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Performance Enhancement of AODV, ZRP and AODVDR Routing Protocols using Fuzzy Logic

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Abstract

MANET is mobile ad-hoc network having various mobile nodes works under different set of protocols. These protocols falls under different protocols like reactive, proactive and hybrid. Each type of protocol has their own set of advantages one over to other. The new protocol which has improved over ZRP. This improvement in the ZRP protocol. Because there stands the selection of the protocols. Out of many protocols one protocol is selected based on requirement. So that if one protocol deteriorate under give situation other protocol will be selected. This will automatically compensate the drawback of the network under the given availability of the network. This availability is in between to 25% to 49%. But while selecting the protocol som sort of end to end delay is wasted. But other factors will improved upon over the other. That means ZRP performance will be enhanced.

Keywords: ZRP, AODV, AODVDR

Introduction

Mobile ad hoc network

MANET is the collections of wireless mobile devices that are capable for working as host as well as router and these devices can move anywhere at any time in the physical environment. The important features of MANETs are that, self-organizing and self- maintenance properties are in-built in these. The mobile ad hoc networks are quick and easily deployed network as compared to other type of wireless networks. In MANET when two nodes comes in the radio range of each other can communicate directly. Otherwise these communicated through intermediate nodes which are calls the intermediate router (boundary router). In ad hoc network each mobile node has all the features of router and these features are used by the mobile nodes at the time of route establishment and delivery of the packets

Wireless Network There is currently two variations of mobile wireless networks:

Infrastructure Network: A network with fixed and wired gateways. The bridges for this type of network are known as base stations. An example of this type of wireless network is the cellular-phone networks where a phone connects to the base-station with the best signal quality. When the phone moves out of range of one base-station and into range of another, a “hand-off”. The “hand-off” should be fast enough to be seamless for the user of the network [18].

Infrastructure less Network: In this kind, there is no infrastructure at all except the participating mobile nodes. This is called an *infrastructure less network* or more commonly an ad hoc network. The word “ad hoc” can be translated as “not organized”, which often has a negative meaning, but the sense in this context is not negative but only describing the dynamic network situation. All or some nodes within an ad hoc network are expected to be able to route data-packets for other nodes in the network beyond their own transmission-range. This is called peer-level multi-hopping

Classification of AD HOC Routing Protocols

Mobile ad hoc network is a one class of wireless network consists of wireless mobile nodes which can communicate without any fixed base station. MANET is a multi-hop wireless network. Due to its fundamental characteristic like infrastructure-less, dynamic topology, self-manageable etc., we cannot uses those routing protocols in MANE which are used in the traditional wired networks. Ad hoc routing protocols are classified a follows shown in Fig. 2

Proactive Routing Protocol (ProRout): As we all know *ProRout* is the more power full

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routing technique that was used in conventional network (Ethernet). After some time this technique was successfully implemented for wireless ad hoc networks (MANET). In this technique each device maintains the information about their neighbor's node in the table. Due to this, it is also called the table driven routing protocol. The information inside the table is updated on the periodic basis. In this technique each node exchanges the topology information with its neighbors. These periodic information exchanges consume lot of network resources like network band width, battery life of communicating devices. The proactive routing gives better performance in the case of stable (zero mobility) network as compared to mobile network. Most widely used table driven routing protocols are: DSDV, WRP, OLSR and STAR

Reactive Routing Protocol (ReRoute): Another approach that is used for route the packet from the source to destination is a *ReRoute* also called on demand routing protocol. As its name on demand, it preserves and establishes the path when node actually sends the data instead of regularly maintain and update the information table about the all neighbor nodes. The major advantage of reactive routing over proactive routing is that it saves the network bandwidth and battery life of nodes. The disadvantage of this technique is that it is slower than table driven routing technique. Most widely used table driven routing protocols are: DSR, AODV, TORA, CBRP, RDMAR and ABR. Figure

