Bluenode: a Bluetooth wrapper for network programming

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February 1, 2019

1 Introduction

The goal of this research project was to create a robust ad hoc network. A simple way to test this network was by building a chatting application on top of this network layer. Bluenode is a dynamic and portable wrapper for network programming on which any application could easily be build upon.

In our application clients are connected with each other in a Bluetooth ad hoc network. This allows clients to communicate in a peer to peer network without any centralized control. A client can host or join a network and start chatting with other clients connected to the network.

2 Network

The reason for choosing Bluetooth is that it supports multiple individual connections natively and rather than using LTE or Wi-Fi, Bluetooth has low energy consumption. A device in this network is both host and client which means when a client disconnects, the network should not be affected.

We implemented a Heartbeat- and a on-change topology sharing algorithm. In the Heartbeat algorithm every peer periodically sends a exist message. A node regards a another node as inactive when it hasn't recently received a corresponding exist message. If so this node it will be removed from the list of active nodes. Removed nodes can sever the network but by removing them manually we can restore the network after.

In the on-change topology sharing algorithm, a node which has been joined by a new node, will broadcast the new topology. A detected disconnect is broadcasted as well.

3 Monitoring and simulation

In order to correctly manage and observe the network, a host runs a monitoring tool. This piece of software keeps track of the IO activity, and CPU utilization. In addition to this monitoring tool have we written our own simulation tool.

4 Results

We have found what the optimal network maintenance algorithms are for different networks. That is to say, Heartbeat for short small networks that change a lot, and on-change for long large networks that are more consistent in topology.

5 Conclusion and future work

For this project we have build a portable and dynamic ad hoc network on which we have build a chatting application. We have shown that with Bluetooth we can replicate most of the functionality that we find in other communication protocols. Certainly, there is substantial room for improvement, however. For example, we have not implemented any form of security or authentication into our protocol, meaning malicious nodes pose a big problem to our network.