

Networks and Protocols

BM057-4-3-EN

(Individual Assignment)

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Submission Date: 11/08/2010

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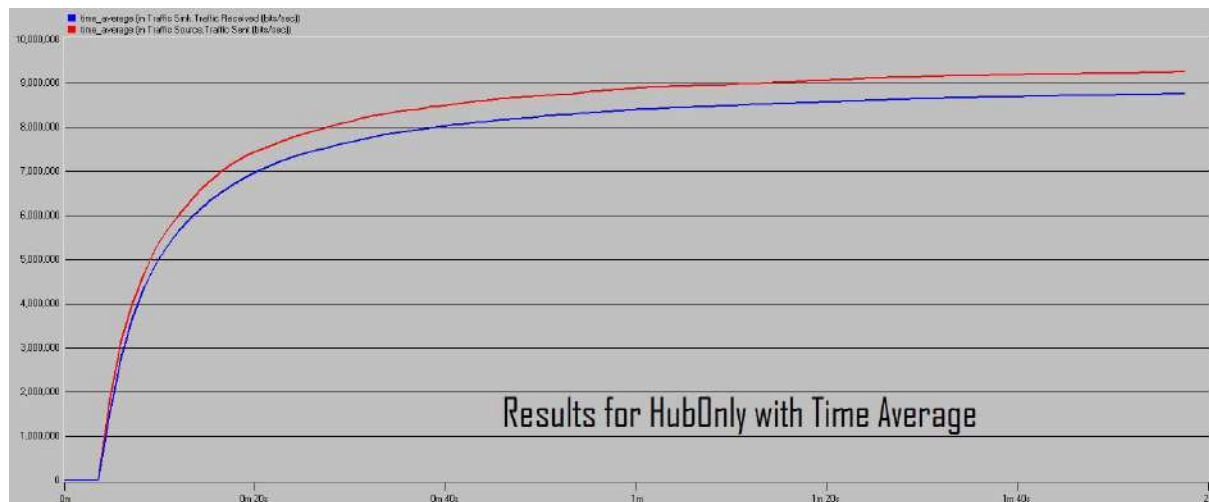
This project has for purpose to give us bases of data transferred in real situation. For a better understanding, we divided it into 3parts. The first one is going to familiarized ourselves with Hub configuration and some notions like rate transferred, rate received and send and collisions count. The second part will introduce the switch. And finally we will have to compare the different configurations.

We will use a star topology network which has a centralized hub or switch.

The traffic that each node will generate can be found by the formula: $\frac{\text{packet size} \times 8}{\text{interarrival time}} = \frac{1500 \times 8}{0.02} = 0.6\text{Mb/s}$

The traffic on the entire network is the traffic of a node multiplied by the number of the similar nodes:

0.6 Tapez une équation ici. $0.6 \times 16 = 9.6\text{Mb/s}$



Moreover, on the simulation we can notice that the average traffic on the network is approximately equal to 9,500,000 bits/sec.

However, the traffic received (in blue) is inferior to the traffic sent (in red). So we can say that there is a loss of information in this network. We will try to explain it in the next part and solve it.

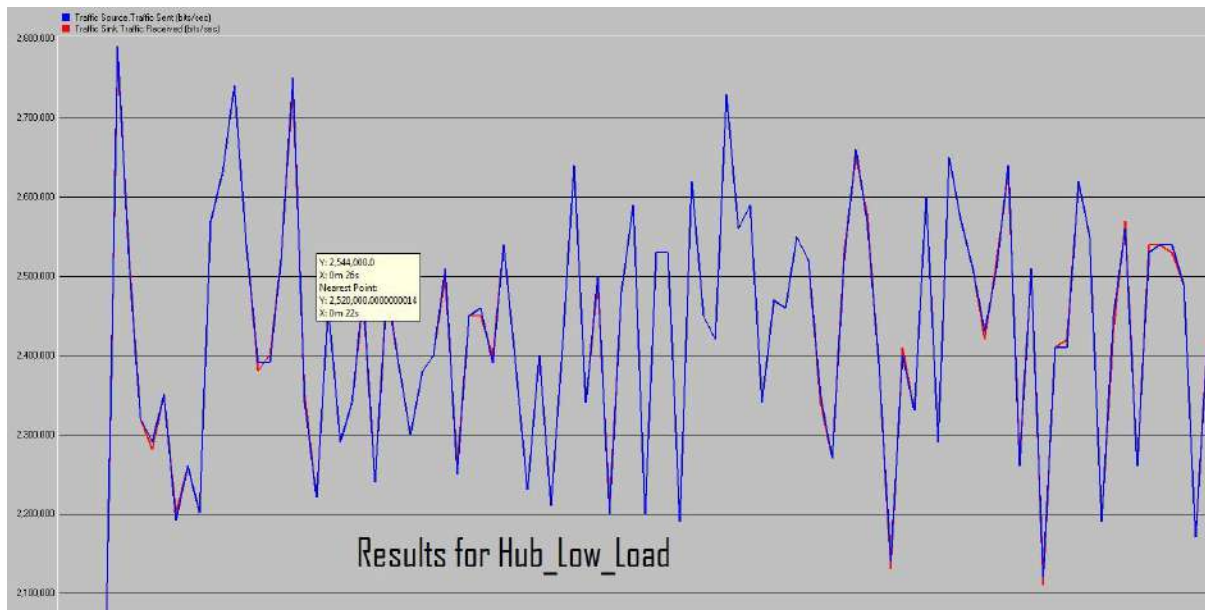
Analysis 1

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

We can try a new scenario where each Ethernet station will generate less traffic by increasing the inter-arrival time. In other words, we will increase the time between each packet or reducing the number of packets sent.

