COMPARATIVE PERFORMANCE ANALYSIS OF ROUTING PROTOCOLS IN MANET USING NS-2

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Abstract - *We are studying and analyzing the wireless ad hoc network and its protocols, using the new edge simulation method NS-2. By the overall study of main three routing protocols we are going to analyze AODV , DSDV and DSR with different functional parameters with the help of NS-2 simulator.The protocol designs will be improved to adapt themselves to changing scenario of the networks and this will be helpful in many applications.By comparing all parameters i.e end to end delay,Averaging Routing load,Packet Delivery Ratio etc we will get to know which protocol is better than the other in specified conditions.*

Key Words: AODV, DSR , DSDV , NS - 2 ,wireless network simulator, mobility.

1. INTRODUCTION

A routing protocol specifies how routers communicate with each other, distributing information that enables them to select routes between any two nodes on a computer network. A routing protocol shares this information first among immediate neighbors, and then throughout the network. Routing algorithms determine the specific choice of route. Each router has a prior knowledge only of networks attached to it directly

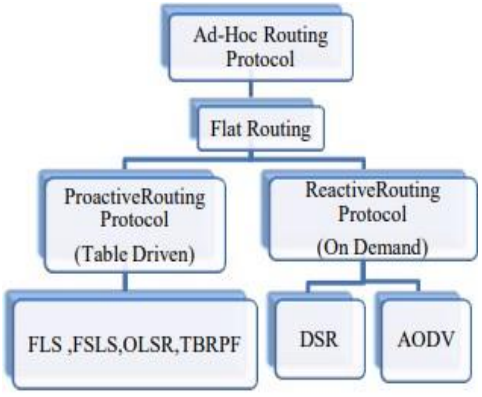


fig. a. Classification of MANET Routing Protocol

Proactive routing protocol (Table driven):-

Reactive Routing Protocol is a bandwidth efficient on- demand routing protocol for Mobile Ad-Hoc Networks

Reactive Routing protocol(On demand):-

In proactive or table-driven routing protocols, each node consistently maintains up-to-date routing information for all known destinations

1.1 AODV

In AODV routing mechanism, each node is maintaining a routing table which consists of next hop IP and destination addresses and also their sequence numbers. Along with these information, the routing table also consists of lifetime information, distance to destination and precursor nodes list.

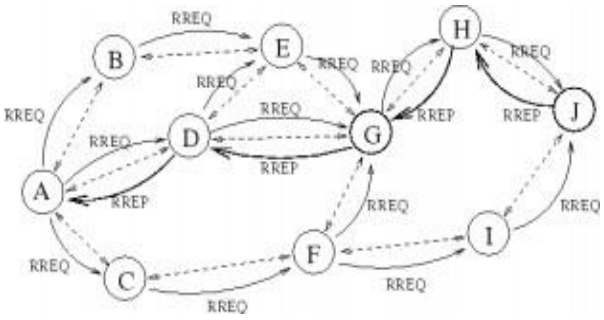


Fig. AODV route lookup session

1.2 DSDV

DSDV is one of the routing protocols which is based on Bellman - Ford routing algorithm. This Bellman - Ford routing algorithm has a routing loop problem which gets solved by DSDV3. For solving this problem, it uses sequence number for each entry in the routing table.This protocol can disperse the information of routing between nodes by the full dumps or by smaller incremental updates.

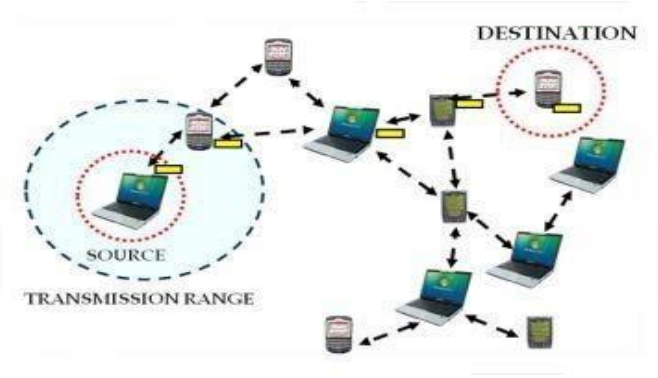


Fig. DSDV route session

1.3 DSR

DSR algorithm is one of the important routing protocol in ad hoc networks. This type of protocol uses less bandwidth in networks where the mobility is low. This is one of the efficient and simple routing protocol for ad hoc networks.DSR is able to support rapid topology changes.

