Analysis of changing nodes speed in MANET routing protocols QUALNET software

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ABSTRACT

Mobile wireless nodes are considered in Mobile ad hoc network (MANET). There is no centralized control which controls these mobile nodes they are randomly moved. MANET is organized and configured in a self mannered and mobile nodes are connected with them. Mobile nodes are received and forwarded with the help of router. Routing in MANET is very critical issue so that we are focus in this paper on the performance analysis of routing. We compared four routing protocols i.e. DYMO, FSR, RIP and ZRP. The simulation tool which we are used is QUALNET. Performance of these routing protocols is based on: End to end delay, Throughput and Jitter. Deeply we are discussing the performance under speed of the nodes. The comparison is based on these routing protocols and then at last the conclusion we will find out which routing protocols works better in which situation.

INTRODUCTION:

In MANET analysis is among four protocols: DYMO, FSR, RIP and ZRP. Here we consider the simulation time, terrain area, pause time, nodes and source and destination etc. with these parameter we evaluated end to end delay, jitter and throughput value. To find out what effect of nodes speed happen to these routing protocols and which one perform better in which condition.

ROUTING PROTOCOLS:

I. Chakeres and C. Perkins, "Dynamic MANET On-demand (DYMO) Routing draft-ietf-manetdymo-17" Internet Engineering Task Force, Mar. 2009. [Online]. Available: http://tools.ietf.org/html/draft-ietf-manet-dymo-17.

DYMO: The Dynamic MANET On demand (DYMO) is a reactive on demand routing protocol that not update route information periodically[1]. DYMO is a small memory stores routing information that generated Control Packets when in a route path a node receives the data packet. The basic operations of Dynamic MANET On demand source router generates Route Request (RREQ) messages and floods them for Destination routers for whom it doesn't have route information. Intermediate nodes store a route to the originating router by adding it into its routing table during this dissemination Process. The target node after receiving the RREQ responds by sending Route Reply (RREP) Message. RREP is sent by unicast technique towards the source. An intermediate node that receives the RREP creates a route to the target and so finally it reaches to originator. Then Routes have been established between source and destination in both directions .The DYMO nodes monitors link over which traffic is flowing in order to cope up with dynamic network topology. A Route Error (RERR) message is generated when a node receives a data packet for the destination for which route is not known or the route isbroken. Is RERR notifies other nodes about the link failure. The source node reinitiate route discovery quickly as it receives this RERR .Hello messages are used by all nodes to maintain routes to its neighbor nodes The sequence numbers are used in DYMO to make it loop free. These sequence numbers are used by nodes to determine the order of route discovery messages and so avoid propagating stale route information.

2 G. Pei, M. Gerla, and T. W. Chen, "Fisheye State Routing in Mobile Ad Hoc Networks," In Proceedings of the 2000 ICDCS workshops, Taipei, Taiwan, Apr. 2000.

FSR: The FSR protocol is the next generation technology of Global State Routing strategy (GSR). FSR maintains Entries of nearby nodes in the routing table are updated and exchanged with neighbors more frequently (to reduce the update message size).The accuracy of route increases as packets gets closer to the destination. The main drawback of FSR is as the mobility of remote

nodes increases the accuracy of the routing information decreases.[2]

RIP: It is a distance vector routing protocol. It calculates the best route on hop count. It uses the Bellman Ford Routing algorithm. Parameter considered is:

(i) Administrative distance value = 120.

When configuring this protocol, we need to be aware of administrative distances as these are used to rate the trustworthiness of routing information received on a router from a neighbor router. [3]

3. http://docstore.mik.ua/univercd/cc/td/doc/product/software/ssr90/rpc_r/54043.html

