Impact of Cbr and Ftp Traffic Patterns on the Performance of Aodv, Dsr and Wrp Routing Protocols in Manet

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Abstract - A Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile nodes that communicates with each other without using any existing infrastructure, access point or centralized administration. In this paper, an attempt has been made to evaluate the performance of three well known routing protocols AODV, DSR and WRP with two traffic Generators CBR and FTP by using two performance metrics such as packet delivery ratio, average throughput. The Performance evaluation has been done by using simulation tool GloMoSim (Global Mobile information systems Simulation).

Keywords: MANET, AODV, DSR, WRP, CBR, FTP, GloMoSim.

I. INTRODUCTION

Wireless Network refers to any type of computer network that is not connected by cables of any kind. Wireless network is a growing new technology that will allow users to access services and information electronically, irrespective of their geographic position. Wireless Networks can be classified in two types: Infrastructure Network and Infrastructure less (ad hoc) Networks. In Infrastructure network consist of fixed and wired gateways. A mobile host communicates with a bridge in the network (called base station) within its Communicate radius. The mobile unit can move geographically while it is communicating. When it goes out of Range of one base station, it connects with new base station and start communicating through it. This is called handoff [1]. In this approach the base station are fixed. Infrastructure less (ad hoc) networks are collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or stand-alone infrastructure. Ad-hoc network are basically peer-to- peer self organizing and self configuring multi-hop mobile wireless network where the structure of the network changes dynamically [1].

II. MOBILE AD-HOC NETWORK (MANET)

A Mobile Ad-hoc Network (MANET) is a self-configurable, Infrastructure less, autonomous and self-healing system of nodes using wireless links [2]. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Mobile Ad hoc Networks (MANETs) is a collection of wireless nodes which are connected without any infrastructure or any centralized control. In MANET each node can be used as either as endpoint or as a router to forward packet to next node [3].

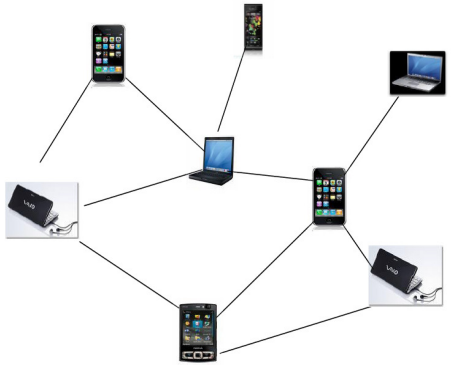

Figure 1. Ad-Hoc Wireless Networks

Figure 1 shows a simple Mobile Ad-hoc Network with eight nodes, which are connected to each other by wireless links. These nodes will find route to other nodes by request / response packets and maintain these routes according to topology changes. MANET nodes are laptop, personal computer, personal digital assistants, mobile phones MP3 Players and these can be located in airplanes, trains, ships, cars offices and homes [2].

III. ROUTING IN MANET

Routing can be defined as the process of information exchange from one node to the other node in a network. . A routing protocol is needed because it has to pass several hops (multi-hop) to ensure that a packet reaches the destination [10]. Routing protocols for mobile ad-hoc networks can be classified into three major categorizes, based on the routing information update mechanism Shown in Figure 2 They are:

(i) Table Driven routing Protocols (Proactive)

(ii) On Demand routing Protocols (Reactive)

(iii) Hybrid routing protocols

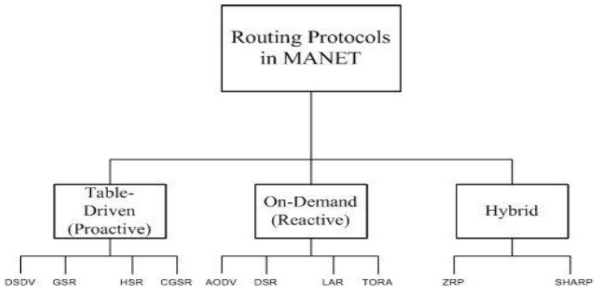

Figure 2 MANET Routing Protocols

A. Proactive Routing Protocol: A proactive routing protocol is also called "table-driven" routing protocol. Using a proactive routing protocol, nodes in a mobile ad hoc network continuously evaluate routes to all reachable nodes an)d attempt to maintain consistent, up-to-date routing information. Examples of Proactive Routing Protocols are: Destination Sequenced Distance Vector Routing (DSDV), Global State Routing (GSR), Hierarchical State Routing (HSR) and Cluster head Gateway Switch Routing (CGSR) [4].

