Quality of Service based Performance Metrics on Routing Protocols in MANET with Limited Nodes

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Abstract
Because the backbone of MANET has changed over time, routing is a laborious task. Since a mobile ad hoc network is made up of a collection of free-moving, independent nodes that use radio signals to communicate, all of them were designed with data transfer and battery backup in mind. To efficiently route signals from source to destination via intermediary nodes in a timely manner, various routing algorithms have been proposed for ad-hoc networks over the past ten years. Through simulation and a side-by-side comparison of stated proactive type routing protocols and specified reactive type routing protocols in a MANET with few nodes, we aim to ascertain and acquire efficiency in this study. Using Qual-Net Simulator in this instance, the performance of the routing protocols has been evaluated on a small number of mobile nodes to achieve quality of routing.

General Terms: Algorithms, Performance, Experimentation, CBR traffic.

Introduction

In this work, we compare the proactive Fisheye State Routing Protocol (FSR), Source Tree Adaptive Routing Protocol (STAR), Dynamic Source Routing Protocol (DSR), On demand Routing Protocol (DYMO) are examined and provided, and implementers are free to use any routing system that is simple and effective for delivering packets without an access point. With the use of the QualNet 5.0.2 simulator, we implemented under Constant Bit Rate (CBR) client-server traffic conditions to examine the effects of QoS measures like throughput, average end-to-end delay, and average jitter on routing between nodes. By employing a simulator alone, graphs with the X axis representing Node Count and the Y axis representing the Quality of Service metric are plotted to demonstrate performance efficiency.

The main element that defines how effectively a multi-hop wireless network responds to topology (backbone) changes on the basis of bandwidth on demand is how frequently these changes occur.

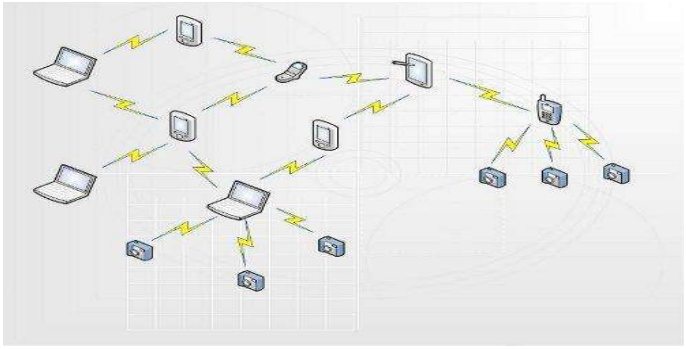

Figure 1 Mobile Ad hoc Network environment

Routing Strategy:

This work focuses on how effective routing methods are in comparison to other protocols. A routing protocol's main goal is to send messages with improved performance and the least amount of delay possible from source to destination. Conventionally, Routing strategies are implemented by two ways.

1. Proactive (Table driven) routing strategy
2. Reactive (On-demand) routing strategy

Proactive Routing Strategy

Proactive routing strategy is used in packet switching networks. Routing information gleaned from neighbors is periodically used to maintain the routing table.

Now we discuss the following kinds in this strategy.

1. Source Tree Adaptive Routing (STAR)
2. Fisheye State Routing (FSR)

Fisheye State Routing (FSR)

The Global State Routing strategy(GSR)'s (FSR) next-generation technology. The routing table entries of neighboring nodes are updated and shared more frequently because to FSR maintenance. As packets approach their destination, the precision of the route improves.

Source -Tree Adaptive Routing (STAR): This is based on the link state algorithm. Each router keeps track of a source tree, which is a collection of links that contains the recommended routes to destinations. By utilizing a least overhead routing approach (LORA) to communicate routing information, this protocol has drastically reduced the amount of routing overhead propagated throughout the network.

Reactive Routing Strategy

This strategy finds a path as and when necessary is also known as a demand-driven approach. They merely keep track of active routes and execute route discovery before data transmission by flooding destination node replies with route reply packets and route request packets. The following are used for this kind.

1. Dynamic MANET On-Demand Routing (DYMO)
2. Dynamic Source Routing (DSR)

Dynamic Manet On-Demand Routing (DYMO)

This routing protocol is reactive. All reactive routing protocols depend on route request packets quickly spreading throughout the MANET to find routes between sources and destinations.

Dynamic Source Routing (DSR)

Hear a packet is routed that is chosen by the sender in this on-demand routing system. A list of routing intermediate nodes is contained in the packet header. Every node that has learned a source route maintains a cache of that route.

