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Performance Evaluation of Proactive and Reactive Protocols Under a Large Scale and Highly Dynamic MANETs

[1]P. Srimanchari, [2]M. Saroja and [2]M. Venkatachalam
[1]Department of Computer Science, Erode Arts and Science College, Erode, Tamil Nadu, India
[2]Department of Electronics, Erode Arts and Science College, Erode, Tamilnadu, India

Abstract: Mobile Ad Hoc Network (MANET) is a temporary association of mobile nodes. It forms the network on the fly over wireless links using multi-hop communication in the absence of pre-established infrastructure. Recently, there is a rapid growth in the mobile computing field owing to the proliferation of a large number of widely available wireless devices. This paves a way for numerous mobile nodes with highly dynamic mobility patterns. Frequently changing topology in a large network with highly dynamic mobility leads to high overhead, and consume more resources. It ultimately has a great impact on the routing performance. The standard protocols cannot be able to provide efficient routing under a large network and high mobility. This offers new challenges in designing an efficient routing. Performance evaluations reveal that there is no realistic routing protocol under large network size and dynamic mobility pattern. This study compares the scalability and mobility properties of core protocols such as AODV and DSDV under the MANET environment. The performance of these routing protocols is analyzed under large network size and dynamic mobility in the aspects of packet delivery ratio, control overhead, latency and throughput. The NS2 based simulation result reveals that AODV and DSDV are suitable for small and low mobility MANETs and are not efficient under the scalable and the highly dynamic mobile environment. These results motivate the need for a new routing protocol that provides efficient routing under a large scale and dynamic network conditions for the future.

Key words: MANET, routing protocols, AODV, DSDV, performance evaluation

INTRODUCTION

Nowadays, the advancement of wireless communication and availability of affordable, small and robust wireless devices have totally changed the potential usage of mobile computing application. A self-organized MANET consists of mobile nodes that establish communication among them through the wireless mode (Cordeiro and Agrawal, 2002). MANET is a temporary and dynamic wireless environment with the characteristics of autonomous, infrastructure less, energy and bandwidth constraint (Hoebeke *et al.*, 2004; Chlamtac *et al.*, 2003). Mobile nodes can establish direct communication with other nodes if it is within the communication range. Direct communication is limited to few neighbor nodes because of the short communication range. Therefore, indirect multi-hop communication is the effective way of utilization of wireless nodes. In order to establish the multi-hop communication path between the mobile nodes, an efficient routing protocol is needed (Johnson, 1994). Dynamic and rapid changes in network topology and node mobility are the challenging factors which impact the efficiency of routing. Several routing protocol has been suggested previously to manage the routing process under various network conditions. The routing protocols in MANET are categorized into proactive, reactive and hybrid. The proactive routing constantly retains the routing table to update network dynamics and the reactive routing discovers a route only if it is needed. The hybrid mechanism follows both proactive and reactive routing mechanisms. Performance evaluation reveals that the most of the routing protocols perform well under MANET environment with limited nodes and mobility conditions. Some of the dominant protocols are Destination-Sequenced Distance-Vector Routing (DSDV) (Perkins and Bhagwat, 1994) Optimized Link State Routing Protocol (OLSR) (Jacquet *et al.*, 2001) Ad-hoc On-Demand Distance Vector Routing (AODV) (Perkins and Bhagwat, 1994; Perkins and Royer, 1999) and Dynamic Source Routing (DSR) (Johnson *et al.*, 2001).

The rapid evolution and adaptation of wireless technology has tremendous potential for large scale commercial MANET deployment. The potential applications for large scale network have been a steady growth in recent days. This prompted for design of scalable routing protocol for large scale MANETs. The