B. Reactive Protocols: Reactive routing protocols for mobile ad hoc networks are also called "on demand" routing protocols. In a reactive routing protocol, routing paths are searched only when needed. When a source node requires a route to a destination, it initiates a route discovery process within the network. Examples of Proactive Routing

Protocols are: The Dynamic Source Routing (DSR), Ad hoc On-demand Distance Vector routing (AODV), TORA and LAR [4].

C. Hybrid Routing Protocol: Hybrid routing protocols try to maximize the benefit of proactive routing and reactive routing by utilizing proactive routing in small networks (in order to reduce delay), and reactive routing in large-scale networks (in order to reduce control overhead) [10].

IV. AD HOC ON-DEMAND DISTANCE VECTOR (AODV)

AODV is an on-demand routing protocol used in ad hoc networks. This algorithm, like any other on-demand routing protocol, facilitates a smooth adaptation to changes in the link conditions. In the case a link fails, notifications are sent only to the affected nodes. This information enables the affected nodes invalidate all the routes through the failed link. It has low memory overhead, builds uni-cast routes from source to the destination and network utilization is minimal. It uses Destination Sequence Numbers (DSN) to avoid counting to infinity. This is one of the distinguishing features of this algorithm [7].

V. DYNAMIC SOURCE ROUTING

DSR is a reactive routing protocol for ad hoc wireless networks. It also has on-demand characteristics like AODV but it's not table-driven. It is based on source routing. The node wishing to send a packet specifies the route for that packet. The whole path information for the packet traversing the network from its source to the destination is set in the packet by the sender. This type of routing is different from table-driven and link-state routing by the way routing decisions are made. In source routing, routing decisions are made by the source node. The source node collects the addresses of all the intermediate nodes between itself and the intended destination when discovering routes. During the process of route discovery the path information collected by the source node is cached by all the nodes involved in this process. The intermediate nodes use this information to relay packets. The information in the packet traversing the network includes the IP addresses of all the nodes it will use to reach its destination. DSR uses a flow id to facilitate hop-by-hop forwarding of packets [6].

VI. WIRELESS ROUTING PROTOCOL (WRP)

The Wireless Routing Protocol (WRP) is a proactive unicast routing protocol for mobile ad-hoc networks (MANETs). WRP uses an enhanced version of the distance-vector routing protocol, which uses the Bellman-Ford algorithm to calculate paths. Because of the mobile nature of the nodes within the MANET, the protocol introduces mechanisms which reduce route loops and ensure reliable message exchange.
WRP, similar to DSDV, inherits the properties of the distributed Bellman-Ford algorithm. To counter the count-to-infinity problem and to enable faster convergence, it employs a unique method of maintaining information regarding the shortest distance to every destination node in the network and the penultimate hop node on the path to every destination node.

VII. SIMULATION ENVIRONMENT AND PERFORMANCE EVALUATION SETUP:

A. Simulation Model: Simulation is a fundamental tool in the development of MANET protocols, because the difficulty to deploy and debug them in real networks. The simulation software used the GloMoSim (Global Mobile information systems Simulation). Global Mobile Information System Simulator is a popular network simulation tool, which is frequently used in the study of the behavior of large-scale hybrid networks that include wireless, wired, and satellite based communications are becoming common in both in military and commercial situations.

B. Simulation Parameter: The parameters used for carrying out simulation are summarized in the Table 1

Table 1 Simulation Parameter

Parameter	**Value**
Simulation Time(sec)	600
Area	1000*1000
MAC Protocol	802.11
Routing Protocol	AODV,DSR,WRP
Mobility Model	Random Way Point
Propagation Model	2-Ray Ground
Nodes Density	15,30,45,60,75,90
Traffic Source	CBR, FTP
Seed[st.pt]	10
Transmission Range	350m
Node Placement	Random

C. Mobility Model: The mobility model plays a very important role in determining the protocol performance in mobile Ad Hoc Network. To evaluate the performance of protocol in MANET, the protocol should be tested under realistic conditions such as – transmission range, data traffic, movement of mobile users (nodes) etc. There have been a wide variety of mobility models (MM) proposed and it is expected the MM should attempt to mimic the movement of real mobile nodes, the changes in speed and direction must occur in reasonable time slots [6].

