EFFECT OF CBR, FTP, FTP/GENERIC AND TELNET TRAFFIC PATTERNS ON THE PERFORMANCE OF ROUTING PROTOCOLS IN WIRELESS NETWORK

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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 and centralized administration. Understanding the performance of routing protocols in ad hoc networks is a key feature to determine which routing protocol is best suited for which type of network scenario. So, In this research work, an attempt has been made to evaluate the performance of three well known reactive and proactive (AODV, DSR and WRP) routing protocols with various traffic Patterns CBR, FTP, FTP/GENERIC and TELNET by using PDR, LPP and average throughput performance metrics under different network scenarios like as Node density, Node Speed and pause time. The Performance evaluation has been done by using simulation tool GloMoSim on Redhat platform.

Keywords: Reactive, Proactive, AODV, DSR, WRP

1. INTRODUCTION

A wireless network is any type of computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes, telecommunications networks and enterprise (business) installations avoid the costly process of introducing cables into a building, or as a connection between various equipment locations. Wireless telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level (layer) of the OSI model network structure.

MANET

A mobile ad hoc network (MANET) is generally defined as a network that has many free or autonomous nodes, often composed of mobile devices or other mobile pieces that can arrange themselves in various ways and operate without strict top-down network administration. There are many different types of setups that could be called MANETs and the potential for this sort of network is still being studied

Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. Due to the mobility of the nodes in the network, these nodes are self-organizing and self-configuring. Not only they act as hosts, but also they function as routers. They direct data to or from other nodes in the network. In MANETs, routing protocols are necessary to find specific paths between the source and the destination. The primary goal of any ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology. Therefore, an efficient route between any two nodes with minimum routing overhead and bandwidth consumption should be established. The design of these routing protocols is challenging due to the mobility and the dynamic nature of the mobile ad-hoc networks. MANET routing protocols are categorized into two types: proactive and reactive.

ROUTING

Routing is the process of selecting a path for traffic in a network, or between or across multiple networks.

1.1 Routing Protocol in MANET

A Routing Protocol is a protocol that specifies how routers communicate with each other to disseminate information that allows them to select routes between any two nodes on a network. Typically, each router has a priori knowledge only of its immediate neighbors. A routing protocol shares this information so that routers have knowledge of the network topology at large. In this section give a brief overview of the routing protocol which is used in the performance analysis.

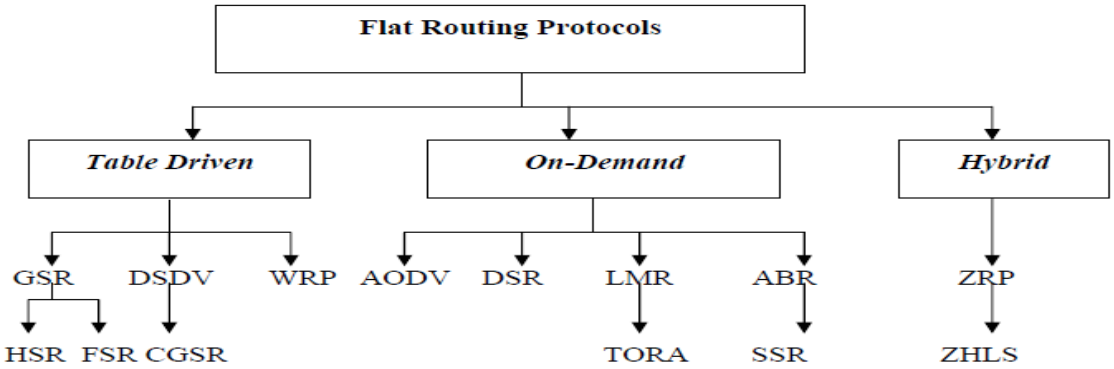

Fig.1 Categorization of Routing Protocols in MANET

1.1.1 Ad-hoc On Demand Distance Vector Protocol (AODV)

Ad hoc On-Demand Destination Vector, (AODV) is a distance vector routing protocol that is reactive. The reactive property of the routing protocol implies that it only requests a route when it needs one and does not require that the mobile nodes maintain routes to destinations that are not communicating. AODV guarantees loop-free routes by using sequence number that indicate how new, or fresh, a route is. AODV requires each node to maintain a routing table containing one route entry for each destination that the node is communicating with.

