Subjective Analysis of Routing Protocols in MANET

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***Abstract*— MANETs are an emerging type of wireless networking in which mobile node associate on an extemporaneous or ad hoc basis. In today's scenario, popularity of ad hoc networks are rapidly increasing, data rates are raised and their respective prices are going down. From the establishment of ad hoc networks to present, number of routing protocols has been introduced; though very few of them are capable of producing effective and efficient routing. In this paper , we have try to compared the results of two routing protocols namely*Reactive* and *Proactive* by considering different web based application like HTTP, FTP, e-mail, Video conferencing etc.**

Key terms—AODV,TORA,ZRP,OLSR

I. INTRODUCTION

In "MANET" **M** stands for "***mobile***" **A** for "***Ad hoc***" and **NET** for "network", on putting these words together they will form **Mobile Ad hoc Network** that means continuously configure its route and infrastructure by itself without using any cable wires or any physical entity. MANET has a feature that every individual mobile node is free to move in any direction as user wants. Sothe changing into its links to other device will be very frequently. The main focus in MANET is equipping each device to continuously maintain the information required to properly route traffic. There are different types of MANET [1], like **Vehicular MANET** in which two different vehicles have communication which will provide enhanced version of vehicle. **Internet MANET** which means mobile nodes are interconnected with each other using internet. **Military/tactical MANET** which will provide special connectivity between military candidates .When two nodes wants to communicate with each other, it is essential to find a path between them, termed as ROUTING.[5]Various protocols were introduced for routing, but only few of them are being very popular. Some researchers categorized routing protocols of MANET into two types**:*Link state protocol*** and ***Distance vector routingprotocol.***[3] Broadly theyare divided into threecategories:***Reactive***,***Proactive***,***hybrid.***

Several researches had been made in the last decade but only**PGP trust based security** get popular.

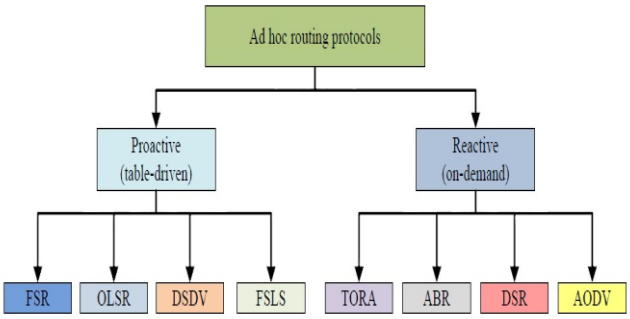

Fig1.1. various types of ad-hoc routing protocol.

II. APPLICATION FIELDS OF MANET

The area of implementation of MANET is very wide or we it is worldwide. For example in a regular person life wireless technology is playing a very important role which is good example of MANET by which a person is free to move within a range with the provided access to connected network.In **autonomous sensor system** is also a vast area of MANET.[7]In Business environment, MANET rather than WLAN is preferred as it made people free from wire/cable implementation.[7].

III. DESCRIPTION OF ROUTING PROTOCOLS

1. Reactive protocol

Protocols which setup their routes on-demand are known as reactive protocols. When a device wants to start interaction with another device where route is unknown, this routing protocol will try to find out path such a route.

•*ADOV*

The "AODV" stands for Ad-Hoc On-Demand Distance Vector routing protocol which is basically reactive protocol which follows the basic idea that data is only sent by nodes on-demand. When a device wants to send some data to a host, where path is unknown, then protocol will release a request to be flooded to other devices, which will called as **RREQ route request**. This will lead to **CTO**(control traffic overhead) to be dynamic, that's why result will have initial delay, while starting such interaction. When flooded Route request reaches to its

proper host, then route is said to be found [1]. Protocol stays passive, how long route exits between two devices. If somehow route becomes lost or not valid, then protocol has to release RREQ again. For every route, this protocol tries to escape from the "counting to infinity" by using sequence number from the classical distance vector algorithm. This problem arises when nodes updates about each other in loop [8].

