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Analysis of Optimized Link State Routing Protocol Using UDP & TCP Traffics in Wireless Ad Hoc Network

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ABSTRACT: The goal of this paper is to think about the execution of TCP/FTP and UDP/CBR movement in OLSR directing convention in a remote impromptu system environment (i.e. MANET). A versatile specially appointed system (MANET) comprises of portable remote hubs. The correspondence between these versatile hubs is done with no incorporated control. The transmission of data in a MANET depends on the execution of the activity operator and information movement utilized as a part of a system. In this paper we will investigate the execution measurements of OLSR directing convention through expanding number of hubs in system. The study and recreations is being done utilizing NS-2 to break down results, which are assessed for execution measurements, for example, throughput, parcel conveyance proportion and normal end to end delay.

KEYWORDS: MANET, TCP/FTP, UDP/CBR, OLSR, NS-2.

I. INTRODUCTION

Mobile Ad-hoc network (MANET) is a collection of wireless mobile nodes forming a temporary network without any fixed infrastructure where all nodes are free to move arbitrarily and these nodes configure themselves. The entire collection of nodes is interconnected in various ways. There is more than one path from one node to another for routing. The MANET imposes several challenges for communication, out of which one of the important challenge is to provide secure and efficient routing of data in the network [1, 3]. Thus a great need to develop dynamic and efficient routing protocols, which can ensure efficient and secure routes for communication.

The Optimized Link State Routing Protocol (OLSR) is a proactive link state routing protocol i.e., exchanges topology information with other nodes of the network regularly. Each node selects a set of its neighbour nodes as "multipoint relays" (MPR) [1]. In OLSR, only nodes, selected as such MPRs are responsible for forwarding control traffic, intended for diffusion into the entire network. MPRs provide an efficient mechanism for flooding control traffic by reducing the number of transmissions required. Nodes selected as MPRs; also have a special responsibility when declaring link state information in the network. Indeed, the only requirement for OLSR to provide shortest path routes to all destinations is that MPR nodes declare link-state information for their MPR selectors. Nodes which have been selected as multipoint relays by some neighbour node(s) announce this information periodically in their control messages. Thereby a node announces to the network, that it has reach ability to the nodes which have selected it as an MPR. A node selects MPRs from among its one hop neighbours with "symmetric", i.e., bi-directional, linkages. OLSR is developed to work independently from other protocols. OLSR is well suited for networks, where the traffic is random and sporadic between a larger set of nodes rather than being almost exclusively between a small specific set of nodes. As a proactive protocol, OLSR is also suitable for scenarios where the communicating pairs change over time: no additional control traffic is generated in this situation since routes are maintained for all known destinations at all times.

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II. RELATED WORK

The Optimized Link State Routing Protocol (OLSR) is a proactive link state routing protocol for mobile ad hoc networks (MANETs), which use HELLO and Topology Control (TC) messages to discover and disseminate link state information throughout the network. The different types of messages are as follows:

a. HELLO MESSAGE

This involves transmitting the Link Set, the Neighbour Set and the MPR Set. In principle, a HELLO message serves three independent tasks:

i. Link sensing
ii. Neighbor detection
iii. MPR selection signaling

Three tasks are based on periodic information exchange.

b. TC MESSAGE GENERATION

Keeping in mind the end goal to assemble the topology data base, every hub, which has been chosen as MPR, telecasts Topology Control (TC) messages. TC messages are overflowed to all hubs in the system and exploit MPRs. MPRs empower a superior versatility in the circulation of topology data. OLSR minimizes the overhead from flooding of control movement by utilizing just chose hubs, called MPRs, to retransmit control messages.

c. MULTIPOINT RELAYS

The idea of multipoint relays is to minimize the overhead of flooding messages in the network by reducing redundant retransmissions in the same region. Each node in the network selects a set of nodes in its symmetric 1-hop neighbourhood which may retransmit its messages. This set of selected neighbour nodes is called the "Multipoint Relay" (MPR) set of that node.

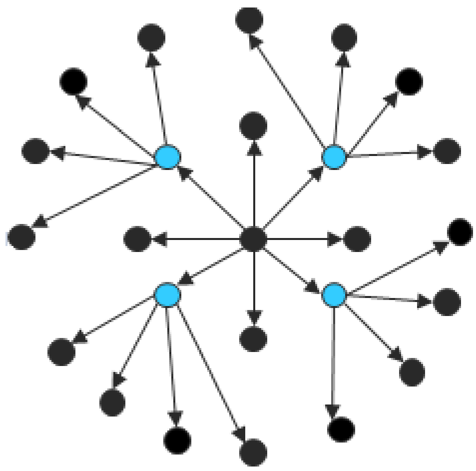

Figure 1: MPR election in OLSR protocol.

