Optimization of Scheduling Information in a Network-Based Standard IEEE802. 17 and Measurement for Video Transmission

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ABSTRACT:
One of looped networks that in recent years has been much noticed is standard known as IEEE 802.17 RPR ring network or the return packet. Architecture RPR ring network protocol that transmits data between nodes connected in a double ring structure to support. RPR has two single transit buffer structure (STB) and double transit buffer (DTB), respectively. Single transit buffer architecture, just a high-priority traffic buffering (HP) and low priority (LP) passing through the ring buffer architecture serves and double, two separate buffer for high-priority and low priority traffic is considered passing. Send information for scheduling algorithms used in network nodes RPR, queue priority (Priority-Queue), respectively. In this way, the separation of traffic based on priority and high priority traffic has absolute priority over lower priority traffic so that always the highest priority to transit buffer appropriated therefore of high priority traffic such as video packet, the nodes access to congested suffered numerous delays and instability vibration are ring (Jitter). In this thesis addition to scheduling priority queue, plans, schedules DRR and DRR + to increase the quality of service to traffic with high priority on congested node in a network with a ring structure with 10 nodes software Opnet simulation and the performance timing of passing information about at least two network nodes in the hub scenario (hUB) in which all the nodes transmit information to a node with video traffic conditions, congestion were examined happened and qualitative results were compared to that, the display shows the relative improvements in reducing delays and instability shaking changes in the timing of DRR and DRR + compared to the recommended standard.

KEYWORDS: return- closed loop network scheduling priority queue-scheduling DRR- timing DRR+.

1. INTRODUCTION

By the Institute of Electrical Engineers IEEE 802.17 RPR architecture with standardized network protocol that transmits data between nodes in the ring is connected in a double ring structure support. RPR protocol packet networks to meet the needs in the future and has developed a reactionary mechanism, flexible and effective packet traffic on the network. The architecture supports 256 nodes and 2,000 km of circles with a maximum optimized environment [2], [3].

Among the characteristics of networks, RPR, reuse of space, bandwidth efficiency, easy management, resiliency, scalable, and such benefits RPR network to regional and local alternative to high-speed networks is made. RPR has two ring-buffer architecture is passing single and double transit buffer [2], [3], [4], [5]. For both architecture, a buffer is high priority and low priority in the Client. In architecture, STB, a Transit buffer, high priority traffic and low priority traffic on the loop combination.

In architecture DTB, two HP and LP for traffic transit buffer is intended. When the traffic is out of the loop, if the current node is reserved Drop by the way the buffer pass (in the structure of STB) or in the buffer crossed with high priority or low-priority transit buffer in accordance with its classification (on the DTB) Placed. More details is in reference [1].

2. BACKGROUND RESEARCH

RPR networks, each node is connected to two rings and a full duplex communication out there. In the IEEE802.17 standard based on the number line that is considered to accommodate passing traffic in two different designs for MAC is proposed.

2.1. MAC architecture with single transit buffer

In this design, only one column is intended to accommodate cross frames in the queue original password which is said in low combined in the same buffer. Traffic buffer has the highest priority.

2.2. MAC architecture with double transit buffer

The design of the two lines is intended to accommodate cross frames. They will be A frames that service class (high priority) will be entered into a queue to which PTQ is said and frames that their service class B or C (low priority) enters the queue to another queue are the so-called secondary passage.

3. METHODS

Queuing mechanisms used in the continuous and non-continuous network in two general categories divided.

3.1. Round Robin queuing method

In this way, instead of an infinitely small amount, accumulated a package of services is any connection. Round robin is one of the disadvantages of Packet Switched networks with different packet length does not serve packages are fair and more bandwidth to service the queues with packets with a length greater.

3.2. Bitwise Round Robin method

If the contrast Round robin, single discharged from the queue instead of packets, bits be considered, each independent of the size of the packages 1/N capacity allocated. This is the same idea Bitwise Round Robin method. (N is the number of queues or streams.)