3 control statements are used by the protocol for maintenance of route:

RREQ – When device wants to establish path between itself and another device, RREQ requires. This protocol uses Expanding Ring Technique (ERT) for optimization purpose while flooding these request messages to other nodes. Each RREQ has its TTL(time to live) values which shows the number of hops to be forwarded of this message. The TTL value is set to be fix to a pre decided value at the first transmission and increases at every retransmission. Retransmissions occur only if when have no reply from other nodes. The Data packets waiting for the transmission should be transmitted by a FIFO order and buffered locally when a route is set.

RREP – this message is transmitted by destination host to that node who was finding route.

RERR - An essential route maintenance task is to monitor the link status of upcoming nodes in active paths. If a link breakage is detected in an active route, then a RERR message is used to send to other nodes to notify them about the loss of the link. Each node keeps a ``precursor list'', so that it can enable this reporting mechanism, having the IP address of each its neighbors devices who are likely to use it like a next hop towards each destination.

•*DSR*

Distance source routing (DSR) is apopular reactive protocol, developed at Carnegie Mellon University, Pittsburgh USA and it is ademand driven protocol. DSR is a core protocol unlike AODV which is combination of DSR and DSDV [1]. This protocol is based on thebasis of source routing. Source routing is a mechanism where a packet sending node knows about the whole sequence of the nodes by which packet has to go through. The purpose of this protocol was to enable the use of multi hop wireless MANET. This protocol is said to be complete self-organized and self-configured protocol. This protocol is combination of two main operations they are

(a) Route discovery process, where node searches for an optimum route between source and destination node.

(b) Route maintenance, who ensures that searched optimum path is stable and free of loop.

•*TORA*

"TORA" stands for temporally ordered routing algorithm, and this protocol follows LTP's (link traverse protocol) topology. According to LTP there should be multiple routes provided in MANET to send data packets to destination by source. This protocol becomes popular and efficient due to its adaptability and scalability. There are 3 basic operations of this protocol and they are Create routes, Maintain routes, Erase routes.

2. PROACTIVE PROTOCOL

In proactive protocols routing is based on table-driven approach. In this approach every node has its routing table maintained about the nodes which comes in its range so that node does not have searching overhead for route between source and destination. In this approach all nodes have knowledge about. The best part of these protocols is routing traffic overhead is always constant and no initial delay.

•*OLSR*

OLSR is Optimized Link State routing (OLSR) which is a table-driven pro-active protocol. An optimized manner it uses link state routing to diffuse topology information. In this algorithm the information of link state is flooded in whole network. This approach is used by OLSR, but it is known that protocol runs in wireless multi-route form then an optimized way will be used to broadcast message to save bandwidth. TheMulti Point Relaying optimization technique is used as it is a table-driven approach, the main task in OLSR is to update and maintain the information in form of table. The received control traffic will make changes in data in tables and that received data will be used to control traffic activities from the table. The route calculation itself is also driven by the tables.

OLSR has 3 essential control messages:

HELLO –This message will be broadcast to all nearby nodes to do sensing of nearby nodes and to calculate MPR of all of them.

TC - Topology Control theses messages provide signal of the link state at OLSR [9]. To optimize this conversation MPR value contributes a lot.

MID - Multiple Interface Declaration These messages are transmitted by active nodes in OLSR who has more than one interface. All IP addresses used by a node is listed by this message.

3. HYBRID PROTOCOL

To gain theefficiency of both Reactive and Proactive protocol, another category will know as **Hybrid protocols**. In these protocols strategy of both protocols

are to be followed. As of table driven approach, Proactive protocols are meant to be in limited area (zone), whereas, reactive protocols will find the route of those nodes who are presented outer of that zone.

•*ZRP*

A common fact about interaction is that it takes places between those nodes which are close to each other. **ZONE ROUTING PROTOCOL (**ZRP) protocol follows this fact and so it divides the whole network in a number of zones. Proactive protocols are used to find all nearby neighbor nodes and Reactive is used to connect with the nodes out sided of the zone [2]. In Zone perimeter, number of hops will define the size of zone. Dependencies of zone size are strength of signal, required power availability and last reliability of different nodes. ZRP is a combination of three protocols:

(a)*IARP* Intra zone routing protocol, which monitors the route discovery mechanism inside of zone.