Each node maintains information about the set of neighbours that have selected it as MPR. This set is called the "Multipoint Relay Selector set" (MPR selector set) of a node. A node obtains this information from periodic HELLO messages received from the neighbours.

Optimized link state routing protocol (OLSR) is a proactive and link state routing protocol designed especially for the mobile ad-hoc networks. Advantage of OLSR are only small subsets of links are declared and it provides various parameters to control the overheads.

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1. Procedure: OLSR keeps up multipoint Relays (MPRs) which minimizes the flooding by doling out the connections of neighbours inside its MPRs instead of all connections. Multicasting conduct of OLSR course revelation method can be joined with the portable IP administration by inserting the versatile IP specialist ad into OLSR flooding. A few augmentations of OLSR are accessible that relate to various system situations. Because of the proactive nature, OLSR works with the intermittent trade of messages like HELLO messages and Topology control messages just through its MPR.

2. Performance Analysis Objectives: OLSR Routing protocol performance in Mobile Ad Hoc Network

Objectives carried out for paper work are as follows:

i. To Design Network scenario for implementing existing OLSR Routing Protocol.
ii. To make certain modifications in OLSR Routing Protocol.
iii. To decide input/output parameters.
iv. To carry out Performance Analysis of Existing and modified routing protocol using TCP/FTP and UDP/CBR traffic.

3. Management of Routing Table: The steering table for every last hub comprises of a rundown of every single accessible hub, their next jump to the destination, their metric and a grouping number created by the destination hub. With the assistance of the MANETs, directing table is utilized to send the information parcels. Directing table can be kept predictable with the powerfully changing topology of specially appointed system by occasionally overhauling the steering table with some\ little changes in the system. Consequently, portable hubs give their directing data by TV the steering table redesign bundle. The metric of the redesign bundle begins with the underlying estimation of one for one jump neighbours and goes on increased with every sending hub. The accepting hub upgrades their directing tables if the grouping number of the overhaul is more prominent than the present hub or equivalent to the present hub. Changes in the directing table are minimized by postponing the notice of courses until we locate the best course through OLSR.

III. SIMULATION ENVIRONMENT

A. SIMULATION MODELLING

Simulation helps in analysing the performance and behaviour of complex networks before implementing it in today's real application. Several network simulators are available, whose output depicts as close as possible to real time implementation. In this work, we have used the discrete-event simulator NS2(version 2.35) and the performance analysis were conducted using AWK script. There are several models available in NS2 simulator, from which, we considered the following models:

a) Node Model for energy source, memory capacity, processing capabilities etc.
b) Node deployment Model for placement of nodes and its position as uniform model.
c) Node mobility model for dynamic network topologies as Random Waypoint Mobility model.
d) Radio Model for characteristics of radio used by node with a proper frequency, bandwidth, MAC layer Functionality as IEEE 802.11 MAC model.
e) Wireless Signal Propagation Model for SNIR at receiver as Two Ray Ground propagation model
f) Packet loss model for packets collision or dropped in Markov error model.
g) Traffic Model for nodes sending traffic to destinations mostly CBR, UDP Model.

B. SIMULATION METHODS AND PARAMETERS:

The goal of our experiments is to examine and quantify the effects of various factors and their interactions on the overall performance of ad hoc networks. Each run of the simulator accepts as input a *scenario file* that describes the exact motion of each node using Random Waypoint mobility model and the exact sequence of packets originated by each node together with exact time at which change in packet or motion origination occurs. Hence, to evaluate the

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performance at a particular factor, we consider 10 random simulation runs to generate 10 random scenario patterns and the performance of the considered factor is the average of these 10 outputs. In all our experiments we considered five sample points of a particular factor and verified for three different protocols i.e. AODV, OLSR and DSDV [2,4,5,8]. Therefore 150 simulation runs were conducted to analyse each performance factor for these three protocols. Since our experiments is based on network layer characteristics so changes in routing strategy is only observed where as other characteristics like antenna gain, transmit power, ground propagation model and receiver sensitivity as physical layer characteristics, MAC 802.11 as wireless Ethernet for data link layer characteristics, UDP as transport layer characteristics and CBR as application layer characteristics remain fixed.

