Improving The Performance of AODV with or without Load

Er.Richa Sharma, Dr.Rajiv Mahajan, Er.Satish Kumar

Abstract— **The mobility behavior of nodes in the application is modeled by the random waypoint model through which random locations to which a node moves are generated, and the associated speed and pause time are specified to control the frequency at which the network topology is dependent and is changed. The Optimized-AODV protocol incorporates path accumulation during the route discovery process in AODV to attain extra routing information. It is evident from the results that Optimized-AODV improves the performance of AODV under conditions of high load and moderate to high mobility.**

Index Terms— **Wireless, Ad-hoc, WLAN, FTP, HTTP.**

I. Introduction

Wireless LANs have become popular in the small offices, organization and home due to ease of installation, and wireless access of data exchange to their customers; often for free [1]. The IEEE (Institute of Electrical and Electronic Engineers) released the 802.11 specifications in June. The initial specification, known as 802.11, used the 2.4 GHz frequency and supported a maximum data rate of 1 to 2 Mbps then The 802.11b specification increased the performance to 11 Mbps in the 2.4 GHz range while the 802.11a specification utilized the 5 GHz range and supported up to 54 Mbps [1-4]. The IEEE 802.11 standard defines the protocol and compatible interconnections of data communication equipment via the “air” (radio or infrared) in a local area network (LAN). It encompasses the physical (PHY) and the media access control (MAC) layers of the ISO seven-layer network model [2, 14]. Wireless local area networks (WLANs) based on the IEEE 802.11 standard are one of the fastest growing Wireless access technologies in the world today. They provide an effective means of achieving wireless data connectivity in homes, public places and office and also enable people on the move to communicate with anyone, anywhere at any time with a range of multimedia [1-3]. There are different flavors of IEEE 802.11 but IEEE 802.11b, IEEE 802.11a, IEEE 802.11g and IEEE 802.11n are the most common used protocol in today’s environment. There are two operation modes defined in IEEE 802.11. which are as follows:

Er.Richa Sharma *CSE/ , PTU/GIMET/GIMET, Amritsare,India 9855074422.*

Dr. Rajiv Mahajan*,CSE, PTU/ GIMET/GIMET, Amritsar,India,9876146321.*

Er.Satish Kuma*r, CSE, PTU/ GIMET/GIMET, Amritsar,India,8146563683.*

a) Infrastructure Mode

In the infrastructure mode above, the wireless network consists of at least one AP (access point) connected to the wired infrastructure. All the wireless stations are connected to the AP. An AP controls encryption on the network and also can router the wireless traffic to a wired network (same as a router). We can think an AP as the base station used in cellular networks. This is the mode we are using for this project.

(b) Adhoc Mode

AP is not requiring in Ad-Hoc mode, the wireless station is connecting to each other directly without using an AP or any other connection. The topology is very useful to set up a wireless networks quickly and easily. Ad-Hoc mode is also called peer to peer mode or (IBSS) Independent Basic Service Set.

The comparison table of various variants of IEEE 802.11 is given in table 1.1.

TABLE 1.1
COMPARISON BETWEEN PROTOCOLS

802.11 a	802.11b	802.11g
5GHz	2.4GHz	2.4GHz
9 channels	11 channels	22 channels
54Mbit/s	11Mbit/s	52Mbit/s
25Mbit/s	6Mbits/s	25Mbits/s
Not compatible	Not compatible	Compatible with b
Up to 50M	Up to 100M	Up to 100M

The WLAN media is error prone and the bit error rate (BER) is very high compared to the BER of wired networks. In addition, carrier sensing is difficult in wireless networks because a station is incapable of listening to its own transmissions in order to detect a collision. So this paper deals with the optimization techniques based on the advanced network simulator, OPNET Modeler 9.1. The OPNET (Optimized Network Engineering Tool) can be best described as a set of decision support tools, providing a comprehensive development environment for the specification, evaluating and improving WLANs performance for best communication via mobile networks.

In Our model we used two workstations in which we transfer information/data through wireless with the help of different techniques and data rates which are available in OPNET MODELER 9.1. Here we made 3 scenarios having different data rates and techniques.

