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Performance Comparison of TORA, LDR and ZRP MANET Routing Protocols

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Abstract:

In this paper we are presenting a performance comparison of TORA, LDR and ZRP MANET routing protocol. Using the OPNET 14.0 module as a module, throughput, network load, end-to-end delay, and packet delivery rate are used as performance indicators for FTP traffic, and the impact on routing efficiency, especially focusing on pause time, scalability, and node density. Observed. Simulation tool. Based on observations from the literature and empirical studies conducted on OPNET, we found that none of the three protocols successfully provided optimal efficiency in different MANET scenarios.

Keywords: FTP, OPNET, TORA, LDR and ZPR.

Introduction:

Wireless networks play an important role in everyday communication. It is commonly used in military applications, industrial applications, and even personal area networks. Considering various valuable characteristics such as ease of installation, reliability, cost, bandwidth, total power required, security and network performance, they are very popular in various applications. But like wired networks, they also use fixed infrastructure [7] such as wireless phones, cellular networks, Wi-Fi, microwave communications, Wi-Max, satellite communications, and radar. It is widely used in a variety of applications to address the need for efficient and dynamic communications in mobile user bases, emergency/rescue operations, disaster relief operations, and military networks. Also [3], [2]. Networks cover large geographical areas with no fixed topologies that can change dynamically and unpredictably. These networks improve network scalability compared to infrastructure-based wireless networks due to their distributed nature. In all critical scenarios such as natural disasters and military conflicts, ad-hoc networks offer excellent performance with minimal configuration and fast operation [8], [4].

In MANET, lack of any of these requirements can affect performance and network reliability. Internet Engineering Task Force (IETF) - The MANET working group has worked continuously to ensure that routing protocols are standardized. A working group standardized features of the IP routing protocol suitable for wireless routing applications in both static and dynamic topologies [10]. MANET routing protocols come in three categories: table-driven, demand-driven, and hybrid. Table-driven protocols allow each router to have one or more routing tables, which do not exist in on-demand routing protocols. On demand creates new routes based on demand. Proactive routing protocols offer high reliability and low latency in new route decisions, but the need to maintain large routing tables for thousands of mobile nodes makes these protocols unsuitable for large numbers of mobile nodes. It doesn't work well in scenarios where you use . As a result, routing information cannot update new routing tables, increasing traffic overhead and reducing overall bandwidth efficiency [3]. However, reactive protocols also have some limitations because the source node must wait for a response to the routing request it sends. This leads to significant delays and poor performance for real-time traffic [3]. Hybrid routing protocols combine the advantages of proactive and reactive protocols.

Literature Review:

There have been many studies efforts inside the ultimate decade toward designing an efficient routing protocol suitable for actual-time community scenarios in MANET. distinctive routing protocols comply with distinct strategies to keep away from loops in routing. If the destination node isn't always to be had inside the network or due to link failure, routing may turn out to be in an infinite loop trouble. To ensure loop-free routing, a few protocols use destination sequence numbers, DAG algorithms (route calculations are constantly unidirectional), and viable distances. in which DSR makes use of a supply course to keep away from loops, TORA makes use of a hyperlink reversal algorithm and AODV uses a sequence variety for every destination. maintenance of routing loops and full reachability are two factors that without delay have an effect on routing efficiency [7].

In [3] and [6], the performance of AODV, DSR, Tora, and OLSR routing protocols using the random waypoint model is discovered for distinctive sizes of networks and special community densities in OPNET. In those research works, AODV and OLSR had been proven to have better packet postpone and

community load than TORA, while TORA has decrease throughput than AODV and OLSR. In heavy site visitors surroundings and high congestion community situation, AODV performs higher than OLSR and TORA.

Commonly random waypoint, random stroll and random route are used to layout MANET in various simulators [4]. inside the random waypoint mobility model, the AODV protocol shows better performance than DSDV and TORA with recognize to packet shipping ratio and give up-to-give up delay. AODV also indicates better throughput than DSDV, TORA and DSR protocols [4] in excessive cell node contexts.

OPNET Modeler 14.5 is used to research the overall performance of routing protocols OLSR, AODV, DSR, and TORA for different network sizes, node mobility, and visitors loads [5], [11]. Experimental outcomes show that TORA shows higher overall performance in medium and massive-sized networks below excessive traffic load. DSR is suitable for low node mobility in small length networks. It also plays higher in huge networks with high node mobility. AODV has been located to carry out properly in medium-sized networks at excessive site visitors loads. OLSR also plays comparatively higher than different methods in lots of instances, but its performance degrades and degrades while node mobility and traffic load boom. In a similar scenario, TORA well-knownshows a reduction in throughput compared to AODV and OLSR. In AODV, the routing choice is taken based on the gap stated with respect to the respond-to vacation spot sequence wide variety related to it. LDR additionally uses sequence numbers however it's far controlled through the destination it belongs to. The ordering of the nodes is achieved primarily based at the label for every vacation spot and it usually guarantees loop-free routing in any scenario using the label, blended with the possible distance and the vacation spot series range [5].