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Corresponding Author: P. Srimanchari, Department of Computer Science, Erode Arts and Science College, Erode, Tamil Nadu, India

scalability, dynamic mobility and routing overhead are the key issues when designing high performance routing protocols. The scalability of the routing is the ability to maintain efficiency in the large scale network (Eriksson *et al*., 2005). In a large scale network, high population of mobile nodes causes a frequent route update and consumes high bandwidth. The reliability of the data delivery can be improved on establishing several routes between the source and the destination. However, it introduces additional routing overhead due to the node population and mobility (Mueller *et al*., 2004). Mobility models are used to simulate the dynamic mobility of nodes and commonly used mobility models are random waypoint and random walk. Mobility models are mainly used to investigate the impact of the routing process over the network (Camp *et al*., 2002). Random waypoint mobility model includes velocity and direction of node movement for the specified pause time. High speed and short pause time specify high node mobility. The increased mobile nodes in a large scale network in high mobility increases the control packet size. The transmission of control packets consumes excessive bandwidth and time under a large scale network. The end result of mobility is the increased rate of link breakage and the establishment of the stale routes in the network increases the congestion rate (Al-Akaidi and Alchaita, 2007). Due to these challenges, examination over the impact of these protocols under a large scale and a high mobility network is necessary.

This study investigates the performance of DSDV and AODV for a large scale and a high mobility MANETs. In most of the previous study, the performance of the routing is tested only in a small scale and in less mobility scenarios. This study considers the large scale network with high mobility nodes that communicate with each other. The analysis is based on the performance metrics, including the packet delivery ratio, end-to-end delay and throughput. The performance analysis is the foundation for improvement of effective routing protocols in MANETs for recent advancement. It motivates the design of efficient routing protocols under a large scale and high mobility networks.

Problem statement: In recent applications, the trend towards MANET environment is scalability and dynamic mobility. It is difficult to design the routing protocols to overcome scalability and mobility. In MANET, the increasing number of mobile nodes under dynamic mobility leads to attract high control traffic overhead that affects the performance of routing protocol. It also needs high battery life and storage utilization, but it is extremely limited in energy and resource constraint environment. In existing works, the performance evaluation is carried out in order to determine the best routing protocol which takes few performance metrics under the small network. In contrast, the performance evaluation of proactive and reactive protocol takes one step further that evaluates the performance of routing protocols under various constraints includes a large network with high mobility. The simulated results produced in this study are useful to obtain the in-depth solution about the performance of routing protocol and guidelines to develop the effective routing protocol in the future.

RELATED WORKS

Crafting a routing process for MANET is a challenging task. Numerous routing protocols have been developed in the last two decades. Each protocol has its unique future and improves efficiency over other protocols in a particular network condition. An assessment of routing protocols for MANET is carried out in the context of different network parameters (Abolhasan *et al*., 2004). The functionality, characteristics and the merits of routing techniques for MANET are presented by Royer and Toh (1999). It investigates the performance of different routing protocol for a range of parameters. In study of Draves *et al.* (2004) the performance of DSR protocol is evaluated using link-quality metrics such as per-hop Round Trip Time (RTT), per-hop packet pair delay, and expected transmission count.

A detailed and practical packet-level simulation performance is evaluated for DSDV, Temporally Ordered Routing Algorithm (TORA), AODV and DSR by Broch *et al.* (1998). These simulations are based on the small scale network of wireless mobile nodes with varying mobility patterns and traffic loads. It provides an accurate simulation of wireless LAN based on IEEE 802.11 standard on considering a practical channel pattern for wireless transmission. This study did not think about the large network size with the high mobility environment. On-demand behavior of routing protocol is evaluated for metrics such as latency, the network load, overhead and route cache (Maltz *et al*., 1999). This study takes DSR protocol as a model to evaluate on-demand behavior and evaluate each element of the routing process to valuate overall performance.

The significant impact of a traffic pattern is demonstrated under comparison of different routing protocols by Pucha *et al.* (2004). This study focused on complex traffic patterns and proposes a powerful communication model without much impact of traffic volume. It is stated that the traffic pattern requires the number of source nodes for an efficient routing in

MANET. A realistic analysis of large scale MANET routing protocol is discussed by Zhang and Riley (2005). AODV performs better with various mobility rates and speed with the increase in overhead due to source routing. The elimination of source routing overhead in AODV is more expensive than others. It evaluates the performance of routing protocol on considering all the performance metrics. Hence, this study is not much cost effective due to the limited resources of MANET. The network size and traffic load plays a vital role in evaluating the scalability (Broustis *et al*., 2006). This study exhibits the scalability limits and examine the enhancement strategies on the performance. It fails to evaluate the impact of the routing protocol under a high mobility network.