The performance is evaluated under these scenarios. These scenarios were tested in campus environment with 100*100m WLAN model family. We verify the performance under different data rates of 1, 2, 5.5, and 11 Mbps. In our WLAN simulation model we use three different techniques i.e. Frequency Hopping, Direct Sequence and Infrared respectively.

II. BACKGROUND

2. UDP Performance (Throughput)

2.1 Variation with Distance

The results obtained from the experimentation are presented herewith. Wireless LAN performance for the ad-hoc communication between the two laptops running on window XP Platform with wireless LAN cardsicles is noted by observing the throughput and link quality with variation in separation and directions. Figures 1, 2, 3 and 4 show the throughput variation with distance in different environments. Figures 3 and 4 compare the throughput in urban and freeway crossing scenarios for different packet sizes of 256 and 1400 bytes.

2.2 Throughput variation: Throughput shows a decreasing trend with increasing distance. There, however is a conspicuous feature in the freeway crossing case (Figure 4). The throughput increases with distance initially, before starting to fall with increasing distance. From figures shows the throughput can be seen to fall with increasing relative and average velocities for the suburban scenarios.

Aggression control via packet size variation: The increase is packet size form 256 to 1024 bytes is observed to increase the throughput for urban scenarios. For the freeway crossing case, the packet size increase is conducive to throughput enhancements at smaller separation. However, for larger distances, the throughput is better for smaller packet size. For adverse scenarios with vehicles separated by a large distance, a larger packet size would amount to a larger packet error rate and hence a lower throughput. It is therefore desirable to switch the packet size beyond a specific separation.

Connectivity range: Connectivity can be maintained for inter-vehicle separation of upto 1000 meters as demonstrated by the Figures 2 and 4 (freeway and suburban scenarios). Figure 2 shows that connectivity can be enhanced by decreasing the packet size.

