

# PERFORMANCE ANALYSIS OF WIRELESS NETWORK TOPOLOGIES IN WLAN BY USING OPNET

<sup>1</sup>Dr A V N CHANDRA SEKHAR,<sup>2</sup>Nalamati Venkata Satya Pavan Sai Teja,<sup>3</sup>Vangapandu Charan Kumar,<sup>4</sup>K Bhagya Lakshmi

<sup>1</sup>Professor,<sup>2</sup>Student,<sup>3</sup>Student,<sup>4</sup>Student

<sup>1</sup>Information Technology,

<sup>1</sup>Sasi Institute of Technology and Engineering, Tadepalligudem, India

**Abstract :** Wireless networks can be accomplished by adding Access Points (APs) which is known as infrastructure mode or without an AP which is known as Adhoc mode. Both bring about several issues, the design must be care-fully considered before it is deployed. There are many factors that are affecting the performances of Wireless Local Area Networks (WLAN) topologies designed for network. In this paper we investigating and analyzing the performances of two types of WLAN topologies namely; Basic Service Sets (BSSs) and Extended Service Sets (ESSs). Both BSS and ESS are categorized as Infrastructure mode i.e. they require AP or APs before they can function. The two types of WLAN topologies were modeled with an Optimized Network Engineering Tool (OPNET) into scenarios. There are connections between APs, switch and application server which host application of high priority. The simulation was performed with real-time video conferencing with variations in numbers of users, and data rate in megabit per seconds. Performance metrics such as throughput, and delay were measured and closely analyzed to see which connection maintain its Quality of Service (QoS).

**IndexTerms - WLAN, OPNET, QoS, Topologies, BSS & ESS.**

## I. INTRODUCTION

Wireless networks are a awfully necessary a part of communication recently as everyone need to own access to info at anytime and anyplace. There has been a rise of usage of wireless devices that has created it potential for users to own connections anyplace thus, the requirement to continue study the performances and limitations of wireless networks. A wireless LAN (WLAN) pro-vides network property between devices, additionally referred to as stations, by exploitation ra-dio because the communication medium. [5] All devices that communicate over WLAN change to the interfaces and proce-dures outlined by the IEEE 802.11 standards. [6] There area unit four varieties of wireless networks namely: Wireless native space Network, Wireless Personal space Networks, Wireless Metropolitan Network and Wireless Wide space Networks. In this paper, we have a tendency to shall be analyzing the performances of 2 varieties of Wireless native space Network (WLAN) topologies exploitation Optimized Network Engineering Tool (OPNET) tutorial Edition. 2 varieties of WLAN topologies are modeled, namely; BSS and ESS, into situation one and 2 severally, every modeled situation can have the quantity of users dynamic in their various net-works. There'll be associate degree application of high priority traffic, a high priority in an effort to put high demand on the modeled network resources. it's as a result of its load ought to have a sway on the QoS of the 2 designed networks.[7] An important network parameter rate in Mbps are created constant initially on all the networks because the application is being suffered. the information rate can currently be varied with constant users thus on analyze effectively however they perform and investigate that of the connections maintains its QoS. The aim is to live the performance metrics like turnout and delay that confirm the QoS of a network..

## II. LITERATURE SURVEY

The capability of a wireless network to produce sensible QoS is extremely necessary in to-day's world, therefore so it's to run most priority. [8]Since it defines a system with sensible transmission quality, service convenience and minimum delay. It's necessary for America to check the dependability performance of our LAN topologies network applications because of growing numbers of audio and video being sent over a packet-switched network. Er. Ishu Gupta and Er Perminder Kaul work on comparative output of Wi-Fi and LAN LANs, wherever they compare the performance of each wired and wire-less networks supported varied performance parameters with variation in variety of users. [1] Providing QoS in LAN networks has been an excellent challenge within the past and continues to be. The challenges related to providing QoS square measure various; however the largest challenge for ancient networks has been congestion. However, more challenges exist for wireless and mobile networks. [9] Therefore, a very completely different set of QoS techniques square measure needed for wireless networks than for wired networks. In 1G network and 2G networks like world System for Mobile Communication GSM and CDMA, there was only 1 facet of QoS, and its voice, i.e., providing quality speech was a serious concern. [2] The main purpose of this paper is associate degreealyze} however the 2 kinds of {wlan|wireless local square measure network|WLAN|wireless fidelity|Wi-Fi|local area network|LAN} topologies respond once their networks are subject to an application that needs high information measure such a video conferencing. During this work, we tend to shall be OPNET to implement BSS and ESS with IEEE 802.11n normal.

