



Networks and Protocols

BM057-4-3-EN

(Individual Assignment)

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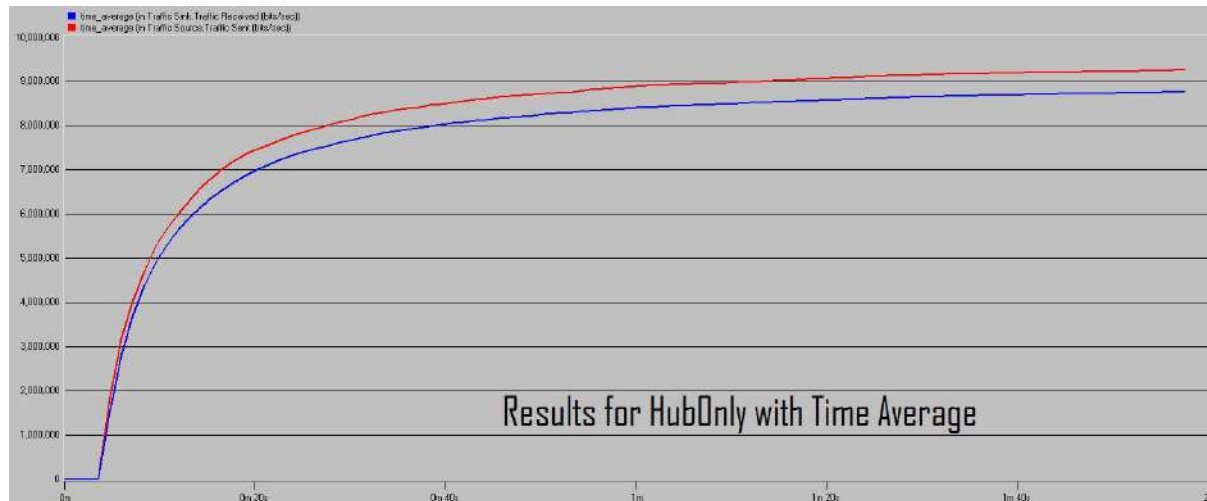
In this lab we will set up Ethernet LANs using hubs and switches. A hub forwards the packet that arrives on any of its inputs on all the outputs regardless of the destination of the packet. A switch forwards incoming packets to one or more outputs depending on the destinations of the packets. We will study which parameters like the type of switching devices used and the configuration of the network influence the throughput and the delay of packets in a network.

In this assignment we will use a star topology network. This means that:

- Each node is centralized to a hub or a switch
- If the centre is going down nothing will work

To set up this project, we had to create scenarios and configure every device used in the network such as the Hub and the Nodes. In this configuration we can obtain this graphic which represents the average traffic generated by every node in the network:





Packet size x 8x 1packet/ interarrival time environ égale à 12,000

We can notice that the average traffic received is approximately equal to 8,700,000 bits/sec whereas the average traffic sent is approximately equal to 9,500,000 bits/sec.

Because the traffic received is inferior to the traffic sent, we can say that there is a loss of information in this network.