3.3. Bitwise Round Robin practice fair queuing

based on the way, serviced list Bitwise Round Robin will be closed completely by the theory being served in the packages based on your completion time are in an ordered list based on the way, serviced list.

3.4. Deficit Round Robin method (DRR)

This algorithm is actually WRR algorithm corrected and can be serve packet length without the need to know the average variable-length packets.in DRR model Weighted-server relationship to the amount of weight multiplied by the amount quantum bits from any kind of relationship serves.

3.5. Improved DRR (DRR +) method

The purpose of this method are bound acceptable delay for real-time traffic. In the DRR + used two classes of service to traffic. For traffic of a class can be used as high-priority real-time communications in the form of practical Bitwise Round Robin queuing service are fair and non-delay-sensitive traffic in a class with lower priority using the DRR serviced. In the timing for both architectures, video traffic (HP posts) can be allocated to it in accordance with the weight regularly have access to the ring. For this reason, quality of service high-priority traffic on the congested node, a significant improvement and thus improving the efficiency of real-time signals sent multimedia and high-priority traffic is generally [1]. Queuing algorithms named DRR and DRR + 2 queuing method as the method used in this article.

4. CONCLUSION

This paper aims to improve network performance for video traffic transmission (HP submissions) with HD quality (720p), which applies network node 9 to see how different timings in both the STB and DTB on the traffic to move to the destination node is checked. For this, a ring network consisting of 10 nodes as shown (a) in OPNET simulation software we are. The three scenarios are designed for network participation. In the first scenario the queue Priority in the second scenario of the third scenario algorithm algorithm and DRR DRR + (and more precisely the algorithm BRR), we use the scheduler nodes.

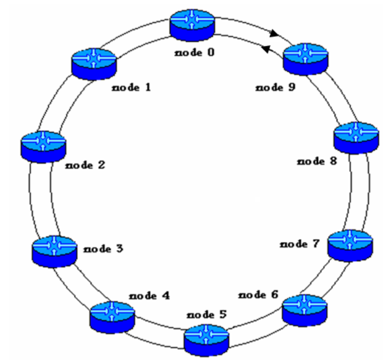

Fig. 1. Topology simulation in software

4.1. Simulation results for the STB

Due to the effectiveness of the algorithms Justice low-priority traffic when congestion occurs, the efficiency of Scheduler to send video projects with two sets of traffic parameters will be evaluated. The first set and the second set caused congestion on the network, network congestion does not occur.

In our simulation, four nodes (6, 7, 8 and 9) depending on the outer ring 10 is sent to the node. Find and study, conducted at 9 knots.

Table 1. The first set of traffic parameters in the simulation scenarios STB

values	values
Link capacity	1Gbit / s
The size of the transmission line	1 Mega bits
packet size	1500 byte

	512 byte
Traffic generated by the nodes 6, 7 and 8	HP: 200 Mbits/s LP: 50 Mbits/s
Traffic generated by the nodes 9	HP: 550 Mbits/s LP: 50 Mbits/s

Table 2. The second set of traffic parameters in the simulation scenarios STB

values	values
Link capacity	1Gbit / s
The size of the transmission line	1 Mega bits
packet size	1500 byte 512 byte
Traffic generated by the nodes 6, 7 and 8	HP: 80 Mbits/s LP: 30 Mbits/s
Traffic generated by the nodes 9	HP: 550 Mbits/s LP: 50 Mbits/s

In the first set of traffic rate for each of the nodes 6-7V 8, 250 Mbits/s is the traffic node 9 550Mbits/s, which is equal to an HD-quality movies in high-priority traffic dominant 50 Mbits/s traffic low priority that then leads to overcrowding, because the node 9 750 Mbits/s to only 9 into the transit buffer node that has the highest priority is also to receive service. On the other hand, the node 9, 550 Mbits/s high priority traffic, but creates a link capacity output node 9 to node 10 only 1Gbits/s is intended In the second set of traffic exchange nodes 6, 7, 8, 110 Mbits/s, which 80 Mbits/s of the high priority traffic and 30 Mbits/s of which belong to priority traffic is low and the node 9 550 Mbits/s high-priority traffic 50 Mbits/s may have low priority traffic.