## III. IMPLEMENTATION AND DESIGN IN OPNET

The simulation of the designed network was allotted mistreatment the OPNET machine. [3]the 2 wireless local area network topologies were sculptural, into 2 main eventualities, state of affairs one is for infrastructure mode BSS and state of affairs two is for infrastructure mode ESS. every of the eventualities can have their knowledge rates and range of users varied, and therefore the results measured and recorded, however the applied application remains constant for all eventualities and during this case, video conferencing is applied.

### 3.1 Scenario 1, Infrastructure mode (BSS)

In this scenario, the network was modelled with one AP, an Ethernet server which hosts the application. Figure below shows a modeled BSS with eight users.

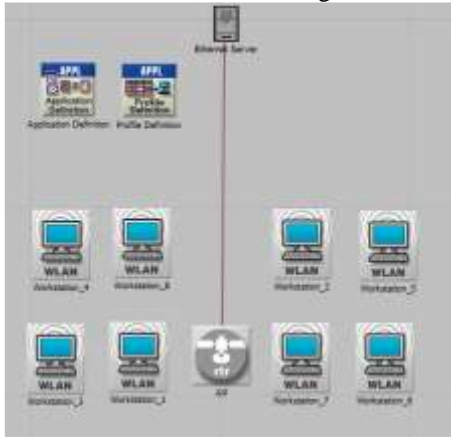


Fig: Infrastructure mode BSS with 8 users

After modeling BSS, both profile definition and application definition need to be configured. The application definition is used to define or specify the type of application to be used, while the profile definition profiled the defined application for it to be hosted by the Ethernet server.

### 3.2 Scenario 2, Infrastructure mode (ESS)

In this scenario there are two APs in the network, with their BSS Identifier set to 1 and 2 respectively. The AP and the workstation are configured as shown in the case of BSS with four workstations set with BSS Id 1 and the other with BSS Id 2. Each AP now has four users each. An Ethernet switch is then used to connect the two APs together with an Ethernet server. Figure below shows a modeled ESS network with eight users.

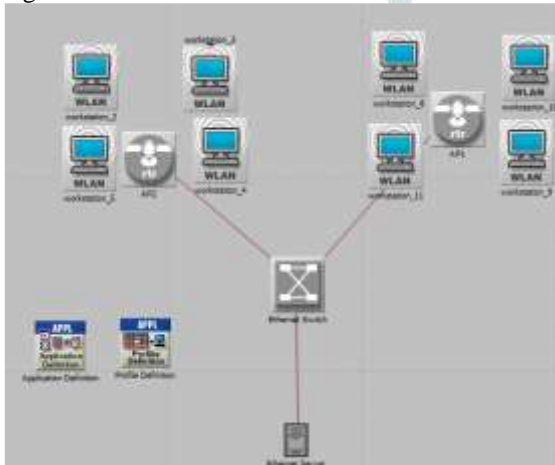


Fig: Infrastructure mode (ESS) with 8 Workstations

## IV. SIMULATION RESULT AND ANALYSIS

### 4.1 Analysis of Scenario 1 Case 1(WLAN Throughput)

In this case the numbers of users keeps on changing while both the data rate and buffer sizes remain constant for four and eight users. As figure 15 below shows, the blue graph represents the four users, while the red graph represents the eight users. Both graphs rise sharply before they become stable, but that of four users rises above that of eight users. If the end of the blue graph is traced to the vertical axis, the value is found to be approximately 51,000,000bits/sec which corresponds to 51 Mbps. If the end of the red graph which represents eight users is traced to the same vertical axis, it is found that the value is approximately 23,000,000 bits/secs, which is 23 Mbps. The results show that as the number of users by is doubled, the throughput is also decreased to more than half its original values for BSS mode network.



