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# Performance Comparison of AODV, DSDV, TORA protocol using Riverbed simulator

**Er. Vikas Kumar(1), Dr. Shelly Garg(2), Mr. Kapil Sachdeva(3)**
I.I.E.T. College, Kinana, Jind
e-mail Id- vikasraionly@gmail.com; s.singla428@gmail.com; sachkapil10@gmail.com

**Abstract:-** MANET'S are the wireless sensor networks in which two different devices communicate without any base station or access points in between them(1). The primary goal of ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology and establish an efficient route between any two nodes with minimum routing overhead and bandwidth consumption. TORA is a highly adaptive efficient and scalable distributed routing algorithm based on concept of link reversal. In this paper we use Riverbed Simulator (OPNET) for studying various characteristics of MANET using TORA routing protocol. & compare them with AODV, DSDV and TORA.



**Keywords:-** MANET, TORA, Riverbed, DSDV, AODV, Throughput, Network Load

**Introduction:-** A MANET is a collection of wireless mobile nodes that can dynamically form a temporary network to exchange information without the aid of pre-existing fixed network infrastructure. MANET's are self organizing and adaptive in nature. Two main feature of Manet are low cost since no base stations or fixed infrastructure is required and convenience which makes it an excellent tool to handle the situation like disaster recovery , rescue operation and automated battle field. In MANET, the mobile nodes are connected by wireless links which are free to move about arbitrarily and often acts as routers at the same time.

Ad-hoc Routing Protocols are required in MANET to establish routes between mobile nodes. These Protoclos can be classified into 2 types

a)Reactive b) Proactive

**Reactive Routing Protocols** discovers routes only when they are essentially required thus it endeavors to save battery power. In **control Proactive routing protocols** establish and maintain routes at all instants of time so as to avoid the latency that occurs during new route discoveries. E.g. AODV and DSDV protocol. TORA is Hybrid Protocol. The paper is organized as follow: Section-2 describes concept of routing protocol in Manet. Section-3 provides Manet with 50 nodes design architecture. Section-4 presents simulation results and performance Analysis. Finally Section-5 concludes the paper with future scope of work.

## 2. Rouing Protocol in MANET:-

A routing protocol is neededwhwnever a packet needs to be transmitted to a destination via number of nodes. Many routing protocols have been proposed for MANETs. These protocols find a route and deliver the packet to the correct destination in a timely manner. IETF (Internet Engineering Task Force) Mante working group is responsible to analyze the problems in the ad-hoc networks and to observe their performance. The

following figure 1 shows the classification of Protocols:-

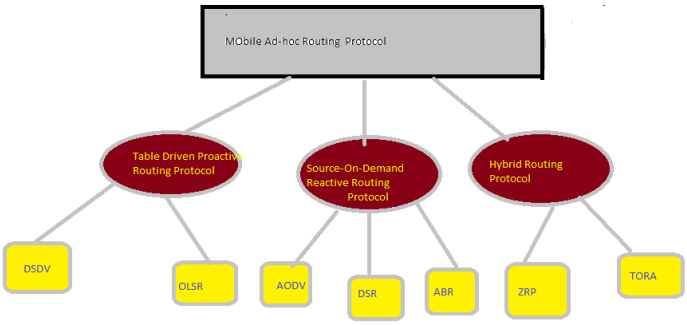



**Fig- 1. Classification of Protocols**

DSDV- Destination Sequenced Distance Vector
AODV- Ad-Hoc On- Demand Distance Vector
OLSR- Optimized Link State Routing Protocol
TORA-Temporary Order Routing Algorithm
DSR- Dynamic State Routing
ZRP- Zone Routing Protocol

## 2.1 AODV Protocol ( Ad-Hoc On demand Distance Vector)

AODV combines some properties of both DSR and DSDV. It uses route discovery process to cope with routes on demand basis. It uses routing tables for maintain route information. It is reactive protocol, it doesn't need to maintain routes to nodes that are not communicating. AODV handles route discovery process with route request (RREQ) message. RREQ message is broadcast to neighbor nodes. The message floods through the network until the desired destination or a node knowing fresh route is reached. Sequence numbers are used to guarantee loop freedom. RREQ message cause bypassed node to allocate route tableentries for reverse route. The destination node uncast a Route Reply (RREP)back to the source node. Fig (2) shows AODV routing protocol with RREQ and RREP message.