C. PERFORMANCE METRICS

The performance metrics helps to characterize the network that is substantially affected by the routing algorithm to achieve the required Quality of Service (QoS) [2,6,7]. In this work, the following metrics are considered.

i. End-to-End Delay (EED): It is the time taken for an entire message to completely arrive at the destination from the source. Evaluation of end-to-end delay mostly depends on the following components i.e. propagation time (PT), transmission time (TT), queuing time (QT) and processing delay (PD). Therefore, EED is evaluated as:

$$EED = PT + TT + QT + PD \ldots\ldots\ldots\ldots (I)$$

ii. Throughput: It is the measure of how fast a node can actually sent the data through a network. So throughput is the average rate of successful message delivery over a communication channel.

iii. Control Overhead: It is ratio of the control information sent to the actual data received at each node.

iv. Packet Delivery Ratio (PDR): It is the ratio of the total data bits received to total data bits sent from source to destination.

IV. EXPERIMENTAL RESULTS AND OBSERVATIONS

The following tables show the observations taken for the various variations, and their effect on the three performance metrics for both TCP/FTP and UDP/CBR. The results are provided through graphs plotted as performance metrics vs. varying parameters.

a. OBSERVATION TABLE

The observations obtained by implementing simulation model for the two traffic scenarios is provided in Table 1.1.The results are based on these observations.

B. THROUGHPUT VS. NUMBER OF NODES

The following Figure 1.1 shows the response of throughput expressed in kbps against number of nodes for the two traffic scenarios obtained by table 1.1. In this graph TCP provides far better performance than the UDP because TCP is a connection-oriented protocol responsible for ensuring the transfer of a datagram from the source to destination machine (end-to-end communications) much faster than UDP. TCP is also a rate-adaptive protocol, in that the rate of data transfer is intended to adapt to the prevailing load conditions within the network.

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C. PACKET DELIVERY RATIO VS. NUMBER OF NODES

Based on the observations of table 1.1 the response of packet delivery ratio in % against varying number of nodes is shown in Figure 1.2

Table 1.1 Observations for Varying Number of Nodes

Number of nodes	Throughput (Kbps)		Packet Delivery Ratio (%)		Average End To End Delay (milliseconds)	
	TCP/FTP	UDP/CBR	TCP/FTP	UDP/CBR	TCP/FTP	UDP/CBR
10	486	52	96	98	550	30
20	590	95	92	97	676	50
30	435	150	94	94	920	150
40	476	160	92	88	955	306
50	330	170	94	72	1116	1142
60	960	130	98	55	372	3336
70	845	115	97	40	398	4612
80	1000	122	97	34	536	4476
90	910	119	95	30	470	5745
100	936	100	95	20	415	5588

In this graph the PDR of UDP/CBR has greater maximum and minimum values than TCP/FTP, the TCP offers almost a constant trend, whereas, the UDP offers highly varying (rising and falling trends).

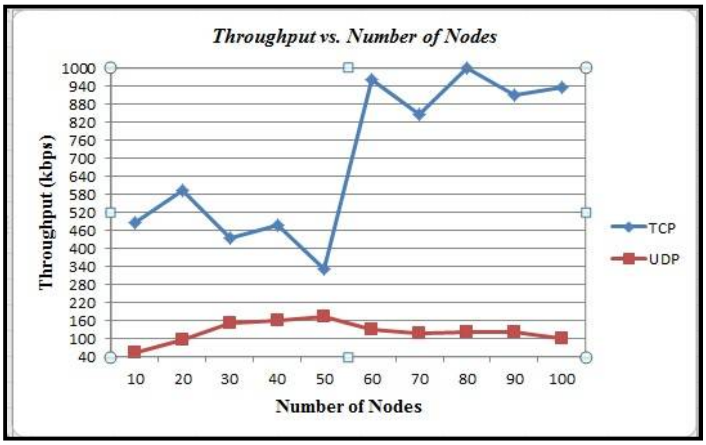

Fig.1.1 Graph of Throughput vs. Number of Nodes

Therefore, TCP/FTP is more reliable than UDP/CBR as TCP provides delivery guarantee, which means a message sent using TCP protocol is guaranteed to be delivered to client. If message is lost in transits then its recovered using resending, this is handled by TCP protocol itself. On the other hand, UDP is unreliable; it doesn't provide any delivery guarantee. A datagram package may be lost in transits.