Jorg (2003) nodes are varied with node density and energy consumption depends on the network size. Therefore, the packet delivery ratio decreases linearly. This study concludes that, there is a negative impact of the routing protocol performance due to traffic load and pause time. It analyzes the solution to solve the causes for packet loss at various network layers, but does not address the way to improve other performance metrics. Three realistic scenarios are introduced to evaluate the protocol performance by Johansson *et al*. (1999). Behavior of protocol was examined for several values of relative motions of nodes. It clearly states that the increased mobility is strived to maintain the routes to every node may increase network overhead. The performance analysis of routing protocol is carried out only for different mobility pattern, but, this evaluation is not much appreciable under high scalability. The main focus of the present study is to analyze the performance of DSDV and AODV under increased network size, high mobility pattern and a large number of pairs of source and destination.

AD HOC ROUTING PROTOCOLS

In MANET, the mobile nodes dynamically establish the routing among themselves by discovering and maintaining links to other nodes (Maltz *et al*., 1999; Zhou, 2003). In such a case, each node acts as a router because there is no fixed infrastructure. The routing protocol gathers and distributes the routing information between routers. The routing information indicates the up-to-date status of the network topology. The steps involved in the routing are Route Discovery and Route Maintenance. If a source node desires to forward the data packets, it initiates the route discovery process. In the route discovery process, Route Request (RREQ) packets are flooded by the source node to its immediate neighbors. This process is repeated till the RREQ packet reaches destination. Soon after the destination receives the RREQ packet, it replies with the Route Reply (RREP) packet towards the source. The route maintenance process maintains the available fresh routes to the destination. In the case of link failure, Route Error (RERR) packet is generated that indicates the link failure to the corresponding source node.

Proactive routing protocol: The proactive routing is a table driven protocol. In proactive routing, nodes maintain routing tables that retain only the fresh routes to all reachable nodes. It maintains the current up-to-date route information using periodic exchange of control messages to inform the route table. The proactive routing protocol frequently floods the link information to its neighbor nodes. The advantage of this protocol is the discovery of the shortest path to other nodes and ensures the availability of routes. The main drawback of this protocol is that, all nodes in the network support updated route table at all the times.

Destination sequenced distance vector (DSDV): DSDV is the proactive protocol which always discovers the path to the destination (Perkins and Bhagwat, 1994).

In Fig. 1, the routing process of DSDV is described. When node S desires to communicate with destination D, it forwards the control packets to its immediate neighbor. If a node receives many packets with the same id, the excessive packets are discarded. The update packet broadcasted with a metric of one hop distance and this process is different from the common routing protocols. Once the updated packet is received, the neighbor nodes update their routing table by incrementing the metric by one. Then, it forwards the packet to their corresponding neighbors. The process is repeated until all the nodes receive a copy of the control packet with the corresponding metric. When the received packets have the same sequence number with the same destination, the packet with smallest metric is used. As a result, the amount of rebroadcasts of a path with the same sequence number has been reduced.

The discovered route among the source and the destination node is retained by the source node. When the node moves from one place to another, the link fails to transmit the packet. The broken link metric is assigned to infinity and the corresponding node broadcasts the update packet to its neighbors. Finally, it discloses the broken link. If the link fails, the next highest metric is selected as the next route to the destination. If there is no path for data transmission, the source node starts to rebroadcast the update packets to explore the new route to the destination.