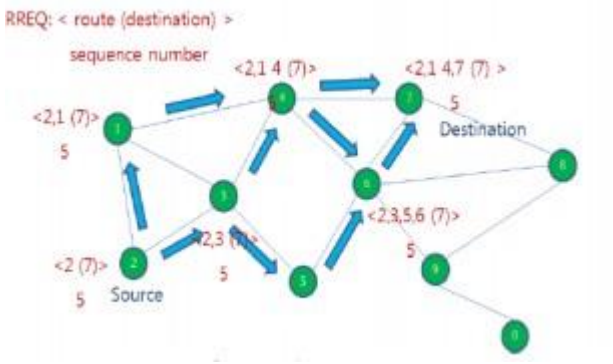


Fig. RREQ Propagation

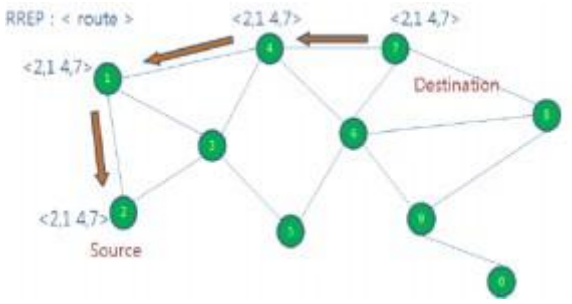


Fig. RREP Propagation

2. REVIEW OF LITERATURE

1. W.G Lol proposed a different perspective that using a simulation model the combined effect of node density and packet length,node density and mobility on the performance of a typical 802.11 MANET is investigated[1].

2. This is a common and realistic scenario in MANET where nodes move around and leave and join the network at any time[1]..So basically the idea is to analyze the performance of four diverse MANET routing protocols with different simulation model and configurations based on end-to-end delay throughput ,routing load and packet transmissions[1].

3. The major goal of this performance analysis in high mobility case under low, medium and high density scenario. unlike military applications most of the other applications of MANET require moderate to high mobility. Hence it becomes important to study impact of high mobility on performance of routing protocols.[2]

4. The main objective of this analysis is to ensure which protocol is best for mobile networks by comparing performance of DSR,DSDV and AODV protocols using NS-2[2].The protocols design will be improved to adapt themselves for all changing scenario of networks that will be helpful in many applications[2].

5. Mobile ad hoc network is a infrastructure less network. it has various applications in fields like military. Sharing of information among the armed forces is an important requirement of military [5].

6. The routing protocol is the key factor of MANET. The property of MANET is that it can be easily configured set-up and build[5].

7. Due to the infrastructure less network communication is dependent on co-operation of nodes[5].

8. A mobile ad hoc network is a self configuring network of mobile nodes that can be formed without any need of pre-established infrastructure or centralized administration. [7]

9. The widely accepted routing protocol designed to accommodate needs of such self organized networks do not possess possible threats aiming at disruption of protocol itself[6]

3. IMPLEMENTATION

A) System requirement (Computer/Laptop):-

1) Atleast 4.5 GB memory

2) Atleast 2GB RAM

3) Linux OS (Ubuntu/Fedora)

4) NS-2 (NS 2.35 or Latest)

NS (Network Simulator) is the literal translation of the network simulator, also known as the network simulator is a network technology for open source, free software simulation platform. NS-2 Network Simulator version 2, developed with the UC Berkeley researchers can easily use the network technologies.

B) Implementation method

1). TCL file (.TCL)

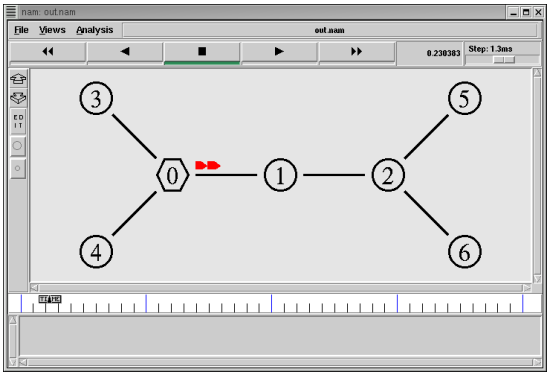
TCL is a **file** extension for a **script** written in **TCL**. **TCL** (also pronounced tickle) stands for Tool Command Language. ... **TCL** is a dynamic open source language used for building web and desktop applications. Whether on Windows, Mac OS X, or Linux operating systems, **TCL files** can be opened and edited by WISH and TCLSH.

2) AWK file (.AWK)

AWK is a data **file** format created by **AWK** programs. **AWK** is a programming language used for processing text-based data. **AWK files** contain information used for reading and scripting text-based data. **AWK** is similar to Perl.

3) Animation (.Nam)

Nam is a Tcl/TK based animation tool for viewing network simulation traces and real world packet trace data. The first step to use **nam** is to produce the trace **file**. The detailed format is described in the TRACE **FILE** section. Usually, the trace **file** is generated by ns(1).



a. Trace file (.tr)

Trace File are **trace** (or dump) **file** that Oracle Database creates to help you diagnose and resolve operating problems. Each server and background process writes to a **trace file**. When a process detects an internal error, it writes information about the error to its **trace file**.

b. X-graph(.xg)

The **x-graph** program draws a graph on an X display given data read from either data **files** or from standard input if no **files** are specified. **X-graph** in ns2 is used to plot the network parameter characteristics like throughput, delay, jitter, latency etc.Interactive plotting and graphing.

