Effect of Traffic generators on routing protocols over Wireless Ad hoc Network

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Abstract – A mobile ad hoc network represents a system of wireless mobile nodes that can freely and dynamically self-organize into arbitrary and temporary network topologies, allowing people and devices to seamlessly communicate without any preexisting communication architecture. Some or possibly all of these nodes are mobile. There are several factor that affects the routing of packets in MANET. Performance of routing protocol is affected by mobility rate as well as mobility model used in the simulation. Mobility Models plays a very important role in determining the protocol performance, and used commonly are either non-realistic or Semi-realistic. In the performance evaluation of a protocol for warless ad hoc network, the protocol should be tested under realistic conditions including, data traffic models, and realistic movements of the mobile nodes. This paper *is* focused on designing scenario for reactive and Proactive routing protocol –AODV, DSR and FSR, basically to discuss by taking what parameters like application level Traffic generator, mobility rates considered give their best and to show how much effective these protocol are. In this paper, the performance of *AODV, DSR and FSR* by varying mobility rate along with communication traffic generator on QoS based performance metrics has been analyzed. The environment has been simulated by NS-2 simulator.
Keywords – MANET, AODV, DSR, FSR, QoS.

I. INTRODUCTION

Wireless networking is an emerging technology that allows users to access information and services electronically, regardless of their geographic position. we are moving from the Personal Computer (PC) to the Ubiquitous Computing age in which individual users utilize, at the same time, several electronic c platforms through which they can access all the required information whenever and wherever they may be [4]. This has led to rapid growth in the use of wireless technologies for the Local Area Network (LAN) environment. Beyond supporting wireless connectivity for fixed, portable, and moving statio ns within a local area, wireless LAN (WLAN) technologies can provide a mobile and ubiquitous connection to Internet information services. WLAN products consume too much power and have excessive range for many personal consumer electronic and computer devices.

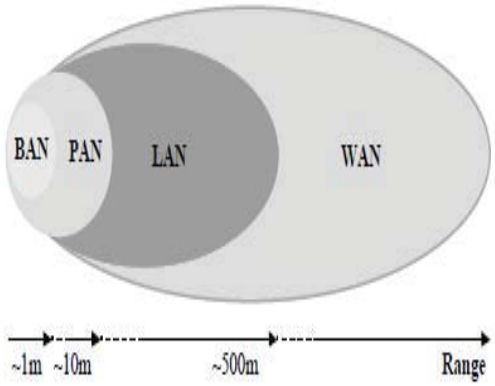

Figure 1.1: Taxonomy of Wireless Ad hoc network.

An ad-hoc wireless network is a collection of wireless nodes that self organize in to a network without the help of an existing infrastructure. Some or possibly all of these nodes are mobile. Ad-hoc networks can be classified in three categories based on applications:

- Mobile Ad-hoc Networks (MANETs)
- Wireless Mesh Networks (WMNs)
- Wireless Sensor Networks (WSN).

A. Mobile Ad hoc Network

A Mobile Ad hoc Network is self-organizing and adaptive. This means that a formed network can be de-formed on-the-fly without the need for any system administration. The term "ad hoc" tends to imply "can take different forms" and "can be mobile, standalone, or networked." Ad hoc nodes or devices should be able to detect the presence of other such devices and to perform the necessary handshaking to allow communications and the sharing of information and services.
An ad hoc network is a collection of wireless mobile nodes (or routers) dynamically forming a temporary network without the use of any existing network infrastructure or centralized administration. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a stand-alone fashion, or may be connected to the Internet. Multihop, mobility, large network size combined with device heterogeneity, bandwidth, and battery power constraints make the design of adequate routing protocols a major challenge. Some form of routing protocol is in general necessary in such an environment, because two hosts that may wish to exchange packets might not be able to communicate directly, as shown in Figure 1.2.

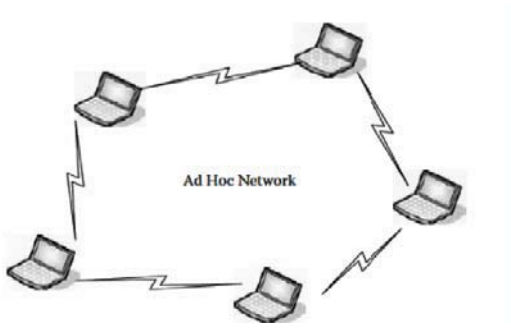

Figure 1.2 : Mobile Ad hoc Network (MANET).

