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PERFORMANCE ANALYSIS OF WLAN BY COMPARATIVE STUDY OF VARIOUS ATTRIBUTES USING OPNET SIMULATOR

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Abstract—Analysis of wireless LAN is very important because by using LAN sharing capability of network we share large data at far distances. In this paper we are analyzing various parameters and set their value for optimized performance of network. We are taking various value of data rate, analyze for different segment size and fragmentation threshold. Further we increase no. of nodes and analyze the network for same parameters. At the end we compare the simulation results and get final conclusion. We are analyzing these all performance for OLSR routing protocol which is used for WLAN.

Index Terms— Segmentation, Fragmentation, Data rate, OLSR, Throughput, Delay, WLAN

1 INTRODUCTION

AS we well know about WLAN that may have fixed nodes or mobile nodes. In analysis of Ad-Hoc network these results are very useful. For the analysis we are taking 6 node networks in which 5 mobile node work station and 1 server node. In each workstation having Wi-Fi facility through which they can communicate to each other. We form wireless LAN of these workstation where the nodes are also moving. By changing various attributes we find out the optimized value of each attribute for which network performance is best. In this paper we are analyzing three important attributes segment size, data rate in wireless LAN and last one is fragmentation threshold. For analysis we apply various applications are 1) video conferencing 2) FTP application 3) E-mail, all are heavy load application. For each attribute we analyze various parameters such as throughput and delay. For WLAN we are using Transmission power 0.005W and packet reception power threshold -95.

2 ROUTING PROTOCOLS

For our work we are analyzing the performance of WLAN network through OLSR routing protocol. Optimized link state routing is a proactive routing protocol which is suitable for mobile Ad-Hoc network; it is proactive so that routes to destination are known. Routing overhead is generally larger as compared to the other reactive routing protocols. We are using mobile nodes but we not apply any trajectory, we are assuming that the nodes are either stationary or moving with very slow speeds. Generally fast moving nodes cause to degrade the performance of WLAN.

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3 ATTRIBUTES

As we discussed earlier that we are analyzing various attributes and set the values of these attribute for which the network performance is best. All the attributes discussed below.

3.1 Fragmentation: Fragmentation generally here specifies the fragmentation threshold, when we process the data packet if its size is larger than the fragmentation threshold it is divided into fragments; we only process the packets whose size is smaller than fragmentation threshold. When data packets are divided into packets they both are processed separately over radio interface. It means that fragmentation threshold is the largest data packet size that can be transmitted through transmitted end, depend its value on receiving data packet. Sometimes size of packets is too large that it can be divided into several fragments. Different option of fragmentation threshold are given in which a special option "None" indicates that fragmentation is not used on transmission end. Regardless the value of this attribute if the size of higher level packet is larger than maximum MSDU which is given by 2304 bytes, then such packets are not to be allow to transmit by the MAC, and it will be discarded. To change these behaviors we need to configure attribute Large Packet Processing [1].

3.2 Data Rate: Basically date rate depend upon technology of WLAN, various technology of WLAN and Wi-Fi having their minimum and maximum data rate. But throughput is not 100% of data rate even in ideal condition the data rate remain up to 50% to 75% of its value. In the OPNET there are various options of different technologies (DSSS, Frequency Hopping,

Infrared, Extended Rate PHY and OFDM) and their data rates (1Mbps, 2Mbps, 5.5 Mbps and 11Mbps).The set of supported data rates depending on the deployed physical layer technology are specified in IEEE's 802.11, 802.11a, 802.11b and 802.11g standards [1].

3.3 Segment size: This is the maximum size in bits of any segment that TPAL (Transport Protocol Adaptation Layer) layer transmit to application layer. Maximum segment size is a parameter control of TCP protocol that specifies the largest amount of data, that computer communicated device can receive in a single TCP segment and therefore in a single IP datagram.

4 PARAMETER ANALYZED

4.1 Throughput: -As from the analysis it is clear that when we analyze for segment size the best throughput we get at 16000 (fig 2). When we analyze for fragmentation threshold we get best performance for 1024 bytes (fig 4) similarly best data rate for maximum throughput is 11 Mbps (fig 6).