1.1.2 Dynamic Source Routing Protocol (DSR)

Dynamic source Routing (DSR) is a reactive routing protocol that uses source routing to send packets. It is reactive like AODV which means that it only requests a route when it needs one and does not require that the nodes maintain routes to destinations that are not communicating. It uses source routing which means that the source must know the complete hop sequence to destination. Each node maintains a route cache, where all routes known by this are stored.

1.1.3 Wireless Routing Protocol (WRP)

The Wireless Routing Protocol (WRP) is a proactive uni-cast 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.

Traffic Patterns

CBR: Constant bit rate (CBR) traffic model is used. The source-destination pairs are spread randomly over the network. Only 512-byte data packets are used. The number of source-destination pairs and the packet-sending rate in each pair is same in the network.

FTP uses tcplib to simulate the File transfer protocol. File Transfer Protocol. The FTP server process awaits connections and creates a slave process to handle each connection. The slave process accepts and handles a control connection from the client.

FTP/GENERIC does not use tcplib to simulate File transfer. Application/**Generic** Represents a more configurable model of the File Transfer Protocol server and client. The size of the items sent is not determined by network traces, but instead are specified by the user. Instead, the client simply sends the data items to the server without the server sending any control information back to the client.

TELNET

TELNET uses tcplib to simulate the telnet protocol. In order to use TELNET, the following format is needed:

TELNET <src> dest> <session duration> <start time>

2. Simulation Tool (GLOMOSIM)

GloMoSim stands for Global Mobile information systems Simulation library was designed as a set of library modules, each of which simulates a communication protocol in the protocol stack. The library uses the OSI layer approach and supports multiple protocols in each layer. The layers are separated and each layer has its own API.

Simulation Parameters:

Parameter	Value
Simulation Time	600 Seconds
Terrain Size	1100 X 1200 meters
Mobility Model	Random Waypoint Model
Node Placement	Random
Nominal traffic type	Constant Bit Rate (CBR), FTP
CBR Packet Size	512 Byte/Packet
Network Protocol	Internet Protocol
MAC Layer Protocol	802.11
Routing Protocols	AODV,DSR,WRP
Bandwidth	2 mbps
Radio Propagation Model	Two-Ray Ground Model

3. Performance Metrics

Packet Delivery ratio (PDR) - It is the ratio of data packets delivered to the destination to those generated by the sources.

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

4. Results

4.1 Results for CBR Traffic Pattern

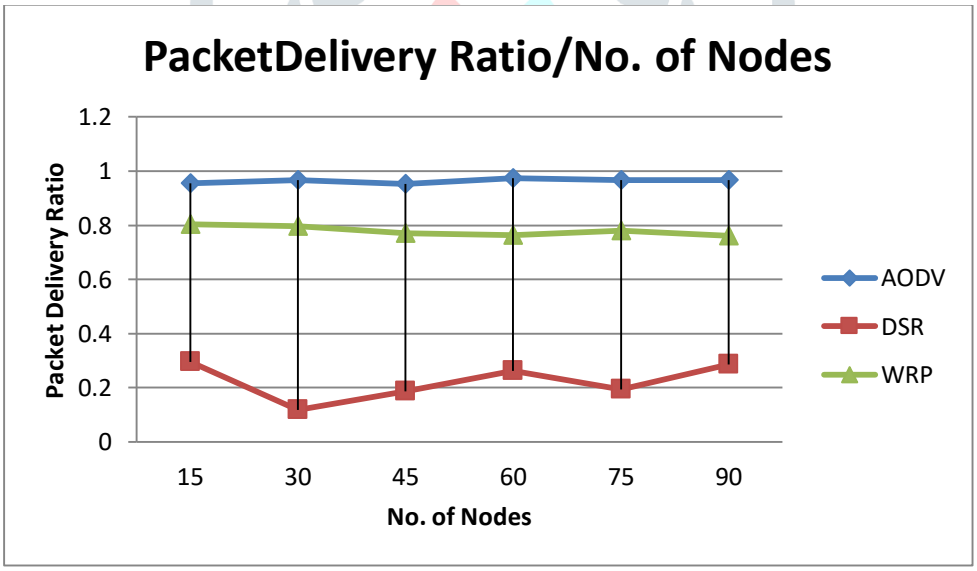

Fig. 2 Packet Delivery Ratio/No. of Nodes

This is shown in above fig. 2 as it can be seen that in the case of CBR traffic pattern that the packet delivery ratio of AODV and WRP is better than DSR. In this, Packet delivery ratio of AODV is almost constant and it's around 95 to 96 percent which is better than others two protocols.