1) Random Waypoint Mobility Model: We used the Random Waypoint Mobility Model for our examinations, which is by far the most often used model. It was first used by Johnson and Maltz in the evaluation of Dynamic Source Routing, and was later refined by the same research group .In this model, a mobile node moves from its current location to a randomly chosen new location**.** Within the simulation area, using a random speed uniformly distributed between [vmin, vmax]. vmin refers to the minimum speed of the simulation, vmax to the maximum speed [5].

D. Performance Metrics

Different performance metrics are used in the evaluation of routing protocols. They represent different characteristics of the overall network performance. In this report, we evaluate two metrics used in our comparisons to study their effect on the overall network performance.
There are two main factors over which the performance of the AODV, DSR and WRP will be analyzed that are Packet Delivery Ratio and Throughput.
1) Packet Delivery Ratio (PDR): It is the ratio of data packets delivered to the destination to those generated by the sources. Packet delivery ratio is calculated by dividing the number of packets received by the destination through the number of packets originated by the source.

Packet delivery Ratio (PDR) = Received Packets /Sent Packets

2) Average Throughput: Throughput measures the efficiency of the system. The rate of successfully transmitted data per second in the network during the simulation. It is measured in bits/sec.

VIII. RESULTS AND DISCUSSION

Here we present a comparative analysis of the performance metrics of the routing protocols AODV, DSR and WRP with both CBR and FTP traffic sources for different node density
(15, 30, 45, 60, 75, 90).

A. Result for CBR Traffic Generators:

PDR with Varying Node Density

The performance of the routing protocols in terms of packet delivery ratio is examined with respect to Node Density. The simulation results are shown in the Table 2

Table 2 PDR with Varying Node Density

No. of Nodes	AODV	DSR	WRP
15	0.781389	0.255972	0.445000
30	0.883056	0.196667	0.436111
45	0.911944	0.184167	0.434444
60	0.908194	0.165556	0.452083
75	0.903611	0.168750	0.447500
90	0.898194	0.166667	0.423889

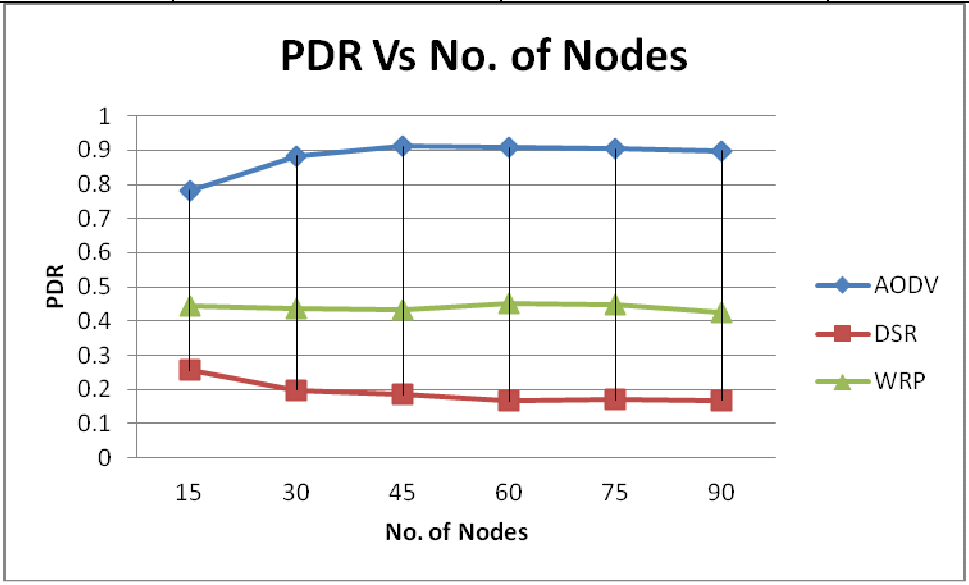

Figure 3 PDR with Varying Node Density

AODV perform better when the number of nodes increases because nodes become more stationary will lead to more stable path from source to destination. DSR performance dropped as number of nodes increase because more packets dropped due to link breaks. Packet Delivery Ratio in given data shows that AODV perform better then DSR and WRP, where WRP slightly better than DSR.