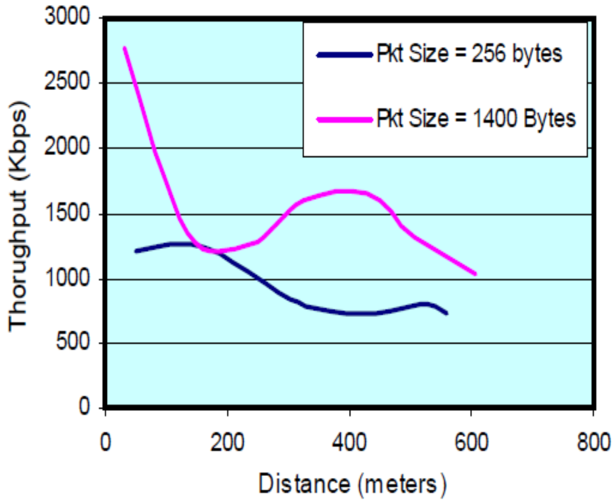

Figure:1 Throughput vs Distance for Urban Scenarios

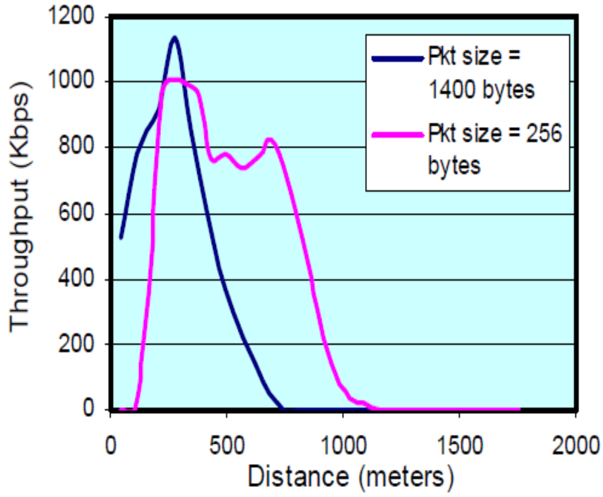

Figure:2 Throughput vs Distance for Urban Scenarios

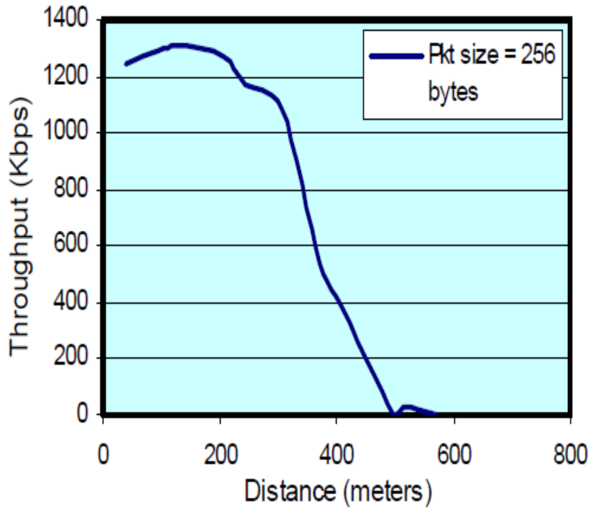

Figure:3 Throughput vs Distance for Freeway Following Scenario

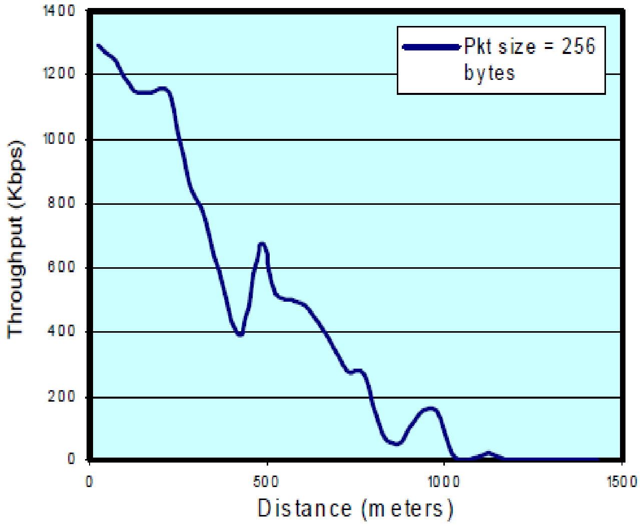

Figure:4 Throughput vs Distance for Suburban Scenario

III. RESULTS AND DISCUSSIONS

3. SIMULATIONS RESULTS

Simulation Results of WLAN with variable data rates and using different physical transmission schemes. The performance of WLAN is analyzed with throughput, medium access delay, and data dropped. The results are categorized as

3.1 Medium Access Delay at Different Data Rates under Different Techniques

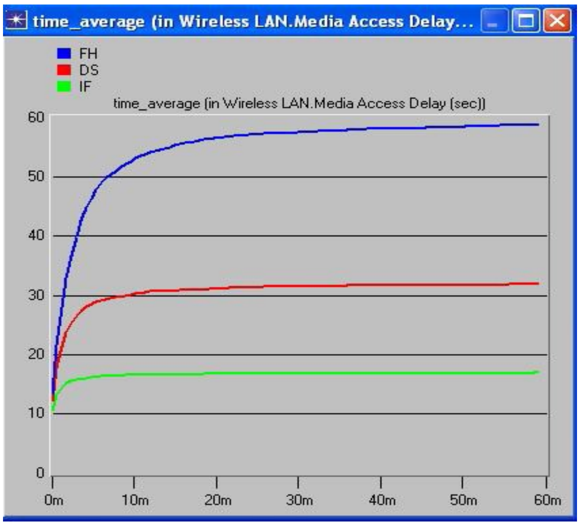

Figure:3.1 (a)

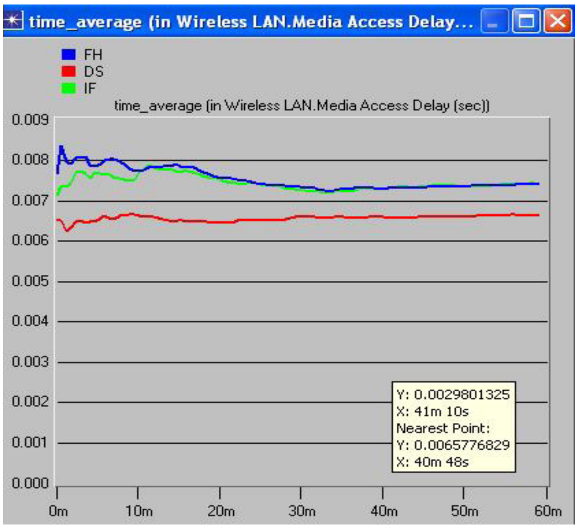

Figure:3.1(b)