Research Question

- How does a proactive routing approach fail to improve efficiency in a MANET scenario with high node mobility?
- How does the reactive approach work without creating a enormous routing table in large networks with thousands of mobile nodes?

Studies method

Many MANET routing protocols have already been designed and tested in diverse simulators; but to date, no studies attempt has been able to offer highest quality routing performance to make sure excessive network overall performance. Several elements inclusive of community density, pause time, node mobility, community scalability, and so forth. have a right away impact on decision making in routing. therefore reading the results of pause time, network density, node mobility and network scalability at the overall performance of routing protocols will assist in designing an green routing protocol that is the key problem to enhance the overall performance of MANET. With the aid of reading the details at the running precept of TORA, LDR and ZRP, we've got chronicled the working technique knowledge of reactive and hybrid protocols, that are in general tailored to MANET. To evaluate the overall performance amongst MANET routing protocols which include TORA, LDR and ZRP with recognize to throughput, network load, latency, and to have a look at the consequences of community density, scalability and node density on routing protocol performance, we finished a developed community model. Environment in OPNET 14.zero. Even though OpenET has a variety of attractive capabilities in comparison to different current simulators, we encountered a obstacle in that it supports handiest six MANET routing protocols.

Result Analysis

LDR

Label Distance Routing (LDR) protocol is an on-demand routing protocol. Within the case of on-call for routing protocols, the matter to infinity trouble is an crucial issue. This hassle occurs while routing gets into an infinite loop because of link failure or absence of a vacation spot node within the community. To keep away from this hassle, it makes use of the destination collection number. It makes use of this series number in this type of way that the vacation spot node is needed to reply fewer RREQs [26]. Two parameters are used to carry out the operation: the destination collection variety and the viable distance (the shortest recognised distance from the router to a specific destination). Both are used to reset the distance to the destination node, which permits the node to file a bigger distance to the subsequent hop than the node's possible distance. The shortest distance to a vacation spot node is maintained with the aid of the node of its cutting-edge sequence range as a way to find the destination. In LDR, nodes are ordered based on the label of every destination, in which the label is the cost of the possible distance. An vital assets of LDR is that it constantly ensures loop unfastened properties [25]. To overcome the boundaries of sequence numbers, it makes use of distance labels. It makes use of specific parameters - the feasible distance of twin and the same collection variety as AODV.

TORA

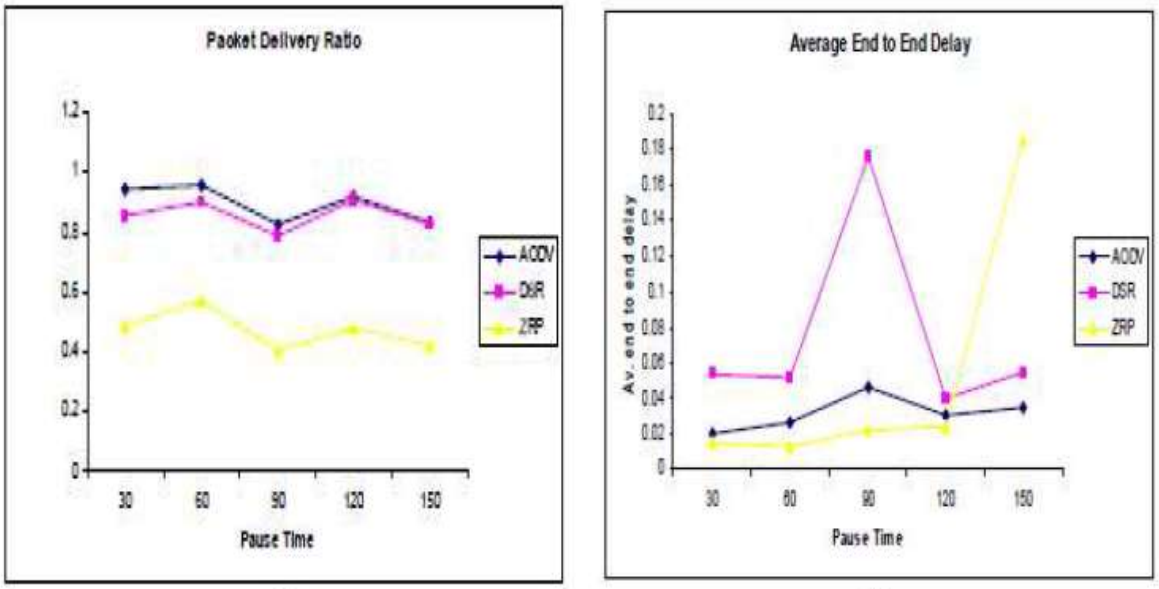
The Temporal Ordered Routing set of rules (TORA) is a reactive routing protocol, additionally called a hyperlink reversal protocol. it's miles powerful in solving the present boundaries of MANETs. due to the high mobility of nodes, congestion is one of the main troubles in MANETs. The traditional shortest direction algorithm, adaptive shortest path algorithm, and hyperlink kingdom routing may not paintings nicely in cell networks. it's far tough to replace the routing desk of dynamic nodes. In TORA, every node publicizes a query packet and the recipient broadcasts an update packet. It supports loop-free, more than one direction facilities. through the usage of a "flat" non-hierarchical routing algorithm, it also gives higher scalability. To find a new direction, it uses the Directed Acyclic Graph (DAG) algorithm and also a set of fully ordered height values at all times. in this method, facts can