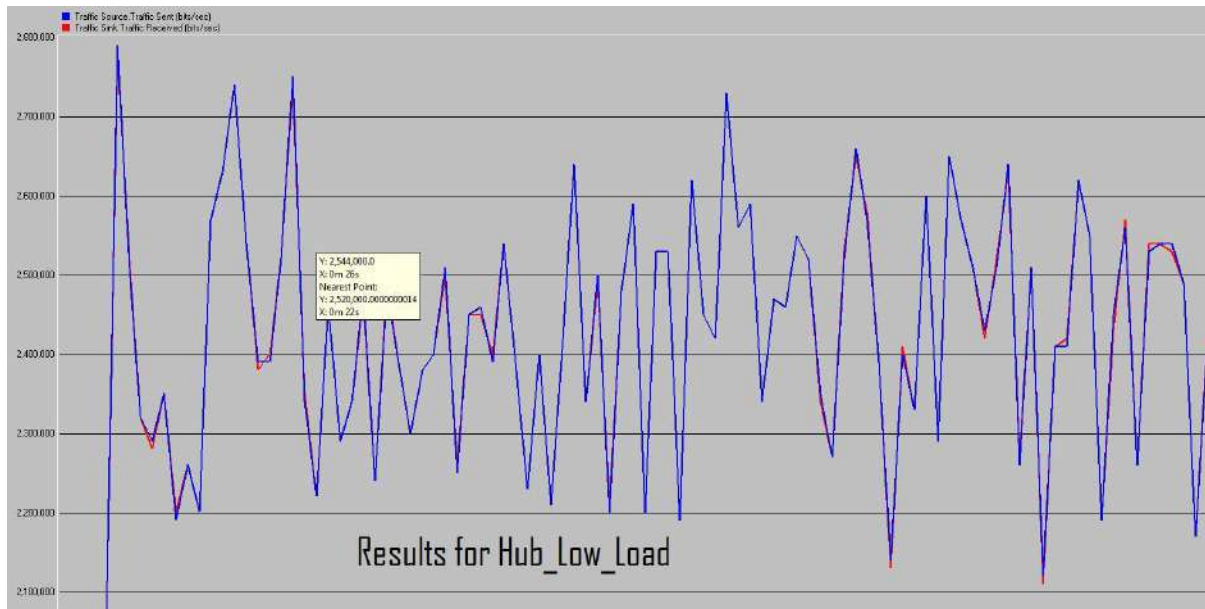
We will try to know why there is a this loss of information and how to reduce it.

Analysis 1 (il faut revoir pour le calcul du trafic)

A hypothesis about this loss of information is that the throughput is too important for the network to transfer every information.

We can derive a new scenario where each Ethernet station will generate less traffic. By changing this parameter from “Inter-arrival Time = exponential (0.02)” to “Inter-arrival Time = exponential (0.08)”.

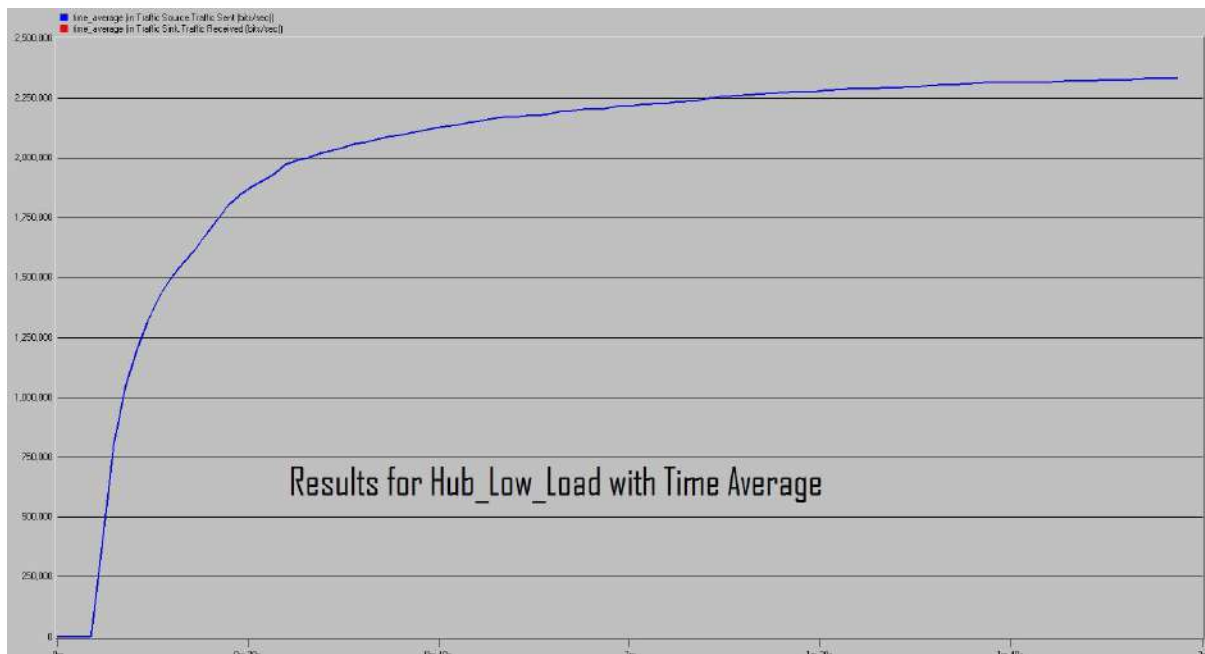
We will see if reducing the throughput affects the loss of information in the network with this graphs :



WTF ????