Delivery Ratio

No. of Nodes	AODV	DSR	WRP
15	0.954167	0.295278	0.802778
30	0.966667	0.116806	0.796250
45	0.953611	0.185972	0.770139
60	0.974167	0.260972	0.762778
75	0.967917	0.194306	0.780694
90	0.967917	0.284861	0.761944

Loss packet percentage

No. of Nodes	AODV	DSR	WRP
15	4.58	70.47	19.72
30	3.33	88.32	20.38
45	4.64	81.40	22.99
60	2.58	73.90	23.72
75	3.21	80.57	21.93
90	3.21	71.51	23.81

Average throughput

No. of Nodes	AODV	DSR	WRP
15	3912	1291.83	3301.33
30	3963	574.6	3274.25
45	3909.83	1016.89	3167
60	3994.08	1760.78	3136.58
75	3968.58	1062.44	3212.42
90	3968.91	1501	3184.08

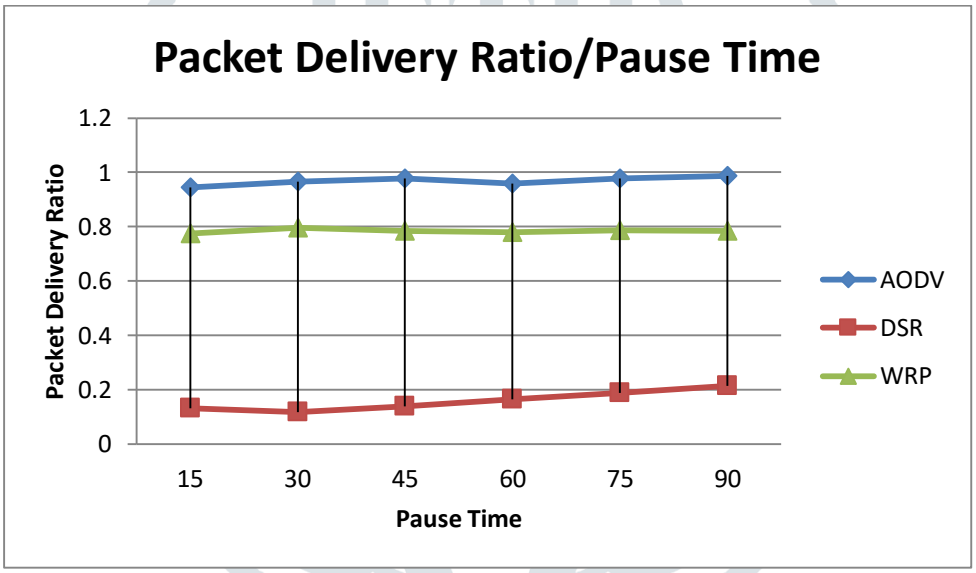

Fig. 3 Packet Delivery Ratio/Pause time

According to fig. 3, it shows that packet delivery ratio of AODV and WRP remains constant as pause time changes. AODV have highest delivery ratio which is 98% occur at pause time 90.

Delivery ratio

Pause Time	AODV	DSR	WRP
15	0.945417	0.131250	0.774583
30	0.966667	0.116806	0.796250
45	0.976806	0.138611	0.783611
60	0.957639	0.163611	0.780278
75	0.978611	0.188611	0.787500
90	0.987222	0.213611	0.784306

Loss packet percentage

Pause Time	AODV	DSR	WRP
15	5.46	86.88	22.54
30	3.33	88.32	20.38
45	2.32	86.14	21.64
60	4.24	83.64	21.97
75	2.14	81.14	21.25
90	1.28	78.64	21.57

Average Throughput

Pause Time	AODV	DSR	WRP
15	3875.42	645.7	3184
30	3963	574.6	3274.25
45	4004.5	682	3221.25
60	3926.17	805	3208.5
75	4012	928.2	3237.5
90	4047.58	1051.2	3225.67