There are some more issues concerned with MANETs:

- The wireless medium has neither absolute, nor readily observable boundaries outside of which stations are known to be unable to receive network frames.
- The channel is unprotected from outside signals.
- The wireless medium is significantly less reliable than wired media.
- The channel has time-varying and asymmetric propagation properties.
- Hidden terminal and Exposed terminal phenomena may occur.

B. Routing protocols in MANETs

since the advent of the DARPA packet radio networks in the early 1970s, numerous protocols have been developed for ad hoc mobile networks. 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. The specific characteristics of routing protocols include the manner in which they either prevent routing loops from forming or break routing loops if they do form, and the manner in which they determine preferred routes from a sequence of hop costs and other preference factors. There are many protocols already have developed for MANET environments [1,3,]. All these protocols can be classified in different ways. Based on the network structure the routing protocols can be classified as flat routing, hierarchical routing and geographic position assisted routing.

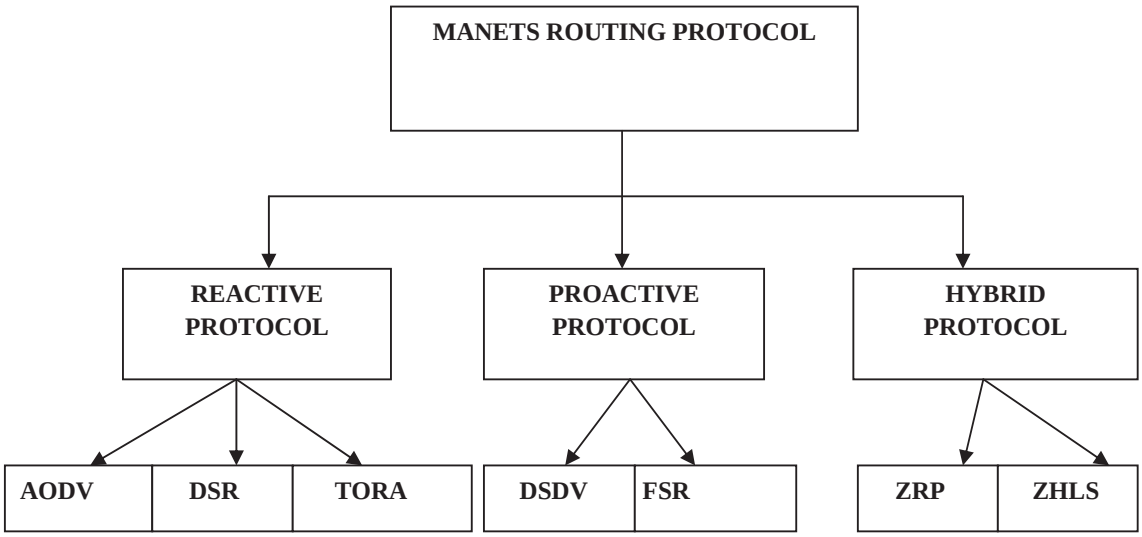

Figure 1.3: Categorization of MANETs Routing Protocols.

Flat Routing protocols can be divided into proactive, reactive and hybrid protocols, depending on the routing topology [2,8].

- Proactive Routing Protocols / Table Driven
- Reactive Routing Protocols / On Demand
- Hybrid Routing Protocols

Reactive or on-demand routing protocols:

Protocols that fall under this category do not maintain the network topology information. They obtain the necessary path when it is required by using a connection establishment process. Hence these protocols do not exchange information periodically.

Proactive or table driven routing protocols:

In table driven routing protocols every mobile node maintains the network topology information in the form of routing table by periodically exchanging routing information. Routing information is generally flooded in the network. Whenever a node requires a path to destination it runs an appropriate path-finding algorithm on the topology information it maintains.

Hybrid routing protocols:

Protocols belonging to this category combine the best features of the above two categories. Nodes within a certain distance from the node concerned or within a particular geographical region, are said to be within the routing zone of the given node. For routing within zone a table driven approach is used. For nodes that are located beyond this zone on-demand approach is used.

II. LITERATURE REVIEW

Sreerama and Das et al. [1] explains an ad hoc network is often defined as an “infrastructure less” network, meaning a network without the usual routing infrastructure like fixed routers and routing backbones. Typically, the ad hoc nodes are mobile and the underlying communication medium is wireless. Each ad hoc node may be capable of acting as a router. It’s characterized by multihop wireless connection and frequently changing networks. We compare the performance of on-demand routing protocols for mobile ad-hoc networks are distributed cache updating for the dynamic source routing protocol(DSR) and ad hoc on-demand distance vector routing (AODV).the simulation model of the medium access control(MAC) layer is evaluating the performance of MANET protocols.DSR and AODV protocols share similar behaviors.

