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Wi-Fi 802.11g VS Wi-Fi 802.11n: Comparative study from a QOS Point of View

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Abstract: ***The main challenge in the development of future wireless communication systems is to provide users with a wide range of services (allow the user access to multimedia information efficiently) across different radio access technologies. This paper presents some comparison between Wi-Fi 802.11 g\n In term of throughput, delay and load using opnet simulator. This paper gives in details a description for each technique and the frequencies used and the extent of coverage and its advantages and disadvantages.***

Keywords: performance, IEEE 802.11g/n, Delay, throughput, load, Wi-Fi.

1. Introduction

Wi-Fi (Wireless Fidelity) is a technology that allows for many electronic devices (laptops or PDAs) of the to send and receive data wirelessly from any location equipped with Wi-Fi access. Radio waves are used for bulk data transfers In computer networks wirelessly. Recently we have witnessed the development of multimedia, especially with audio and video content (in real-time multimedia transfers). Successful transmission of such content over computer networks require utilizing the network resources more efficiently. So it was important to pay attention to the quality of the service and its important role in the evolving wireless network.

1.1 Overview of Wi-Fi 802.11g and Wi-Fi 802.11n:-

802.11g (Wi-Fi):

802.11 is a set of IEEE standards (Institute of Electrical and Electronics Engineers), is a technology that has revolutionized in computer networks (allowing to computers and digital devices to communicate without the need for wires).
Currently there are five major types of Wi-Fi, known as 802.11a, 802.11b, 802.11g, 802.11n and 802.11ac, We use these versions

To provide wireless connectivity in the home, office and some commercial establishments. [2]

802.11b,802.11g the two most common and oldest types, the 802.11g standard offers high bandwidth 54 Mbps on the 2.4 GHz frequency range using OFDM (orthogonal frequency division multiplexing), in a fashion that permits interoperation with 802.11b devices, meaning that devices that support the 802.11g standard can also work with 802.11b. [1]

802.11g is backwards compatible with 802.11b, meaning that 802.11g access points will work with 802.11b wireless network adapters and vice versa. [3]

Pros of 802.11g - fast maximum speed; signal range is good and not easily obstructed. [4]

Cons of 802.11g - costs more than 802.11b; appliances may interfere on the unregulated signal frequency. [4]

802.11n (Wi-Fi):
802.11n (also sometimes known as " Wireless N ") was designed to improve on 802.11g in the amount of bandwidth supported by utilizing multiple wireless signals and antennas (called MIMO technology) instead of one. 802.11n also offers a somewhat better range over earlier Wi-Fi standards due to its increased signal intensity, and it is backward-compatible with 802.11b/g gar. [3]

IEEE 802.11n Its purpose is to improve network throughput over the two previous standards 802.11a and 802.11g with a significant increase in the maximum net data rate from 54Mbit/s to 600Mbit/s with the use of four spatial streams at a channel width of 40MHz. [6] [7] 802.11n standardized support for multiple-input multiple-output and frame aggregation, and security improvements, among other features. It can be used in the 2.4 GHz or 5 GHz frequency bands. [5]

The modulation scheme used in 802.11g is orthogonal frequency-division multiplexing (OFDM) using MIMO and CB.

Pros: Fastest, maximum speed, best signal integrity, resistant to signal interference from outside sources.
Cons: More expensive than 802.11g and use of multiple channels may interfere with other 802.11 b/g networks. [4]

The mechanism of QOS improvement in Wi-Fi:-
Wi-Fi uses a QOS mechanism based on contention access all subscriber stations that wish to pass data through a wireless access point (AP).

Both 802.11 (which includes Wi-Fi 802.11g\n) define Peer-to-Peer (P2P) and ad hoc networks, where an end user communicates to users or servers on another Local Area Network (LAN) using its access point or base station. However, 802.11 supports also direct ad hoc or peer to peer networking between end user devices without an access point.
Although Wi-Fi are designed for different situations, they are complementary.

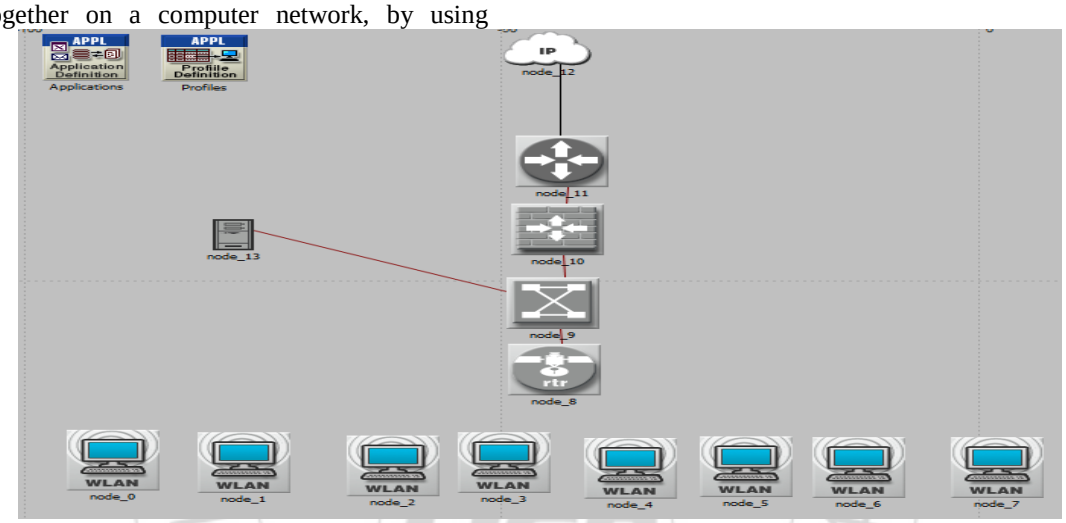
2. Network Description

The goal of the simulation:
Comparison of QOS parameter in different generations of Wi-Fi and particular Wi-Fi 802.11g & Wi-Fi 802.11n to decide which one of better.