Average Throughput with Varying Node Density

The performance of the routing protocols in terms of Average Throughput is examined with respect to Node Density. The simulation results are shown in the Table 3

Table 3 Average Throughput with Varying Node Density

No. of Nodes	AODV	DSR	WRP
15	3204.17	1116.5	1834
30	3620.25	857.75	1795.33
45	3738.17	800.583	1787.67
60	3723.25	804.273	1883.67
75	3704	801.727	1854.08
90	3704	780.727	1781.17

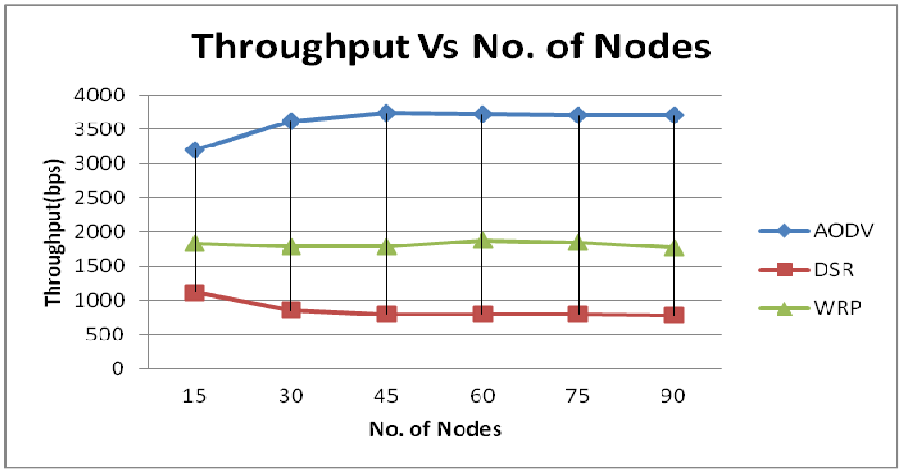

Figure 4 Average Throughput with Varying Node Density

Throughput of AODV increased and consistent when the node density increases. WRP is lower performance to AODV but the result also show the throughput of WRP is consistency which is the increasing of the node is not affected the performance. DSR throughput is decreased with the higher node density.

B. Results for FTP Traffic Generator

PDR with Varying Node Density

The performance of the routing protocols in terms of packet delivery ratio is examined with respect to Node Density. The simulation results are shown in the Table 4

Table 4 PDR with Varying Node Density

No. of Nodes	AODV	DSR	WRP
15	0.998417	0.997739	0.998462
30	0.998836	0.998279	0.998499
45	0.998667	0.996484	0.997965

60	0.998673	0.998226	0.999358
75	0.998949	0.996918	0.997720
90	0.998167	0.996891	0.998035

