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Comparative Analysis of Wired and Wireless Lan Network QOS Using OPNET as Simulation Tool

Kumar Gaurav Bachlas [*1], Prabhjot Kaur [2]
ECE Department Baba Banda Singh Bahadur Engineering College Fatehgarh Sahib (PB), India
Kumarzone.gaurav@gmail.com

Abstract

As already studied about wired LAN and wireless LAN networks. Both these types of networks have their own importance means own advantages and disadvantages. Wired LAN network has different hardware requirements and range and benefits are different. On the other hand wireless LAN takes in to consideration the range, mobility and the several type of hardware components needed to establish a wireless network. In this paper comparative analysis of wired and wireless LAN network has been studied means the quality of service (QoS) for both the networks has been estimated by using OPNET as simulation tool.

Keywords: Wired LAN, Wireless LAN, Quality of service (QoS), OPNET

Introduction

Networks have grown like weed over past few years. Rapid changes have taken place in the field of wired and wireless networks. Each of these type of networking has their advantages and disadvantages according to the security. The wired networks provide a faster and secure means of connectivity but the need of mobility means anytime, anywhere and anyone can access is tilting the network users toward wireless network technology. In this paper Quality of service parameters like traffic sent, traffic received, delay and throughput has shown for both the networks. And conclusion has been drawn after analyzing all the Quality of service parameters at some where wired networks are preferred and at some where wireless networks are preferred. Wired networks play a important role as already discussed it provide high speed connectivity but due to the limitations like extensive cabling and immobility wireless LAN technology have gained momentum. Now a day's computer networks are not only wired but wireless too, depending on the type of conditions like need of mobility, rough terrains, or secure networks. In case of ranges wired LAN provides a connection speed of 10 Mbps to 100 Mbps or higher. Typically the range of a wired network is within a 2,000 foot radius. On the other hand range of wireless LAN technology depends upon the four transmission standard; 802.11, 802.11a, 802.11b and 802.11g which will be discussed later.

Wired LAN

Wired local area network (LAN) includes several technologies Ethernet, token ring, token bus, FDDI and ATM LAN. Wired networks are also called Ethernet networks are the most common type of local area network(LAN) technology. A wired network is simply a collection of two or more then two computers, printers, and other devices linked by Ethernet cables. Ethernet is the fastest wired network protocol, with connection speed of 10 mega bits per sec to 100 Mbps or higher.

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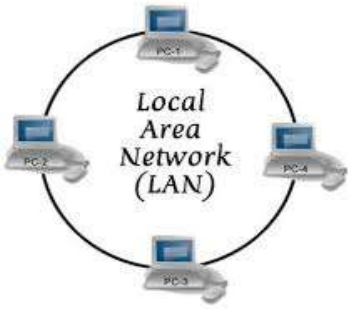

FIGURE: 1 Wired network

To connect a computer to a network with an Ethernet cable, the computer must have an Ethernet adapter sometime called a network interface card (NIC). Ethernet adapter can be internal or external. Some computers include a built-in Ethernet adapter port, which eliminates the need for a separate adapter. The benefit of wired LAN is that bandwidth is very high and that interference is limited through direct connections. Wired networks are more secure and can be used in many situations; corporate LAN, school networks and hospitals. The biggest limitation to this type of network is that it must be rewired every time it is moved.

Wireless LAN

A wireless LAN which uses high frequency radio waves in place of wires to communicate between nodes is another option for home or business networking. Wireless technology allows for devices to be shared without networking cable which increases mobility but decreases range. Also wireless communication is more flexible data communication system implemented as an extension or as an alternative for a wired communication. It has been developed to provide users in limited geographical area with high bandwidth and similar services supported by the wired local area network (WLAN).

