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Estimating a Suitable Routing Protocol in MANET for CBR and FTP Traffic for Varying Pause Time

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Abstract: *In mobile ad hoc networking nodes communicate wirelessly and share the same media (radio, infrared, etc.). The nodes can be rapidly repositioned and move in the region of the network. A MANET is an on-demand network; build dynamically when a source and destination party wants to exchange their data packets. The communication between these mobile nodes is distributed with none centralized management. MANET may be a self-organized and self-configurable network wherever the mobile nodes move every which way. Routing is an important criterion in MANET and in this paper we estimating the performance of three routing protocols namely AODV, DSR and DSDV in respect to CBR and FTP traffic by varying pause time where a number of the node , mobility speed and simulation times are kept fixed. The conclusion of this analysis provides a best protocol along these three protocols.*

Keywords: *AWK Script, CBR, FTP, MANET, Pause Time, TCP, UDP.*

I. Introduction

Mobile Ad-Hoc networks are autonomous networks that not require any centralized physical infrastructure to communicate between multiple nodes [1]. In last few years, the working interest rate of MANET is increased rapidly because of the enormous use of wireless devices. The ease of preparation and also the infrastructure less nature of Mobile Ad-hoc Networks (MANETs) build them extremely fascinating for the current day multimedia system communications [2].

MANETs require autonomous and reliable protocols because they have no centralized configuration and their network structure changes in a frequent manner [3]. Routing protocol provides the source node a way to determine the routing path for data transmission [4].To choose an efficient protocol for transmission of data packets is a critical fact to calculate the performance of MANETs.[5]. The autonomous characteristics of MANET make them much suitable for on-demand network connection. For example, when the natural disaster happens in a rural area and these areas have no communication infrastructure, MANETs protocol can be applied there. MANET is the quick solution of the disaster problem [6].

The objective of this paper is to estimate the performance of AODV, DSR and DSDV protocols under CBR and FTP traffic conditions. In this paper, we discuss how TCP and UDP work under different network parameters [7].

The rest of this paper is organized as follows. MANET protocols are described in section II. Simulation and result discussion is described in section III. Finally, conclusions are given in Section IV.

II. MANET Protocols

In this section, we shortly describe the key features of Ad-hoc On-demand Distance Vector (AODV), Dynamic Source Routing Protocol (DSR) and Destination-Sequenced Distance Vector (DSDV).

A. Ad-hoc On-demand Distance Vector (AODV)

AODV uses a unique technique to providing routing information to its each node in the coverage area. It uses predefined route tables, one entry to one destination node. It is different from DSR in such a manner that DSR maintains several routing information entries for each destination node. AODV uses sequence numbers from source to destination node to identifying the availability of next node and a solving problem of routing loops. Every packet using this sequence number to find the neighbor node. A unique characteristic of AODV is that it uses timer-based states in its entire node. If a node is not used recently its routing information is expired a group of precursor nodes is maintained for every routing table entry, indicating the set of neighboring nodes that use that entry to route information packets. All of these nodes are informed with RERR packets when the next-hop links are break [8].

B. Dynamic Source Routing Protocol (DSR)

The key identifying factor of DSR is the use of hop-by-hop routing. That source node knows the entire hop-by-hop routing information to the destination node. These routing information are storing in a route cache. Every packet contains the sending route information in its packet header [9].

When a source node in MANET wants to send an information packet to a destination node, it uses a route discovery method to dynamically confirm such a route [4].In DSR a route request (RREQ) packet sends to the network where each node receiving an RREQ request and forward it's to the neighbor node until its find the destination. When a destination node finally receives RREQ packet it then sends an RREP packet to the source node that he finally accepted the desired packet. If any route path is broken, the source node is alarmed by the route error (RERR) packet.

C. Destination-Sequenced Distance Vector (DSDV)

DSDV [10] may be a loop-free routing protocol during which the shortest-path calculation is predicated on the Bellman-Ford rule. The transmission of data packets is performed between two nodes using a predefined routing table that is stored in the route cache. Routing table has the possible route information from source to the destination node along with hop-by-hop information. DSDV performs three important tasks: to avoid loops, solve the "count to infinity" problem, and reducing the routing overload problem. Each node provides sequence number information to updates its routing table. Each node keeps applied mathematics information regarding the common setting time of a message that the node receives from any neighboring node. The data is employed to cut back the quantity of rebroadcasts of doable routing entries which will hit a node from totally different methods however with the constant sequence number. DSDV takes under consideration solely bidirectional links between nodes.

III. Simulation And Result Discussion

A. Parameters Information

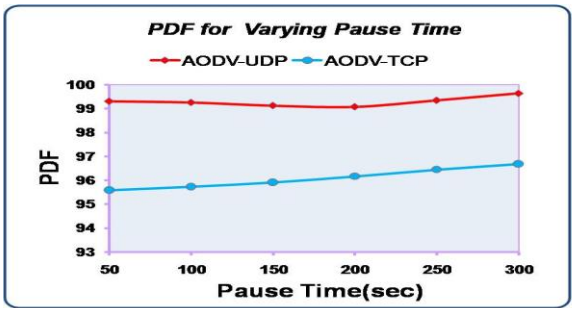
In this section, following table-1 shows the detail parameters information for our simulation to finding the better protocol.