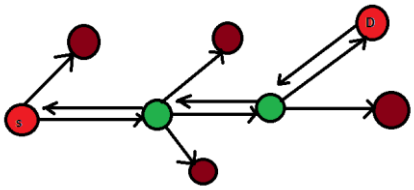



Fig-2 AODV routing protocol with RREQ and RREP message

## 2.2 DSDV Protocol ( Destination Sequence Distance Vector)

This protocol is proactive protocol which is an improved version of Bellman Ford Routing Algorithm as it guarantees loop freredom. In DSDV routing protocol each

node has a routing table for all reachable destinations, which updating it by periodic broadcast.

DSDV tags routes by Sequence Number (SN) for the freshness of the route and route with higher SN are favorable. When a node detects that a route to a destination has broken, then the sequence number of that route is increased. To reduce the amount of broadcasts in DSDV, two types of update message defined, full and incremental dump. The Full dump broadcast all available routing information and the incremental dump only broadcasts the information that has changed since that last full dump.

DSDV protocols present low latency and it reduce "Count to infinity" problem. On the hand DSDV doesn't support multipath Routing and not work well in high mobility network as the broken tink creats storm" of route updates.

**2.3 TORA Protocol ( Temporary ordered Routing Algorithm):-** The main feature of TORA is that the control message are localized to a very small set of nodes near the occerence of a topological change. To achieve this, the nodes maintain routing information about adjacent nodes. This protocol has three basic function:

1. Route Creation
2. Route Maintance
3. Route Erasure

TORA has a unique feature of maintain multiple routes to the destination so that topological changes do not require any reaction at all. In the event of network partitions the protocol is able to detect the partition and erase all invalid routes.

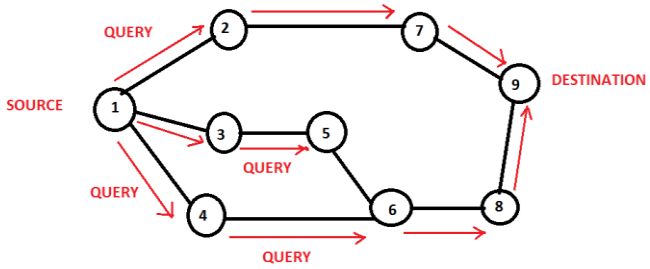



**FIG-3 Route Creation**

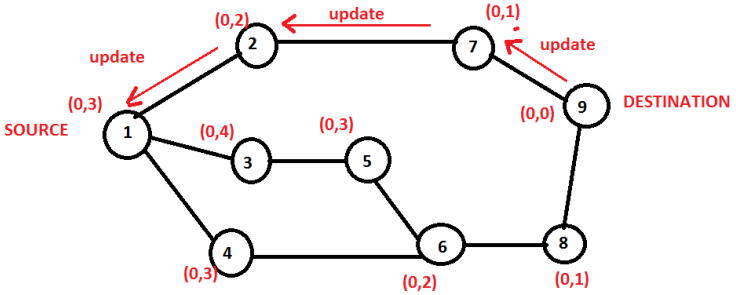



**Fig-4 Route Updation**

**Table -1 Comparison Table of AODV and TORA**

| AODV | TORA |
|---|---|
| • In AODV, routes are established on demand and destination sequence numbers are used to find the latest route to the destination. | • TORA supports multiple routes between ource and destination. Hence failure or removal of any of nodes quickly resolved without intervention by switching to an alternate route to improve congestion. |
| • Lower delay for connection setup. | • TORA doesn't require a periodic update, consequently communication overhead and bandwidth utilization is minimized. |
| • AODV doesn't allow handling unidirectional links. | • TORA provides the supports of link status sensing & neighbor delivery, reliable, packet delivery & security authentication. |
| • Multiple route reply packets in response to a single route request can lead to heavy control overhead. | |

## 3. MANET Architecture TORA 50 NODES

We use Riverbed simulator modeler version 17.5. Our reason for selecting Riverbed is as result of its key feature providing solution for constructing network and applications and it usually give perfect result. Riverbed Modeler is formely known as OPNET modeler suite. OPNET stands for Optimized Network Engineering Tools. We use 50 workstation or nodes connected them with server & using TORA routing protocol.