In this situation, each node creates an average traffic of 0.15Mb/s and thus the average traffic on the network is 2.4Mb/s.

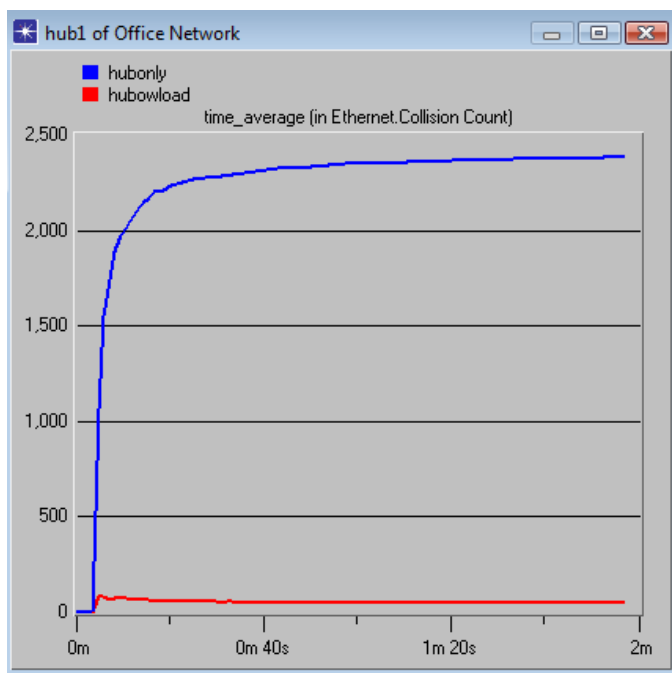
Now we will observe the difference between the traffic sent and the traffic received. On the graph below we can see that both traffics have the same result around 2.4Mb/s.



Remember: in the first simulation, the traffic sent was above the traffic received (first graph).

We can conclude that the inter-arrival time is higher we will have not losses of information. We can say too that if there is too many data in the network, we will loss information.

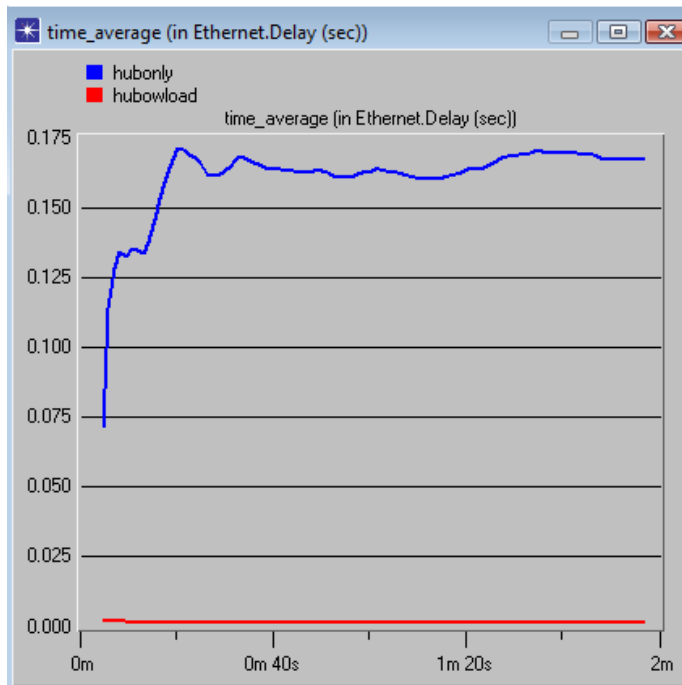
Now we will see the collision count in both scenarios. Collision count is a counter of data which have to be resend due to their lost (by a collision with another data on the network).



We can observe that the collision count of the first scenario, in which one there is a difference between sent and received traffic, is near that 250times more important than the second scenario, without difference between received and sent traffics.

The conclusion of this graph is that if the network has too much information, it will not be able to transfer all of them without losses (or collisions).

We are now looking for the delay in both scenarios. We can notice that the first scenario has a longer delay, around 160times more, than the second one.