handiest drift in a single direction [19]. consequently it is unidirectional simplest; there's no risk of falling into an countless loop. It plays four simple operations that are route creation, course upkeep, route deletion and route optimization [20].

ZRP

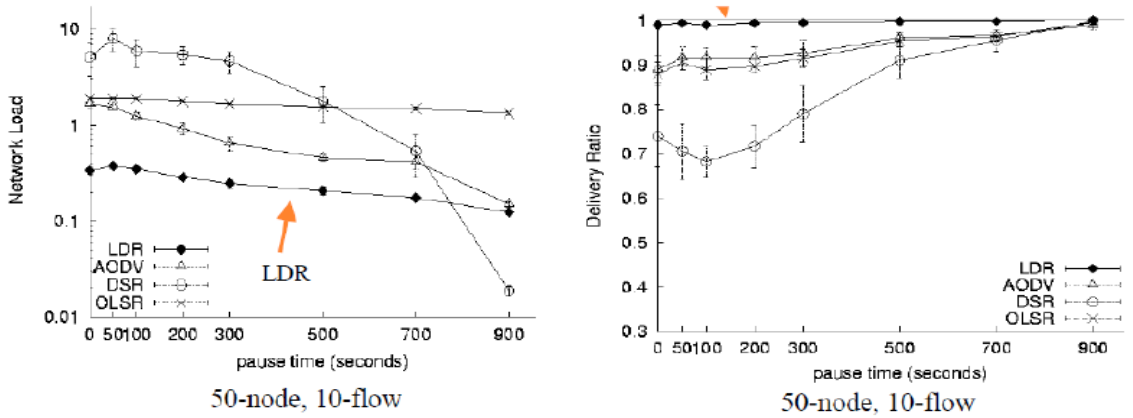
Haas and Perlman first brought the quarter Routing Hybrid Protocol (ZRP) [24] , which divides the whole network area into several smaller areas to carry out their operations. the scale or scope of an area does now not depend on distance or scope; It depends at the quantity of hops. it's miles applicable in a extensive sort of mobile ad-hoc networks with numerous mobility over a big time frame. It makes use of a distinct approach to find a new path between nodes positioned inside or out of doors the area. There are four elements to be had in ZRP: MAC stage feature, IARP, IERP and BRP. In IARP, proactive technique is used to discover a new course in the location and in this example, the hyperlink is believed to be unidirectional. however to speak with nodes, which might also now and again be located out of doors the area, it uses IERP, an on-demand routing method. these different strategies, which includes routing quarter topology and active protection, which enhance routing performance and enhance discovery fine in globally reactive routing ZRP [12] the usage of query/solution mechanism.

