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Packet Transfer Rate & Robust Throughput for Mobile Adhoc Network

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ABSTRACT

An ad-hoc wireless network is highly different considering dynamic stochastic process of its underlying links, leads to link breaks during data transaction. Hence, to provide free flow data transaction, many routing algorithms have the property of link recovery and maintenance procedures to minimize the loss of data during transmission. However these routing method do not guarantee reliable data transmission in some special application conditions with wide requirements on Packet delivery ratio and link quality of the network. Routing is a critical issue in MANET and hence the focus of this paper is the performance analysis of different routing protocols used in the wireless network. We evaluate the ability of a mobile ad hoc wireless network to distribute flows across robust routes by introducing the robust throughput measure as a performance metric. The utility gained by the delivery of flow messages is based on the level of interruption experienced by the underlying transaction. We describe the mathematical calculation of a network's robust throughput measure, as well as its robust throughput capacity. We introduce the robust flow admission and routing algorithm (RFAR) to provide for the timely and robust transport of flow transactions across mobile ad hoc wireless systems.

Keywords – **MANET, AODV, DSR, RFAR, TORA.**

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I. INTRODUCTION

When two nodes are at the accessible distance then packet transmission between the source and destination node occurs. The transmission power in an ad-hoc can change rapidly and unpredictably. The central challenge in the design of ad-hoc network is in maintaining routes and links between these mobile nodes. Mobile ad-hoc networks (MANETs) are characterized by time-varying links and network topology. There are transmission impediments like fading, path loss, blockage and interference that add to the inclined behavior of wireless channels. In such situation, the network must accommodate the changes, providing end-end packet delivery while at the same time incurring low control overhead. This paper proposes an improvement over the existing routing algorithm for MANETs with the primary goal of maximize network connectivity while limiting operating cost by finding those routes which can stay intact for a period of time, failures as well as by fluctuations in the communication transport quality experienced across the network's communications links. When an active route is broken, an on-demand routing mechanism acts to discover an alternate route considering the same souce and destination. At that time, forwarding entries are configured in the routing tables of the routers located across the new route. In turn, under a proactive routing scheme, routing entries are refreshed periodically at all (active or inactive) routers. At such a refresh instant, link failures may be discovered, and the routing entries are updated. The alternate routing of packets occurring under a corresponding proactive routing base datagram-oriented (connectionless) packet switching operation, the re-configuration of the route executed by connection-oriented packet switching networks (including connection-oriented and on-demand ad hoc wireless routing schemes, such as AODV or DSR, and IP-MPLS label switching methods) may induce unacceptably long excess delays. Latencies may be adversely perceived at the impacted layer, and for many applications cause significant degradations in the quality of the provided transport service. Induced by such perceivable re-routing delays, the reception of data packets embedded in flows (or within bursts of such flows) that use routes that are prematurely terminated or altered may be of reduced value to their intended receivers. An application may generate a program (or file, or burst of messages) that must be delivered, as a whole, across the network in a critically timely manner. Kaixin Xu et al. [6] have proposed a Scalable QoS architecture suitable for large scale mobile ad-hoc networks. Xiaoqin Chen et al. [1] have proposed congestion-aware routing protocol for mobile ad-hoc networks which uses a metric incorporating data-rate, MAC overhead, and buffer delay to combat congestion. Ming Yu et al. [2] have proposed a link availability-based QoS-aware (LABQ) routing protocol for mobile ad-hoc networks based on mobility prediction and link quality measurement, in addition to energy consumption estimate. The packets which are equipped to be transmitted are buffered by the Network Interface Queues (IFQ) implemented by AODV [3], TORA [4], and DSR [5] and the network protocol stack receives these packets.