In the forms, diagrams related to the STB with traditional Scheduler (priority queue) and Scheduler and Scheduler DRR DRR +, respectively STB_ORG and STB_DRR and STB_DRR_PLUS marked. The diagrams related to the instability of vibration (Jitter) and delay variation, the vertical axis plots the buffer size in seconds and the vertical axis is in bits.

4.2. Simulation results on the congested node

The results of simulation video traffic (HP posts) Figure (b) and (c) in order simulation results to change and instability vibration delay (Jitter) video traffic (HP posts) node 9 is observed for all three scenarios.

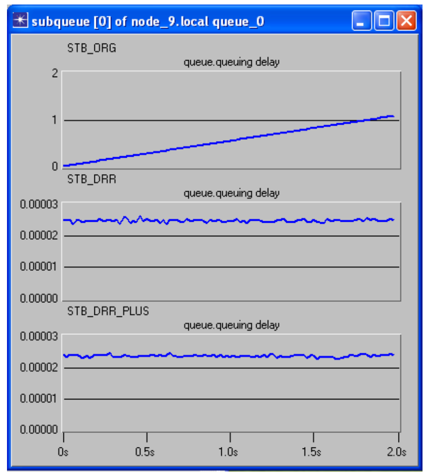

Fig. 2. Delay variation video traffic sent from node 9 for all three scenarios

As seen in this figure, the structure of the STB with the scheduler priority queue, change a lot of video traffic delays because of congestion occurred in node 9 and the volume of passing traffic the highest priority, as much as 4/3 of the capacity of the link-output node .STB with the scheduler in the priority queue until the message in the buffer package for passing traffic is video traffic service does not send data. After the changes are not unexpected traffic delays sending video to be high. Changes in traffic delays sending video for the second and third scenarios is acceptable.

In part (c) instability of vibration (Jitter). With Check Point to Point View is shown that changes in the tremor delay direct relationship with the same points.

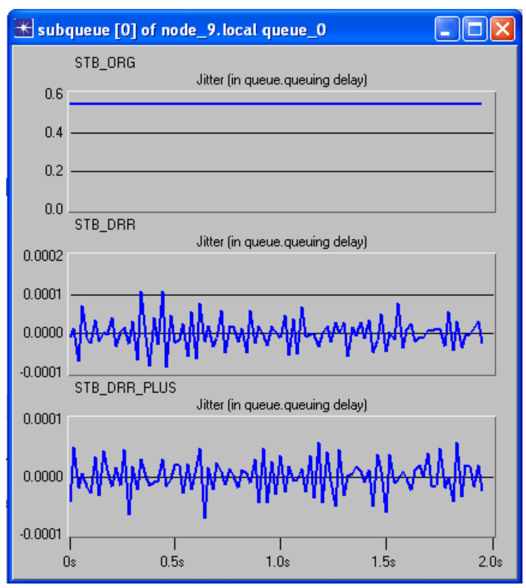

Fig. 3. Jitter video traffic sent from node 9 for all three scenarios

The above figure of improving schedule performance video sending node for traffic in DRR algorithm and DRR + with a delay amount allowed under 20m / s is determined.

4.3. Simulation results for the DTB

According to the expectations raised by the Scheduler DRR +, for the improvement of video traffic (HP posts) against HP transmission and improve traffic flow against the traffic LP LP write, simulation with two sets of traffic parameters do the following. In the first set of traffic exchange nodes 6, 7, 8, 180 Mbits/s which 140 Mbits/s is related to high priority traffic and 40 Mbits/s is owned by low priority traffic. On the other hand, the node 9 550 Mbits/s video traffic

(High priority traffic) and 30 Mbits/s that is a low priority traffic is causing congestion at the node 9 (link capacity output node 9 to node 10 only 1 Gbits/ s is intended).