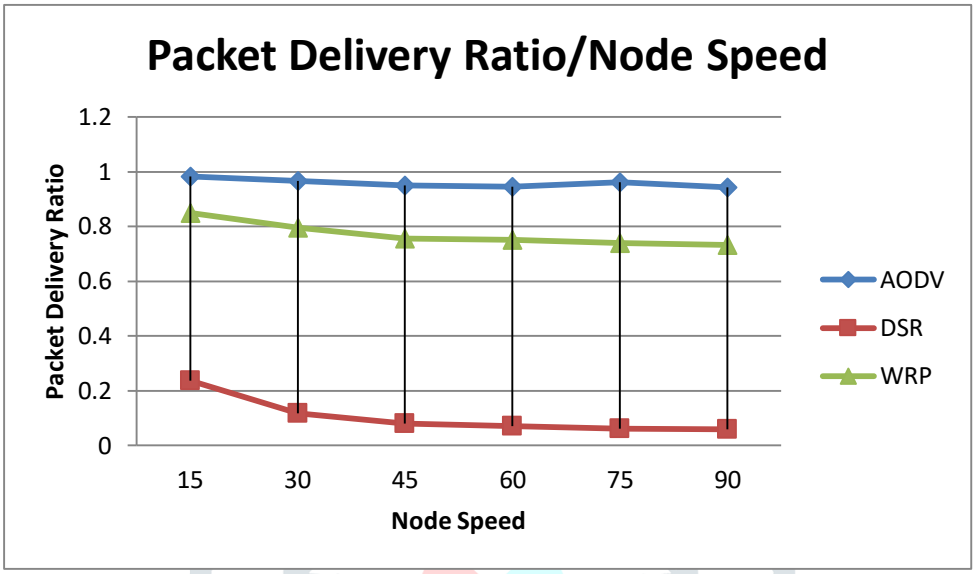

Fig. 4 Packet Delivery Ratio/Node Speed

As it can be seen that in the case of CBR traffic pattern that the delivery ratio of AODV and WRP is better than DSR. In this delivery ratio of AODV and WRP is remains constant as speed. This is shown in above fig 4. Highest packet delivery ratio of AODV protocol is approx. 98 percent.

Delivery Ratio

Node Speed	AODV	DSR	WRP
15	0.983611	0.235556	0.850278
30	0.966667	0.116806	0.796250
45	0.949444	0.080139	0.755000
60	0.944167	0.071389	0.751528
75	0.960417	0.060417	0.738611
90	0.943472	0.058194	0.732500

Loss packet percentage

Node Speed	AODV	DSR	WRP
15	1.64	76.44	14.97
30	3.33	88.32	20.38
45	5.06	91.99	24.50
60	5.58	92.86	24.85
75	3.96	93.96	26.14
90	5.65	94.18	26.75

Throughput

Node Speed	AODV	DSR	WRP
15	4032.5	1159.4	3495.75
30	3963	574.6	3274.25
45	3892.67	492.75	3106.08
60	3871	438.875	3090.92
75	3937	371.375	3036.33
90	3868.08	317.889	3011.67

4.2 Results for FTP Traffic Pattern

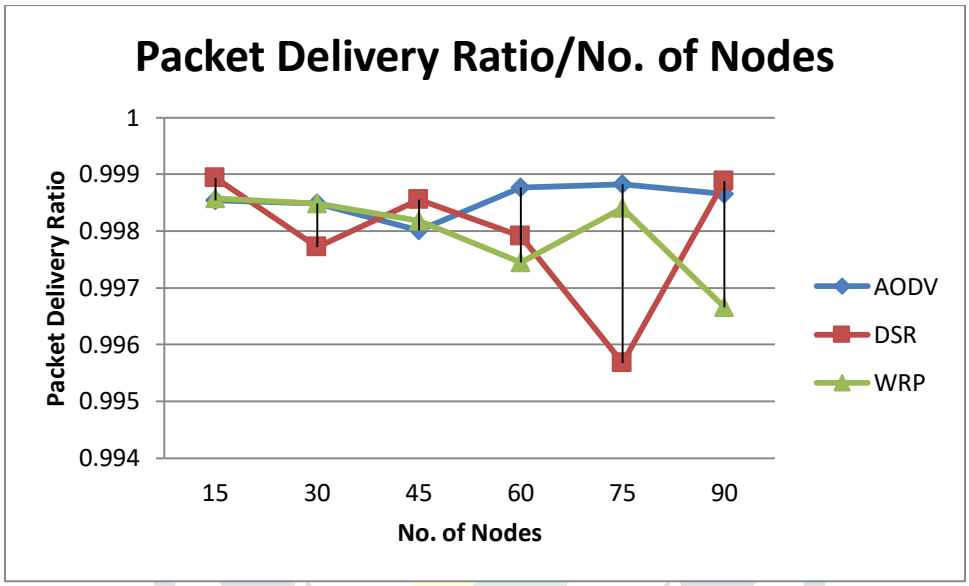

Fig. 5 Packet Delivery Ratio/No of Nodes

In fig 5 it is observed that in the case of FTP traffic pattern packet delivery ratio of AODV protocol is 99%.

