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Comparison of Wireless Networks using Algorithms

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***Abstract*—Growth of Public mobile communication and tendency to provide similar wireless services in indoor environment reacts on the activities in the area of wideband wireless local access, and Wireless Local Area Networks (WLAN) architectures and protocols. The IEEE 802.11 WLAN standard has been developed to provide high bandwidth to mobile users in a short-range indoor environment. Apart from mobility, it should provide some QoS guarantees, for certain set of services. This Paper Analyse the modelling and implementation of Wireless Networks Using QoS Algorithms using different parameters based on OPNET Modeler. In this review of network was given using different priority queues ie algorithms. In this one network is used but different algorithms had been implemented and thus the results are obtained.**

Keywords— ***WLAN, MDRR, DWRR, FIFO, Infra-Red, FTP, VoIP, HTTP, Email, Database.***

I. INTRODUCTION

Wireless local area networks (WLANs) is being widely studied and used in numerous research domains such as mobile and pervasive computing, where WLANs provide high-speed wireless connection and support accessing information from anywhere and anytime. WLANs[1-6] support a wide range of applications, which may include simple applications such as web browsing, file transferring, etc and the other ones, for instance, real-time multimedia applications (e.g., video streaming and video conferencing).WLANs bring the user closer to the promise "anything, anytime, anywhere" of future technology.

802.11 is the approved standard for wireless local area network by IEEE. The IEEE approved this standard in 1997. The standard defines a physical layer (PHY), a medium access control (MAC) layer, the security primitives, and the basic operation modes [7].

We have chosen simulative tool- OPNET Modeler for our research because of the several benefits it offers over the other contemporary tools available. It provides the set of complete tools and a complete user interface for topology design and development. Another advantage of using it is that it is being extensively used and there is wide confidence in the validity of the results it produces. We parameterized the simulation model based on enterise site measurements, and validate the model adjacent to WLAN performance metrics using simple FTP, HTTP, VoIP, Email and Database workload models. It was used to investigate the various performance metrics in wireless LAN.

In this more stress was laid on the QoS as well as on the scaling factor. We used first-in-first-out(FIFO), deficit weighted round robin(DWRR) and modified deficit round robin(MDRR) [9]. In my last paper i discussed the network with queues but in this paper their is addition of scaling factor instead of three subnets six were introduced to check the network performance.

The basic principle of **FIFO queuing** is that the first packet that arrives at a router is the first packet to be transmitted. An exception here happened if a packet arrives and the queue is full, then the router ignores that packet at any conditions [9].

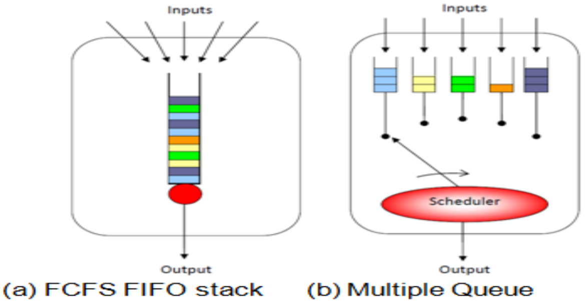

Figure 1: FIFO

Deficit Weighted Round Robin (DWRR) Deficit round robin (DRR) also called DWRR [8]. M. Shreedhar and G.Varghese proposed DRR in 1995. It can handle packets of variable size without knowing their mean size. A maximum packet size number is subtracted from the packet length, and packets that exceed that number are held back until the next visit of the scheduler.

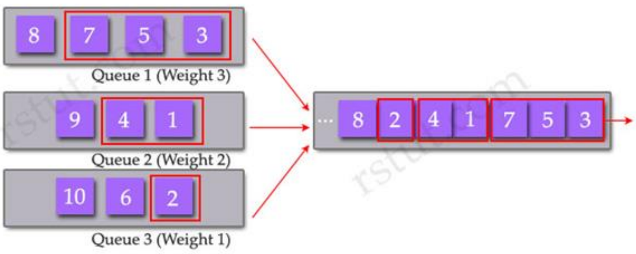

Figure 2: DWRR

Modified Deficit Round Robin (MDRR) MDRR scheduling is an extension of the previously mentioned DRR scheduling scheme [9].There may be different modifications of the DRR scheme and hence the name is MDRR. The algorithm depends upon the DRR scheduling fundaments to a great extent, however, in MDRR the quantum value given to the queues is based on the weight associated with them.