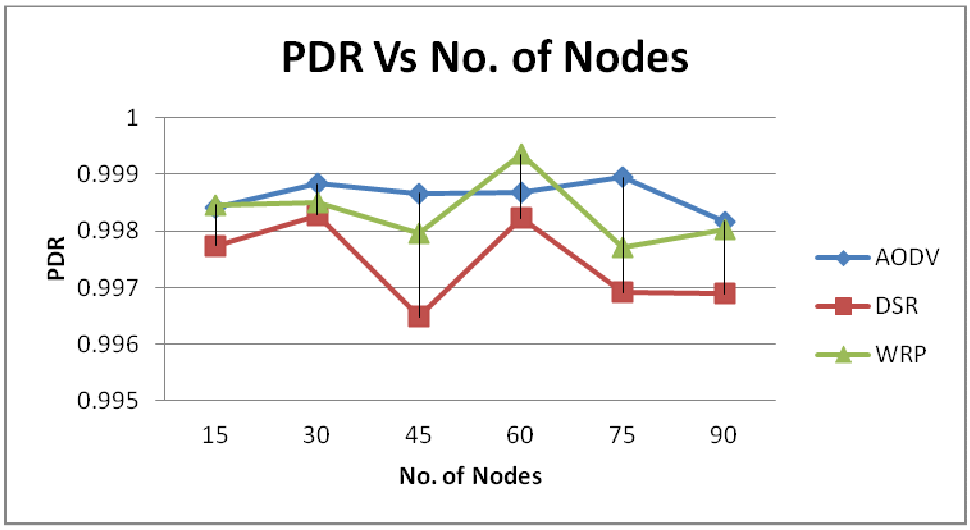

Figure 5 PDR with Varying Node Density

The performance of AODV is changes with the node density increases. DSR performance dropped as number of nodes increases. Packet Delivery Ratio of WRP is high as compare to other protocols when the no. of nodes is 60.

Average Throughput with Varying Node Density

The performance of the routing protocols in terms of Average Throughput is examined with respect to Node Density. The simulation results are shown in the Table 5

Table 5 Average Throughput with Varying Node Density

No. of Nodes	AODV	DSR	WRP
15	88160.3	68507.9	105020
30	77369.4	89169.2	80894.8
45	75783.3	151303	58695.6
60	67960.3	73754.2	61974.7
75	65577.4	143518	68249.1
90	63826.2	64894	43776.2

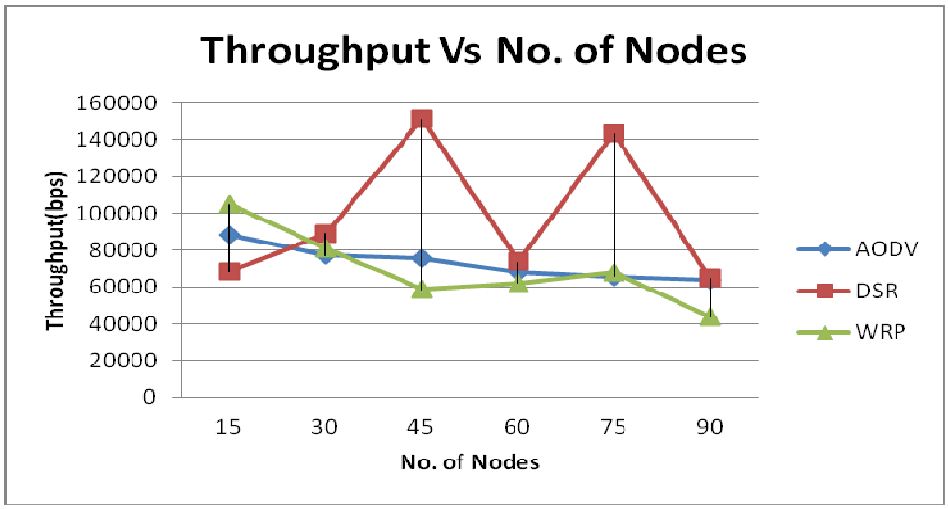

Figure 6 Average Throughput with Varying Node Density

The performance of AODV and WRP decreased with high node density. Throughput of DSR starts very poor but it's very high when node is 45. When node is 60 the throughput of AODV, DSR and WRP are same, after that the throughput of DSR again increased.

4. CONCLUSION: Here AODV, DSR and WRP routing protocols are studied with CBR and FTP Traffic pattern .The performance evaluation parameter for these protocols are PDR and Throughput.

Conclusion for CBR Traffic: Using various numbers of nodes, it is observed that Packet Delivery Ratio of AODV is very high and its increase when the number of nodes increases. DSR and WRP have very less PDR and perform very poor. Throughput of AODV is also high as comparison to DSR and WRP. The higher throughput is contributed the lower delay.

Conclusion for FTP Traffic: With Various numbers of nodes, it is observed that Packet Delivery Ratio of AODV is high as comparison to DSR and WRP. PDR of all three protocols changes dramatically with various node densities. Throughput of DSR is also high as comparison to AODV and WRP.

So, conclusion is that if the MANET has to be setup for a large network, then AODV should be prefer due to high Packet Delivery Ratio and higher Throughput. AODV perform very well as compare to DSR and WRP for both Traffic Pattern CBR and FTP. The performance of AODV is higher with FTP Traffic pattern as compare to CBR. With FTP the performance of DSR is also good. So, AODV is a best protocol for MANET with FTP Traffic Pattern.

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