Network:
The network consist of:

- **Firewall:** is a network security system that controls the incoming and outgoing network site, As they protects the network from viruses**.**
- **Server:** We gave the permission to the server to access to all services.
- **Router:** is a device, used in computer networking, Used for routing.
- **Switch:** is a computer networking device that connects devices together on a computer network, by using packet switching to receive, process and forward data to the destination device**.**
- **Mobile station (MS):** is the basic component in the network, These can Appliances connect to resources a network such as the Internet via a wireless network access point.
- **Access point:** such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. Hotspot coverage can comprise an area as small as a single room with walls that block radio waves, or as large as many square kilometers achieved by using multiple overlapping access points. Access point connected with switch and router through cable and all these devices is connected to IP cloud**.**

Network scenario applied to 802.11g\n standards, Fig (1) Show Below.



- **After we run the scenario we get these results:**
- **Average Delay In All Scenarios Fig (2) shows below**

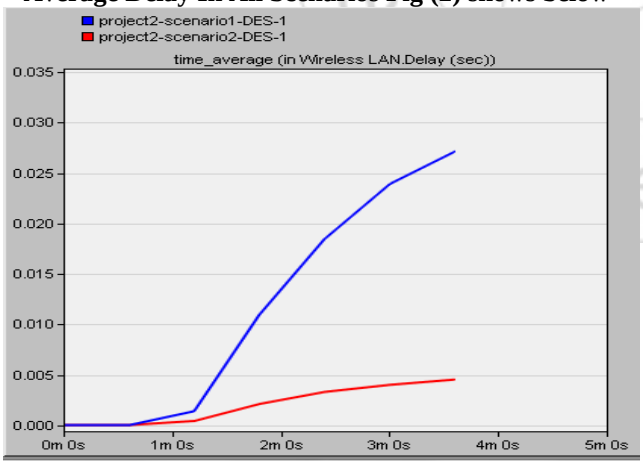


Figure 2: Shows that the delay in Scenario 1 is higher than that of Scenario 2.

Average throughput In All Scenarios Fig (3) shows below

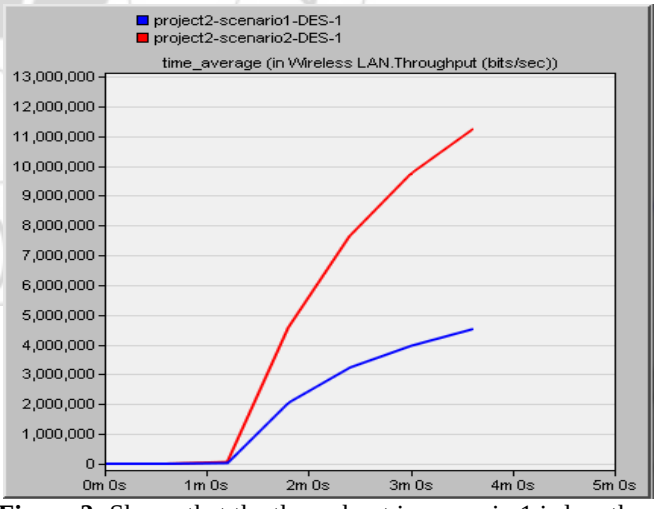


Figure 3: Shows that the throughput in scenario 1 is less than that of scenario 2.

Average load In All Scenarios Fig (4) shows below

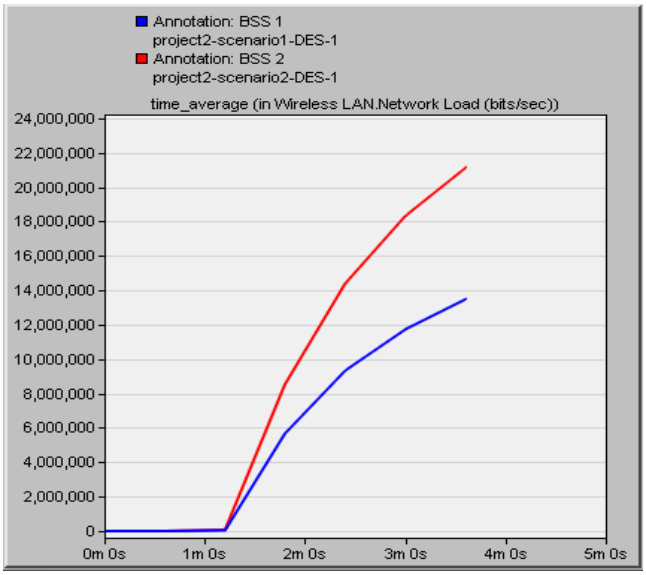


Figure 4: Shows that the load in Scenario 2 is higher than that of Scenario 1

3. Discussion

After reviewing the results Of scenario (802.11g,802.11n) it is found that the 802.11n is better than 802.11g. This is valid for delay analysis, throughput and load. The preference of Wi-Fi 802.11n over Wi-Fi 802.11g is due to the following reasons:

1) Fastest speed and best signal range.
2) Compatible with 802.11a/b/g.
3) Delay less than 802.11g.
4) High throughput.

4. Conclusion

This paper presents a compartive study between 802.11n and 802.11g.

The comparison relies on simulation runs to evaluate QOS performance of the two techniques according to delay, throughput and loading levels.

Simulation results show that, Wi-Fi 802.11n is better than 802.11g as far as the above mentioned metrics are concerned.

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