We can see that the two curves are almost identical : both the average traffic received curve and the average traffic sent curve are approximately equal to 2,450,000 bits/sec. The conclusion is that augmenting the Inter-arrival time reduces the loss of information.

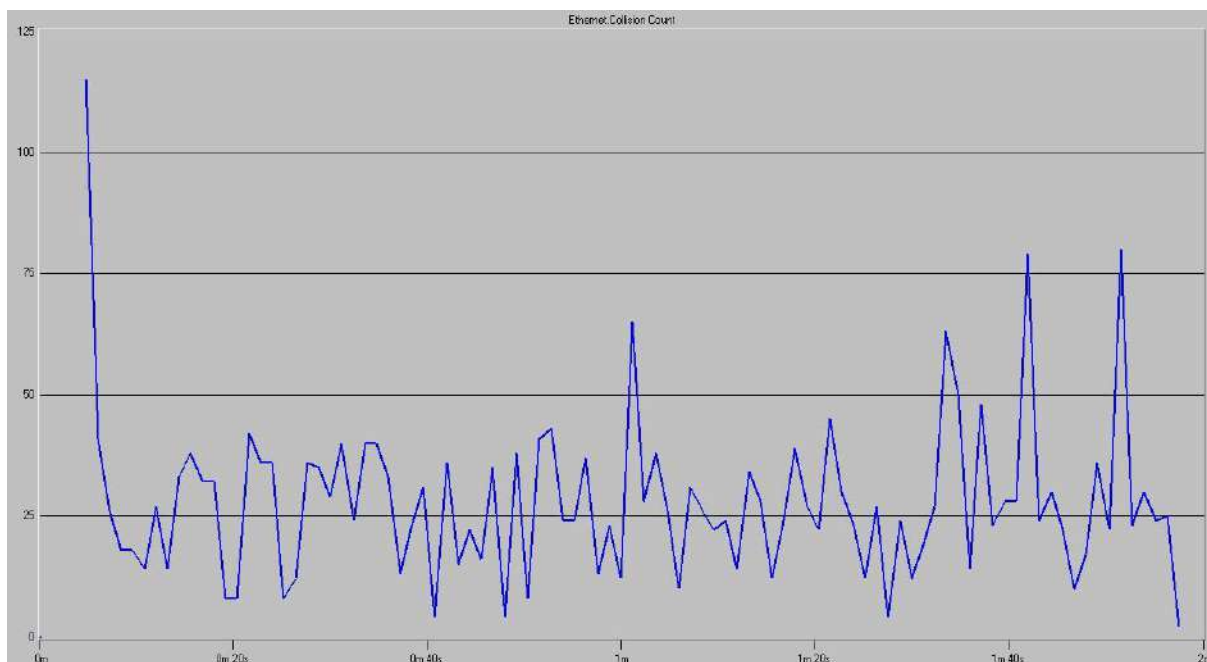
We will now compare the two scenarios : Hub_Only and Hub_Load_Low.



In the first scenario, the curve grows faster than in the second one. As an example, in 1m40sec the time average reaches almost 9,000,000 bits/sec in the first scenario whereas it only reaches 2,300,000 bits/sec in the second one.

We could expect this result because the throughput is slower in the second scenario.

If two nodes send out packets at the same time, a collision occurs and the packets are lost. Then both nodes wait a random amount of time and retransmit the packets. Any part of the network where there is a possibility that packets from two or more nodes will interfere with each other is considered to be part of the same collision domain. The graph below shows collision count in the network which refers to the loss of information.



We can see that the collisions are more frequent when the time increases. Another point is that at the beginning the collision count is very high because every node sends its information.

COMPARER AVEC LE SCENARIO 1

The collision count is lower in the second scenario this is why the network loses less information.