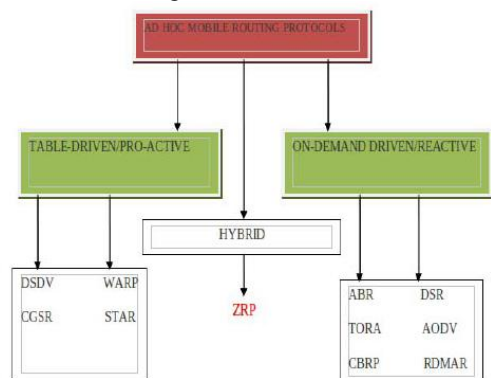


Fig. 1: Protocols

Hybrid Routing Protocol (HyRoute): HyRoute accede the advantage of both table driven and on demand driven routing protocols. The most powerful advantage of table driven routing is high speed and on demand driven is less overhead. HyRoute inbuilt these features. HybRoute protocols may exhibit table driven or on demand driven routing depending on the circumstance, hence allow flexibility based on the wireless network. Most widely used table driven routing protocols are: ZRP and ZHLS

Related Work

Anupam Kumar Sharma (2016) et al: MANET is a collection of computational devices that creates random topology for communication. The beauty of MANET is that it not required any central controller or base station. The devices used in MANET may be fixed or mobile. MANET is only a network in which devices worked as a host as well as router. The routing protocol used in mobile ad hoc network is broadly classified in three category- proactive, reactive and hybrid routing protocol. In this thesis work performance of AODV, AODVDR and ZRP is compared in

the presence of different number of connection, different pause time and different number of communicating devices. In this work, network simulator tool NS2.35 is used for simulation. Simulation result shows the AODVDR is perform better than AODV and ZRP routing protocol.

M.L.Ravi Chandra (2016) et al: As the mobile nodes are mostly resource constrained, in case of faulty nodes packets forwarding could be lead to further complications. Hence in designing a robust mobile ad hoc network fault tolerance plays a major role. Due to the presence of faulty nodes, the performance of routing degrades and the reason for the faulty nodes has to be identified to address routing by exploring network redundancies

Rajeev Paulus (2013) et al: Performance comparison of four popular mobile ad-hoc network routing protocols i.e. Ad hoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR), Optimization Link State Routing (OLSR) and Zone Routing Protocol (ZRP) is presented with variable pause time. A network simulator QualNet 6.1 from scalable networks is used to evaluate the performance of these protocols. The performance analysis is based on different network metrics such as Average End to End delay (s), Average Jitter(s), Throughput and Packet delivery ratio.

Tarunpreet Bhatia(2015) et al: Performance of proactive protocols like DSDV, OLSR, reactive protocols like AODV, DSR and hybrid protocol such as ZRP. The analysis guides us to the evaluation of various performance metrics such as throughput, packet delivery fraction, normalized routing load and average end to end delay under different scenarios such as varying network size, speed of the node and pause time. The focus of this paper is to have quantitative analysis to guide which protocol to choose for specified network and goal.

Abhishek Dixit(2015) et al: The scenario of directional meta material antenna is simulated for comparing and analyzing of different routing protocols such as AODV, DSR and ZRP using QualNet simulator 6.1. The metrics used for performance evaluation of different routing protocols we used throughput, average unicast end to end delay, and average unicast jitter of routing protocols.

Ajay Singh(2014) et al: The performance comparison of MANET mobility models have been analyzed by varying number of nodes, type of traffic (CBR, TCP) and maximum speed of nodes. The comparative conclusions are drawn on the basis of various performance metrics such as: Routing Overhead (packets), Packet Delivery Fraction (%), Normalized Routing Load, Average End-to- End Delay (milliseconds) and Packet Loss (%).

