Effect of Increasing Load on WLAN Analyzed Through OPNET Simulator

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ABSTRACT
Wireless LAN has very important property of LAN sharing make it advantageous in Ad-Hoc networks. In WLAN each node has Wi-Fi capability. In this paper we are analyzing such a WLAN network in which we increase load by increasing traffic and analyze the effect of increasing traffic, we also analyze the network for different routing protocols and check performance of which routing protocol not degraded on increasing load means which routing protocol is less sensitive to load.

Keywords
WLAN, LOAD, AODV, OLSR & TORA

1. INTRODUCTION
Wireless network is a type of computer network in which nodes are interconnected with each other without wires. These nodes have Wi-Fi capability, Wi-Fi stands for wireless fidelity. IEEE 802.11 Wi-Fi is a type of computer to computer connection as in a LAN without need of wire. We can increase the load on WLAN by two ways. In first case we increase the load on server node by increasing the number of nodes and second by increasing the traffic (means we apply heavy traffic by each node). When increasing the load cause increase the collision of packets which cause more data dropped and finally throughput reduces and so that wastage of channel. We analyze the network in both cases and for all three routing protocols. We take two configurations, first configuration is application configuration and other is profile configuration. In a profile we set multiuser profile and in application we set two different application video conferencing and voice application (PCM). In third case we apply FTP Traffic for analysis.

2. WLAN PARAMETERS
There are number of WLAN parameters on which wireless LAN performance is affected. In this section we discuss various WLAN parameters. We are not analyzing network for mobility profile and terrain profile. As shown in Fig BSS set to be auto assigned in this case all the nodes are belong to same BSS, if in a BSS any node need to communicate with other node that belongs to any other BSS than we need to set access point functionality enabled otherwise it is not capable to communicate with node that belongs to other BSS. We set access point functionality disabled because all the nodes belong to the same BSS. We set direct sequence technique and 11 Mbps data rate. All other WLAN parameters are default set as shown in Fig 1.

Table 1: WLAN parameters for analyzed network

SIMULATION PARAMETERS	
No. Of Nodes	52
Playground size	440m*230m
Simulation time	600 sec
ROUTING MAC PROTOCOL	
Routing Protocol	AODV,OLSR,TORA
MAC Protocol	802.11g
Data Rate	11Mbps
RADIO CHARACTERISTICS	
Transmitted Power	5mW
Packet Reception Power Threshold	-95dBm
BSS	Auto assigned

3. PERFORMANCE ANALYSIS
We analyze the WLAN network for 3 cases and for each case there are three scenarios for three routing protocols AODV, OLSR and TORA. We increase the load and compare the performance for two important parameters throughput and delay.

First case (normal case)
In this case we take 12 WLAN network and 1 server node. Server node is capable to support all types of services (such as video conferencing, FTP etc). For each node we set multiuser profile, in multiuser profile there are two types of applications video conferencing and voice application (PCM). We analyze this network for three routing protocols AODV, OLSR and TORA respectively scenarios 1, 2 & 3. WLAN network is shown in Fig 1.

3.2 Second case (Load increases by increasing number of nodes)

Nodes are increases to increase the load on server and analyze the network. Now there are 20 nodes and each node having multimedia profile. Further we analyze this network for all three routing protocols AODV, OLSR & TORA. WLAN network is shown in Fig 2.

3.3 Third case (Load increases by increasing the traffic generated by each node)

In this case we take 12 nodes as taken earlier but FTP traffic with 2 sec inter-arrival time and now we generate more traffic by applying FTP traffic of 0.2 sec & 0.02 sec on application profile. This generates more traffic and so that load on server node increases. We analyze this network for three different routing protocols. WLAN network is shown in Fig 1.