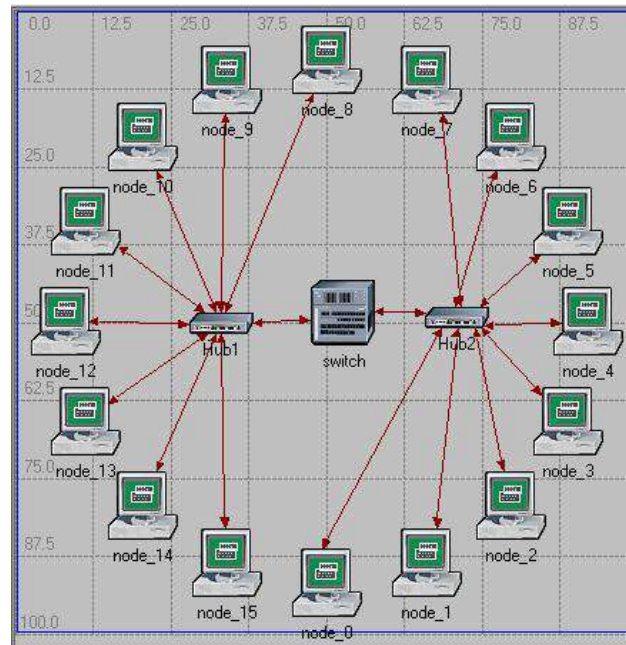
Results of the first analysis :



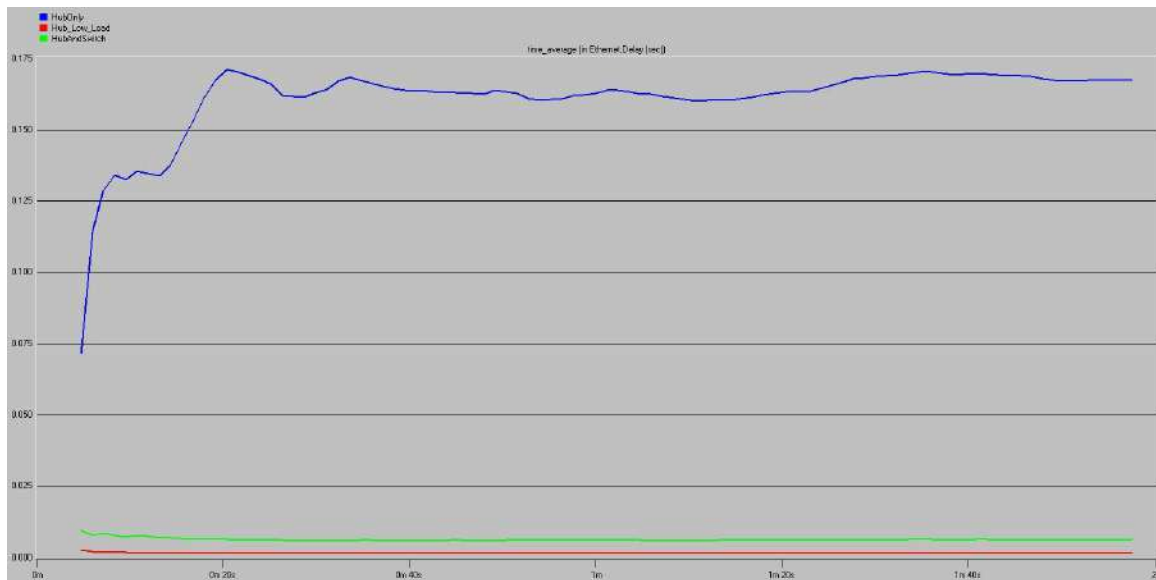
+calculi de merde (cf q4)

Analysis 2

In this new scenario, we will see the influence of a switch in the current network by adding another hub and a switch. With this graph, we can compare the previous scenario and the current one. This lead to a network which looks like this:



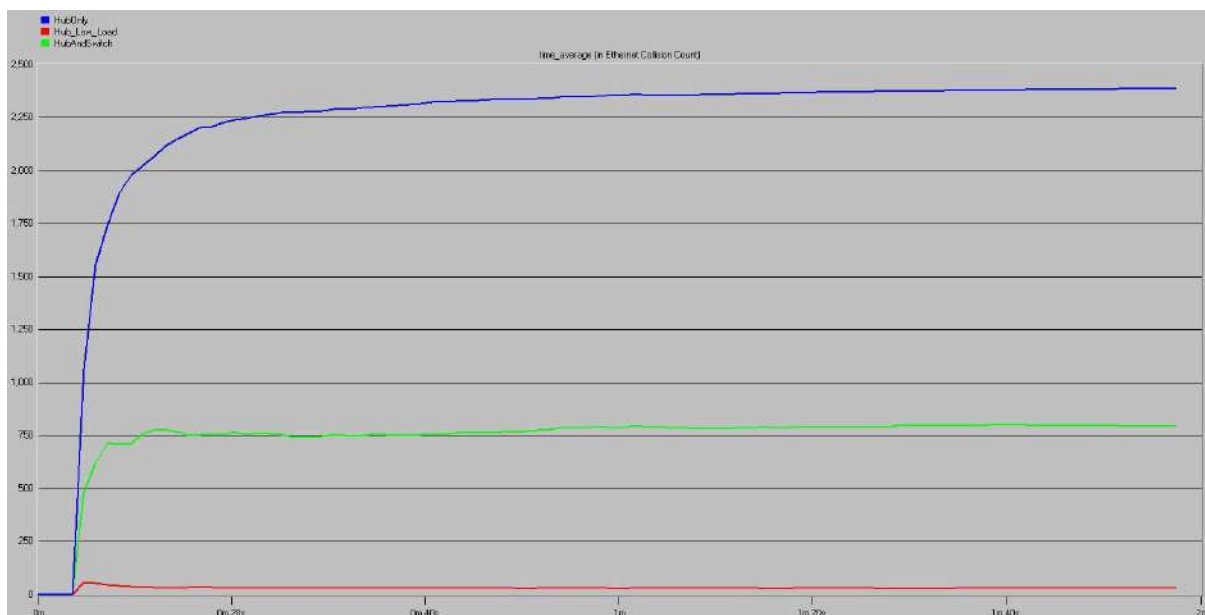
The first thing we can compare is the delay in the network. This means the time computers have to wait before receiving the data they asked for.



We can see that the time average is very low and constant when we use a switch in the network. It is equal to 0,01 sec. In the HubOnly scenario, the time average increase at the beginning and become stable at around 0,162 sec.

Using a switch in a network reduces the delay so it is better to use one.

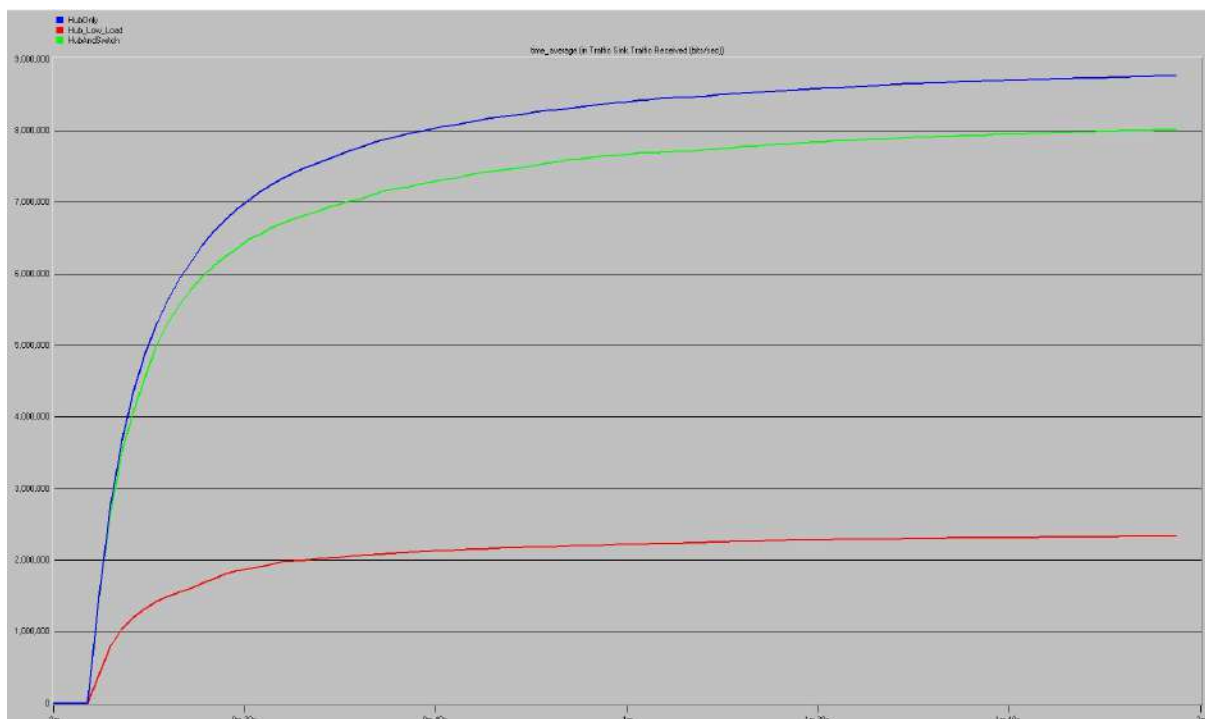
In the previous analysis, we saw that the collisions were responsible of the loss of information. A solution was to reduce the throughput. Does the use of a switch helps to avoid collisions ?