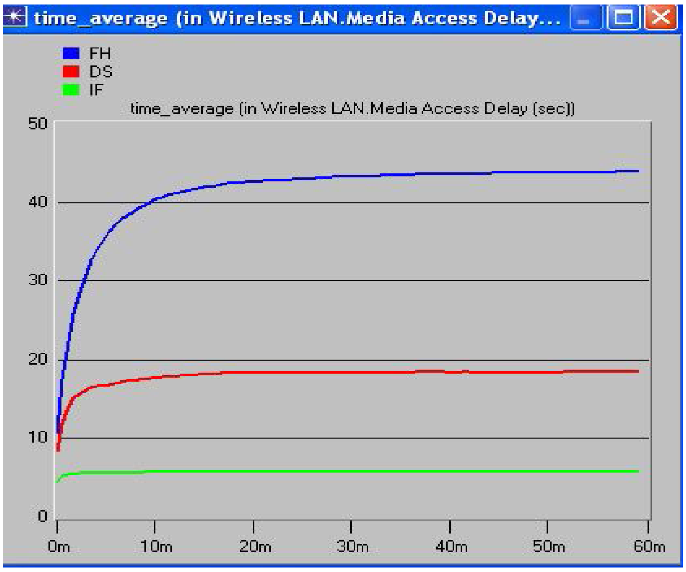

Figure:3.1(c)

Fig. 3.1 Medium Access Delay for different techniques (a) 1 Mbps (b) 2Mbps (c) 11 Mbps

Medium access delay is shown in figure 5.1a to 5.1c. Media Access Delay at 1 Mbps is worst in FH compared to DS and IF by 24 and 38 (sec) at 10-60 m. Similarly at 11 Mbps, FH is worst than DS and IF by 23 and 35(sec) at 10-60 m. At 2Mbps, MAD in DS is better than FH and IF by approx. 0.0015and 0.001(sec) at 0-20 m then after 20 it will show same difference by 0.001(sec) at 20-60m.

3.2 Throughput at Different Data Rates under Different Techniques

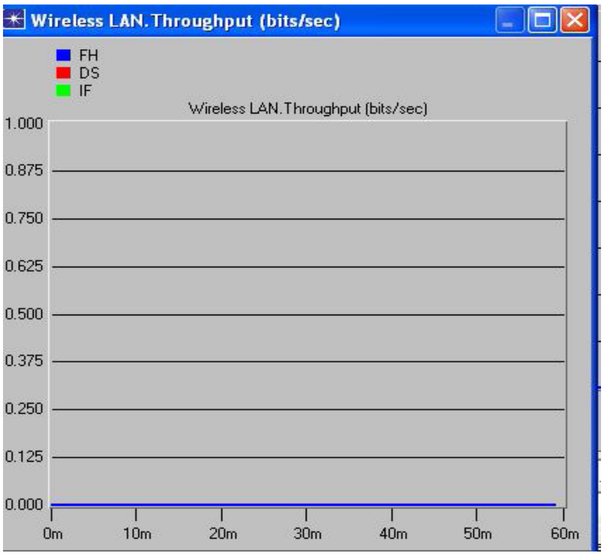

Figure:3.2(a)

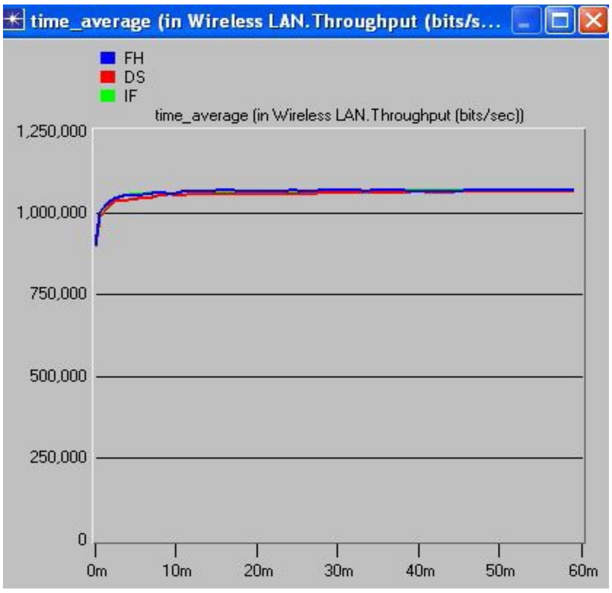

Figure:3.2 (b)