4.2 Delay: - when we analyze all the three attributes for delay we get that minimum delay in case of segment size is at 16000 (fig 3). In case of fragmentation threshold it is at 1024bytes (fig 5) and for data rates minimum delay we get at 11 Mbps (fig 7).

From the above analysis it is clear that the best performance we get at segment size 16000 fragmentation threshold 1024 bytes and data rate 11 Mbps.

4.3 Effect of increasing the number of nodes: On increasing the number of nodes the performance of the network degrades, after analyzing the network for various attributes value we get the optimized value of different attributes, for these optimized values we take three networks 6 nodes network, 11 nodes network and 16 nodes network. From the result it is clear that for 6 nodes performance is best (throughput is maximum and delay is minimum) while as the number of nodes increases performance of the network degrade.

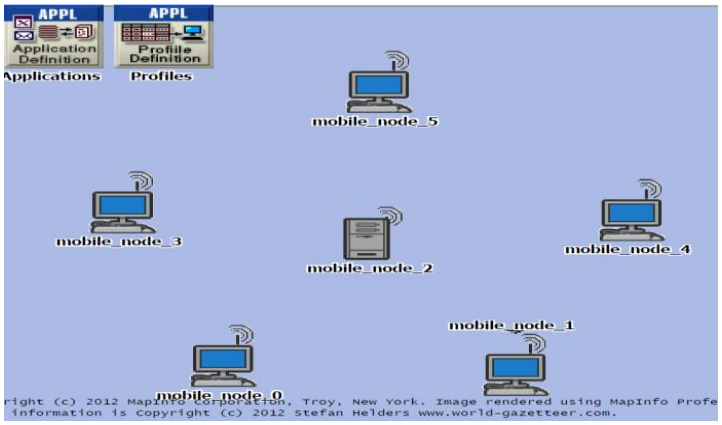

Fig 1: 6 node WLAN network with one server node

5 SIMULATION RESULTS

Below simulation result of various attribute are shown.