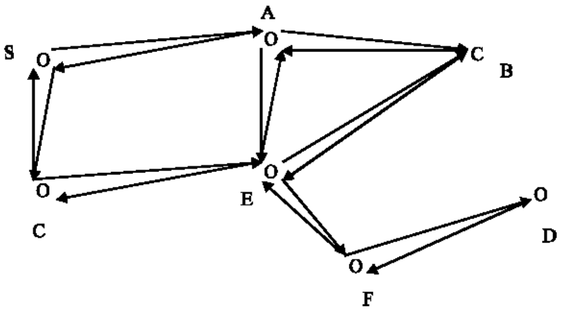

Fig. 1: Routing of DSDV

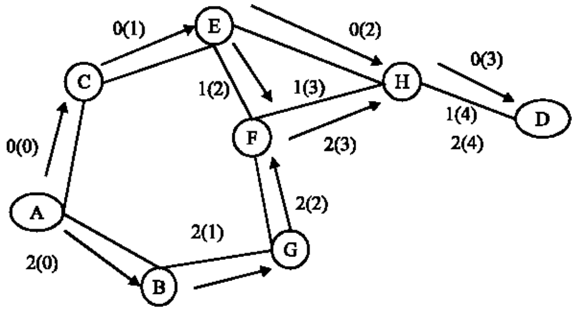

Fig. 2: Route Discovery in AODV

Reactive routing protocol: The reactive routing is an on demand routing protocol. If a source node desires to forward the data packets to a destination, the reactive routing begins the route discovery mechanism. It discovers a route to destination only when it is demanded or required. The major part of this protocol is route maintenance. Unlike the proactive routing protocol, it is not necessary to retain the recent routing information. The advantages of reactive protocols are efficiency, less control overhead and reliability.

Ad Hoc on demand distance vector (AODV): AODV initiates the route discovery process only in on-demand fashion (Perkins and Bhagwat, 1994). If a node desires to transfer the data packet to other node, it starts the route discovery process. Figure 2 explains the process of route discovery. Node S starts the route discovery process, if it wishes to transmit the data to the node D. Every route is denoted with sequence number and thus, avoids the creation of loops.

Route discovery is a two-step process to discover a route from the source to destination. In the first step, the source node transmits the RREQ packet to its neighbor nodes. If a node receives multiple copies of the RREQ packet with the same sequence number, it does not rebroadcast the packets. This process is repeated till it reaches the destination node. In the second step, the destination node checks the path from where it received the RREQ packets in the reverse direction. It also checks whether the path is bidirectional. If it is bidirectional, it sets up the reverse path back to the source node and forwards the RREP packet towards the source node.

In Fig. 3, the broadcasting of route reply packets is described. The node D, forwards the RREP packets to the source node over the discovered route of D-H-E-C-S. On receiving the RREP packets, intermediate nodes forward the RREP packets towards the source node.

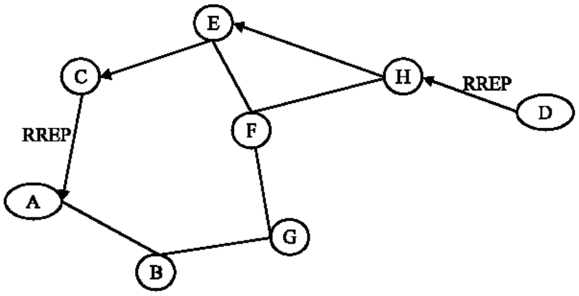

Fig. 3: Route Reply in AODV

If it receives additional RREP packets for the same source node, it modifies the routing information according to the recent network state. It broadcasts the RREP packet only if the packet has a highest sequence number when compared to that of the last packet. As a result, it decreases the number of RREP broadcasting towards the source node. Then, the source node initiates to transmit the data packet, soon after; it receives the first RREP packet.

Route maintenance: In route maintenance, each node maintains the discovered routes in its routing table. When the destination node or any intermediate node moves out, the RERR packet is transmitted to the corresponding source node. The intermediate nodes propagate the RERR packets to their predecessor nodes till it reaches the source node. When the RERR packet reaches the source node, either it restarts the route discovery or terminate the data transfer. The route discovery process establishes a fresh route to the destination, if the source node moves. Other than the control messages, it also demands the exchange of periodic Hello messages between the mobile nodes. This message is used to identify the link failures or to check the connectivity of mobile nodes in the network. Therefore, it improves the efficiency of route discovery and maintenance process.

Comparison of AODV and DSDV protocols: The functional properties of AODV (Proactive) and

Table 1: Comparisons of AODV and DSDV Routing Protocols

DSDV	AODV
It always discovers the route to all available destinations	A route discovery is initiated, only when it is required
The routing table retains the route to all destination table	Only the path with the least hop count value is maintained in the routing
The routing information is propagated periodically, irrespective of the network topology dynamics	The routing information is not propagated unless, the network topology changes
Frequent route discovery requires more control packets for high scalable networks	Requirement of control packets is less, when compared to DSDV
Link breakage due to node mobility does not interrupts the data communication because it ha alternative path to the same destination	The link failure interrupts the data communication until an alternative route is discovered
The increased size of the routing table in a large scale network results in high routing overhead	There is no additional overhead due to the maintenance of a fresh route
Frequently changed network topology affects the data packet latency	Scalability and mobility effect on data packet latency is lower than the DSDV
The increased rate of link failure, achieves poor packet delivery ratio	Packet delivery ratio is higher than DSDV
High scalable MANET incurs high bandwidth and power consumption owing to the frequent route discovery	Power consumption is less than DSDV since, it demands route only when it is required

DSDV (Reactive) routing protocols are explained comparatively in Table 1.