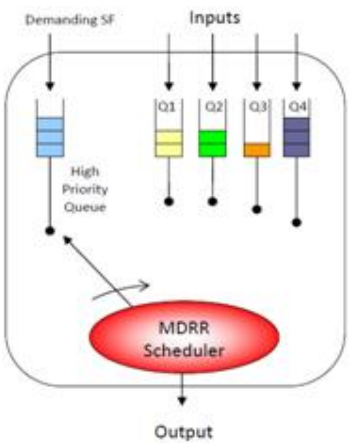

Figure 3: MDRR

Table. 1

Difference between FIFO, MDRR and DWRR			
FIFO		DWRR	MDRR
1	Simplest	Complex	Complex
2	Output comes one by one.	Output follows Robin Round Service Algorithm.	Output follows Robin Round Service and Priority Queue Algorithm
3	No Queue Recognition principle followed	Recognition principle followed	Recognition principle followed
4	Response time is low	More Response time	More Response time
5	No Priority is given to packets	No Priority is given to packets	Priority is given to packets

After briefing the introduction in section I, Section II introduces our model and section III is the conclusion.

II. MODEL OUTLINE

Models representing different Queues are as shown:

Network 1: In this scenario wireless network consist of six subnets in one building and other six subnets in second building which are considered as six different departments of the Enterprise Network as shown in figure 4. In this FIFO is implemented in the network. LAN structure for all the subnets/departments are the same shown in figure 7.

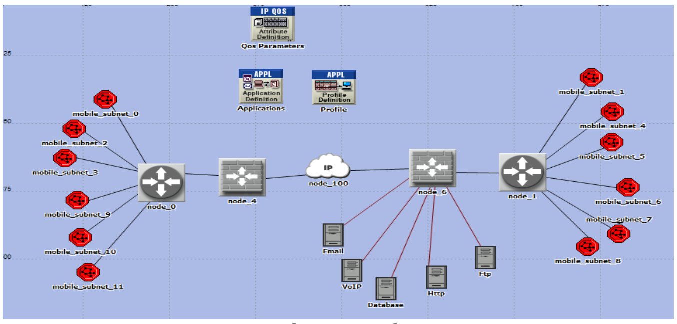

Figure 4: Wireless Network Using FIFO

Network 2: In this wireless network the network layout is same as above wireless network. In this scenario we investigated MDRR algorithm to improve the performance of the wireless network as shown in Figure 5.

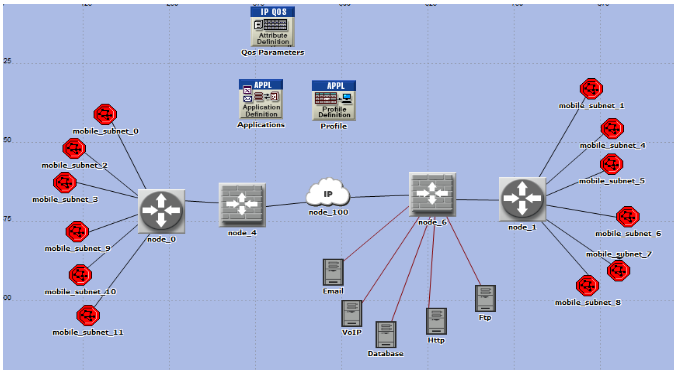

Figure 5: Wireless Network Using MDRR

Network 3: In this wireless network the network layout is same as above wireless network. In this scenario we investigated DWRR algorithm to improve the performance of the wireless network as shown in Figure 6 .