Here is a graph representing the collision count in each scenario. We can see that using a switch reduces by 66% the number of collisions in the network. However it helps, reducing the throughput is a better solution. We can suppose that combine both solution would lead to a better result.

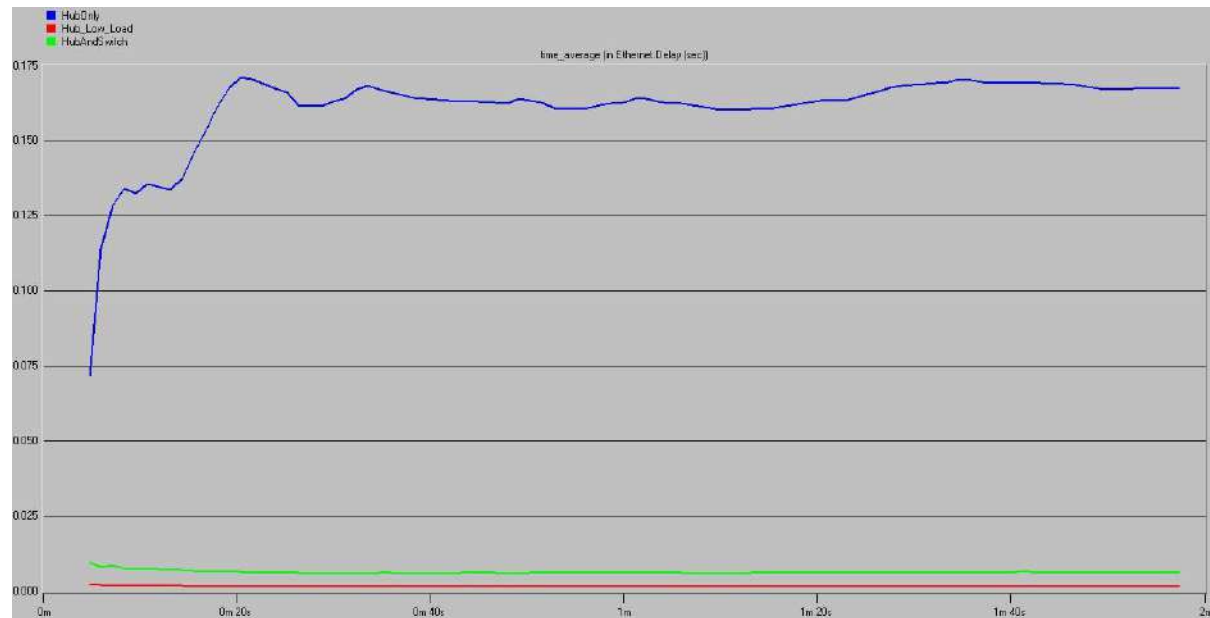
COLLISIONS DOMAINS

Because the number of collision is lower with a switch than without, we can have a look at the traffic received to see its influence.