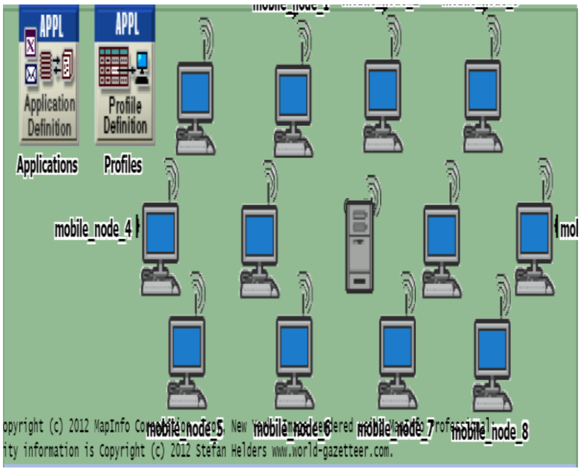

Fig 1: 12 nodes WLAN network in first case & third case

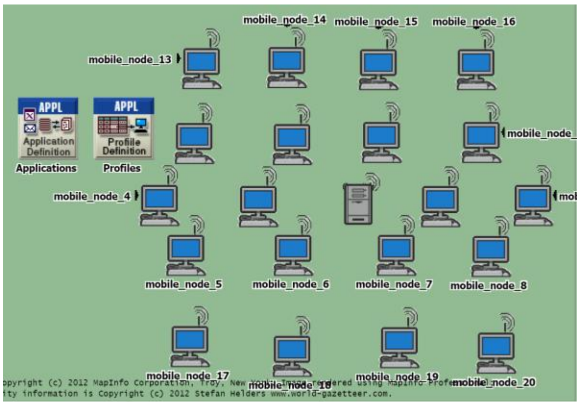

Fig 2:20 node WLAN network in second case

4. SIMULATION RESULTS

By the simulation of these scenarios we get different results and comparing these results we get that as we increase the number of nodes more packet collision take place and data dropped so that throughput reduces and delay increases. When we increase the traffic by increasing number of nodes throughput reduces, delay increases and data dropped increases for AODV, OLSR, and TORA as shown in Fig 3 to Fig 10.

12 node	20 node
(blue)	(red)