Performance Metrics

The following metrics are studied-

Average end to end delay- The amount of time it typically takes for a signal to travel from the source node service access point (SAP) to the destination node service access point.

Throughput- is defined as total number of signalling elements travelled at a unit time.

Jitter- It is the variation of the packet arrival time.

Results & Comparisons

Table. CBR client Throughput (Bits/sec)

nodes #	FSR	STAR-LORA	DYMO	DSR
2	4274	4274	4274	8520
4	4274	4274	4274	8520
6	4274	4274	4274	8520
8	4274	4274	4274	8520
12	4274	4274	4274	8520

Performance Evaluation

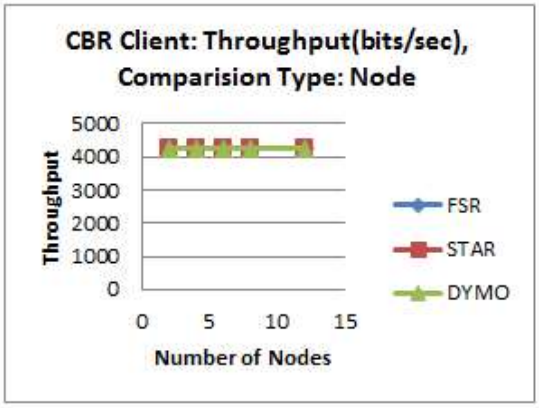

Fig. Graph for Throughput(Bits/sec) Vs nodes

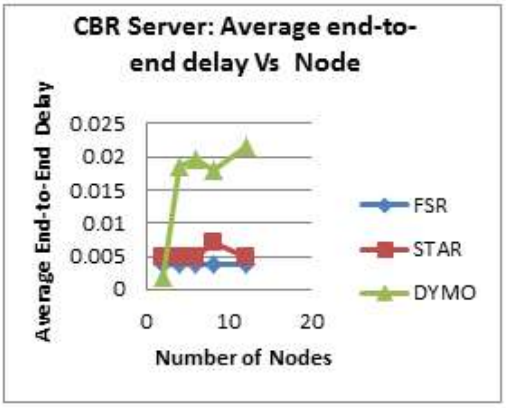

Fig. Average End-to-End delay Vs nodes

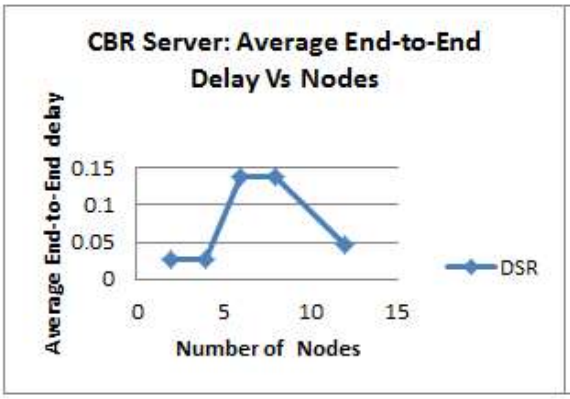

Fig. Average End-to-End delay Vs nodes

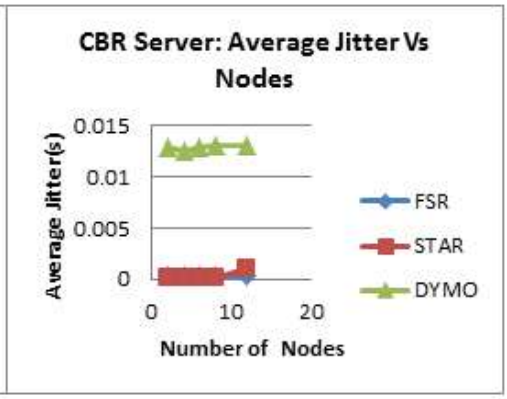

Fig. Average Jitter (s) Vs nodes

Conclusion & Future Work

Using the Qualnet 5.0.2 network simulator, the performance of two proactive routing methods (FSR and STAR) and two reactive routing strategies (DSR and DYMO) for stationary nodes is assessed. It is clear from the graphs that DSR, a reactive routing protocol, is only appropriate for applications where average jitter and throughput are at risk. Researchers are encouraged to improve this paper's objective by running scenarios in addition to using these tools. But there is room for experimenting in the hope of a better tomorrow. One of our future research projects is to create a routing strategy algorithm that can be used for the banking industry and high-secure communication.

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