Table 3. scenarios simulated in the first set of traffic parameters DTB

values	values
Link capacity	1Gbit / s
The size of the transmission line	1 Mega bits
packet size	1500 byte 512 byte
Traffic generated by the nodes 6, 7 and 8	HP:140 Mbits/s LP: 40 Mbits/s
Traffic generated by the nodes 9	HP: 550 Mbits/s LP:30 Mbits/s

Table 4. scenarios simulated in the second set of traffic parameters DTB

values	values
Link capacity	1Gbit / s
The size of the transmission line	1 Mega bits
packet size	1500 byte 512 byte
Traffic generated by the nodes 6, 7 and 8	HP:110 Mbits/s LP: 24 Mbits/s
Traffic generated by the nodes 9	HP: 550 Mbits/s LP:45 Mbits/s

Designed the first set of traffic parameters, traffic Video Post (HP submissions) and HP transit and traffic LP write capacity has saturated link to or on the verge of saturation.

In the second set the rate of traffic at the nodes 6, 7, 8, 134Mbits/s which 110Mbits/s is related to high priority traffic and 24 Mbits/s it belongs to priority traffic is low and node 9 is 550Mbits/s traffic video (high priority traffic) and 45 Mbits/s gives low priority traffic. This traffic parameters don’t causes congestion in the net. If RPR priority queue scheduling scheme is used, the HP transmission buffer is empty. Traffic Video Posted (High priority traffic node 9) has been completed must wait to receive service packages HP traffic be crossed. This means that if you have a large volume of traffic passing HP can access video traffic (HP posts) to make the delayed service.

The RPR priority queue scheduling for the DTB, traffic LP, LP made before the passing traffic gets service. As a result, if the traffic is send a large volume LP, LP traffic can flow available to service disrupted or delayed in the cell.

For the second scenario (DRR algorithm Scheduler node in the structure DTB), weight allocated to high-priority flow is proportional to the Service guaranteed rate it. The remaining portion is allocated to high-priority transit buffer.

The third scenario (DRR + algorithm Scheduler node in the structure DTB) the weight allocated to high-priority flow is proportional to the rate of its guaranteed service. The remaining portion is allocated to high-priority transit buffer. In simulate the weight 1 and weight to high-priority traffic buffer to buffer 9 transit assign high priority. Also weighing 1 to buffer low-priority traffic and low-priority transit buffer weight to assign 9.

These changes are expected, due to quantum assigned to each queue, some computational nodes and hence delay increases overall system but HP absolute priority traffic will be canceled and video traffic passing also will be guaranteed access to services.

The absolute priority traffic LP LP sent to traffic flow will be lifted. HP passing traffic queues and traffic LP write buffer size should be increased to meet the latency created for this is two lines.

The shape of this episode, charts DTB structure Scheduler and Scheduler priority queue and scheduling DRR DRR +, respectively DTB_ORG and DTB_DRR and DTB_DRR_PLUS marked. The charts Delay variation and instability, vibrations, and the vertical axis on the graph corresponds to the size of the buffer in seconds, the vertical axis is measured in bits.

4.4. Simulation results on the congested node

The results of simulation of video traffic (HP posts) The simulation results of delay and instability shake to change video traffic (HP posts) node for all three scenarios in Figure 9 (c) and (d) are shown. The queue for DRR + delay variation observed scenario is much lower than DRR scenario.

It should be noted that in this case occurred but for the traffic congestion in node 9 HP, is normal. The congestion at the node 9 due to high traffic volume passing LP occurred.