ZRP vs. TORA



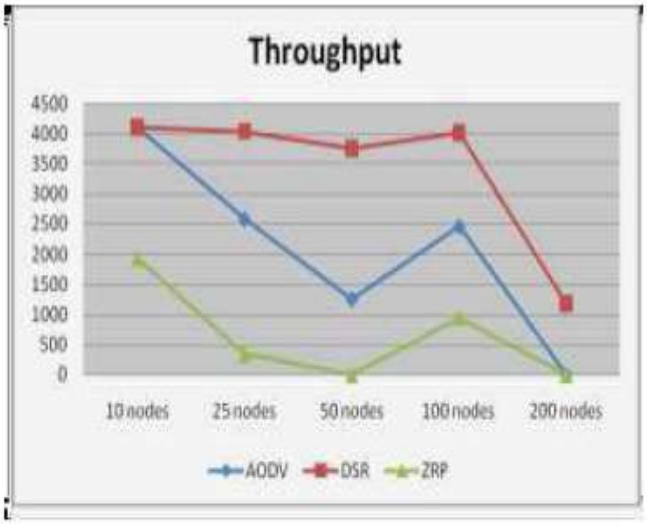
(a) (b)

LDR vs. TORA

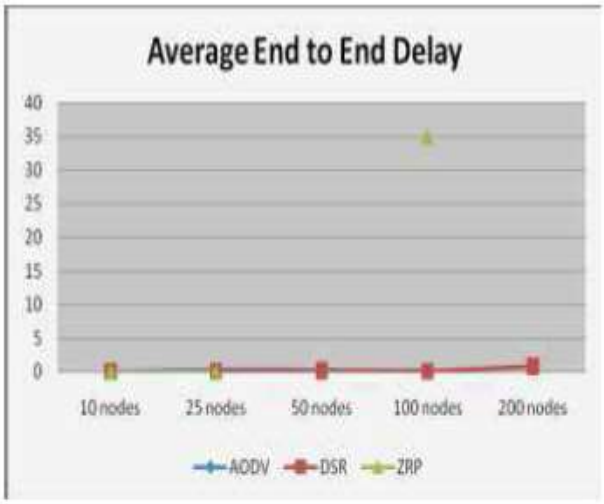


50-node, 10-flow 50-node, 10-flow

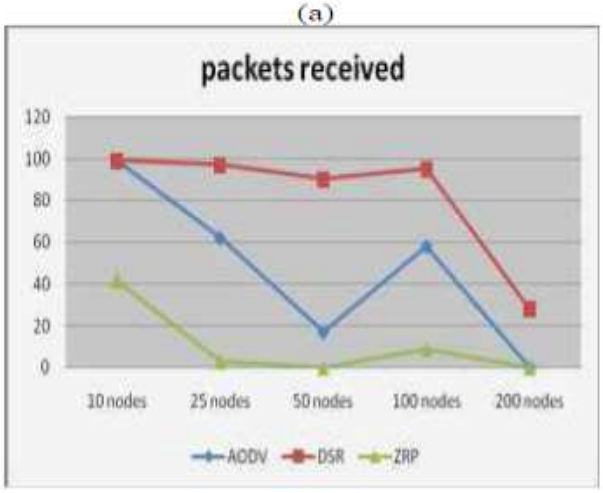
(a) (b)



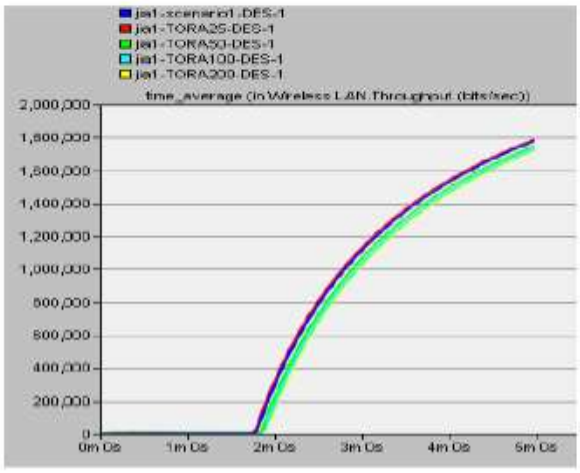
(a)



(b)



(c)



(d)

Conclusion

Various the number of nodes in addition to the scale of the location does now not have an awful lot impact at the packet transport ratio after a certain threshold. After this threshold, a consistent level is maintained in both TORA and ZRP in both instances. In ZRP the throughput fee mechanically decreases primarily based at the increase of nodes, but in TORA, it indicates inverse traits and the modifications are quite small for a huge kind of nodes. It also has a much more effect on the stop-to-stop conduct of ZRP than Torah as shown in the graph. In ZRP if we growth the nodes, the end-to-give up postpone will boom and vice versa. From the above discussion, we are able to conclude that different factors which include pause time, node density and scalability have a great effect on the overall efficiency of TORA, LDR and ZRP routing protocols. The difference in behavior of different routing protocols is due to their one-of-a-kind, reactive, hybrid and proactive natures. No single protocol is found to attain ideal efficiency with admire to community load, throughput and packet delivery ratio for variant of pause time, node density and network length in such a dynamic, adaptive and particularly variable environment.

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