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ROBUST THROUGHPUT: We evaluated the ability of a mobile ad hoc wireless network to distribute flows across robust routes by introducing the robust throughput measure as a performance metric. It describes the rate at which robust data is received by intended destinations. we investigate robust routing in MANETs. Throughput is defined as; the ratio of the total data reaches a receiver from the sender. The time it takes by the receiver to receive the last message is called as throughput. Throughput is expressed as bytes or bits per sec (byte/sec or bit/sec). Some factors affect the throughput as; if there are many topology changes in the network unreliable communication between nodes, limited bandwidth available and limited energy. A high throughput is absolute choice in every network. By "robust" we mean that although a particular routing configuration (in our case, a set of multi-path routes) may not be optimal for a single specific configuration (e.g.,specific network topology and link characteristics), it will perform well over a larger set of likely network configurations: i.e.,it is robust to changes without requiring global recomputation of the network. For example, only transactions that are completed without being prematurely interrupted may convey data to their intended users that are of acceptable utility and are thus accounted (as 'robust'). In the following, we illustrate the mathematical calculation of a network's robust throughput measure, as well as its robust throughput capacity. Different algorithms have been developed to improve the link quality. A large amount of work has been done to improve the quality of service in Manets, as well as extending existing protocols with QoS features. Most of the performance analysis work is based on simulation studies with several design parameters in commercial settings. Through simulation, we compare the reliability of braided routing and various other MANET routing protocols, including AODV, and quantify the relative amounts of control overhead incurred by braided routing and AODV. Routing means to choose a path. Routing in MANET means to choose a right and suitable path from source to destination. Routing has two basic types, which are as under as follows;

Static routing: It is done by the administrator manually to forward the data packets in the network and it is permanent. None of the administrator can change this setting. These static routers are configured by the administrator, which means there is no need to make routing tables by the router itself. The Destination-Sequenced Distance-Vector (DSDV) protocol [17] is a proactive routing algorithm and is an enhanced version of the distributed Bellman-Ford algorithm Jangeun Jun and Mihail L. Sichitiu [7] have exposed a significant fairness problem existent practically in all wireless multi hop networks. Examples include Destination-Sequenced Distance-Vector (DSDV) Routing [11], Wireless Routing Protocol (WRP) [12], Global State Routing (GSR) [13], and Fisheye State Routing (FSR) [14] On the contrary, in on-demand routing protocols, routes are discovered between source and destination pair only when data is to be sent. This provides reduced overhead but high path finding latency as whenever the route is to be found between source and destination, route discovery procedure is initiated. And reSchumacher et al. [7] have approached the problem of load balancing for wireless multihop networks by distributed optimization. Examples include Ad hoc On-demand Distance Vector Routing (AODV) [8], Dynamic Source Routing (DSR) [9], and C luster Based Routing protocol (CBRP)[10].

Hybrid routing protocols combine the merits of both proactive and reactive routing protocols and overcome their short comings. Normally, hybrid routing protocols for mobile ad hoc networks exploit hierarchical network architectures. Proper proactive routing approach and reactive routing approach are exploited in different hierarchical levels, respectively. Examples of hybrid routing protocols for mobile ad hoc networks are the Zone Routing Protocol (ZRP) [15], Zone-based Hierarchical Link State routing (ZHLS) [16].

Dynamic Routing: is automatically done by the choice of router. It can route the traffic on any route depend on the routing table. Dynamic routing allows the routers to know about the networks and the interesting thing to add information in their routing tables. There are several kinds of routing protocols for wireless ad hoc networks. The first kind of protocol is simply called Reactive MANET Protocol(RMP). In these kinds of protocols, communication is only possible when the source node requests to communicate with the other node. Reactive MANET Protocols are mostly suited for nodes with high mobility or nodes that transmit data rarely. These reactive routing protocols include the protocol AODV. The routing information about all the nodes is build and maintained by the proactive protocols. The proactive routing protocols are independent of whether or not the route is needed. Control messages are transmitted with periodically intervals. Even if there is no data flow still control messages are transmitted. Because of these control messages proactive routing protocols are not bandwidth efficient. These proactive routing protocols include DSDV etc.