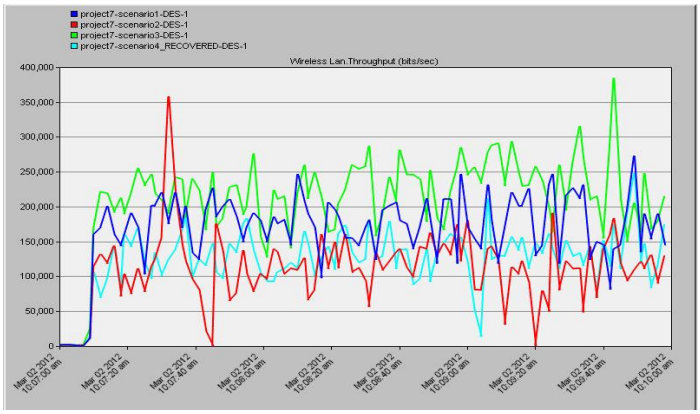

Fig 2: Throughput for different segment sizes

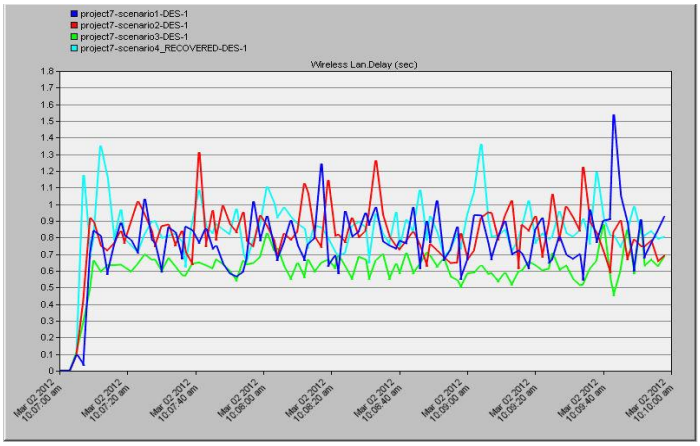

Fig 3: Delay for different segment sizes

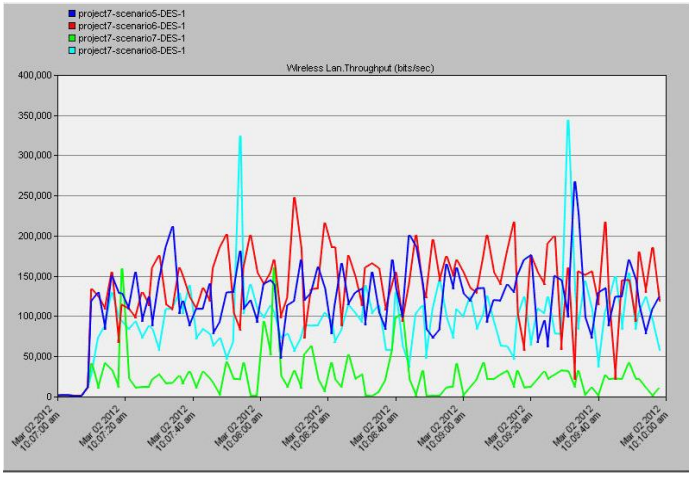

Fig 4: Throughput for different Fragmentation threshold

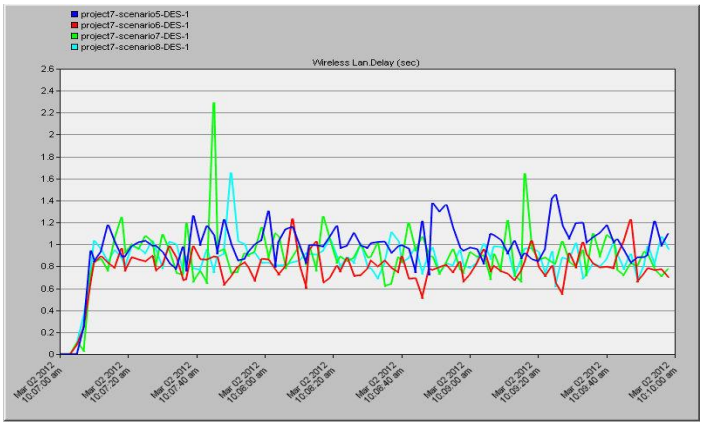

Fig 5: Delay for different Fragmentation threshold

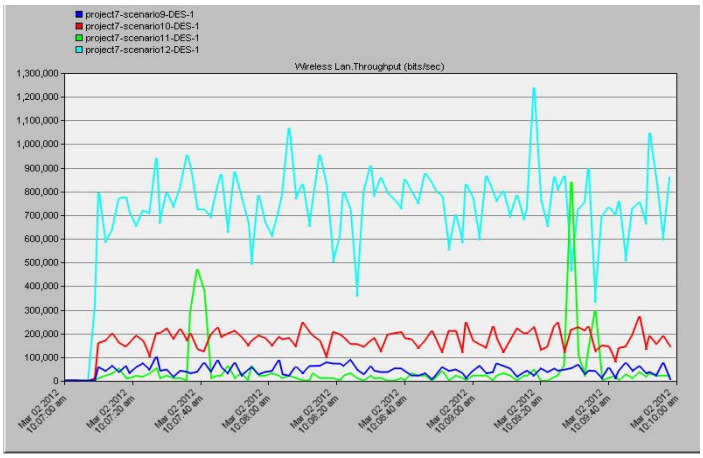

Fig 6: Throughput for different Data rate

Below there are various tables for different attributes are given in which color codes are given, the best performance is given by right symbol and others are given by cross symbol.