Sreerama et al. (2011) et al. [2] explains that Ad hoc Network (MANET) was formed without any existing network; it’s allocated dynamically based on the network model nodes are generated dynamically. In Random Waypoint Model, transmitting the data from source to destination in multiple ways to require an

available path between source node to destination node. A node that includes pause times between changes in destination and speed. A node begins with a point in one location for a certain period of time. The route can be selected as randomly. If the route is not available on selected path, node is choosing the available path. Every node has the available path, when the node is start. each and every node randomly choose the path and reach the destination certain period of time. in this analysis is to perform the better transmission over the dynamic network topology. and also evaluate the better response over the Non Random based method(Not reserved nodes in dynamic network).the existing problem of network is route maintenance and traffic problems.

Bhavyesh Divecha et al.[3] observed the Impact of Node Mobility on MANET Routing Protocols Models. The performance of a routing protocol varies widely across different mobility models and hence the study results from one model cannot be applied to other model. Hence it has considered the mobility of an application while selecting a routing protocol. DSR gives better performance for highly mobile networks than DSDV. DSR is faster in discovering new route to the destination when the old route is broken as it invokes route repair mechanism locally whereas in DSDV there is no route repair mechanism. In DSDV, if no route is found to the destination, the packets are dropped.

Brent Ishibashi et al. [4] studied a number of characteristics concerning the links and routes that make up an ad hoc network. Several network parameters are examined, including number of nodes, network dimensions, and radio transmission range, as well as mobility parameters for maximum speed and wait times. In addition to suggesting guidelines for the evaluation of ad hoc networks, the results reveal several properties that should be considered in the design and optimization of MANET protocols. Overall, the results are cause for concern. Not only do many links break after a relatively short time period, but their short-lifespan is also propagated and exacerbated in the life spans of the routes. The shortness of the route life spans is a problem. With route building already an expensive proposition in MANETs, these rapid routing changes are a severe challenge to the network. For today's protocols, the challenge is insurmountable. Current MANETs simply cannot effectively handle that level of change .

Mona Ghassemian et al. [5] evaluated different proposed routing schemes for mobile ad hoc networks with respect to different mobility metrics. Mobility metrics applied for ad hoc protocol performance evaluations have been studied in this paper. Within an ad hoc network with unreliable links and connections, applying a precise mobility metric that captures the impact of mobility can lead to reliable results. In this paper a new mobility metric called link stability metric that can capture the random mobility of mobile nodes in an ad hoc network has been analyzed in an environment with a random waypoint mobility model

Byung-jae Kwar et al. [6] described that the performance of a mobile ad hoc network is related to the efficiency of the routing protocol in adapting to changes in the network topology and the link status. However, the use of many different mobility models without a unified quantitative "measure" of the mobility has made it very difficult to compare the results of independent performance of routing protocols. In this paper, a mobility measure for MANET's is proposed that is flexible and consistent. It is flexible because one can customize the definition of mobility using a remoteness function. It is consistent because it has a linear relationship with the rate at which links are established or broken for a wide range of network scenario.

R. Manoharan et al. [7] analyzed the impact of mobility pattern on multicast routing performance of mobile ad hoc networks. They observe that in addition to the strengths and weaknesses of the individual multicast routing protocols, the mobility patterns does also have influence on the performance of the routing protocols. The connectivity of the mobile nodes, route setup and repair time are the major factors that affect protocol performance. This conclusion is consistent with the observation of the previous such studies on unicast routing protocols. There is no clear winner among the protocols in our case, since different mobility patterns seem to give different performance rankings of the protocols.

Sabina Baraković et al. [8] concluded that in low mobility and low load scenarios, all three protocols react in a similar way, while with mobility or load increasing DSR outperforms AODV and DSDV routing protocols. Poor performances of DSR routing protocol, when mobility or load are increased, are the consequence of aggressive use of caching and lack of any mechanism to expire stale routes or determine the freshness of routes when multiple choices are available.