II. AODV(Ad-hoc On-demand Distance Vector):

AODV is an on-demand routing protocol. The Ad Hoc On-demand Distance Vector Routing (AODV) protocol is a reactive unicast routing protocol for mobile ad hoc networks [5] in which a route is established only when required by a source node for transmitting data packets.

The AODV algorithm gives an easy way to get change in the link situation. For example if a link fails notifications are sent only to the affected nodes in the network .This notification cancels all the routes through this affected node. It builds unicast routes from source to destination and that's why the network usage is least. Since the routes are build on demand so the network traffic is minimum. AODV does not allow keeping extra routing which is not in use. If two nodes wish to establish a connection in an ad hoc network then AODV is responsible to enable them to build a multi hop route. AODV uses Destination Sequence Numbers (DSN) to avoid counting to infinity

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that is why it is loop free. When a node send request to a destination, it sends its DSNs together with all routing information. It also selects the most favorable route based on the sequence number. There are three messages i.e.,Route Request (RREQs), Route Replies (RREPs), and Route Errors (RERRs). By using UDP protocol.

III AODV Protocol with implementation steps:

1] Begin If intermediate node k receives RREQ from node I.

2] Determine the RREQ Discard limit (or D Lim) of RREQ receives in all sessions on each node from their neighbors node.

3] AVG_VAL = AVG [S1, S2, S3, S4, S5]

4] RATE_LIMIT =max no of RREQ [Si] - AVG_VAL

5] RREQ Discard limit (DLim) = (AVG_VAL+RATE_LIMIT)+1

6] If received RREQ >RREQ Discard limit Drop the RREQ packet Set the node a UNKNOWN NODE.

7] If received RREQ <RREQ Discard limit Process the packet Set as KNOWN NODE

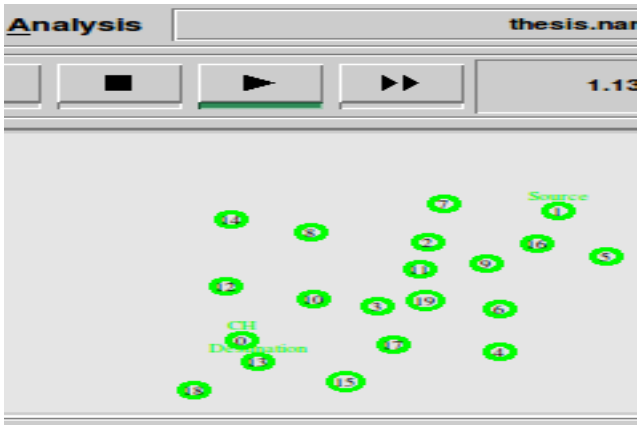

Figure.1 Mobile Node Creations: with source S and Destination D is specified

After creating the nam file and trace file, we set up topography object. set node_ ($i) [$ns node] is used to create the nodes- Node Creation is shown in Figure1.

Packet Transmission: Every node transmits a packet only up to a limited transmission range. This provides multi-hop functionality.

Data transfer rate is a measurement of the amount of data sent between two points on a network in a given time period. It is a highly important concept in modern business networking, with high data transfer rates allowing networks to be used for complex tasks, such as on line streaming. Understanding data transfer rate could help you improve the performance of your business's own network. It is shown in Figure 2.