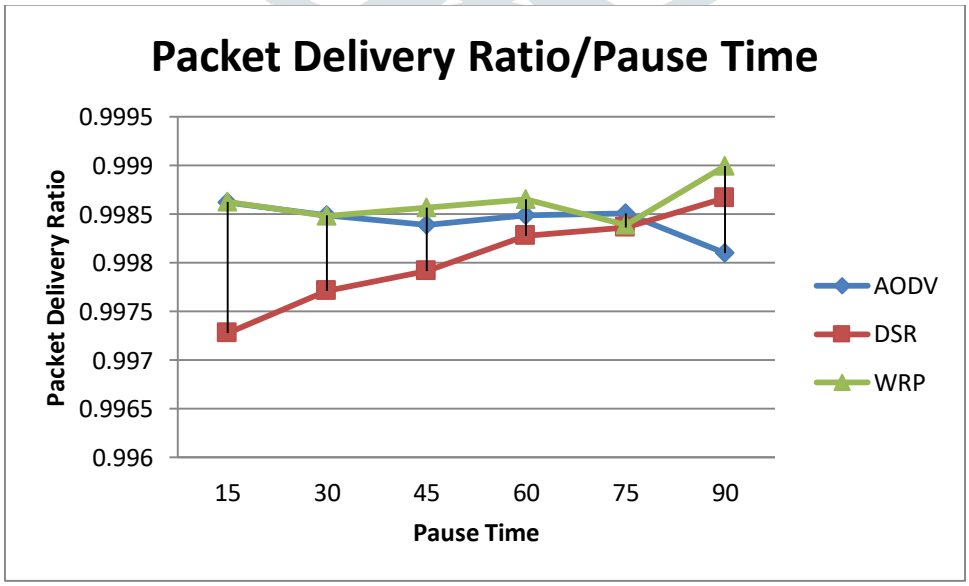

Fig.6 Packet Delivery Ratio /Pause Time

In the case of FTP traffic pattern Packet delivery ratio of all three protocols changes with change in pause time. The maximum Packet delivery ratio of WRP is 0.9989%.

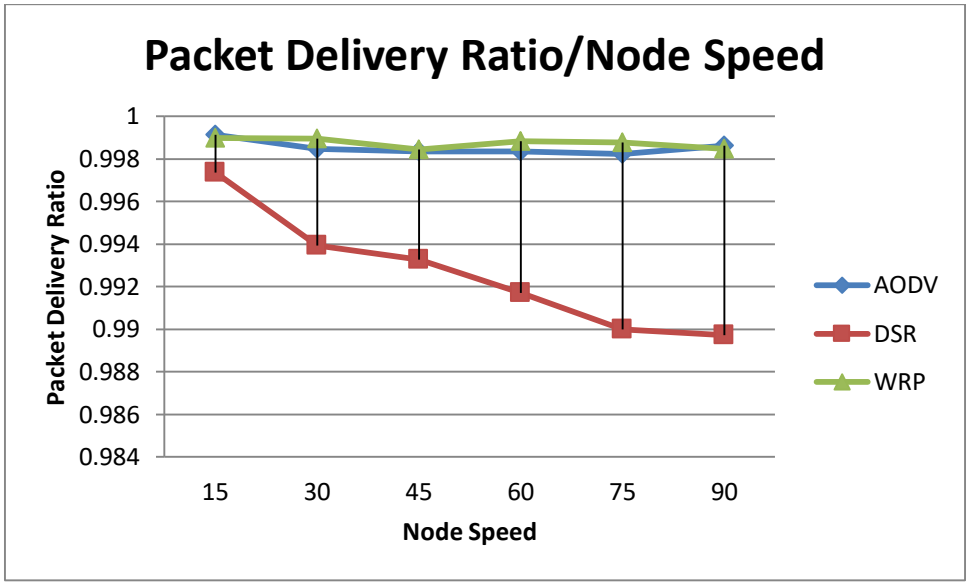

Fig . 7 Packet Delivery Ratio/Node Speed

In fig 7 it is observed that in case of FTP traffic pattern packet delivery ratio of AODV and WRP overlap to each other there is minor variations. Packet delivery ratio of DSR protocol is decreased with increase in node speed.WRP protocol have high delivery ratio which is 0.999%.