Fig 3: color code for Fig 4, 5, 6,7, 8, 9, 10

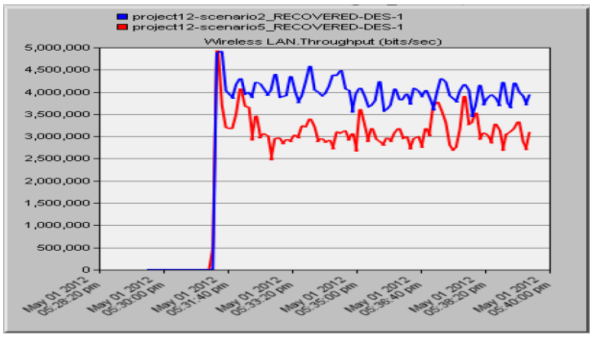

Fig 4: Throughput comparison of 12 node & 20 nodes WLAN network for AODV

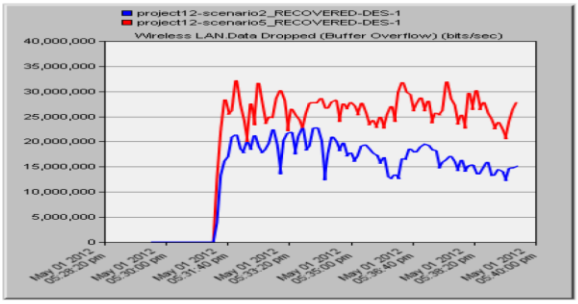

Fig 5: Data dropped comparison of 12 node & 20 node WLAN network for AODV

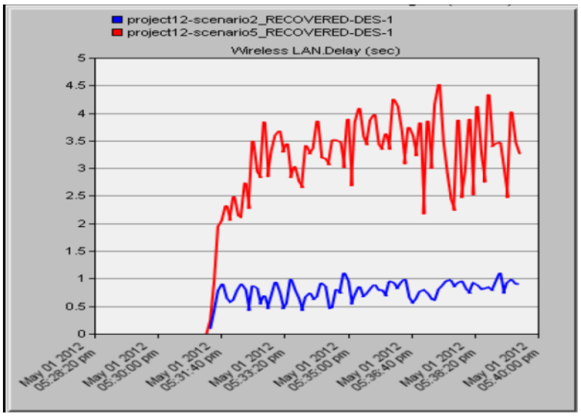

Fig 6: Delay comparison of 12 node & 20 node WLAN network for AODV

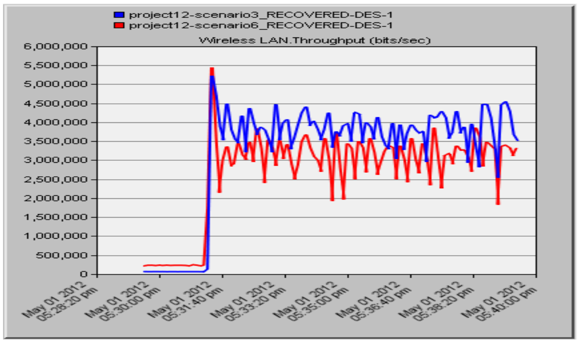

Fig 7: Throughput comparison of 12 node & 20 node WLAN network for OLSR

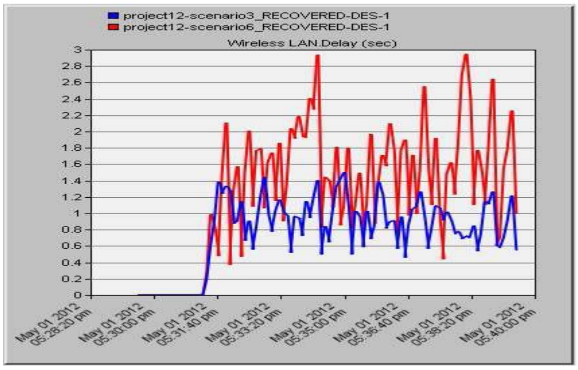

Fig 8: Delay comparison of 12 node & 20 node WLAN network for OLSR

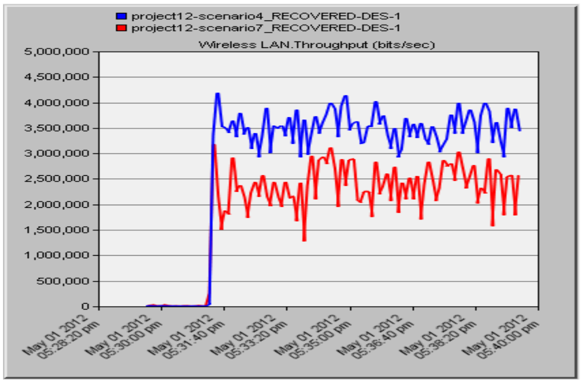

Fig 9: Throughput comparison of 12 node & 20 node WLAN network for TORA

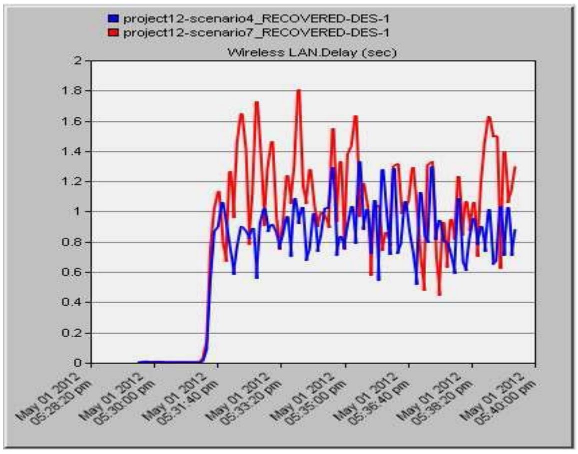

Fig 10: Delay comparison of 12 node & 20 node WLAN network for TORA

Normal traffic Inter-arrival time 2 sec	Increased traffic Inter-arrival time 0.2 sec	Increased traffic Inter-arrival time 0.2 sec