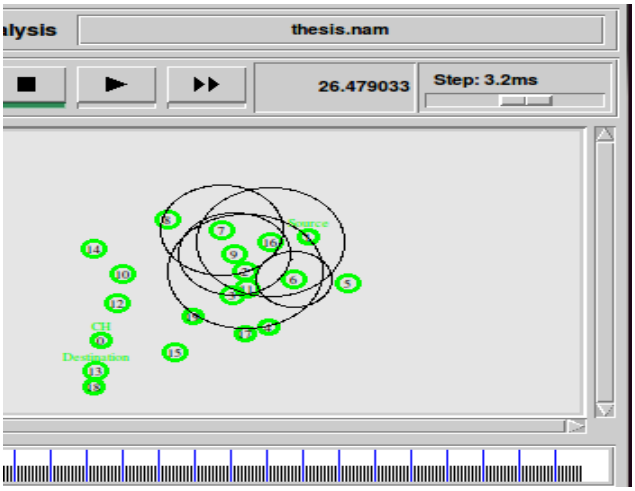

Figure 2 Packet Transmission between nodes

Mobility of Nodes: Number of nodes is fixed in the program. Nodes are configured with specific parameters of a mobile wireless node. Initial location of the nodes is fixed. Specific X, Y coordinates are assigned to every node. Nodes are given mobility with fixed speed and specific destination location which is generated randomly. Nodes' mobility will change time to time. Here we set the initial size for the every node by using initial_node_pos. AODV routing protocol is used here. $val(stop) specifies the end time of the simulation.

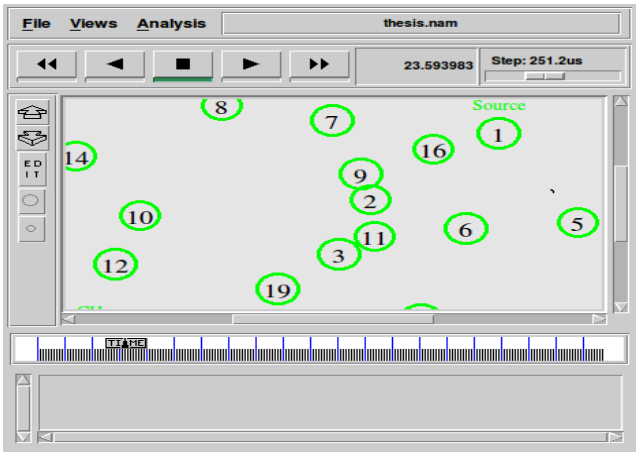

Figure 3. Mobility of Nodes from source S to Destination D

Throughput: Throughput: is a measure of how many units of information a system can process in a given amount of time. It is applied broadly to systems ranging from various aspects of computer and network systems to organizations. Related measures of system productivity include the speed with which some specific workload can be completed, and response time, the amount of time between a single interactive user request and receipt of the response.

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The cumulative throughput plot is much smoother and fairness plot does not show any improvement when pacing is on. Throughput is the number of successfully received packets in a unit time and it is represented in bps. Throughput is calculated using awk script which processes the trace.
Throughput=No of packets received from application layer with No of packets generated in application file and that produces the result.

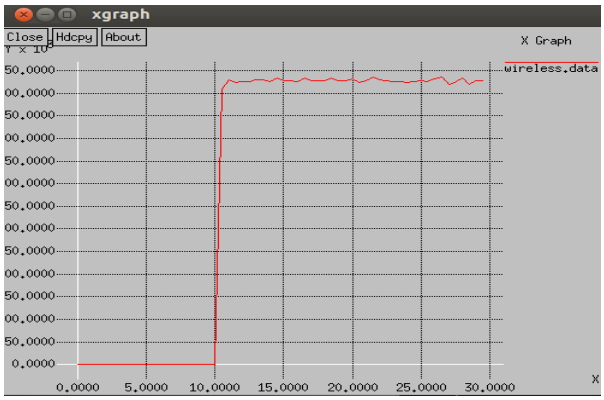

Figure 4. Throughput of a graph

IV CONCLUSION:

We proposed robust throughput and packet transfer capacity measures to characterize the ability of a mobile ad hoc wireless network to provide highly survivable transport of flows. Such a service is critically required for supporting applications that often required flow transactions to be carried out to completion without interruption to yield maximum benefit. We note that a network system that is designed to yield a high throughput rate does not necessarily provide its users with a high measure of robust service and consequently may be characterized by low robust throughput performance.

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