While doing so, data cannot be accurately processed, so they are simply forwarded, using the actual kernel routing table information. Once the networs is stable, program takes over the forwarding. If there are more links to a destination, they should be used. Because of the limitations of OLSR, it can be only assumed that links with the same metric are comparable.

The processing time on the local node is always lower than the travel time of the packet. Combination of multiple links should provide more bandwidth.

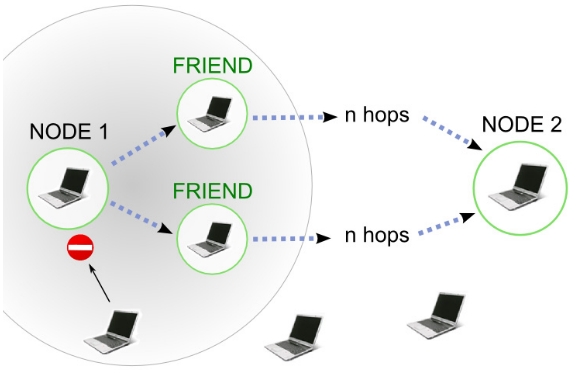

Figure 2

Figure 2 shows an example of load balancing using two links with the same metric.

4 CONCLUSION

This solution combines the foreign traffic limitation in order to keep the power consumption as low as possible with complete network end-to-end reachability and maximum possible throughput to be achieved without risking high packet drop or large data flow desynchronization.