Ayyaswamy Kathirvel et al. in [10] compared the performance of DSR, AODV, FSR and ZRP with respect to propagation model. Reactive routing protocols (AODV and DSR) have got good packet delivery ratio. When compared with proactive and hybrid routing protocols, hybrid routing protocol have got next higher packet delivery ratio. Similarly reactive routing protocols have got less delay and jitter

Zygmunt J Haas et al. in [12] studied the performance of route query control mechanism for the ZRP for Ad hoc networks. Their proposed query control scheme exploit the structure of the routing zone to provide enhanced detection and prevention of overlapping queries. This query control mechanism allowed ZRP to provide routes to all accessible network.

Dr. Rajneesh Kumar et al. in [7] analyzed the impact of scalability on various QoS parameters for MANET proactive (DSDV) routing protocol and reactive on reactive routing protocols. They observed simulation from eight different scenarios and analyzed AODV protocol in QoS ware routing protocols under the

effect of scalability in terms of variation in number of nodes, mobility and packet intervals.

III. PROPOSED METHODOLOGY

From the literature review, it was found that there are several problems in routing with Mobile Ad hoc Networks like asymmetric links and interference. In asymmetric links most of the wired networks rely on the symmetric links which are always fixed. But this is not a case with ad-hoc networks as the nodes are mobile and constantly changing their position within network. But major problem is interference in which mobile ad-hoc networks as links come and go depending on the transmission characteristics, one transmission might interfere with another one and node might overhear transmissions of other nodes and can corrupt the total transmission. one node transmission might interfere with another one and node might overhear transmissions of other nodes and can corrupt the total transmission. Also from the literature survey it was found that there is a lot of work done on evaluating the performance of various MANET routing protocols for Constant Bit Rate (CBR) traffic but there is very little work done for variable bit rate like FTP, FTP/Generic, TELNET and HTTP type of traffic. CBR traffic does not reflect the complex nature of traffic in real applications and the traffics generated by FTP, web server pages i.e HTTP scenarios are more representative of network loads placed on a real world MANETs. Hence the relationship between traffic and routing is well worth investigation.

IV. SIMULATION AND RESULTS

The NS-2 simulator supports for simulating wireless networks consists of different network components including physical, data link, and medium access control (MAC) layer models. In this paper, it is proposed to evaluate and analyze the performance of proactive (FSR) and reactive (AODV, DSR) routing protocols based on traffic generators like FTP, FTP GENERIC under varying network scenarios such as node speed. In this work, main aim is to simulate and analyze performance of ZRP routing protocol under varying mobility rate and communication distance. Simulations are done considering a network of 60 mobile nodes placed randomly within 1500×1500 m^2 area. For traffic source and application, File Transport Protocol (FTP) and FTP / Generic are used above the agent TCP. The numbers of source and destination that have been used throughout the simulations. The source-destination pairs are spread randomly over the network. The data generator are FTP and FTP/Generic considered for varying node's mean speed values (5m/s-30m/s). 1040-byte data packets are used from sender to receiver and 40 byte acknowledgments are used from receiver to sender.

Table 1.1: Salient Simulation Parameters

Parameter	Value
Terrain Area	1500×1500 m^2
Number of Nodes	100
Node Placement Strategy	Random
Propagation Model	Two-Ray Model
Mobility Model	Random-Waypoint
Radio Type	Accumulated Noise Model
Mobility rate	10,20,30,40 (m/s)
Routing Layer Protocols	AODV, DSR and FSR
Traffic Generator	FTP and FTP/Generic

Throughput

Figure1.4 shows the impact of FTP data generator on the throughput under different mean speed or mobility rates. It is observed that the throughput of DSR and FSR routing protocols is better than AODV routing protocol when FTP is used as application data generator. When the mobility rates is minimum; the throughput is minimum as nodes mean speed increases the changes of asymmetic links between nodes are decreases and as a result throughput also increases. The throughput is representative of number of bits received per second.