ANALYSIS

The network capacity is constrained by concurrent transmissions (Gupta and Kumar, 2000). The additional burdens in the high scalable and mobility networks are communication delay, link failures and traffic control. The node density and mobility pattern have an impact on the protocol performance. Other parameters which have an impact on protocol performance are node density and the average number of connections. This section briefly discusses the analytical result of throughput and overhead of AODV and DSDV routing protocols with regards of scalability and mobility.

Overhead and throughput of AODV and DSDV: The high scalability and mobility affects the overhead and throughput of routing protocols in MANET. The overhead can be considered as the number of non data packets transferred to the destination node. The throughput is defined in terms of bits per second for every node. The overhead and throughput of these routing protocols is tightly coupled with the connection of an establishment (Con_{es}) or multiple diversity paths and the rate of mobility (Grossglauser and Tse, 2001). If a node receives the same data from several other nodes, it leads to a broadcast storm problem (Ni *et al*., 1999). The redundant rebroadcast is directly proportional to the routing overhead and the broadcast storm problem. This analysis determines the presence of the broadcast storm problem in AODV and DSDV.

DSDV overhead and throughput: Let us define some parameters which describe the performance of AODV and DSDV.

Notations:

$R_{req}(n)$ = Cost of a single RREQ
Con_{es} = Rate of connection establishment
$R_{rrq}(n)$ = Rate of repeated RREQs
$R_{rep}(n)$ = Rate of RREPs
path(n) = Path length
W = The number of bits per second
n = Total number of nodes
m = Mobility rate per sec
C(s) = Total number of control packets
Avg_{cp} = An Average number of control packets per node
S(n) = Size of the network

Overhead of DSDV derived in terms of the network size and quantity of control packets:

$$S(m, n)\ \alpha\ C(n) \tag{1}$$

From the Eq. 1, it is clear that the rate of control packets involved in flooding is straightforwardly related to the number of nodes and the rate of mobility. The size of the network and the routing table increases linearly with the node density. In DSDV, the mobile nodes under the high mobility pattern are engaged in transmitting the routing table:

$$Dsdv\ (o) = C(R_{req}(n).\ con(m,n) + R_{rrq}(n) + R_{rep}(n)) \tag{2}$$

$$R_{req}(n) + R_{rep}(n) = R_{rre}(n) \tag{3}$$

From the Eq. 2 and 3:

$$\mathrm{Dsdv}\ (o) = C(R_{req}(n)\bullet \mathrm{Con}_{es}\ (m,n) + R_{rrq}(n) + R_{rep}\ (n)) \qquad (4)$$

$$\mathrm{Avg}_{cp} = C(R_{req}(n)\bullet \mathrm{Con}_{es}\ (m,n) + R_{rrq}(n) + R_{rep}\ (n))/n \qquad (5)$$

$$\mathrm{Dsdv}(t) = W/(n)^{1/2} \qquad (6)$$

$$W = ((S(n)/m)^{1/2}/\ \mathrm{Con}_{es}) \qquad (7)$$

From the Eq. 4 and 6, the number of multiple diversity path establishments (con) affects the overhead and throughput of DSDV which are inherent over the total number of mobile nodes. The average control packet (Avg_{cp}) received by any node is estimated from the Eq. 5. If the number of average control packets per node exceeds the predetermined threshold value, the broadcast storm problem is conformed.

AODV overhead and throughput: With the above parameters, the routing overhead per-unit time of AODV is quantified as follows:

$$\mathrm{Aodv}(o) = C(R_{req}(n) + R_{rrq}(n) + R_{rep}(n)) \qquad (8)$$

$$\mathrm{Avg}_{cp} = C(R_{req}(n) + R_{rrq}(n) + R_{rep}\ (n))/n \qquad (9)$$

From the Eq. 8, it is clear that, the Aodv(o) increases with the number of repeated RREQ and RREP packets under a high scalable and mobile network.