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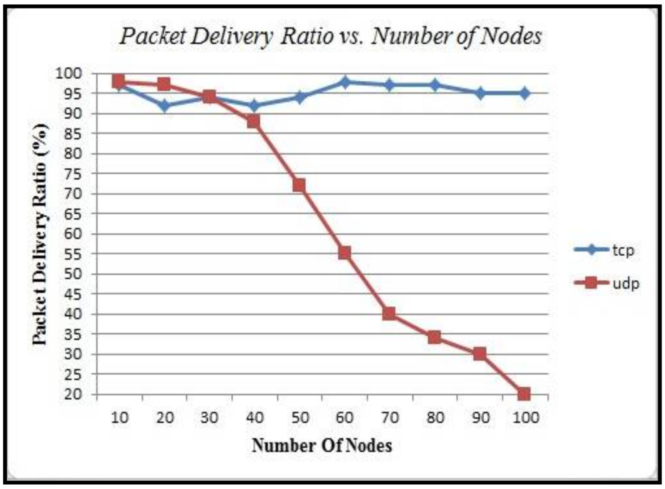

Figure 1.2 Graph of Packet Delivery Ratio vs. Number of Nodes

D. AVERAGE END-TO-END DELAY VS. NUMBER OF NODES

Based on the observations of table 1.1, the response of average end- to- end delay in ms against varying number of nodes is shown in Figure 1.3.

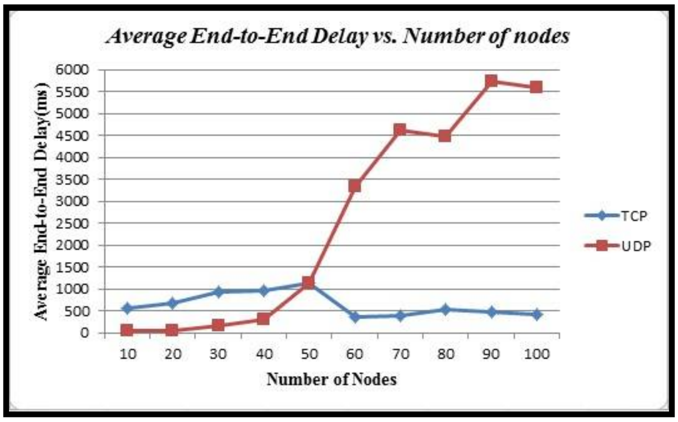

Figure 1.3 Graph of Average End – to – End Delay vs. Number of Nodes

In this graph the UDP/CBR offers lesser average end to end delay, than TCP/FTP, therefore better speed of transmission. Average end to end delay includes the total time of transmission i.e. propagation time, queuing time, route establishment time etc. A network with minimum average end-to-end delay offers better speed of communication.

V. CONCLUSION & FUTURE SCOPE

The conclusions displayed in this thesis analyse the two movement situations that are TCP/FTP and UDP/CBR, executed in the system under test utilizing OLSR convention. To discover the reasonableness from these two accessible traffics in a system in different situations, the outcomes are thought about and fundamental conclusions are made. The paper closes on the premise of execution offered by the activity designs for the three execution measurements: End-to-End Delay, Throughput and Packet Delivery Ratio. A few reproduction situations in ns2, over various system topologies and information stream examples were completed. The point was to assess the execution of OLSR steering convention by utilizing these traffics as a part of system execution. This work legitimizes that the OLSR steering convention performs better under TCP activity regarding three measurements. Future work investigate the

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improvement of altered adaptation of the Optimized Link State Routing conventions, which ought to consider diverse parts of directing conventions, for example, rate of higher course foundation with less course breakage and the shortcoming of the conventions said ought to be extemporized for future expansions. OLSR can likewise be executed for multi-bounce steering in remote systems. The same work can be reached out for other proactive and receptive steering conventions with TCP and UDP traffics. One can likewise enhance OLSR convention and its execution by utilizing more parameters, for example, vitality parameters, lifetime of system, battery life time, security, QoS. This clarified work can likewise be explored and broke down for blurring and non blurring situations in remote specially appointed systems.

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BIOGRAPHY

Ganesh Gupta is a Assistant professor in the Computer Science Department, Amity School of Engineering and Technology, Amity University Haryana ,Gurugram. He received Master of Technology (M.Tech(I.T.)) degree in 2008 from Guru Gobind Singh Indra Prastha University, Delhi, India. His research interests are Computer Networks (wireless Networks), Ad-hoc wireless networks, Various Simulation Tools like NS-2 , Qualnet, GNS3 etc.

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