Serial . No		Fragmentation (bytes)	Performance		
			Throughput	Delay	Overall
1		256	Max	Max	X
2		512	Medium	Medium	X
3		1024	Max	Min	✓
4		2048	Min	Medium	X

Table 1: performance comparison for various Fragmentation thresholds

Serial	Segment	Performance

. No		size	Throughput	Delay	Overall
1		64000	Medium	Medium	X
2		32000	Min	Medium	X
3		16000	Max	Min	✓
4		8000	Medium	Max	X

Table 2: performance comparison for various Segment size

Serial No.		Data Rate(Mbps)	Performance		
			Throughput	Delay	Overall
1		1	Medium	Max	X
2		2	Medium	Medium	X
3		5.5	Min	Medium	X
4		11	Max	Min	✓

Table 3: performance comparison for various Data Rates

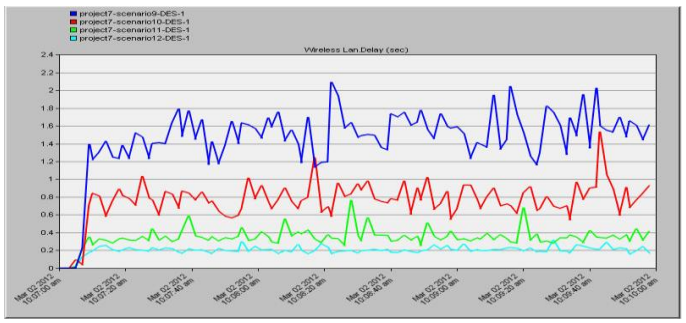

Fig 7: Delay for different Data rate

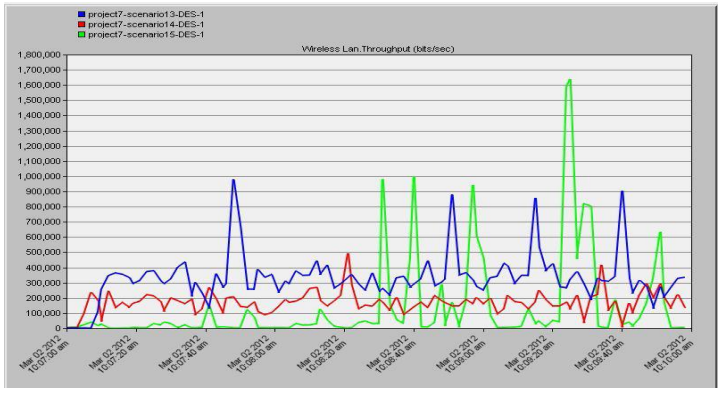

Fig 8: Throughput for 6 nodes, 11 nodes, 16 node WLAN for Optimized value of different attributes

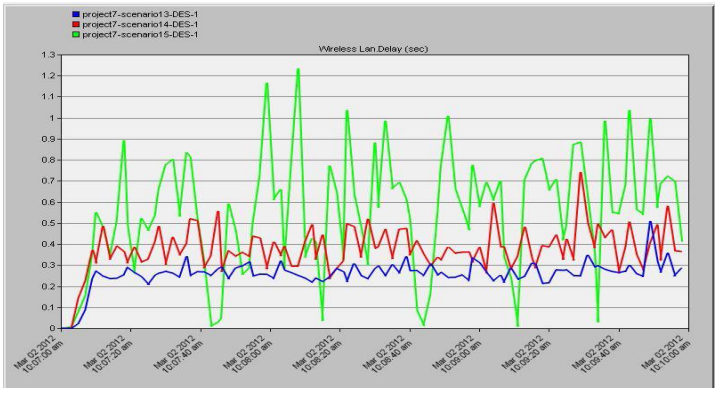

Fig 9: Delay for 6 nodes, 11 nodes, 16 nodes WLAN for Optimized value of different attributes

6 nodes	11 nodes	16 nodes

Fig 10: Color code for fig 8. and fig 9.

6 Conclusion And Future Work

Basically in this paper our work is based on the analysis of various attributes and set these attributes for their optimized value. At last we increase number of nodes and find out the effect of increasing the nodes. From the result it is clear that segment size 16000, fragmentation threshold 1024 bytes and data rate 11 Mbps are the best values for this WLAN network. Also these values are not set best for all type of WLAN network. After increasing the nodes it is clear that performance degrades as the traffic increases.

In future all these parameters are analyzed by increasing the nodes and see that what is the effect of increasing the nodes and what is the optimized value for increased nodes.

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