ZishanHaider Y. Noorani(2013) et al: There are two approaches for routing in MANET one is Proactive and another is Reactive. Zone routing protocol is a hybrid protocol means that it uses Proactive approach in its inter-zone whereas Reactive approach in its intra-zone. This work revolves around enhancement in Zone routing protocol in the area of fast route reconfiguration and route acquisition delay.

Algorithm

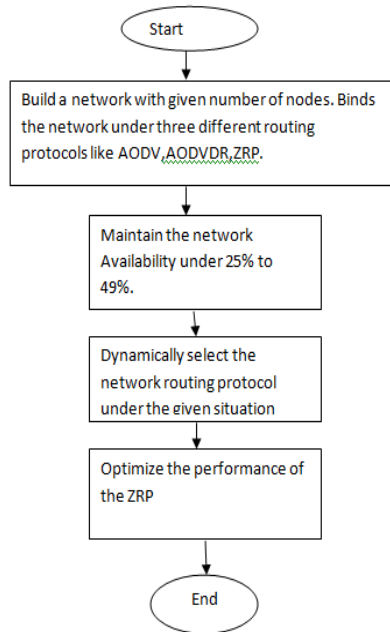
Step1: Set the network with different number of nodes with three protocols like AODV, AODVDR, ZRP.

Step2: Set nodes to be the source and destination. So that data packets can be sent from source to the destination.

Step3: Maintain the network Availability under 25% to 49%.

- Step4:** Select dynamically which protocol is best suited for the situation under given availability.
- Step5:** Optimize the performance under give availability of the network.
- Step 6:** Optimize the performance of the ZRP under given availability.

Flowchart



Performance Parameter

| Parameter | Value |
|----------------------------|-------------------|
| No. of Nodes | 50 |
| Routing protocol | ZRP, AODV, AODVDR |
| Communication protocol | TCP, UDP |
| Application Layer Protocol | CBR, FTP |
| Ifqueue length | 50 |
| Packet Size | 512 Bytes |
| Delay | 3 ms. |

Table 1

Performance Parameters

There are various performance parameters, which are used to measure the performance of the network. So that network basic settings can be configured and compared to some other basic pre-set values.

End to End Delay: End to End delay is the determined time in which packet has been sent.

End to End Delay = (receive time- sent time)

Packet Delivery Ratio: The packet Delivery ration measures the number of packets have been delivered from source to the destination.

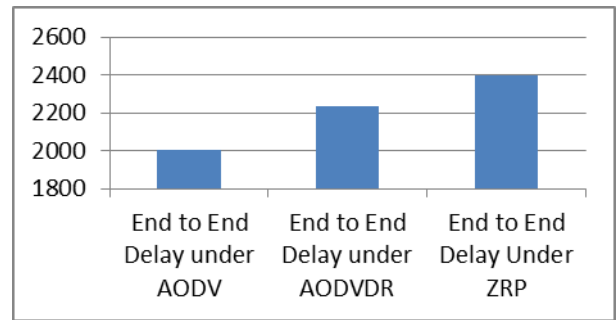
Packet Delivery Ratio = (Sent packet-Receive packet)/total packet

Success Rate: What is the success rate. that means how successfully packets have been delivered from source to the destination.

Success rate = (Sent Packet-dropped Packet)/Total Packet.

Throughput: How much packets has been delivered per unit interval of time.

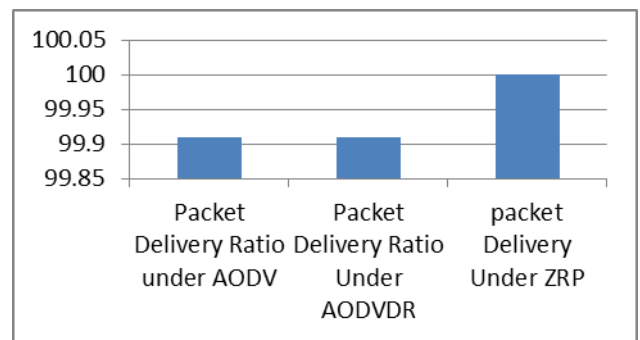
a. End To End Delay



Graph 1

This graph (1) shows the end to end delay under ZRP is maximum. Compare to the AODV and ADODVDR. This performance is measured under the network overload of 22% to 56%. Such that with the increase in the end to end delay the other factors can be enhanced.