(b)*IERP* Inter zone routing protocol, which work for route discovery and route maintenance outside of the zone.

(c)*BRP*Border cast Resolution Protocols, in perimeter nodes this protocol optimizes routing overhead.

IV. ANALYSIS OF DIFFERENT SIMULATIONS

Simulation means to observe the result of running process in given environment. For example to simulate different events like sending, receiving, forwarding and dropping packets is a part of evaluation of routing protocols. To simulate different events at a same time, we require software called as simulator, for example NS-2.34. An object oriented simulator written in C++, with OTcL interpreter as a front end. Because most of the scripts for simulation are written in TcL(Tool command Language). The result is presented graphically on its screen.For this simulation we use OPNET(Optimized Network Engineering Tool) simulator.The first simulation model we are here to describe is run with 25 nodes and a WLAN server randomly distributed over in a square area of 800m*800m. The movement of nodes is according to mobility model "Random waypoint" with aspeed of 3 meters per second and a pause time of 100 seconds. The comparison is also made between heavy and light traffic. Heavy traffic means browsing so fast like 60 pages per hour, if we consider 10 objects per page and 12000 bytes per object, then it will become heavy traffic.Light traffic means browsing so slow like 5 page per hour. Two basic parameters of performance are:

*Throughput:*It is the rate of the successful message delivery over a communication channel. It is measured in Bits per sec. It is a synonymous of digital bandwidth consumption.

Delay: This is the time it takes for a packet to be transmitted from the source node to the destination nodes. It is expressed in seconds. Short delay is desirable.

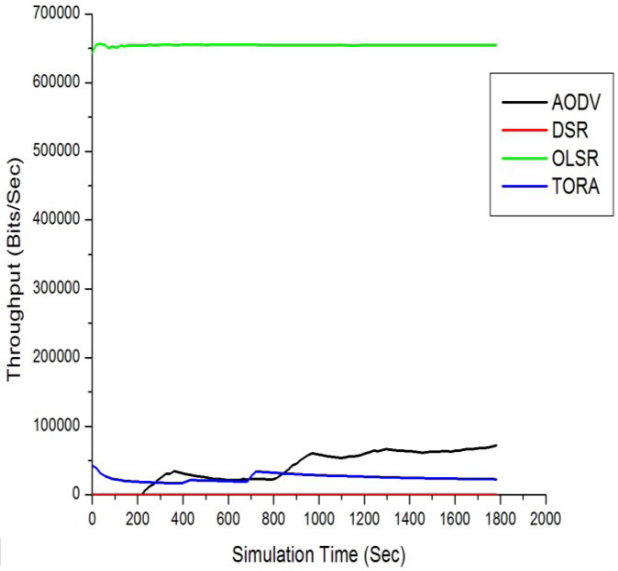

Fig.1.2.Throughput comparison of protocols.

This graph shows that OLSR has highest throughput in comparison of all other protocols. Because OLSR does not need to find route, a routing table is already maintained over there. Due to increment in load, TORA has lowest throughput.

Another simulation was done on NS-2 simulator using CBR traffic source. Random waypoint, Mobility model was used in 500*500m^2 square shape area. Comparison between ZRP, DSR and DSDV, using 30 nodes

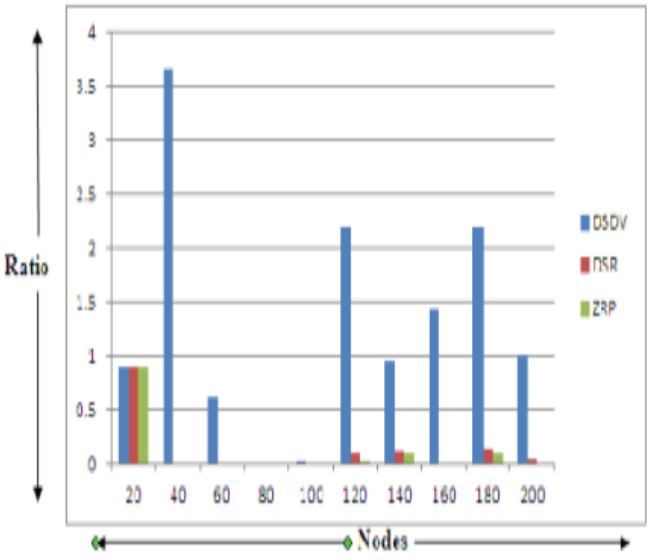

Fig.1.3.packet delivery ratio of DSDV, DSR and ZRP.ZRP downtrend the result.

