Performance Analysis of DSDV & OLSR for quality of services issues for MANETs using NS-3 Simulator

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Abstract

Today wireless networks are gaining terribly quality. A mobile adhoc network is accommodates self-configuring networking devices it means that every device works as host and as a router in network. Every node helps to different nodes for conveyance info.
Routing is vital task of MANET that gives higher communication In MANETs. Performance of routing protocol evaluated supported totally different performance metrics like Routing Overhead, Packet Delivery quantitative relation, Average Delay, and Packet Loss below totally different network situation like node density, quality speed, network traffic.
Lots of problems are potential of packet loss in MANETs like broken links, transmission errors, no route to the destination. AODV routing protocol uses 2 varieties parameter like sequence variety and hop count. Sequence variety describes the recent info of the network and hop count shows shortest routes. The Paper proposed a best routing protocol basis of quality of services for mobile ad-hoc on wireless network analyzed performance on NS3 Simulators.

Keywords: *MANET, DSDV, AODV, OLSR*

1. INTRODUCTION

In the past few years, wireless communication has fully grown terribly quickly. The most effective feature provided by such networks isn't any wires. Users will exclude hand-held devices anyplace with them. They get benefited from tiny devices, long lasting batteries. High bandwidths are accessible from new communication standards. So as to speak via such a network, fixed infrastructure isn't necessary. These self organizing networks (Ad hoc networks) have gained interest on an outsized scale in recent times. The foremost common applications of wireless networks are cluster commonplace for Mobile communications (GSM) and Wireless native space Network (WLAN). Nodes don't seem to be organized in any explicit fashion in such networks. Thus to make sure higher communication in between nodes, some routing protocols has been developed for such networks.

These protocols conjointly facilitate to utilize the resources optimally. Optimized Link State Routing (OLSR) [1] protocol is one example of such protocols. it's very talked-about and used terribly immensely. However there are some vulnerability in OLSR, like lack of a robust security mechanism. Associate assailant will profit of the vulnerabilities to meddle with the system and temper with traffic in network. Associate assailant will record, manipulate or/and delete management packets moreover as knowledge packets motion within the network as presently it's intruded into the network. In different words we can say that associate intrusive node can compromise the protection and launch attacks on network. During this thesis a study of varied attacks against OLSR are given.[1]

Wireless networks are enjoying a serious role within the space of communication. Wireless Networks modify the users to speak and transfer knowledge with one another with none wired medium. Currently we tend to are victimization wireless networks in military applications, industrial applications and conjointly in personal space networks. The most distinction between wireless and wired networks was solely in line. In wired network physical medium exists and doesn't exist in wireless network. In general, wireless networking devices use of infrared or oftenest signals to transfer info and resources between devices one another. Nowadays many sorts of wireless devices are accessible like, mobile terminals, hand-held PCs, laptops, cell phone, PDA, wireless sensors and satellite. Wireless networks are 2 varieties initial is termed infrastructure based mostly wireless networks and second is termed Infrastructure less network. Infrastructure less network is additionally referred to as Ad-hoc Network. Ad-hoc networks are often classified in 3 classes supported applications; Mobile Ad-hoc Networks (MANETs), Wireless Mesh Networks (WMNs), Wireless device Networks (WSN). Wireless networks became very talked-about owing to several factors like easy installation, responsibility, cost, bandwidth total needed Power,Security and network performance.[2].

An ad hoc network is essentially a set of wireless nodes not having a permanent network. They're with none fixed infrastructure like access points or base stations. In spontaneous networks each node is willing to forward knowledge for different nodes, and that nodes forward knowledge is determined dynamically supported the network property. The term 'ad hoc' implies that the network is structured for a special, generally exclusive service designed for specific applications (eg, disaster recovery, battlefield). Usually a poster hoc network is established for a finite quantity of your time. They're with none fixed infrastructure like access points or base stations. In spontaneous networks the communication is organized utterly localized, not like the communication in infrastructure based mostly networks. To regulate or control the traffic there is no central authority. A node is often receiving and origination network traffic, conjointly forwarding traffic on behalf of different nodes. And this sort of act is often performed by all nodes at constant time. The surroundings might amendment dynamically and also the applications will Maine mobile moreover, so it's thus

obvious that topology conjointly keeps on dynamical. Owing to their flexibility and special nature, spontaneous networks are advantageous in different environments [3].

One of the important research areas in MANET is establishing and maintaining the ad hoc network through the use of routing protocols. Though there are so many routing protocols available, this paper considers DSDV and OLSR for performance comparisons are analyzed based on the important metrics such as packet delivery ratio, average end-to-end delay and routing overhead presented with the simulation results obtained by NS-3 simulator.

2. DSDV and OLSR ad hoc routing protocols

The existing routing protocols in MANETs can be categorized into proactive (table-driven), reactive (on-demand) and hybrid protocols. Proactive/table driven protocols find paths in advance for all source-destination pairs and periodically exchange topology information to maintain paths so that when a route is required, the route is already known and can be immediately used [4]. In on demand/reactive protocols, the routing paths are searched only when needed. A route discovery operation invokes a route-determination procedure. [3] In a mobile ad hoc network, active routes may be disconnected due to node mobility. Therefore, route maintenance is an important operation of reactive routing protocols. Proactive protocols such as OLSR, DSDV and reactive protocols such as AODV, DSR.The hybrid network takes the advantages of each routing style. Hybrid protocols such as CBRP (Cluster Based Routing Protocol) and ZRP (Zone Routing protocol) provide the reactive/ proactive framework and take advantage of the strengths of each of these protocols [5].