Fig: Throughput for BSS Case 1.

#### 4.2 Scenario 1 Case 1 (WLAN Delay)

The graph in figure shows the WLAN delay at varied number of users, the blue graph represents four users. The red graph represents eight users, if the end of both graphs are traced to vertical axis, it can be seen that the delay for four users is approximately 0.0075s while that of eight users is approximately 0.023s. The result shows that a higher number of users experienced more delay which eventually has an impact on the network as its throughput was also reduced to almost half than that of lower number of users.

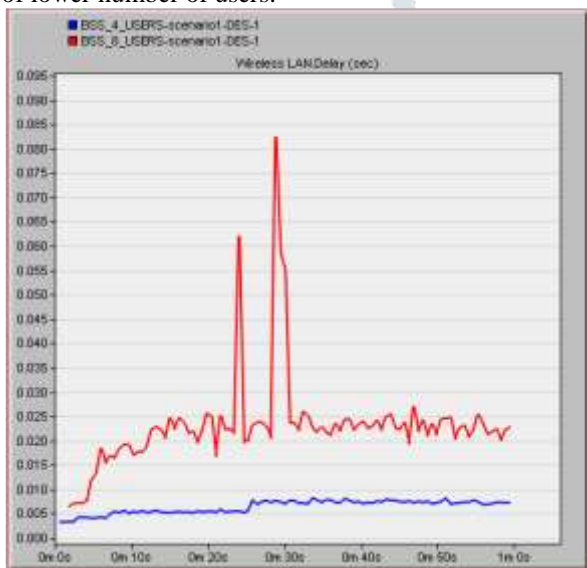


Fig: WLAN delay for BSS Case 1

#### 4.3 Scenario 2 Case 1 (WLAN Throughput)

From the graph in figure (below), by tracing both the red and blue graphs to vertical axis it can be seen that, at four users the throughput equals 45 Mbps. As the number of users is increased to eight from four, the throughput dropped to 37 Mbps, this signifies that as more users were on the network its throughput reduced. It can also be seen that both graphs rise rapidly before becoming stable.



Fig: WLAN Throughput for ESS Case 1

#### 4.4 Scenario 2 Case 1 (WLAN Delay)

The WLAN delay graph as shown in figure (below) shows that at four users, the delay for ESS is 0.0054. When the number of users is increased from four to eight, the delay rises to 0.014. It shows that as more users descend on the network, the delay experience also increases.



Fig: WLAN Delay for ESS Case 1

#### V. CONCLUSION

In this paper work the performances of 2 varieties of LAN topologies, BSS and ESS, are evaluated supported performance metrics, outturn and delay. We've investigated however these 2 varieties of LAN topologies reply to AN application that needs timely packet and information delivery with spare band-width. From the results obtained when the simulation, it had been shown that at different situations the performance metric changes. Ad hoc network was born from implementation as its outturn is simply too low to be enforced. Consistent with Dr. Jarmo Prokkola of convergence Networks Laboratory, IEEE 802.11 isn't an awfully sensible protocol for spontaneous networks. It can, therefore, be all over that because the range of users will increase, the through-put is reduced in each BSS and ESS. Because the range of users will increase, there's a rise in delay for each BSS and ESS. Once the info rate is hyperbolic in each BSS and ESS, there's a rise in outturn as information ar delivered a lot of precisely and at a quicker rate. When the amount of users doubles, the outturn in BSS born by approximately five hundredth whereas at constant in ESS, its outturn solely born by approximately V-J Day. All-time low price of delay expertise is for ESS at sixty five Mbps rate. The overall outturn of BSS is encouraging at four users, however step by step loses its QoS because the range of users will increase. It will currently be all over that ESS would be appropriate for an outsized network with a lot of users which ESS has additionally managed to take care of its QoS.

#### VI. FUTURE SCOPE

Future work for this paper work would be to analyze however each BSS and ESS respond once enforced with mobile flight, in such the simplest way that the mobile40 nodes will move at an outlined speed and on an outlined flight path whereas the performance metrics square measure measured.

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