ZRP: Zone Routing Protocol (ZRP) combines the advantages of both reactive and pro-active protocols into a Hybrid scheme, taking advantage of pro-active discovery within a node's local neighborhood, and using a reactive Protocol for communication between these neighborhoods. In a MANET, it can safely be assumed that the most Communication takes place between nodes close to each other. The ZRP is not so much a distinct protocol as it provides a framework for other protocols. The separation of a nodes local neighborhood from the global topology of the entire network allows for applying different approaches – and thus taking advantage of each technique's features for a given situation. These local neighborhoods are called zones each node may be within multiple overlapping zones, and each zone may be of a different size. The ``size" of a zone is not determined by geographical measurement, but is given by a radius of length, where is the number of hops to the perimeter of the zone. By dividing the network into overlapping, variable-size zones, the Zone Routing Protocol consists of several components, which only together provide the full routing benefit to ZRP. Each component works independently of the other and they may use different technologies in order to maximize efficiency in their particular area. Components of ZRP are IARP, IERP and BRP. [4]

4. Haas, Zygmunt J., Marc R. Pearlman, and Prince Samar. "The zone routing protocol (ZRP) for ad hoc networks." draft-ietf-manet-zone-zrp-04. txt (2002).

SIMULATION METHODOLOGY AND PERFORMANCE METRICS:

SIMULATION METHODS AND PARAMETERS:

RESULT ANALYSIS:

CONCLUSION:

III. SIMULATION METHODOLOGY AND PERFORMANCE METRICS

In our studies we considered the following parameters:

(i) Nodes speed,
(ii) Packet size,
(iii) Random way point speed,
(iv) Area.

Using these values we observed throughput, end to end delay and jitter values. Comparing these metrics we checked the performance of each of the four protocols. During simulation the source and destination nodes were fixed. The number of nodes was fixed at 50 and connection type was taken to be of constant bit rate (CBR).

SIMULATION MODELLING

Implementing a complex network can be a costly affair; hence simulation tools are used to analyze the performance and behavior of complex networks. For this purpose many simulators are available like NS2, QUALNET and OPNET etc. In this work, QUALNET simulator is used. Several models are available in QUALNET, out of which we considered the following:

(i) Node Model for energy source, memory capacity, processing capabilities etc.,
(ii) Node deployment model for placement of nodes,
(iii) Node mobility model for dynamic network topology as Random Waypoint Mobility model,
(iv) Radio Model for characteristics of radio used by node with a proper frequency, bandwidth, MAC layer functionality as IEEE 802.11 MAC model,
(v) Wireless Signal Propagation Model for SNIR at receiver as Two Ray Ground propagation model, Packet loss model for packets collision or dropped in Markov error model,

(vi) Traffic Model for nodes sending traffic to destinations mostly CBR, UDP Model [2].

SIMULATION METHODS AND PARAMETERS

The goal of our experiment is to examine and quantify the effects of various factors discussed above and their interactions on the overall performance of MANET. Each run of the simulator accepts a scenario file as input that describes:

(i) The exact motion of each node using Random Waypoint mobility model.
(ii) The exact sequence of packets originated by each node.
(iii) The exact time at which change in packet or motion origination occurs.

To evaluate the performance, we considered four random simulation runs to generate four random scenario patterns and the performance of the considered factor is the average of these four outputs. 100 simulation runs were conducted to analyze each performance factor of the four protocols. Since our experiments are based on network layer characteristics so only change which is observed is related to routing protocols. Whereas, 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 [3].

The parameters of our simulation are reported in Table 1.

End-to-End Delay (EED): It is the time taken for an entire message to arrive completely at the destination from the source[5]. Its evaluation depends on:

(i) Propagation time (PT),
(ii) Transmission time (TT),
(iii) Queuing time (QT) and
(iv) Processing delay (PD).

Therefore, EED is evaluated as:

EED = PT + TT + QT + PD.