Table 1. Simulation parameters

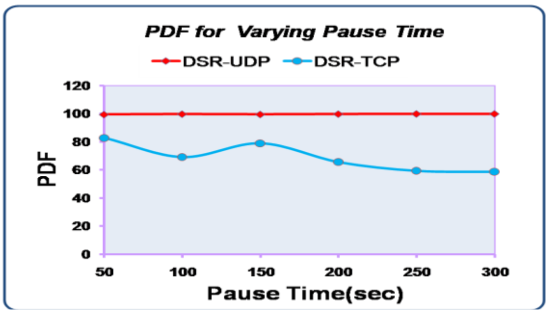
Routing Protocols	AODV,DSR and DSDV
Network Simulator	NS2
Trace File Analyzer	AWAK Script
Area	1000*1000 Square meters
Number of Node	30
Mobility Speed	5 meters per second
Simulation Time	300s
Pause Time	50s,100s,150s,200s,250s,300s
Data Packet Size	256 Bytes
Traffic Source	Constant Bit Rate(CBR) File Transfer Protocol(FTP)
Packet Delivery Fraction	$PDF = \frac{Number\ of\ Generated\ Packet}{Number\ of\ Received\ Packet} \times 100$
End-to-End Delay	E2E= Packet receives time - Packet sends time

B. Packet Delivery Fraction (PDF) Performance for Varying Pause Time

In this section, the PDF are plotted at varying pause time to see how the PDF varies for different network scenarios as shown figure 1. Figure 1(a) shows that AODV offers more PDF when UDP traffic is transmitted. This is because no flow control is used in UDP and no need to wait for the acknowledgment. The increase in Pause Time does not affect the packet delivery fraction of UDP traffic that much because of its unidirectional feature. But TCP traffic experiences slight rise over AODV protocol. PDF of UDP is almost about 99% for AODV and PDF of TCP is about 96% for AODV.



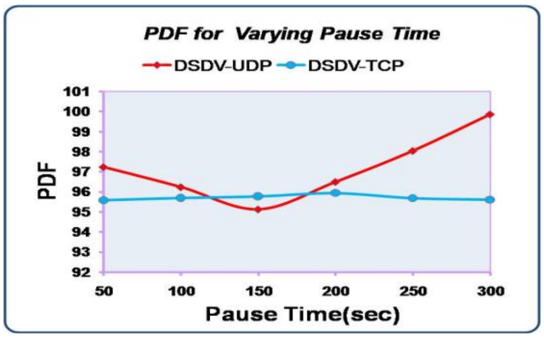
1(a)



1(b)

Figure 1(b) shows that DSR offers higher PDF when UDP traffic is transmitted. PDF of TCP traffic is much less over DSR. This is due to the flow control and congestion control mechanism of TCP. The increment in Pause Time does not affect the UDP traffic over DSR. This is because DSR includes the feature of route caching which saves packet dropping at the time of route discovery. But when Pause Time increases, the TCP traffic observes an average fall down of PDF. The congestion control mechanism might be the cause for this because at a certain time several nodes gather at a certain area. PDF of UDP is almost about 100% for DSR and PDF of TCP is about 60-70% for DSR.

Figure 1(c) shows that DSDV offers greater average PDF when UDP traffic is transmitted. This may be because, in proactive protocols, routes are available at the moment they are needed. While increasing Pause Time with exceptions near 150 second the PDF increases gradually. Because of being proactive protocol, DSDV does not drop packets during the route discovery. When Pause time increases PDF of TCP traffic is almost constant. PDF of UDP is almost about 96% for DSDV and PDF of TCP is about 95.5% for AODV.



1(c)

Fig.1. PDF comparison for variable Pause time

It can be concluded for TCP traffic that, AODV has the higher PDF over DSDV and DSR. This is because Route discovery is easier with greater pause time. Over DSDV, a slightly reduced but constant PDF for TCP is observed. The PDF for TCP traffic is the least and suffers a nonlinear variation over DSR.

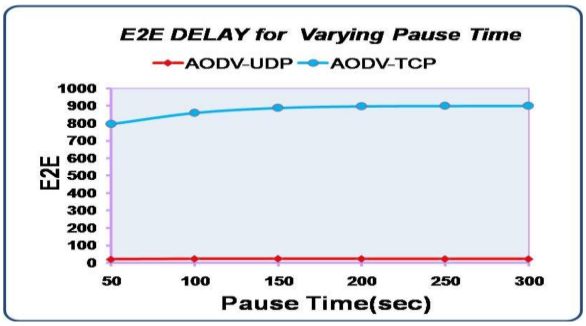
We can also conclude for UDP traffic that, DSR has the higher PDF over AODV and DSDV. This is because AODV uses route expiry, dropping some packets when a route expires and a new route must be found. PDF of DSR and AODV is better than DSDV because, in proactive routing protocol like DSDV, stale routing table entry directed the packets to be forwarded over broken links dropping many packets. The simulated results of different scenarios for PDF are summarized in the table 2 below.