In AODV, the packet overhead per node grows linearly with the hop count value or path length:

$$\mathrm{PackOver}(m,\ n) = C(\mathrm{path}(n)) \qquad (10)$$

The two hop relaying strategy in AODV, dramatically increases the throughput rate in delay tolerant applications which is expressed as:

$$\mathrm{Aodv}(t) = W/(n)^{1/2} \qquad (11)$$

$$W = (S(n)/m)^{1/2} \qquad 12)$$

From the Eq. 8, the increased number of nodes and mobility, increase the routing overhead. From Eq. 11 and 12, it is clear that, the throughput rate of AODV is affected by network scalability and mobility. From the Eq. 9, AODV protocol has only less probability of broadcasting storm occurrence than DSDV.

PERFORMANCE EVALUATION

Simulation model: Performance comparison between AODV and DSDV protocol is conducted under four different scenarios using the NS-2 simulator (http: //www. isi.edu/nsnam/ns/). In this simulation set up, the performance evaluation is carried out for a large number of nodes under a varying node mobility pattern. The execution time for simulation is 500 sec. In this study, both the routing protocols are evaluated based on the parameter metrics including Packet Delivery Ratio, End-to-End Delay and Throughput. The Table 2 shows the simulation parameter.

Table 2: Simulation Parameters

Parameter	Value
Mobility model	Random Waypoint Model
Number of nodes	10, 40, 90, 160 and 250
Node density area for the various number of Nodes	100×100, 200×200, 300×300, 400×400 and 500×500
Node density	0.001
Speed	50 m sec^{-1}
Pause time	0, 3, 9, 27 and 81 sec.
Application for traffic	CBR (Constant Bit Rate)
Packet size	512 bytes
Packet interval	0.25 sec

Network size and communication model: The simulation is carried out in four different scenarios such as 10, 40, 90, 160 and 250 nodes in a field of size 100×100, 200×200, 300×300, 400×400 and 500×500. The number of nodes is varied to compare the protocol performance for low and high mobility and different scalability. The traffic pattern for the node setup is 5, 20, 45, 80 and 125 sources which is started to connect at random times during the simulations. The size of the data packet is 512 bytes and communication range is about 150 m. The NS2 simulator has limitations on the number of nodes and therefore, it does not support large network size. Hence, the maximum network size is limited to 250 nodes.

Mobility Pattern: The mobile movement is set as per random way point model. The nodes select the random way points to move within the network and a node waits for a pause time before the next move. The simulation is varied under different size and mobility model. The varied pause time of mobile nodes is 0, 3, 9, 27 and 81 sec and node velocity is 50 m sec^{-1} and the simulation period is 500 sec.

Traffic pattern: Traffic is generated using CBR (Constant Bit Rate). The number of source and destination pairs within the network is varied according to the network size, in order to maintain the same rate of pairs of communication over the network. The data rate is fixed as 4.0 mbps.

SIMULATION RESULTS

The simulated results of the different simulation setup are discussed in this section. The key evaluation metrics are packet delivery ratio, end-to-end delay and throughput.

Effect on packet delivery ratio: The comparative graph in the Fig. 4 and 5, describes the packet delivery ratio for AODV and DSDV under various scenarios. From Packet Delivery Ratio (PDR) graphs, the packet delivery ratio of AODV and DSDV protocol degrades, when the number of node increases. This is because; it is difficult to maintain the routing information under a large scale network. From the analysis, the PDR of AODV is close to 100% over the small network. For 10 nodes the PDR of AODV is 100%, and 250 nodes it is 8.4075%. The PDR of DSDV is also dropped with respect to the scale of the network and the packet delivery ratio for 250 nodes is 6.772%. The effect of node mobility on the packet drop is high which leads to the poor packet delivery ratio. It is a significant factor which affects the performance of the network due to the frequent link breakage of the mobile nodes. The PDR degrades for high mobility, which is inversely proportional to the pause time. From the results, the PDR of AODV is close to 100% over the small network with low mobility. For high node mobility, the PDR of AODV is dropped, for 160 nodes it is 23.8% with the pause time of 81s and 16.815% for the pause time of 0s. For DSDV, the low mobility network (81s pause time) of 160 nodes delivers 18.619% data packets to the destination and high mobility (0s pause time) it attains only 13.5445% of packet delivery ratio.