Fig 3.2 (a) Throughput at 1 and 11 Mbps (b) Throughput at 2 and 5.5 Mbps

Throughput at 2 and 5.5 Mbps data rates under different techniques is same i.e. it gives same results at any distance. But if we talked about 1 and 11 Mbps then throughput exist for frequency hopping technique only. And it will gives the value 0.000(bits/sec) at all distances.

3.3 Data dropped at different data rates under different Techniques

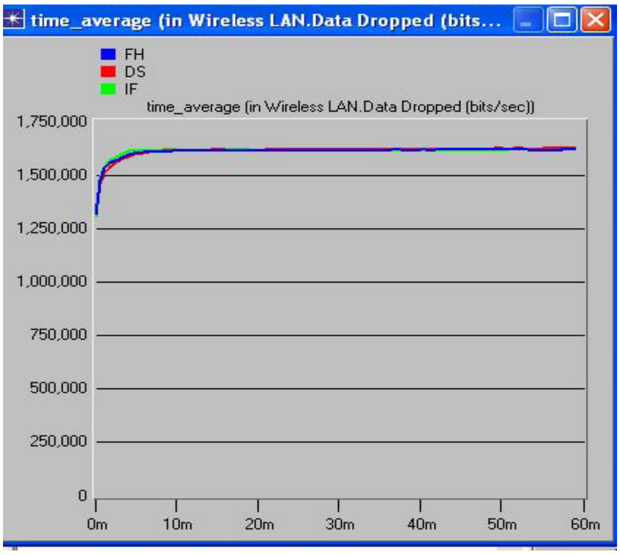

Fig 3.3(a) Data dropped at 1 Mbps under different techniques

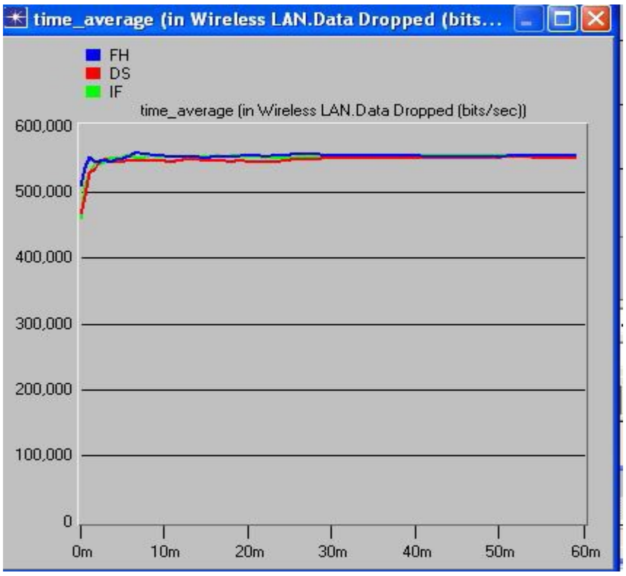

Fig 3.3(b) Data dropped at 2 Mbps under different techniques

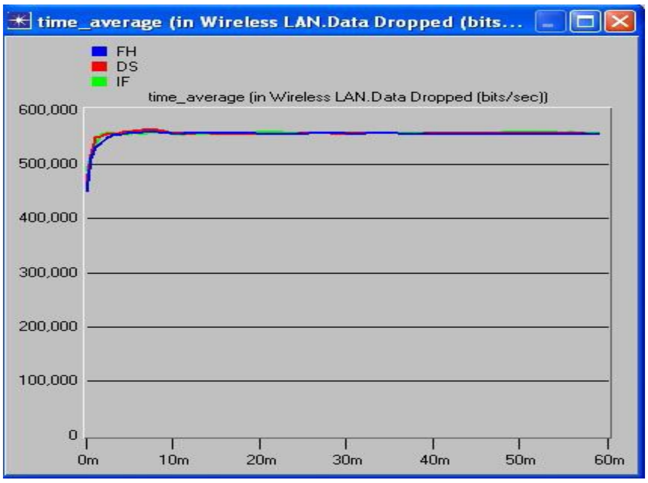

Fig 3.3(c) Data dropped at 5.5 Mbps under different techniques

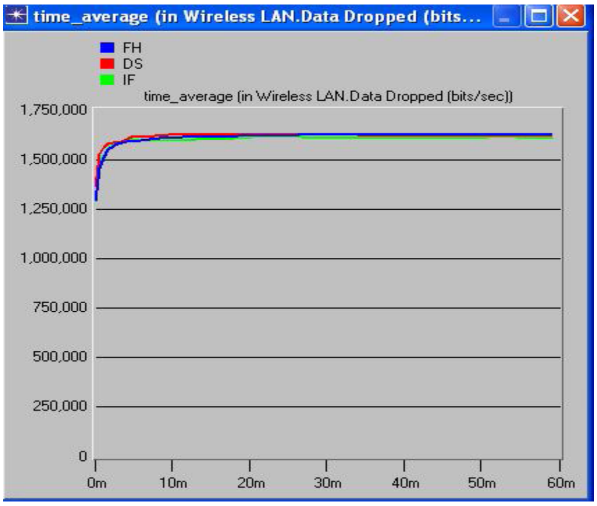

Fig 3.3(d) Data dropped at 11 Mbps under different techniques

We seen that Data Dropped (bits/sec) at 1 Mbps and 11 Mbps is near about same at distance of 0-60 m. but Data dropped at 11 Mbps is much more than the other data rates .It conclude that higher data rate means higher Data dropped(bits/sec). We evaluate the performance of the IEEE 802.11 Wireless Local area networks in detail with the help of OPNET Modeler. The performance has been analyzed with the help of the parameters like throughput, media access delay, dropped data packets etc. From results it is analyzed that delay is better at 2 Mpbs in direct sequence technique compared to others according to the attributes of workstation. If we talked about load then it will show better result at 11 Mbps in infrared technique means higher the data rate and lesser the distance gives the good result of load and Media access delay. Throughput is good in 2 and 5.5 Mbps according to the attributes of the workstations.

IV. CONCLUSION

During the study of packet delivery ratio of data packets, Optimized-AODV scales better than AODV in large networks. The performance of Optimized-AODV remains stable, for low node density as well as in the high node density. At the low mobility end the performance of all three protocols is close.