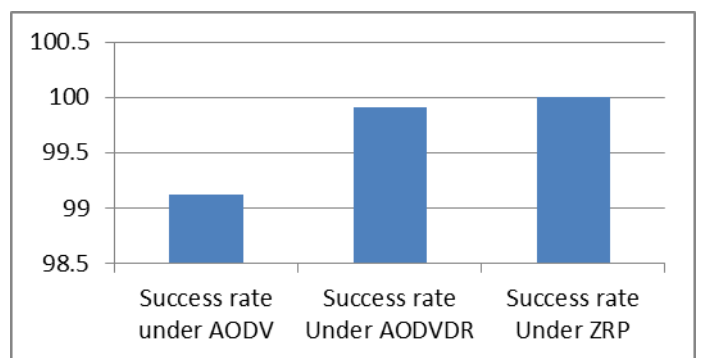
b. Packet Delivery Ratio



Graph 2

This graph (2) shows the Packet Delivery Ratio of AODV, AODVDR, ZRP. The packet Delivery Ratio for ZRP has enhanced to 100%. This is done with the increase in the end to end delay. This performance is enhanced in the load of 22% to 56%.

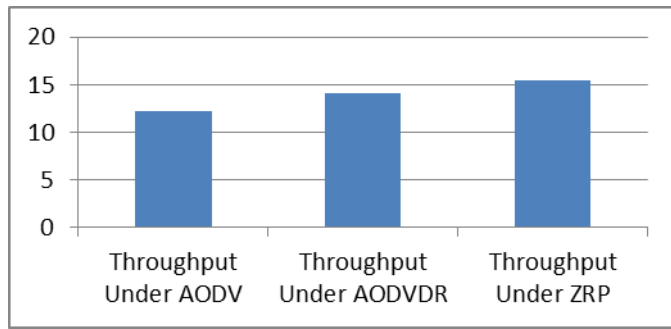
c. Success Rate



Graph 3

Success rate has grown to 100% in case of ZRP. That means the performance in terms of success full packet Delivery has been grown. This is again under the load of 22% to 56% of total load.

d. Throughput



Graph 4

This graph (4) shows that the throughput performance under all the three protocols. ZRP still has shown the enhanced performance. ZRP has throughput better than both AODV and AODVDR.

Percentage Improvement

| | |
|-------------------------------|------|
| End To End Delay for ZRP | -10% |
| Packet Delivery Ratio For ZRP | 1% |
| Success Rate For ZRP | 1% |
| Throughput Under ZRP | 10% |

So from above table it is clear that the all the factors have improved. Like packet Delivery ratio, Success Rate, Throughput etc. But End to End Delay has reduced. That means with little improvement in the procedure will increase in the end to End delay. But in results will increase the performance of packet Delivery ratio, Success rate, Throughput.

Conclusion and Future Work

MANET is mobile ad-hoc network having various mobile nodes works under different set of protocols. These protocols falls under different protocols like reactive, proactive and hybrid. Each type of protocol has their own set of advantages one over to other. The new protocol which has improved over ZRP. This improvement is in the ZRP protocol. Because there stands the selection of the protocols. Out of many protocols one protocol is selected based on requirement. So that if one protocol deteriorate under give situation other protocol will be selected. This will automatically compensate the drawback of the network under the given availability of the network. This availability is in between to 25% to 49%. But while selecting the protocol some sort of end to end delay is wasted. But other factors will be improved upon over the other. That means ZRP performance will be enhanced. In future further another protocol falls under different categories can be used for enhancement of the performance of the network. Which works under the network availability of 25% to 49%.

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