*[5]https://www.ijircce.com/upload/2016/november/46_Analysis.**pdf***

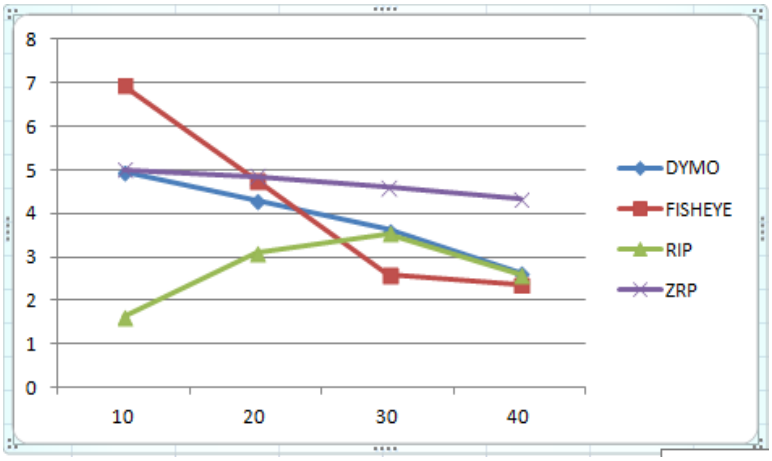
Throughput: It is the average rate of successful message delivery over a communication channel [5].

Throughput = Number of Data packets received/ Number of Data packets sent

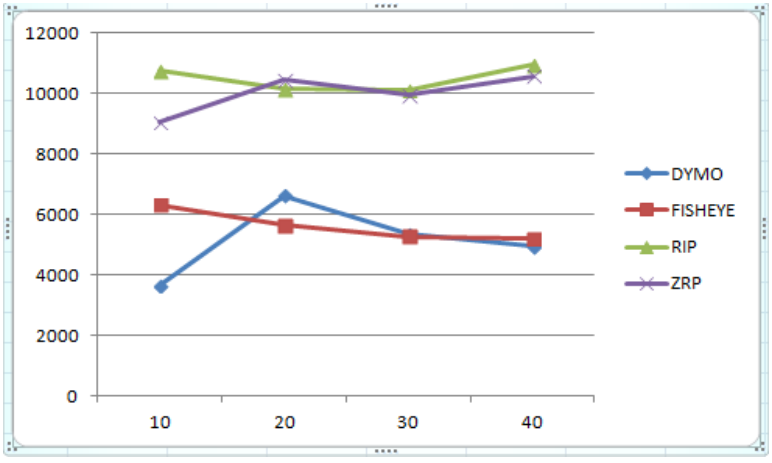
Jitter: It is the variation in latency. It is measured as variability over time of the packet latency across the network. A network with constant latency has no variation (jitter). Packet jitter is expressed as an average of the deviation from the network mean latency .[6]

6. Comer and Douglas E., "Computer Networks and Internet," Prentice Hall, p.476, ISBN 9780136061274, 2008.

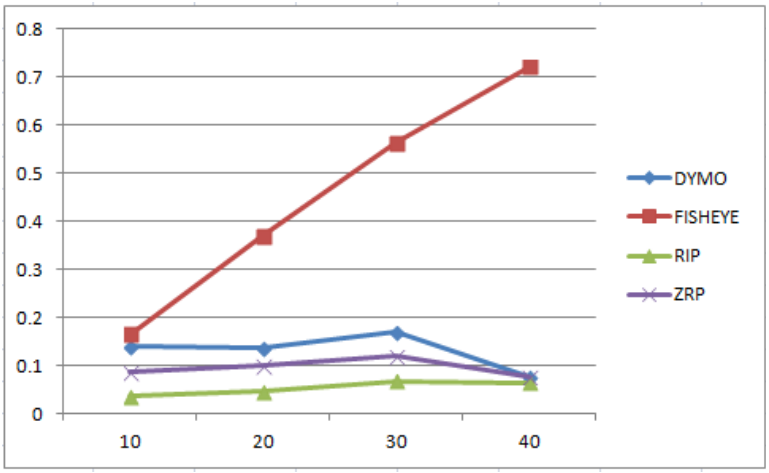
Node speed:



End to end delay.



Throughput



Jitter.

Simulation Parameter	**Values**	**Simulation Parameter**	**Values**
Network Type	Mobile	Connection Type	CBR
Item size	2048 byte	Interval	.0002 sec
Connection Pattern	Random Way point	Simulation area (sq. m)	1500
Item sends	100	Number of nodes	50
Duration	100s	Pause time	30 s
Connection	802.11	Node speed	10, 20, 30, 40 m/sec

Protocols	End to end delay	Throughput	Jitter
Dymo	low	very low	Medium
Fsr	medium	Low	High
Rip	very low	High	very low
Zrp	high	Medium	Low

Conclusion nodes speed.