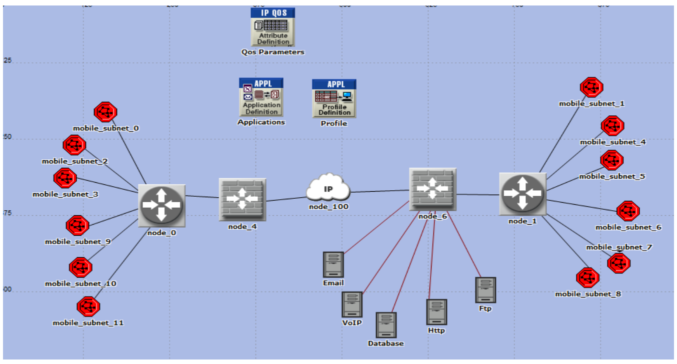

Figure 6: Wireless Network Using DWRR

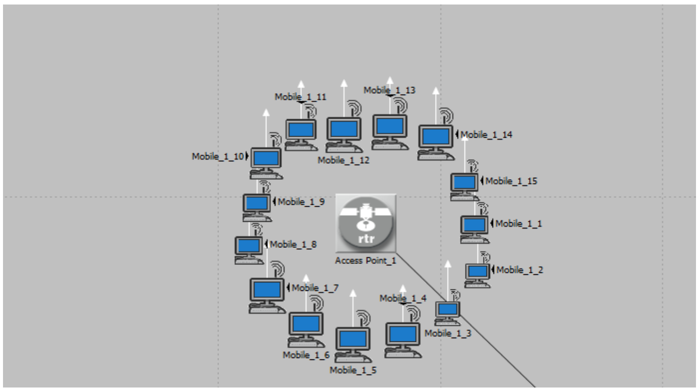

Figure 7: Subnet

Same layout for subnet are used for all networks which we made above in figure 8.

III. SIMULATION RESULTS

We have closer performance metrices:

- **Jitter :** If *Tc(i)* is the difference between the times when packets *i* and *i* + 1 were created at the source node and *Tp(i)* is the difference between the times when packets *i* and *i* + 1 were played back at the destination node, then
  Jitter = Tp(i) – Tc(i).
- **Delay:** This statistic records the average network-wide delay in seconds experienced by all TCP packets. It is measured from the time an application layer packet is sent from the source TCP layer until it is completely received by the TCP layer in the destination node.
- **MAC:** This statistic records the medium access delay experienced by the packets submitted for transmission on all WLAN interfaces in the network. This value is computed as the interval from the time the packet was inserted into the transmission queue until the time when the packet was sent to the physical layer for the first time.
- **Throughput:** This statistic records the amount of data forwarded from WLAN layers to higher layers in all WLAN nodes of the network.
- **Retransmission Attempt:** This statistic records the total number of retransmission attempts by all WLAN nodes in the network.

The network was run for four different scenarios and the performance of different parameters have been analysed. Five graphs were selected after simulation which is shown below:

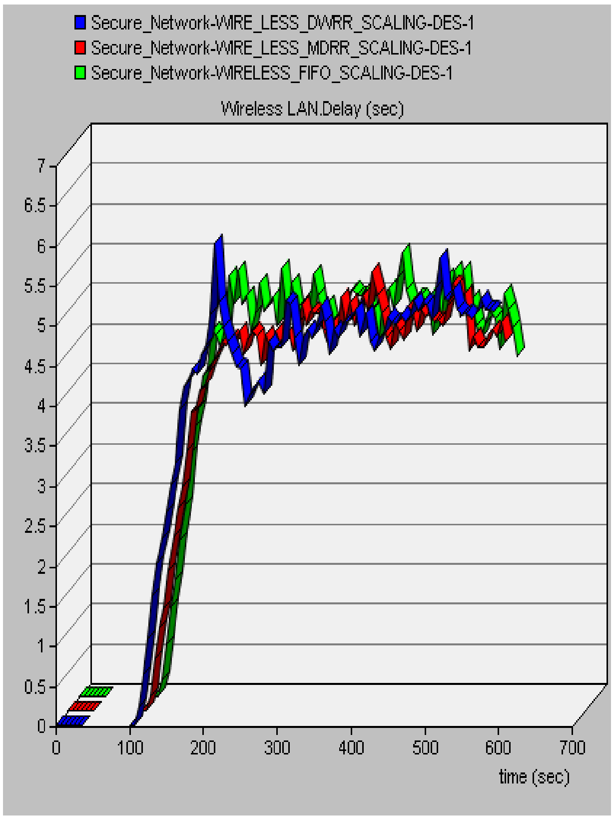

Figure 8: Wireless LAN Delay (sec)

From figure 8 the WLAN Delay decreases nearly 3% using MDRR and increases 0.8% in DWRR. We observed in with FIFO algorithm average value is 4.0973s while in MDRR it is 3.9772s and in DWRR it is 4.1292s with respect to transmission time from Table no. 2.1.