4.3 Results for FTP/ Generic Traffic Pattern

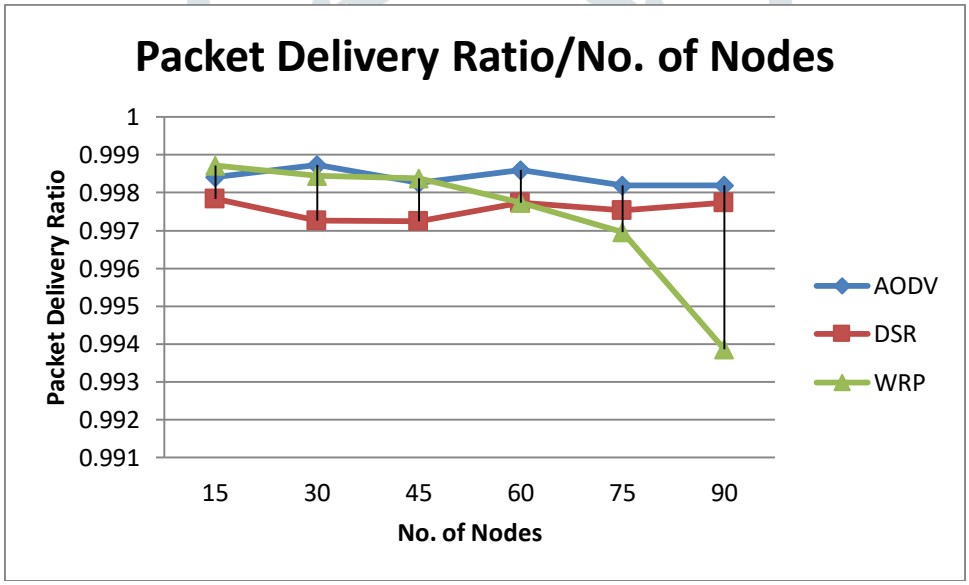

Fig. 8 Packet Delivery Ratio/No. of Nodes

As it can be seen that in the case of FTP/generic traffic pattern that the delivery ratio of AODV and WRP same up to node point 45 then delivery ratio of AODV is increased and delivery ratio of WRP is decreased sharply.

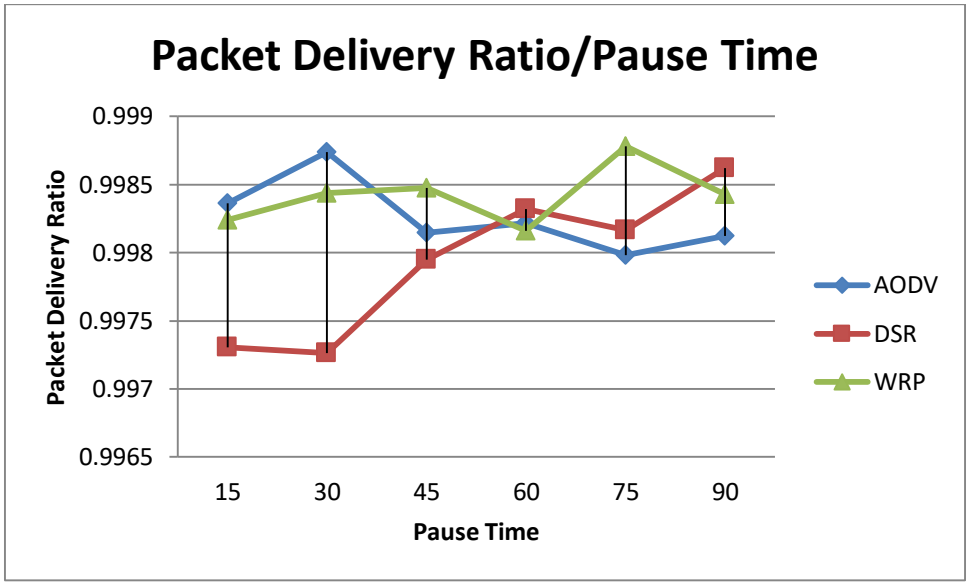

Fig. 9 Packet Delivery Ratio/Pause Time

As it can be seen that in the case of FTP generic traffic pattern that the delivery ratio of AODV and WRP is better than DSR.