4. RESULTS

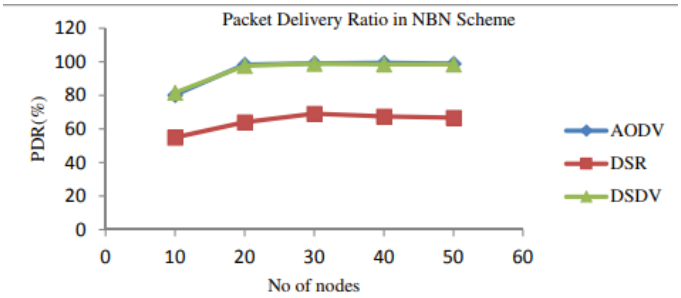


fig: Number of nodes vs Packet delivery ratio

It can be observed from fig. 1, if the number of nodes are increasing the packet delivery ratio also increases linearly from number of nodes 10 to 20and then get stabilize at a constant value from 20 to50 nodes for AODV and DSDV protocols. Packet

Delivery Ratio increases gradually from nodes 10 to30 where as from nodes 30 to 60 a little negative inclination is observed in DSR protocol. So it is stated that the Packet Delivery Ratio is not constant in DSR where as it is constant in AODV and DSDV from nodes 20 to 50.

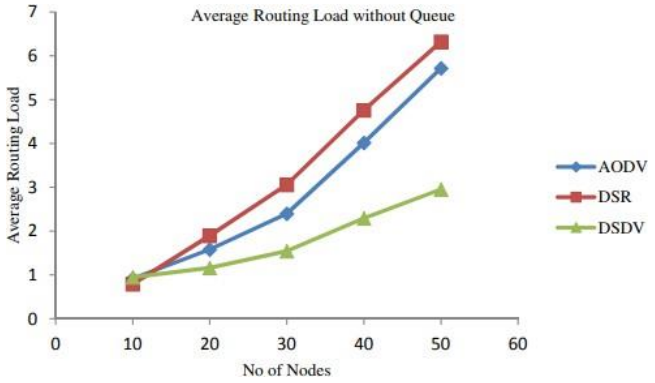


fig: Number of nodes vs Average routing load

In fig.2, it is identified that if the number of nodes Increases then the end to end delay remains constant in DSR routing protocol from nodes 10 to 50. In DSDV if number of nodes increases from 10 to 20 then it gradually decreases the end to end delay and then it remains approximately constant from nodes 20 to 50. The end to end delay varies according to number of nodes in AODV. In this case it is observed that DSR protocol is best in terms of minimum end to end delay.

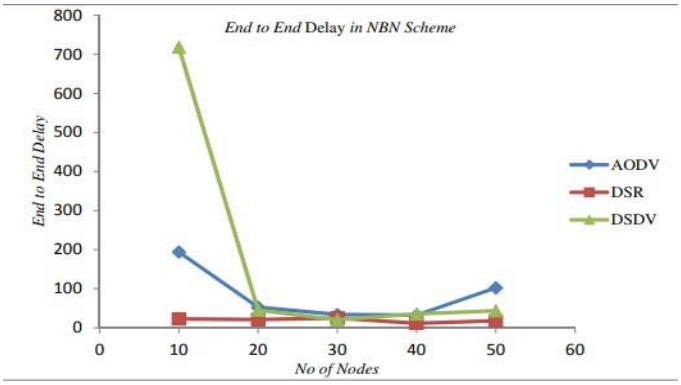


fig: Number of nodes vs End to End delay

In Fig.3, if number of nodes increases from 10 to 50 the average routing load increases in all the routing protocols. It is observed from these three protocols DSDV has the lower average routing load. From this Perspective one can say that DSDV works with a very Low average routing load.

Comparison chart

DSR	AODV	DSDV
Packet Sent:171	Packet Sent:173	Packet Sent:6
Packet Received:688	Packet Received:520	Packet Received:185
Dropped Packets:-517	Dropped Packets:-347	Dropped Packets:-179
Packet Delivery Ratio:4.0233918128655	Packet Delivery Ratio:3.00578034682081	Packet Delivery Ratio:30.8333333333333
Start Time:0.508746463	Start Time:0.500000000	Start Time:0.470844958
Stop Time:5.493340353	Stop Time:5.499269365	Stop Time:5.480000000
Total bytes:675456	Total bytes:508580	Total bytes:167576
Throughput : 1058.66197256042 kbps	Throughput : 794.772387704698 kbps	Throughput : 261.358949567926 kbps
End to End Delay:0.0956171634210526	End to End Delay:0.0295186259820359	End to End Delay:0.00113729333333329
Jitter :0.0959779093294117	Jitter :0.0293337446144578	Jitter :0.00116860299999995

5. CONCLUSIONS

- Based on the study of different protocols that is comparison of different protocols which is based on the parameters such as end-to-end delay, packet delivery ratio, average routing load without queue, end-to-end delay the results of DSR protocol is observed to give the best result among the other protocols
- It is observed that among the various parameters we have tested the result of DSR is giving better result. The losses that occur when we test the protocols on various parameters is less or to be said there is very minimal loss. So we conclude that DSR is the best protocol among other protocol with minimum loss as tested and it is shown by the graphs of different parameters.

6. REFERENCES

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