Effect on end-to-end delay: The Fig. 6 and 7 show the performance of AODV and DSDV protocols in terms of delay. The end-to-end delay is very high for a large network. For the large network, the route discovery process consumes more time to find the short hop count path to the destination. It causes the link failure often and it leads to the repeated route recovery process. Finally, it introduces a large delay in the network. Thus, the increased mobility causes more routing packet generation to find the fresh route. If the valid route is known under the route discovery process, data packets are forwarded to the destination; otherwise, data packets are buffered until the route is discovered, which makes delay in the data transmission. From the simulation results, the end-to-end delay for AODV is 0.0060s over the small network, and the large network, it is 11.514s. In a small network, the end-to-end delay for DSDV is 0.0060 and 25.612 sec for the large network.

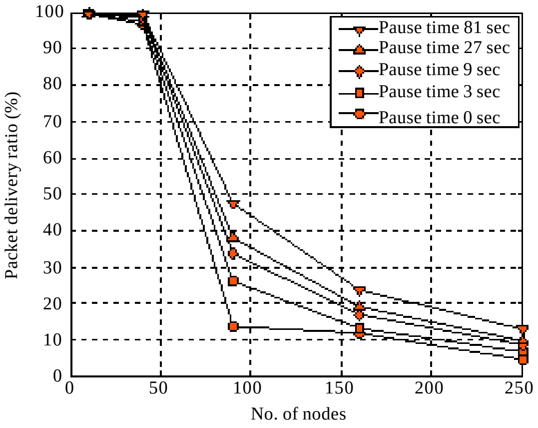

Fig. 4: Packet Delivery Ratio Graph for AODV

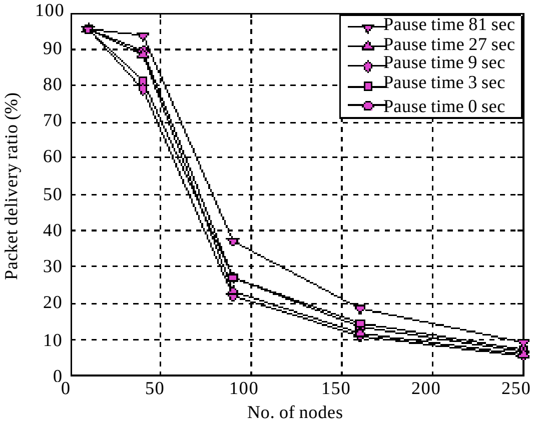

Fig. 5: Packet Delivery Ratio Graph for DSDV

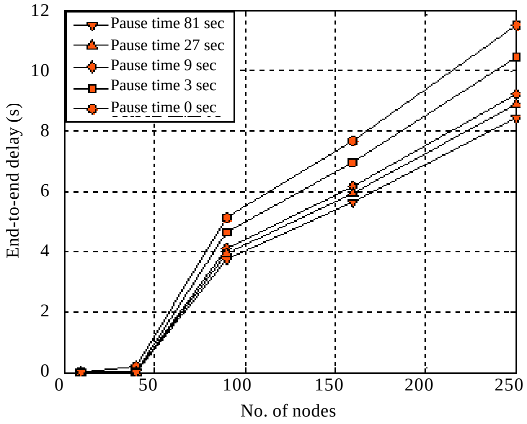

Fig. 6: End-to-End Delay Graph for AODV

Effect on throughput: The Fig. 8 and 9 depict throughput of AODV and DSDV for the large network with high mobility. In the large network, the data rate is reduced due to the congestion and increased stale routes. Therefore,