Fig 11: color code for Fig 12, 13, 14, 15, 16, 17

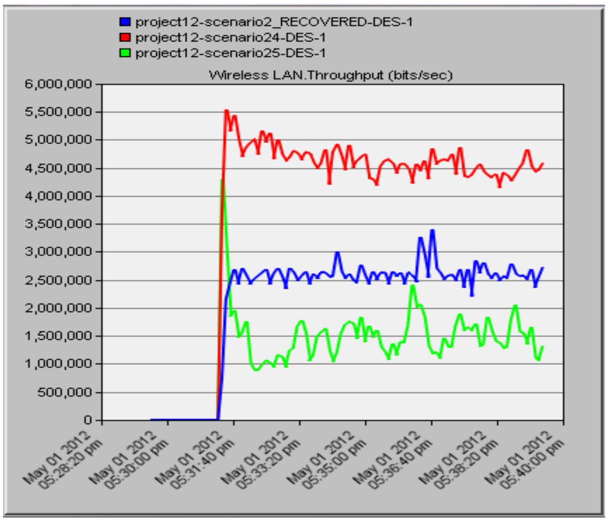

Fig 12: Throughput comparison of 12 nodes WLAN when traffic increases by each node for AODV

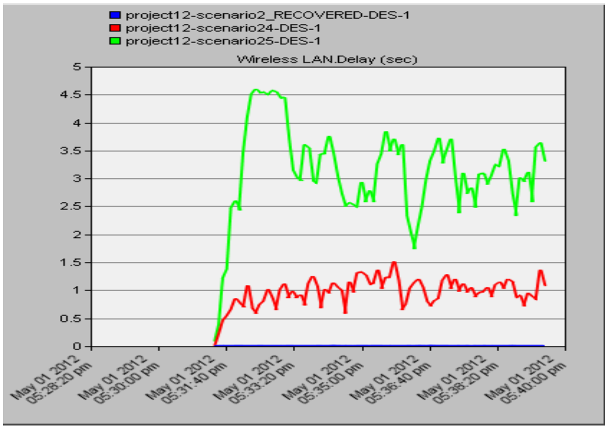

Fig 13: Delay comparison of 12 nodes WLAN when traffic increases by each node for AODV

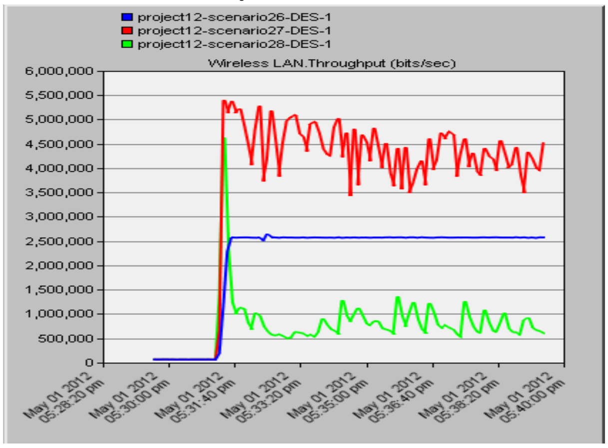

Fig 14: Throughput comparison of 12 nodes WLAN when traffic increases by each node for OLSR

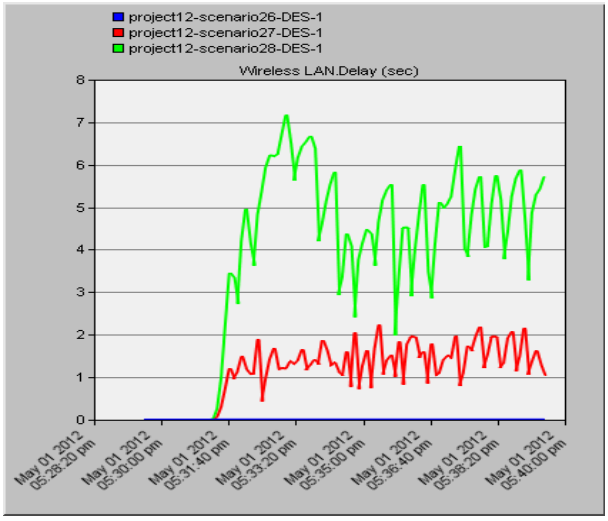

Fig 15: Delay comparison of 12 nodes WLAN when traffic increases by each node for OLSR