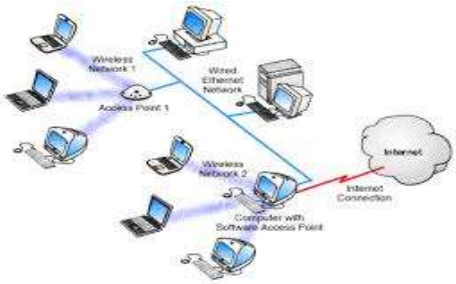

FIGURE 2: Wireless LAN

Above figure: 2 represents two wireless networks first one is wireless network 1 which is known as infrastructure wireless network and second one is wireless network 2 which is known as ad-hoc or peer-to-peer wireless network. An ad-hoc or peer-to peer wireless network made up of number of computers each equipped with a wireless networking interface card represents in figure 3 . Each computer can communicate directly with all of the other wireless enabled computers.They can share files and printers this way, but may not be able to access wired LAN resources , unless one of the computer act as a bridge to the wired LAN using special software.

FIGURE 3: Ad-hoc or peer-to-peer wireless network

Another type of wireless LAN is infrastructure wireless network consists of an access point or base station represents in figure 4. In this type of network the access point acts like a hub, providing connectivity for the wireless computers. It can connect or bridge the wireless LAN to a wired LAN, allowing wireless computer access to LAN resources, such as file servers or existing internet connectivity.

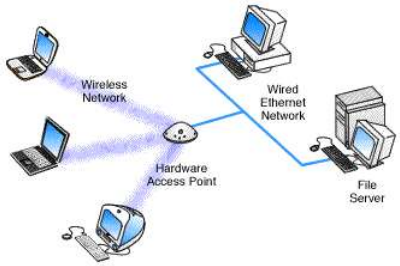

FIGURE 4: Infrastructure wireless LAN

Ranges, speed and frequency of wireless LAN depends upon the four basic types of transmission standards; 802.11, 802.11a, 802.11b, 802.11g. These types are produced by the Institute of Electrical and Electronics Engineers (IEEE). 802.11 and 802.11b are the slowest at 1 or 2 Mbps and 5.5 and 11 Mbps respectively. They both operate off of the 2.4 GHz radio frequency. 802.11a operates off of a 5 GHz frequency and can transmit up to 54 Mbps and the 802.11g operates off of the 2.4 GHz frequency and can transmit up to 54 Mbps. Wireless networks are reliable but when interference occur it can reduce the range and quality of signal. But on the other hand, many wireless networks can increase the range of the signal by using many different types of hardware devices. A wireless extender cab be used to relay the radio frequency from one point to another without losing signal strength. But still one drawback occur with wireless extender that it extends the signal, but the transmission speed will be slowed.

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Quality of Service (QoS)

Quality of Service is the overall performance of a computer network particularly seen by the user of the network .Quality of Service (QoS) enables a network administrator guarantee a minimum bandwidth for certain classes of traffic and limit the maximum bandwidth for certain classes of traffic. It is the integral part of wired and wireless LAN. In this paper, Quality of Service (QoS) has been checked for both networks. Various parameters such as Traffic sent, Traffic received, delay and throughput under Quality of Service were analyzed .

OPNET (Optimized Network Engineering Tool)

OPNET is a software that provides performance management for computer networks and applications. It is first introduced in 1986 and currently there are about 2700 OPNET users. It is an object oriented general purpose network simulator. Basically it provides a comprehensive modeling environment for unique specification, simulation and analysis of the performance of computer network.

Simulation Scenarios

There are two scenarios model used in this paper one for wired and other for wireless LAN network and two other scenarios one indicate the configuration for application definition and other indicate the configuration for profile definition.