During the study of End to End delay, Optimized-AODV shows low delays in all cases, as instead of buffering data packets for a new route to be found, Optimized-AODV forwards the data packets through alternative routes. During the study of routing overhead, it was found that with high node mobility route failure occurs more frequently, and AODV will cause flooding of large number of route finding packets, while the number of routing packets in Optimized-AODV is independent of node mobility. With less mobility, the performance of Optimized-AODV still remains stable and the overhead of AODV is slightly less than Optimized-AODV. DSDV shows a very high difference in comparison to the other two protocols. In the throughput comparison, Optimized–AODV shows approximately constant graph, which indicates the scalability of Optimized-AODV protocol. With the change in density its throughput is stable. In case of AODV protocol when number of nodes increases, initially throughput increases as large number of routes are available, after a certain limit throughput becomes stable due to increase in end-to-end delay. DSDV gives comparatively lower throughput as the large number of routing bits is required. Increase in overhead reduces the throughput. The difference in the routing load of Optimized-AODV and DSDV decreases with an increase in the load. Optimized-AODV can be used either as an alternative to AODV or as an optimization under moderate to high load scenarios. Based on these simulated results, it is clear that the Optimized-AODV could also be suitable if overall routing load or if the application oriented metrics such as delay and packet delivery ratio are important consideration for the ad hoc network application. Optimized AODV is recommended as a better protocol especially for large Mobile Ad hoc Networks.

V. REFERENCES

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