Another simulation study is about used simulator was NS-2.35. Comparison was done in between these protocols AODV, DSDV, DSR. The traffic source used

was UDP and application agent used was CBR. The mobility model was Random waypoint. The radio model was two way ground way point and 35 nodes were used for 150 sec using Omni Directional Antenna in 650*650meter.

Observed effect of Variable Burst Time:

It has important role in performance. When host/source node generates packets for target/sink node.

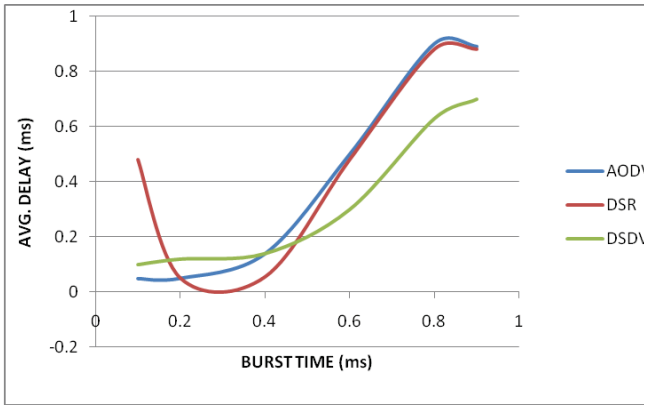

Fig.1.4 observation throughout the simulation

And this gives result that reactive protocols perform better than proactive protocol in reference of the delay.

Estimated effect of Variable Pause time:

In MANET, mobile nodes are free to roam from one position to another position in a range. Pause time is when a node stays in a position before to move another position.

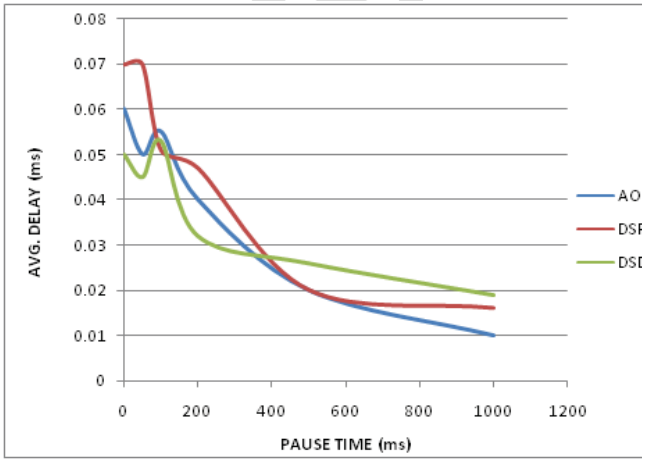

Fig.1.5. proactive protocol was better for average delay at high mobility

The figure shows proactive protocol was better for average delay at high mobility, because they are table driven approach, route had been maintained already. In proactive protocol, routing overhead remains constant.

CONCLUSION

In this paper we have studied about the various routing protocol and found a following conclusion on the basis of different simulation models:

(1)The routing overhead of DSR is lesser than AODV's routing overhead.

(2)The poor delay and packet delivery ratio of DSR is mainly due to caching and lack of mechanisms to expire stale routes.

(3) The overhead in DSDV is high due to exchange in routing table would increase with larger number of nodes and it would perform better if number of nodes is larger.

(4) ZRP is hybrid protocol and always better than reactive and proactive protocols.

(5) If we consider a medium size MANET than OLSR would be best among the all because it does not have to find the route, no route discovery is needed.

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