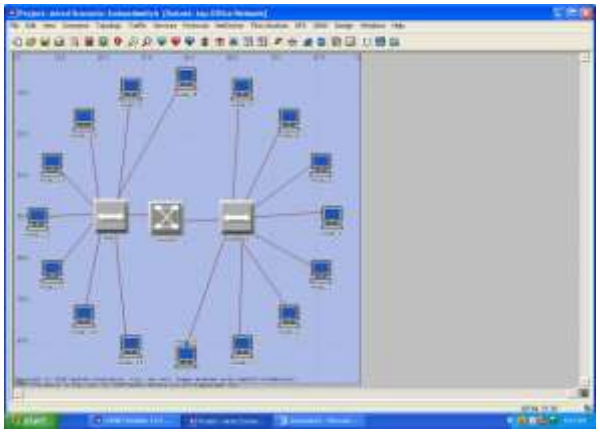

FIGURE: 5 Wired LAN or Ethernet Wired Network

FIGURE: 6 Wireless LAN

FIGURE: 7 Application Definition in Wireless LAN

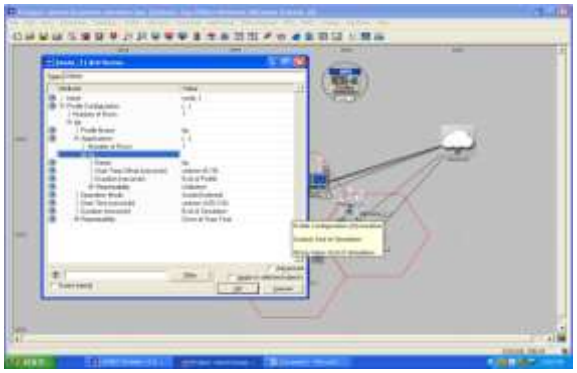

FIGURE: 8 Profile Definition in Wireless LAN

Results

In this paper, the Quality of Service parameters were estimated for the above simulation scenarios. Firstly, the analysis of Wired Ethernet Network was done in which different parameters like delay, Traffic sent, Traffic received, Throughput were analyzed and same parameters for wireless LAN were analyzed later on

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Simulation Setup	
OPNET 14.5 Simulator	
Area	11*11 km
Nodes	16
Simulation Time	60 minutes