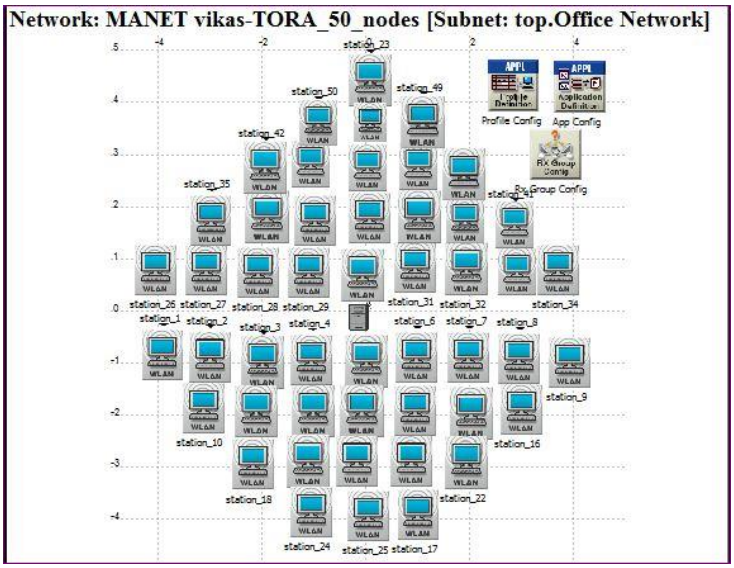



Fig-5 Network Architecture

## 4. Simulation Result and Analysis:-

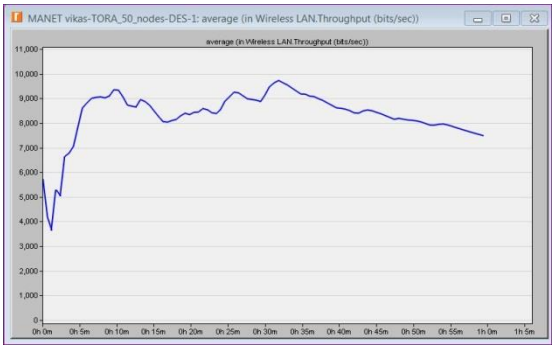
In this paper we will try to compare the result of two routing Protocol AODV & TORA. The simulation setup has been comprises 50 nodes at a speed of 10 m/sec with heavy FTP traffic.

The simulation has been performed in office network with 5*5 km squared space. The use of riverbed is broken down in four major steps:

- Modeling ( creating network nodes)
- Choose statistics
- Run simulation
- View and analyse result

**4.1 Throughput:-**

Throughput is the number of packets that are passing through the channel in a particular unit of time and it can be improved with increasing node density. Ti is usually measured in bit/sec or byte/sec. fig 5 shows TORA, AODV, DSDV graph throughput. It is clear from the graph DSDV routing protocol is showing higher. Throughput than AODV routing protocol of the network & TORA gives better output throughput as compared to AODV.



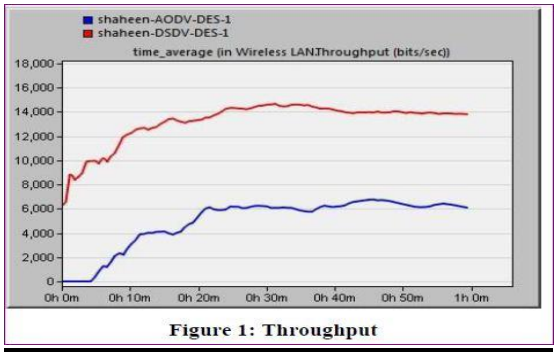




Fig-6 comparison of throughput using AODV, DSDV and TORA protocol

**4.2:- Network Load:-**

It repreents the total load measured in bit/sec. which is submitted to wireless LAN layers by all higher layers in all WLAN nodes of the network. It shows the effectiveness of routing protocols when the packets are being received. It can be seen in figure 6 as expected, the network load is DSDV is higher than AODV. Also TORA has higher network load than AODV. TORA is hybrid in nature & DSDV is proactive in nature, maintain routing table regularly. Hence have large routes MAC overhead which automatically increases overall network load.