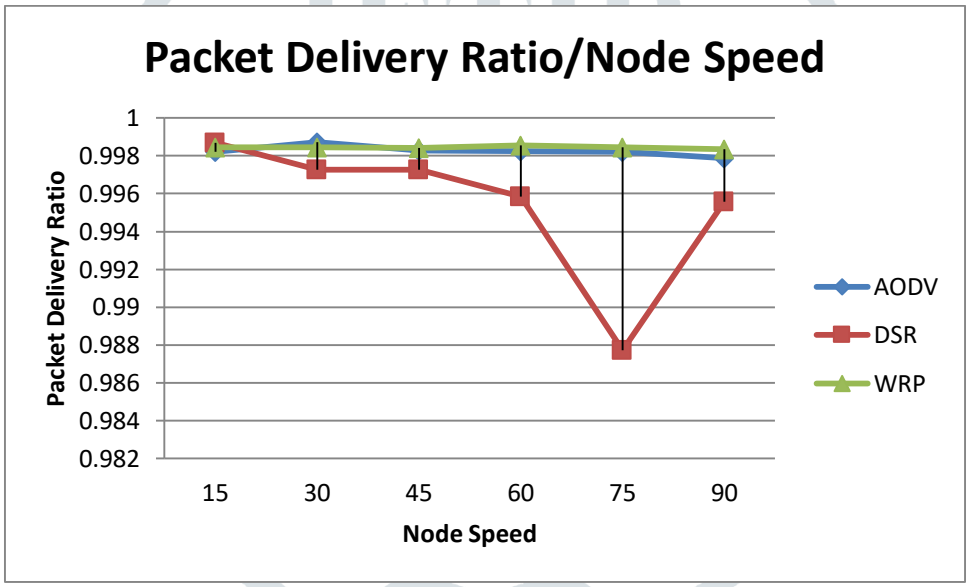

Fig.10 Packet Delivery Ratio/Node Speed

The performance of AODV and WRP is almost same and at its highest level.

4.4 Results for TELNET Traffic Pattern

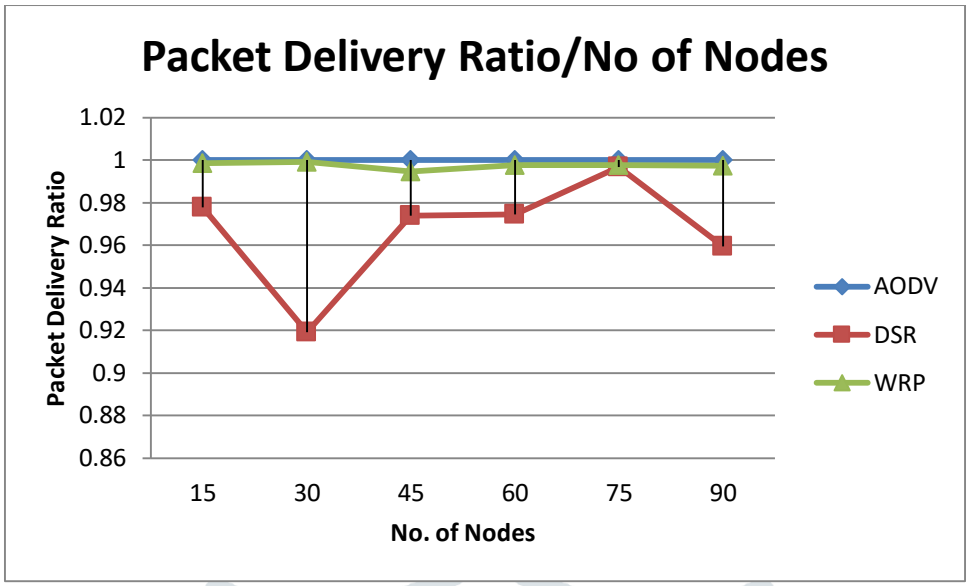

Fig.11 Packet Delivery Ratio/No of Nodes

In the case of TELNET traffic pattern packet delivery ratio of AODV is its highest level and which is 100%. PDR of WRP is almost same as of AODV.