For Ethernet Wired network or Wired LAN

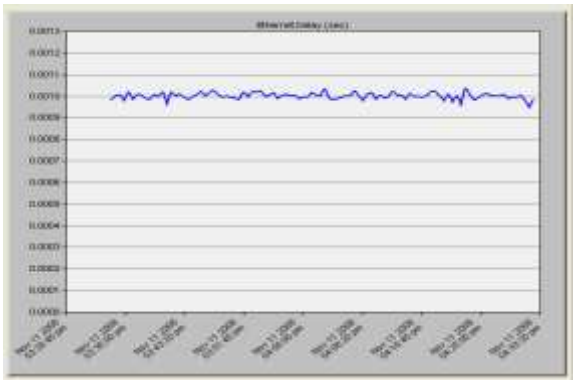

FIGURE:9 Delay for Wired LAN

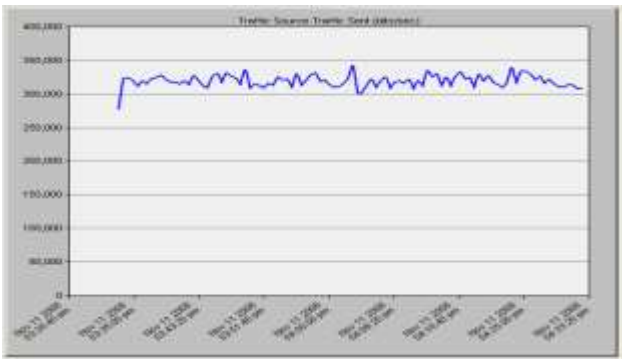

FIGURE: 10 Traffic Sent

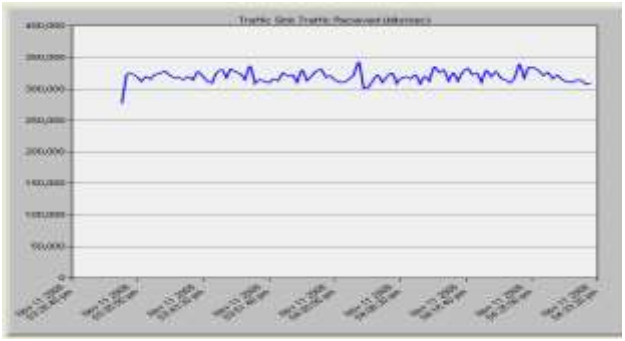

FIGURE:11 Traffic Received

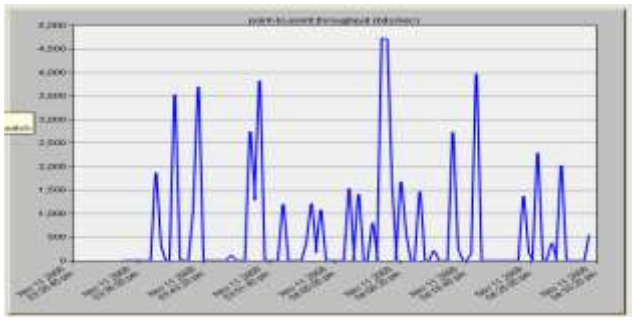

FIGURE: 12 Point-to-Point Throughput

For Wireless LAN

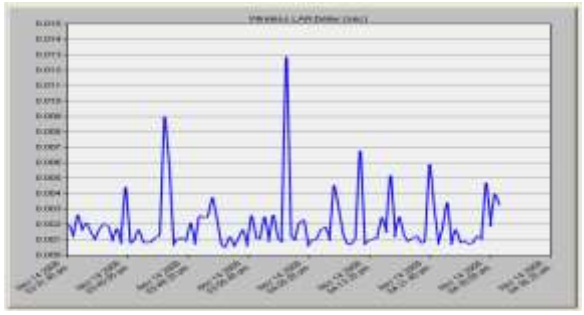

FIGURE: 13 Delay for Wireless LAN

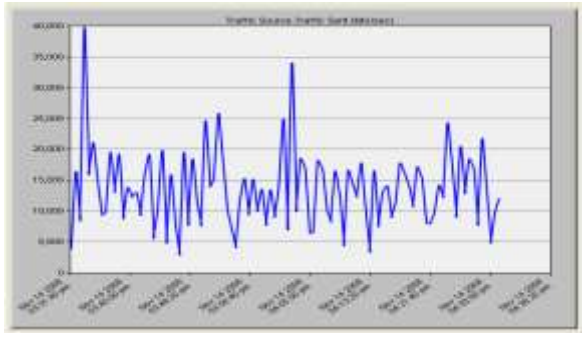

FIGURE: 14 Traffic Sent

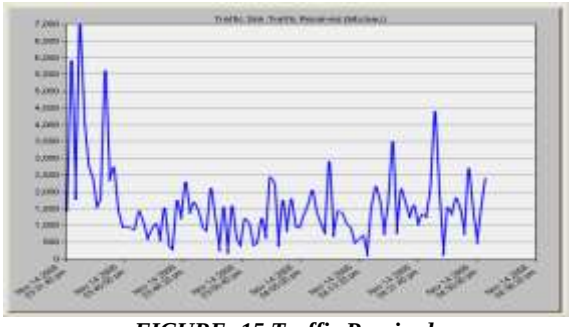

FIGURE: 15 Traffic Received

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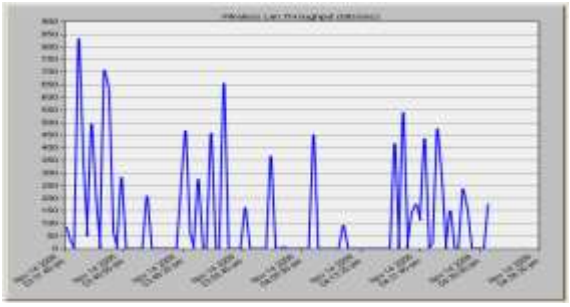

FIGURE: 16 Throughput

Conclusion

This paper gives the comparative analysis of both the networks using the network simulator OPNET. After analyzing all above results it has been investigated that the performance of wired network is better in case of delay because delay is very low in case of Wired LAN as compare to Wireless LAN. So, in case of low delay and less interference Traffic sent and Traffic received is same in case of Wired network but in case of Wireless LAN peaks in graphs represents that Traffic sent is more but Traffic received is less in case of Wireless LAN. But one important advantage of Wireless LAN is that it provides mobility means anywhere, anytime and anyone can access. So, due to this Wireless networks also achieve preferences.

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