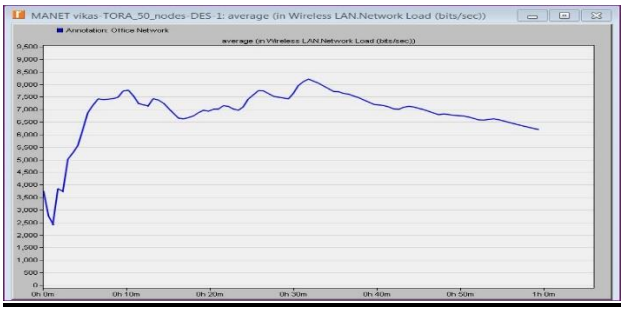



**Fig-7 Network load**

**4.3 End to End Delay:-**

The Packet end to end delay is the average delay of data packets from source to destination. It is also called Data Latency. It is expressed in second. From fig 7 it is clear that DSDV outing protocol

is showing higher end to end delay than AODV routing protocol with 50 fixed nodes setup in environment. TORA lies between AODV & DSDV protocol. AODV is of reactive nature which helps to reduce the end to end delay.

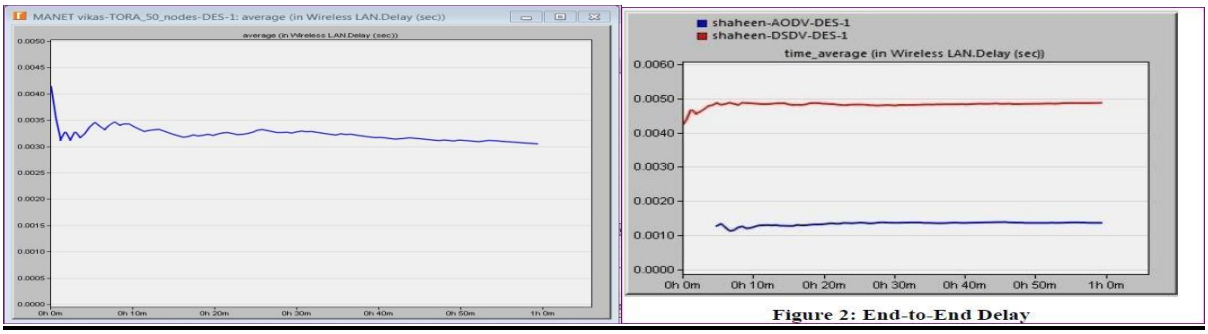



**Fig-8 End to End delay**

## 5. Conclusion and Future Work:-

In this paper, a performance comparison of AODV( Ad-hoc On Demand Distance Vector) Routing protocol and Proactive includes DSDV ( Destination Sequence Distance Vector) Routing protocol and TORA ( Temporary Ordered Routing Algorithm) Hybrid Routing Protocol on the basic of throughput, Network Load and Average End to End delay by using Riverbed(OPNET) simulator. We have simulated the protocol with 50 no. of fixed nodes for FTP environment.

**Table 2- comparison table between AODV DSDV and TORA**

| s.n. | Parameter | AODV Reactive | DSDV Proactive | TORA Hybrid |
|---|---|---|---|---|
| 1 | Throughput | 6000 bit/sec | 13000 bit/sec | 9000 bit/sec |
| 2 | Network Load | 6000 bit/sec | 13000 bit/sec | 9000 bit/sec |
| 3 | Avg End to End Delay | 0.0013 sec | 0.0047 sec | 0.0034 sec |
| 4 | Multicast Routing | No | No | Yes |
| 5 | Packet Delivery Ratio | High | High | High |
| 6 | Path optimality | Average | Good | Good |
| 7 | Protocol Type | Distance Vector | Sequenced Distance Vector | Link Reversed |

It has been concluded that performance of TORA is better for dense networks. TORA perform much better in packet delivery owing to selection of better routes using acyclic graph. The AODV is better for moderately dense networks. The DSDV has shown worst performance in packet end to end delay and network load. It is used for high capacity networks.

In future, number of nodes, more sources and additional metrics such as average hop count, average jitter and routing overhead may be used. The future work suggested that the effort will be made to enhance ad-hoc network routing protocol by tackling core issues.

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