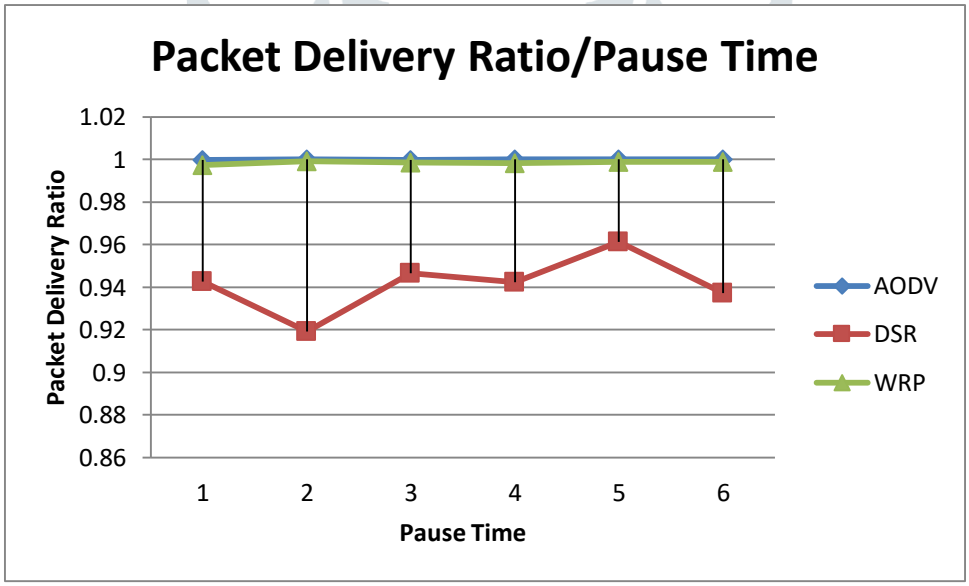

Fig.12 Packet Delivery Ratio/Pause Time

In the case of TELNET traffic pattern packet delivery ratio of AODV routing protocol and WRP routing protocol is constant whereas the PDR of DSR is changed rapidly.

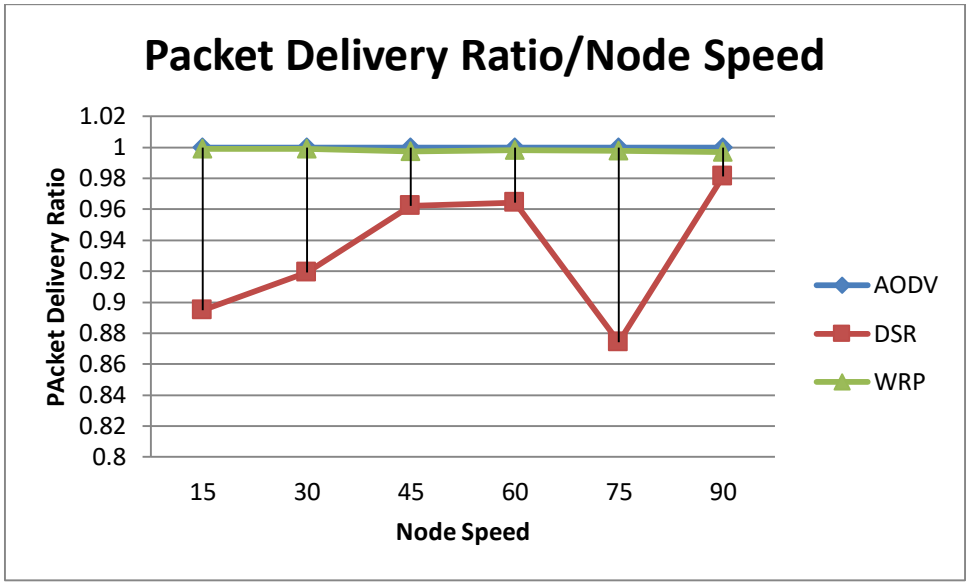

Fig.13 Packet Delivery Ratio/Node Speed

In the case of TELNET traffic pattern Packet Delivery ratio of AODV routing protocol approx. 100%.

5. CONCLUSION

The overall conclusion is that AODV is compatible with all type of traffic patterns. So it is an evergreen protocol which works in every situation and performs on its best level. TELNET is the more relatable traffic pattern in which AODV performs its 100%.

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