As expected the traffic received in the HubAndSwitch scenario is just under the traffic received in the HubOnly scenario. The reason is that we have less collisions so there are more data in the network. If there is more data, the time of gather every of them is increased so the throughput is reduced.

To end this analysis, we can compare every scenario we made. The graph below shows the Ethernet Delay in each network



With this graph, we can conclude that the best solution is to use a hub with a low throughput considering the results. In fact, however the HubAndSwitch scenario has a very low Ethernet delay, the Hub_Low_Load one has a lower one.

The reason is that having a low throughput let the network deal with data more easily. It also implies that the network will need more time to deal with every data. It may not be the best solution if we are looking for a network which work quickly and efficiently.

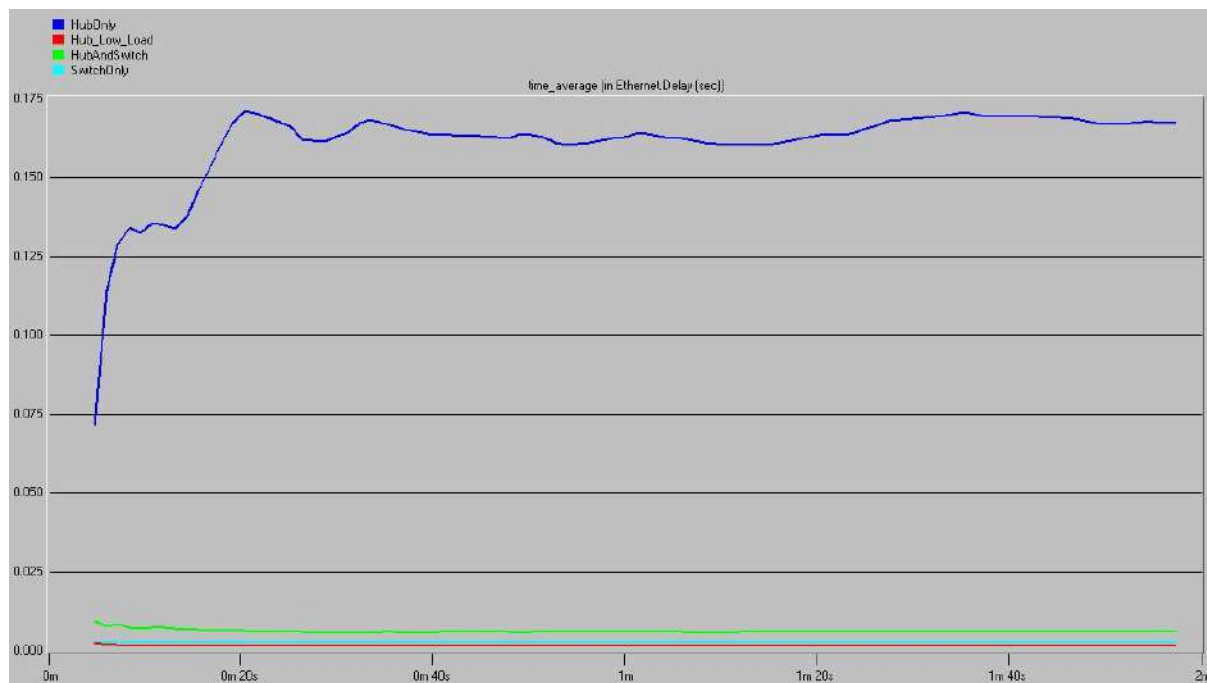
Each solution has its own pros and cons, we have to choose the one which best suits our needs.

Analysis 3

In the previous scenarios we use a hub or a hub and a switch, we can consider the fact of using only switches in the network as another solution.

We made two new scenarios: one to see the influence of using only a switch and the other to see the influence of the number of switches in the network.

When we use only one switch in the network, we obtain the graph below :



The results show that using only a switch is better than combine a switch and a hub in the network. But the Ethernet delay in the Hub_Low_load scenario is still the lowest.

When we add another switch in the network, the results obtained are :

GRAPHIQUE

+

COMMENTAIRES

+

CONCLUSION

Conclusion

In this assignment we studied the influence of many combination of components to see which one is the best considering many factors. We have also seen the influence of reducing throughput in a network and how the collisions affects the efficiency of a network.