Table 2. Simulated Result for PDF for variable Pause time

Node	Pause Time	AODV		DSR		DSDV	
		TCP	UDP	TCP	UDP	TCP	UDP
30	50	95.5839	99.31	82.899	99.50	95.5784	97.23
	100	95.7308	99.26	69.2747	99.83	95.6929	96.23
	150	95.9105	99.13	79.0204	99.61	95.7734	95.12
	200	96.1633	99.08	65.7319	99.88	95.9435	96.49
	250	96.4464	99.35	59.4982	100.0	95.6815	98.04
	300	96.6859	99.64	58.8303	100.0	95.6041	99.86

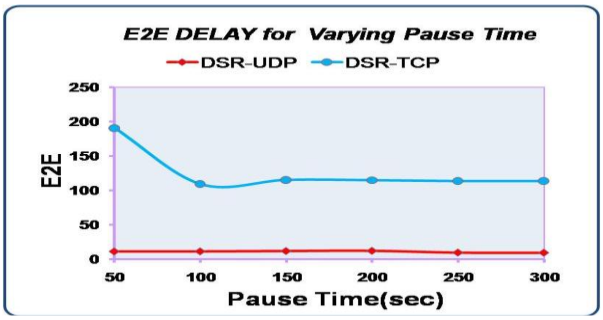
C. End-to-End Delay Performance for variable pause time

In this section, the E2E are plotted at varying pause time to see how the E2E varies for different network scenarios as shown figure 2.



2(a)

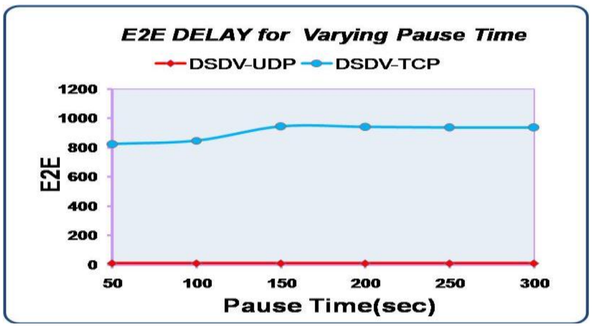
Figure 2(a) shows that in the case of AODV protocol, end-to-delay for UDP packets suffers much less than TCP packets. This is because UDP packets do not need to wait for acknowledgment but for TCP traffic; delay rises with increasing Pause Time.



2(b)

It can be observed from figure 2(b) that, end-to-end delay of UDP packets is much lesser than TCP over DSR protocol. This is because of the same reason stated before. End-to-End delay of UDP traffic over DSR does not suffer much as the Pause Times is increased. But for TCP traffic; delay suffers more rise and fall with increasing Pause Time.

It can be observed from figure 2(c) that, UDP packets experiences better and constant end-to-end delay performance than TCP over DSDV protocol. With the increase in Pause Times, the delay experiences average increase for TCP traffic because the routes between the source and destinations become shorter and longer more frequently.



2(c)

Fig.2. End-to-End Delay comparison for variable pause time

In most of the cases, TCP traffic experiences least delay (around 100-200) over DSR. This is due to the source routing used by DSR, which implies that a destination node does not need to discover a new route to the source node in order to send the acknowledgment. Among the other two protocols average delay (around 800-1000) over DSDV is higher than the average delay (around 800-900) over AODV. This is because TCP's congestion control and flow control mechanism restricts the source from sending packets over the network when it is already overloaded with the control overhead of DSDV.

End-to-End delay of UDP traffic experiences least and constant delay over DSDV. This is due to the fact that, in the case of proactive protocol like DSDV routes are available the moment they are needed. UDP traffic suffers more delay over AODV and DSR. This is because in reactive protocols there is some finite latency while the route is discovered. Among these two reactive protocols DSR has less delay because of its route caching feature. The simulated results of different scenarios for End-to-End are summarized in the table 3 below.

Table 3. Simulated Result for End-to-End Delay for variable pause time

Node	Pause Time	AODV		DSR		DSDV	
		TCP	UDP	TCP	UDP	TCP	UDP
30	50	796.985	19.82	190.75	11.15	824.259	10.18
	100	860.793	23.17	109.11	11.25	847.702	10.09
	150	889.238	24.10	115.28	11.77	946.805	9.75
	200	898.531	23.28	114.76	12.05	943.303	9.53
	250	900.337	22.71	113.46	9.64	938.982	9.44
	300	901.186	22.27	113.51	9.41	938.509	9.69

IV Conclusion

In this paper, after detailed analysis based on pause time variation for UDP traffic, we find DSR better protocol than AODV and DSDV provided the highest PDF and lower end-to-end delay. For TCP traffic, we find AODV better protocol than DSR and DSDV provided the highest PDF and moderately lower delay.

Acknowledgements

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