2.1 DSDV (Destination Sequence Distance Vector Routing Protocol)

DSDV routing protocol is distance vector, table driven based on Bellman ford routing procedure. It provides loop free routes. DSDV protocol also avoids counting to infinity problem by using sequence number [6]. Nodes increment its sequence number when there is change occur in neighborhood like that link addition or removal. Each node maintains a route to every other node in the network because DSDV nature is proactive.

In DSDV routing table have the following information for each entry such as destination ip address, destination sequence number, next-hop ip address and hop-count. This routing protocol uses two types message for route updates such as full dump and incremental packet. The full dump packet carries all the routing information of the network. But incremental packet carries only the information changed. DSDV routing creates large amount of overhead due to the periodic update message. Every time interval each node in the network

broadcast to its neighbor its current sequence number with any routing table updates. The routing table updates are of the following form[7].

< Destination Ip Address, Destination Sequence Number, Hop-count >

2.2 Optimized Link State Routing (OLSR)

The Optimized Link State Routing protocol is a point-to-point and based on periodically exchange of topology information. The key feature of OLSR uses Multi Point Relays (MPRs) to reducing the overhead of network flooding and the size of link state updates. During topology updating each node in the network selects a set of neighboring nodes those are responsible for retransmission of packets. Node which is not in the set can only read and process but cannot retransmit[8].

OLSR generally uses two types message for route update:

• Hello-Message: A Hello message is used for MPR selection and neighbor sensing procedure.

• Topology control message: A Topology control message is used for route calculation. Topology control message contains the list of the senders MPR selector. Only MPR nodes are forwarding TC message.

3. PERFORMANCE EVALUATION OF ROUTING PROTOCOL

Routing concepts is basically includes two process first determining the optimal path and second is forwarding information. It is difficult to say which routing protocol is efficient and optimal under different network scenario such node density, traffic load and mobility speed[9] . Here I have evaluated the performance of DSDV and OLSR by using different performance metrics such as Routing Overhead, Packet Delivery Ratio, Average End-to-End Delay and Packet Loss via simulation. I have created a network with following Simulation parameter for performance evaluation of routing protocol shown in table 3.1.

3.1 Performance Metrics

Routing Overhead: The routing overhead describes how many routing packets for route discovery and route maintenance need to be sent. Routing overhead is the total number of routing packets divided by total number of delivered packets[10].

Packet Delivery Ratio/Packet Delivery Fraction: Packet Delivery ratio is measured by dividing the total received packets to the destination by total sent packets. It describes packet loss rate. When more PDR it means routing is efficient[11].

Average End-to-End Delay: Average end-to-end delay is measured by subtracting sending time from receiving time for each received packets. End-to-End delay includes all the possible delay such as buffering for route discovery process, queuing processing at the interface queue, propagation and transfer times[12].

Packet Loss/Drop: Packet loss calculated by subtracting total receives packets from total send packets. Some packet may be dropped any error condition in the network[13].

3.2 Experiments Parameters, Simulation Results and analysis:

I have calculated Packet Delivery Ratio, Routing Overhead and Average End-to-End Delay for DSDV and OLSR via simulation.

Parameter	Value
Simulator	NS-3
Number Of Nodes	30
Simulation Time	100 sec
Traffic Type	CBR(Constant Bit Rate)
Simulation Area	1000X1000
Packet Size	1000 Bytes
Mobility Model	RandomWayPointMobilityModel
Routing Protocol	OLSR, AODV
Application used	On Off Helper
Speed, Pause	10 m/s,2 sec

Table 3.1: Simulation Parameter Setup

Routing Protocol	Data Packets	Control Packets	Routing Over Head (%)	Average Delay(sec)
DSDV	99	2574	96.29	0.001
OLSR	99	1701	94.50	.0009

Table 3.2: Simulation results of DSDV and OLSR

Speed(m/s)	DSDV (PDR %)	OLSR (PDR %)
20	98.85%	100
40	95.20%	96.46
60	92.80%	94.90
80	95.20%	97.45
100	98.40%	98.70

Table 3.3: Simulation results of PDR with speed(m/s)

3.3.1 Routing Over Head: OLSR has less routing overhead comparison to DSDV because OLSR uses Multi Point Relay(MPR) for transmission. MPR is a process that reduces unnecessary retransmissions in the network.

3.3.2 Average End-to-End Delay: Average End-to-End Delay tells possible Delay in the network b/w source and destination node and also provides quality of communication. OLSR and DSDV routing are proactive nature it means all routes are available at all times. OLSR Routing low end to-end delay than DSDV because its TC message provide to avoid stale route problem and wide bandwidth. Delay in the network is affected by mobility speed.

3.3.3 Packet Delivery Ratio: From the above table 3.2, OLSR has more PDR comparison to DSDV. When we increase mobility speed the lots of links are breaks and affect the packet delivery ratio. Packet Delivery Ratio higher represents the better communication reliability.

4. Conclusion:

We have examined the performance in terms of quality of services issues as Packet Delivery Ratio, Average Delay, Routing overhead of DSDV and OLSR by varying different simulation parameter. From this comparison each routing protocol has its own advantage and disadvantage. OLSR Routing low end to-end delay than DSDV because its TC message provide to avoid stale route problem and wide bandwidth. Delay in the network is affected by mobility speed. OLSR has more PDR comparison to DSDV. When we increase mobility speed the lots of links are breaks and affect the packet delivery ratio. Packet Delivery Ratio higher represents the better communication reliability. OLSR has less routing overhead comparison to DSDV because OLSR uses Multi Point Relay(MPR) for transmission. MPR is a process that reduces unnecessary retransmissions in the network.

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