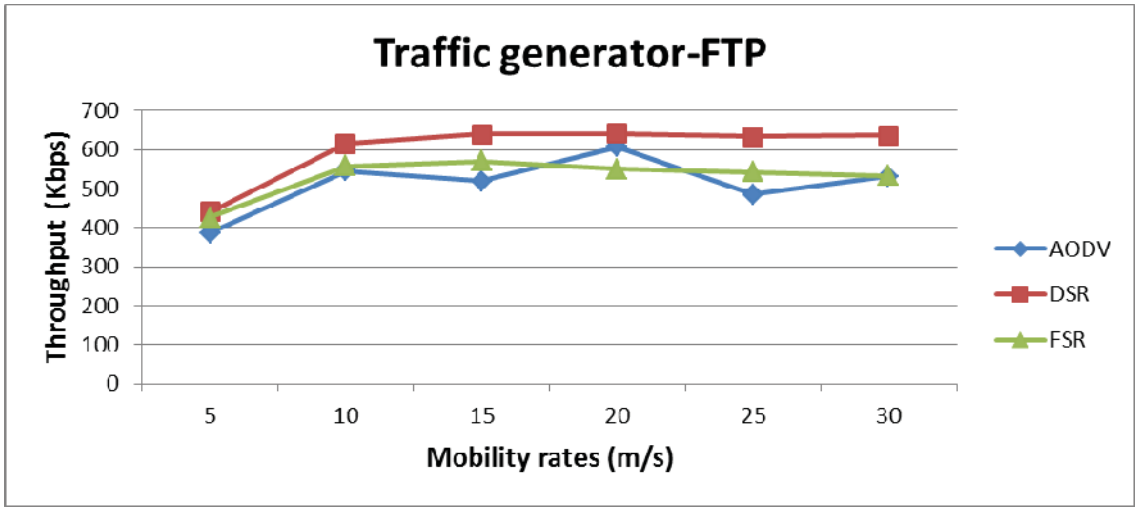

Figure 1.4: Impact of FTP data generator on the Throughput of AODV, DSR and FSR Protocols

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The Figure 1.5 shows the impact of FTP/Generic data generator on the throughput for three different. It is observed that the throughput of FSR protocol is better than both AODV and DSR routing protocols. For lower node's mobility rates, all protocol namely perform better as compare to higher mobility rates.

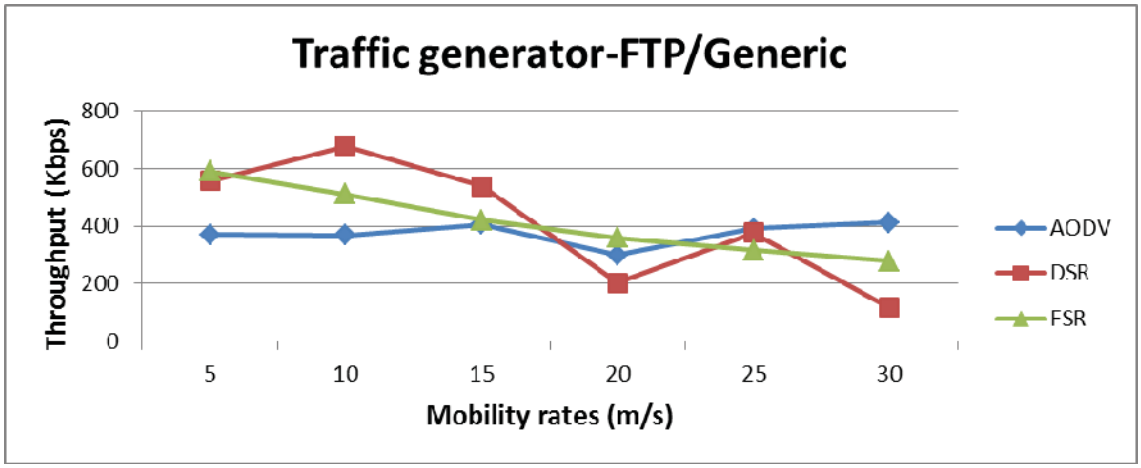

Figure 1.5: Impact of FTP/ Generic data generator on the Throughput of AODV, DSR and FSR Protocols.

Packet Delivery Ratio

The figure 1.6 shows the impact of FTP data generator on the packet delivery ratio of above said protocols under varying mean speed. It is observed that the throughput of FSR and DSR routing protocols gives higher packet delivery ratio than AODV protocol. When the Network mobility rate is minimum; the PDR is minimum as network mean speed increases, PDR increases against FTP apllication level data generator.