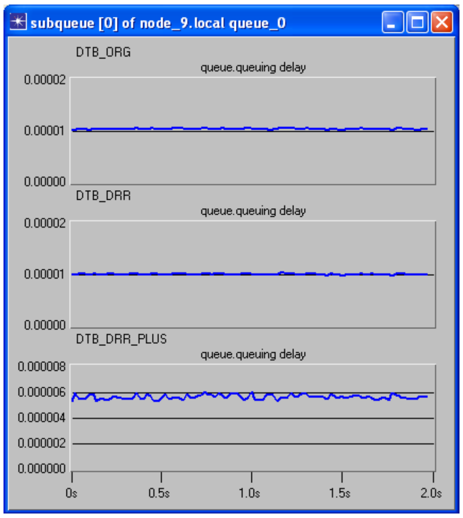

Fig. 4. Delay variation video traffic sent from node 9 for all three scenarios

In the form of (d) volatility vibration (Jitter) on DTB structure Scheduler priority queue, DRR and DRR + is displayed.

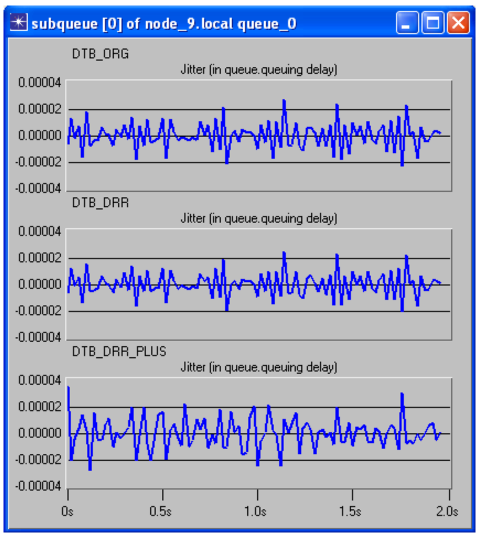

Fig. 5. Jitter video traffic sent from node 9 for all three scenarios

REFERENCES

1. Alharbi, Fahd, Nirwan Ansari, **"Distributed bandwidth allocation for resilient packet ring networks"**, *U.S. Patent No. 7948881. 24*, May 2011.
2. Bonald, Thomas, Sara Oueslati, and James Roberts. **"Technique for communication between a plurality of nodes",** *U.S. Patent No. 8797894. 5*, Aug. 2014.
3. Domzal, Jerzy, **"Congestion control in Flow-Aware Resilient Multi-ring Networks",** *Computing, Networking and Communications (ICNC), 2014 International Conference on. IEEE*, 2014.
4. Francisco, Mark Joseph, et al., **"A comparison of two buffer insertion ring architectures with fairness algorithms",** *Communications, 2003. ICC'03. IEEE International Conference* on. Vol. 1. IEEE, 2003.
5. Ji, Liang, T. N. Arvanitis, and S. I. Woolley, **"Fair weighted round robin scheduling scheme for DiffServ networks"**, *Electronics Letters 39.3* (2003): pp. 333-335.
6. Kao, J., **"Darwin Proposal for IEEE Standard 802.17.",** (2002).
7. Kleinrock, Leonard, and Simon S. Lam, **"Packet switching in a multiaccess broadcast channel: Performance evaluation",** *Communications, IEEE Transactions on 23.4* (1975), pp.410-423.
8. M. Kaiser, **"suggested scheduling information using DRR + node in a network based on IEEE802.17 of standard and comparing the results of simulation in other methods",** *Master Thesis*, 1391, Islamic Azad Majlesi University.
9. Takefman, M. 2004. IEEE Draft P802.17, Draft 3.3. September 20, **"http://www.ieee802.org/17/ performance_committee.htm"**.
10. Tsiang, D., G. Suwala. **"The Cisco SRP MAC layer protocol",** *No. RFC 2892*. 2000.
11. Yilmaz, Mete, Nirwan Ansari, **"Achieving destination differentiation in ingress aggregated fairness for resilient packet rings by weighted destination based fair dropping",** *Computer Networks 62* (2014), pp.43-54.