Table 2.1
Wireless LAN Delay (sec)

Parameters	Network Design	Average Value
Wireless LAN Delay (sec)	**Wireless with FIFO** **Wireless with MDRR** **Wireless with DWRR**	**4.0973** **3.9772** **4.1292**

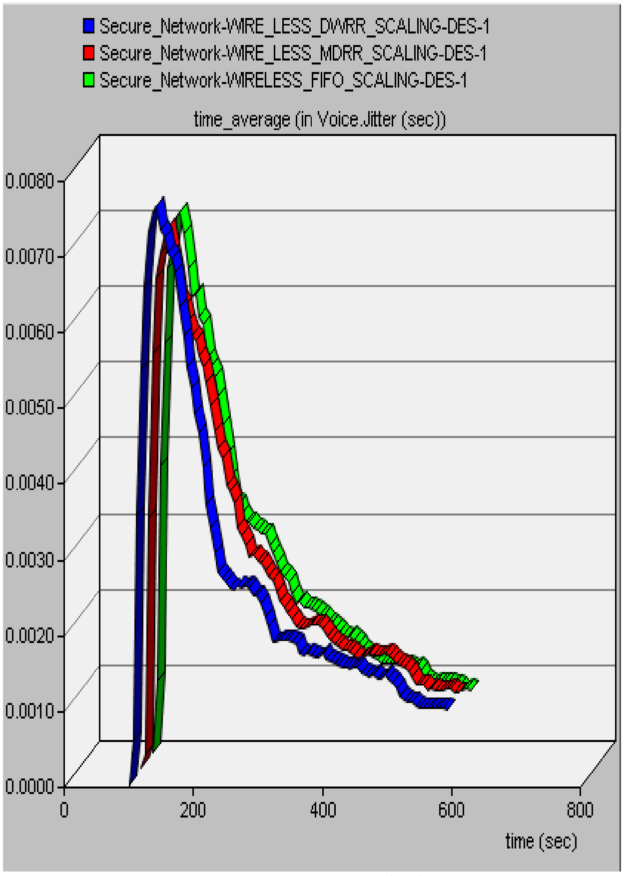

Figure 9: Voice Jitter (sec)

From figure 9 the voice jitter increases nearly 21% using MDRR and increases 16.2% in DWRR. We observed in with FIFO algorithm average value is 0.000862s while in MDRR it is 0.001043 and in DWRR it is 0.001002 with respect to transmission time from Table no. 2.2.

Table 2.2

Voice Jitters (sec)

Parameters	Network Design	Average Value
Voice Jitters (sec)	**Wireless with FIFO** **Wireless with MDRR** **Wireless with DWRR**	0.000862 0.001043 0.001002

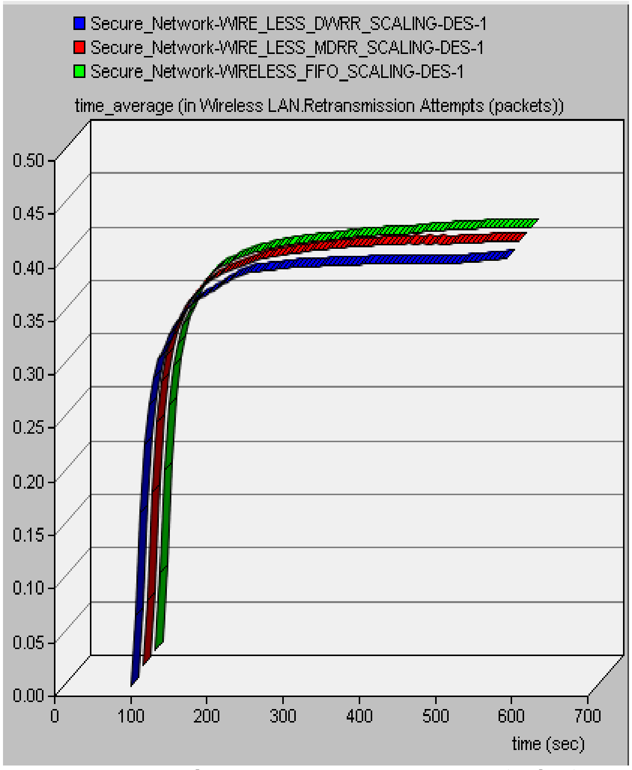

Figure 10:Wireless LAN Retransmission Attempts (packets)

From figure 10 the WLAN Retransmission Attempt it increases nearly 0.05% using MDRR and decreases 0.9% in DWRR. We observed in with FIFO algorithm average value is 0.41154s while in MDRR it is 0.41180s and in DWRR it is 0.40775s with respect to transmission time from Table no. 2.3.