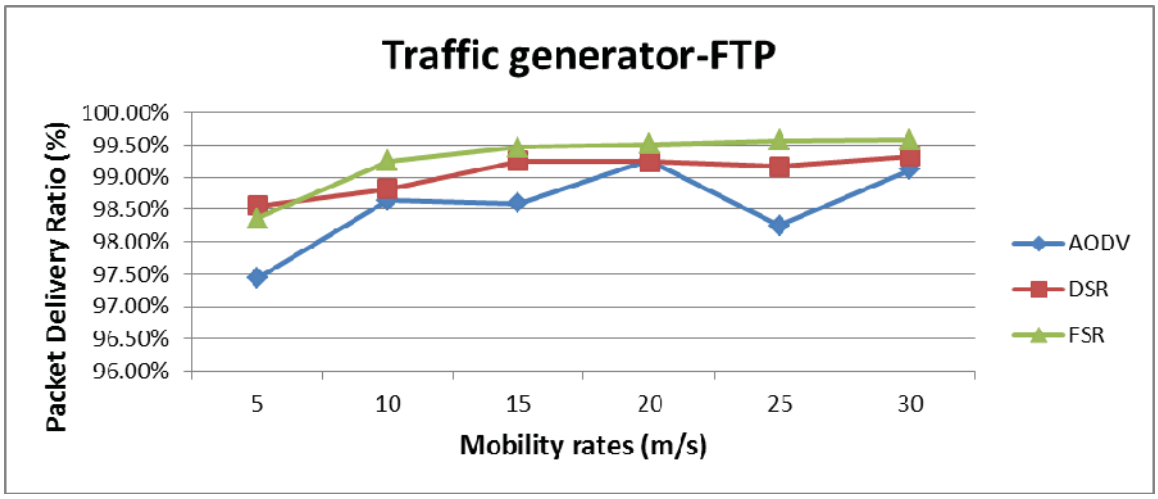

Figure 1.6 Impact of FTP data generator on PDF of AODV, DSR and FSR Protocols.

The figure 1.7 shows the impact of mean speed on the PDR against FTP/Generic data generator. It is observed that PDR of DSR is higher than that of the AODV and FSR routing protocol when the mean apeed is varied from 5 to 30 m/s under FTP/Generic apllication for different number of source-destination pairs. So it is evaluated that the routing overhead of DSR protocol is better than both AODV and FSR protocols.

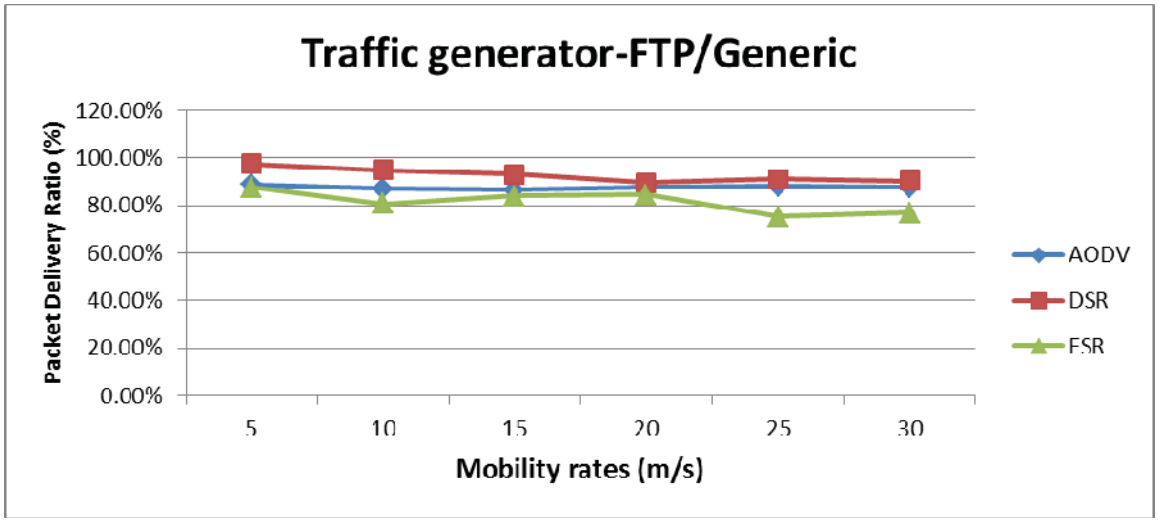

Figure 1.7 Impact of FTP/Generic data generator on PDF of AODV, DSR and FSR Protocols.

V. CONCLUSION

In this paper, the effect of Application level data generator and nodes mean speed is examined on to evaluate the performance of three protocols FSR (proactive), DSR (reactive) and AODV (reative) over multi-hop ad hoc environment. From the simulation results it is observed that proactive protocol DSR and FSR has best all-round performance under different mean speed scenarios considered against FTP and FTP Generic data generation. DSR and FSR in terms of throughput performs better than other routing technique considered but for packet delivery ratio FSR under both traffic scheme performs better than DSR and AODV for FTP whereas DSR under both traffic scheme performs better than FSR and AODV against FTP/Generic traffic over Wireless Multihop Ad hoc Network.

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