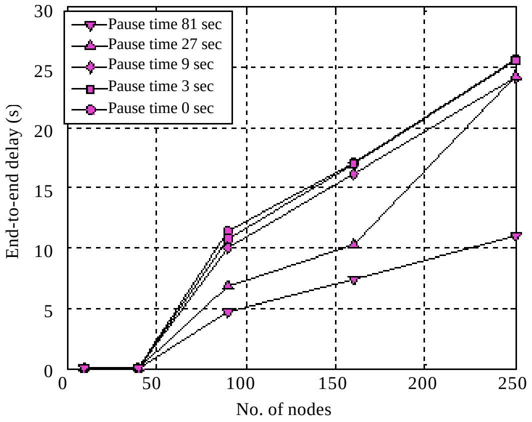

Fig. 7: End-to-End Delay Graph for DSDV

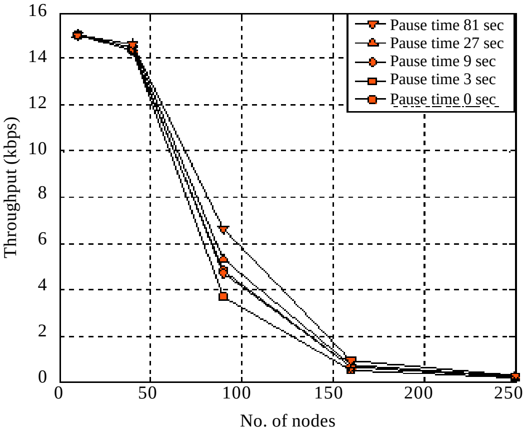

Fig. 8: Throughput Graph for AODV

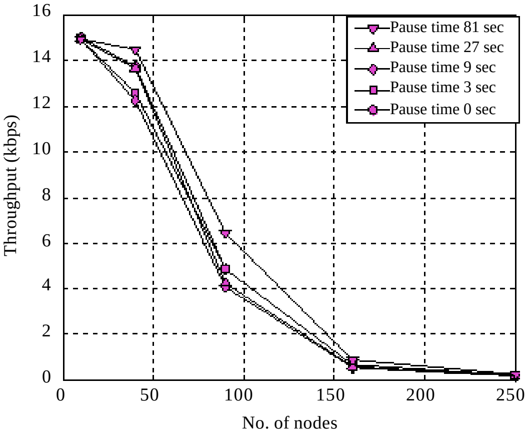

Fig. 9: Throughput Graph for DSDV

more routing traffic is generated due to the large network which makes the throughput decreases. The graph shows that the throughput of AODV gradually degrades, for 10 nodes, it is 15.026 kbps and for 250 nodes it is 0.211 kbps. For the large network, the throughput of DSDV degrades to 15.038 kbps for 10 nodes and for 250 nodes it is 0.219 kbps. Due to the high mobility rate of the network, the routing overhead is increased which affects the data rate over the channel. The throughput for 250 nodes with low mobility (81s) is 0.2988 kbps and for high mobility (0 sec) is 0.2113 kbps. In DSDV, the throughput is degraded with respect to node mobility. For 250 nodes, the throughput of DSDV is 0.290 kbps under low mobility (81 sec pause time) and high mobility (0 sec) it is 0.219 kbps.

In order to assess the performance of these protocols under the small scale with a limited mobility pattern, simulations are carried out with a limited quantity of nodes. The result obtained from the simulation makes it clear that, DSDV and AODV works efficiently under small scale networks. Since, it consumes less bandwidth owing to the less frequent broadcasting of update packets under a small scale with a low mobility pattern. To estimate the performance level of these protocols under the large scale dynamic network, simulation with 90, 160 and 250 nodes is performed. On comparing, the performance of these protocols under this scenario, the AODV performs better than DSDV. The high mobility scenario leads to frequent link failures which in turn results in high overhead. When the node moves frequently in a large scale network, these protocols do not perform well. Both the protocols attain poor performance under large scale MANET. This simulation result reveals that increased scalability and dynamic mobility in MANETaffects the performance of AODV and DSDV. This observation leads us to conclude that these protocols are not suitable for large scale and high mobility MANET applications.

CONCLUSION

This study, presents the performance evaluation of Proactive and Reactive routing protocols such as AODV and DSDV under a large scale and the high mobility network. In this study, the performances of these protocols are tested under various network scenario such as increasing scalability and dynamic mobility under the same network density. The simulation results yield the protocol performances under various MANET environments. These protocols scale particularly well in terms of PDR, end-to-end delay and throughput under a small scale network, but suffered in a large scale network. On comparing the performance of these protocols in a large scale network, AODV performs better than DSDV. At last, the NS2 based simulation result reveals that these protocols are not suitable for large scale and high mobility MANETs. The simulation result reveals that both DSDV and AODV have drawbacks in networks with high scalability and mobility. Therefore, this study can motivate further investigations to improve the routing protocol performance under MANET environment.

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