Table 2.3

Wireless LAN Retransmission Attempt (packets)

Parameters	Network Design	Average Value
Wireless LAN Retransmission Attempt (packets)	**Wireless with FIFO** **Wireless with MDRR** **Wireless with DWRR**	0.41154 0.41180 0.40775

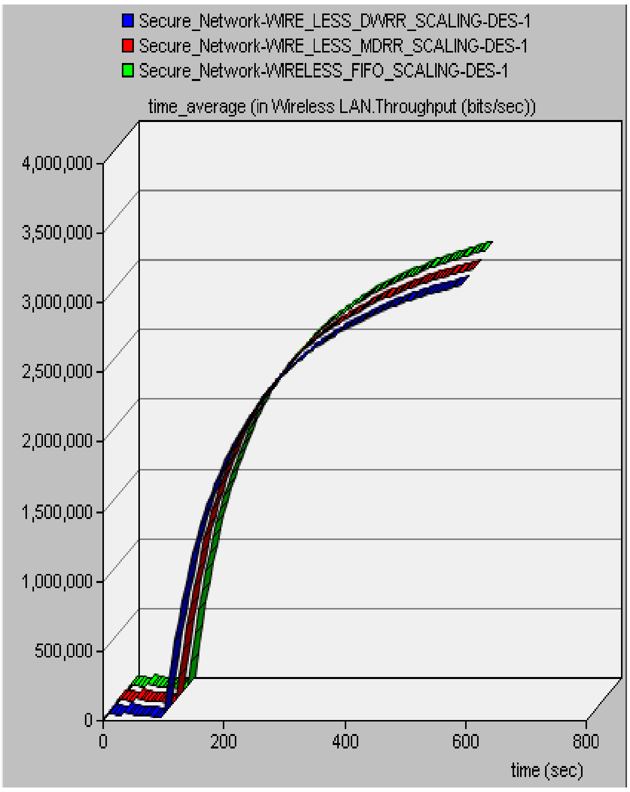

Figure 10:Wireless LAN Throughput (bits/sec)

From figure 10 the WLAN throughput decreases nearly 0.9% using MDRR and decreases 2.5% in DWRR. We observed in with FIFO algorithm average value is 3167047 b/s while in MDRR it is 3136962 b/s and in DWRR it is 3119211 b/s with respect to transmission time from Table no. 2.4.

Table 2.4
Wireless LAN Throughput (bits/sec)

Parameters	Network Design	Average Value
Wireless LAN Throughput (bits/sec)	**Wireless with FIFO** **Wireless with MDRR** **Wireless with DWRR**	3,167,047 3,136,962 3,119,211

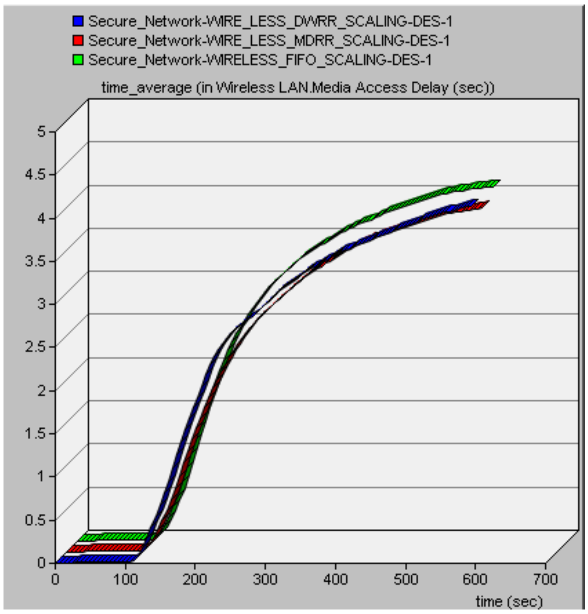

Figure 11:Wireless LAN Media Access Delay (sec)

From figure 11 the WLAN MAC Delay decreases nearly 3% using MDRR and increases 0.8% in DWRR. We observed in with FIFO algorithm average value is 4.1051s while in MDRR it is 3.9847s and in DWRR it is 4.1360 with respect to transmission time from Table no. 2.5.

Table 2.5
Wireless LAN Media Access Delay (sec)

Parameters	Network Design	Average Value
3. Wireless LAN Media Access Delay (sec)	**Wireless with FIFO** **Wireless with MDRR** **Wireless with DWRR**	4.1051 3.9847 4.1360

IV. CONCLUSION

In this paper different parameters were analysed based upon their different applications. Our main concern behind the network scaling was to check whether after scaling Algorithm provides better results or not. After Simulation through the OPNET Modeller, from the statistics or the graphs we come to a point that FIFO and MDRR algorithm provide us with the best results even if the network is scaled. All results of simulations were shown up in the tables from 2.1 to 2.5 along with the figures from 8 to 11. So, it proved to be a booning aspect for our network and overall Percentage impacting in better result varies by 5 to 6 %.

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