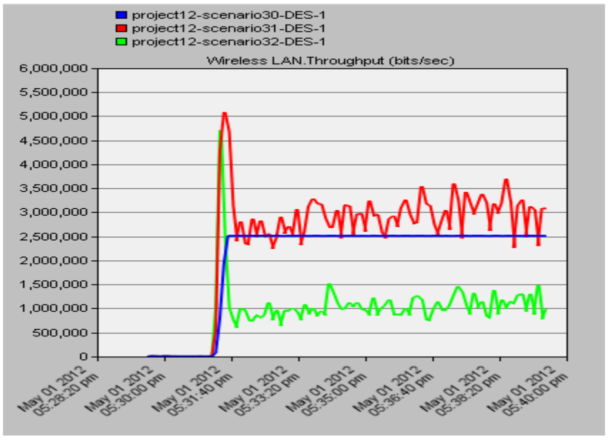

Fig 16: Throughput comparison of 12 nodes WLAN when traffic increases by each node for TORA

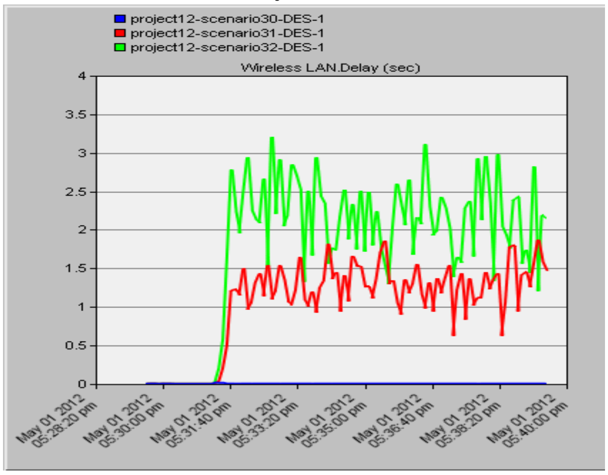

Fig 17: Delay comparison of 12 nodes WLAN when traffic increases by each node for TORA

From the Figures it is clear that as number of nodes increases throughput of AODV and TORA are more effected as compared to OLSR. Now we increase FTP traffic in third case by varying inter-arrival time 2 sec to 0.2 sec & then 0.02 sec. Due to increase in traffic from 2 sec to 0.2 sec inter-arrival time throughput increases but more increase in traffic cause reduction in throughput because channel becomes congested & so increase in collision count. In all cases delay increases when increase in traffic take place as shown in Fig 11 to Fig 17.

5. SIMULATION SOFTWARE

We are using 14.5 version of OPNET simulator, OPNET stands for optimized network simulator which is advanced software for this generation. It is also supported windows and easy to design the network because it support GUI (Graphical User Interface).

6. CONCLUSION AND FUTURE WORK

From the above analysis it is clear that as the when load increases by increasing number of nodes throughput reduces and delay increases. Similarly when load increases by increasing data traffic of each node throughput increases but if we increase more traffic its performance degrades due to increase in collision count and so throughput reduce. Due to increase in traffic data dropped due to buffer overflow also increases and so that delay also increases. When traffic increases more packet collision take place and so that performance degrades. From the results it is also clear that OLSR having lesser delay. In terms of throughput AODV & OLSR perform better with respect to TORA. In future we try to design new routing protocol whose performance will not effected to much by increasing traffic load because due to large traffic much of the information lost.

7. ACKNOWLEDGEMENTS

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