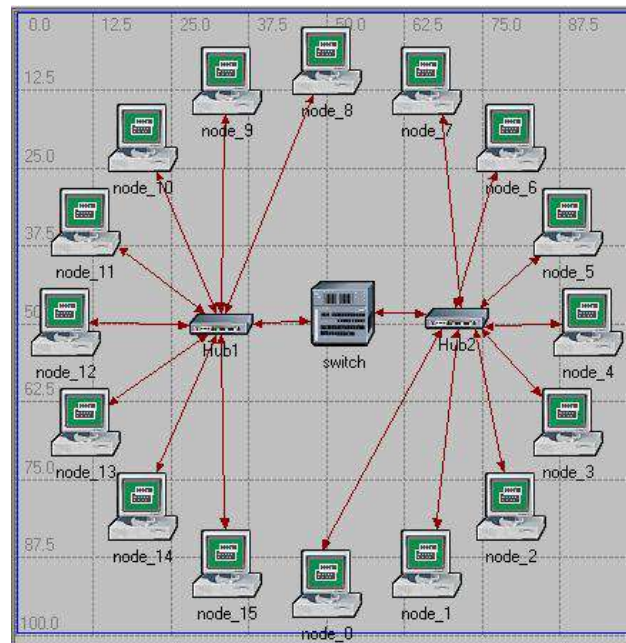
We can explain this delay by a saturation of the network. Thus in the second scenario (in red) we have any saturations and so any delay. At opposite, in the first scenario, the network is full and so there is a delay.

The expected delay can be calculated by the following formula: $\frac{\text{packet size}}{\text{average traffic}}$

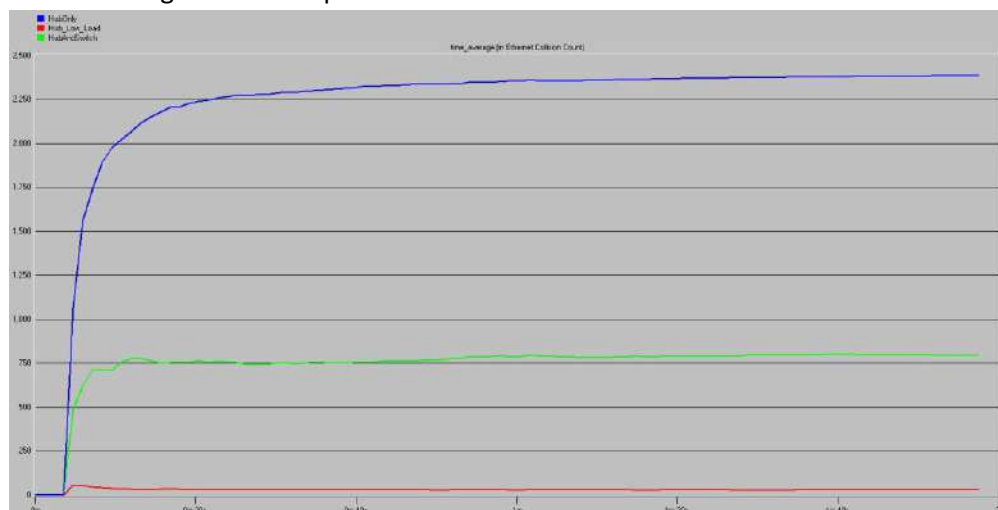
The first scenario should have a delay of $\frac{1500}{600000} = 0.0025\text{s}$ and for the second scenario we should have $\frac{1500}{150000} = 0.01\text{s}$. We notice that the second scenario has a delay which should be longer than the first scenario. This can be explained by the inter-arrival time. We have increase the time between each packet sent. So we have increased the delay. But this do not take in count the collisions.

Analysis 2

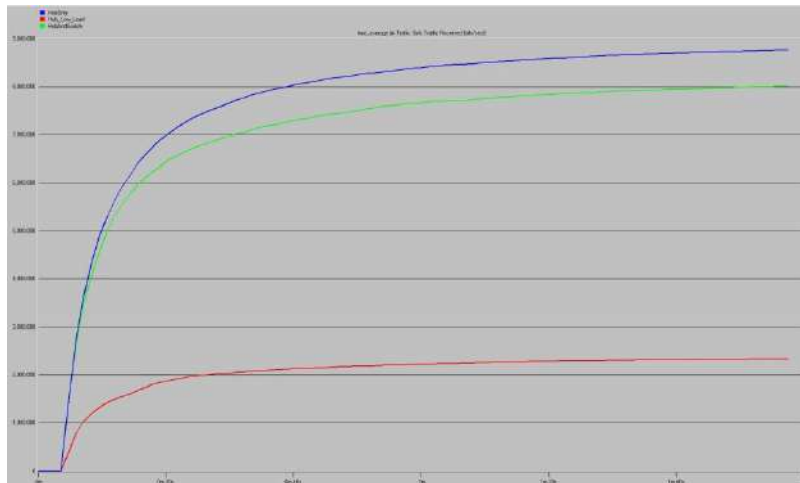
In this new scenario, we will see the influence of a switch in the current network by adding another hub and a switch. We can now compare HubOnly scenario (the first one) and this one.



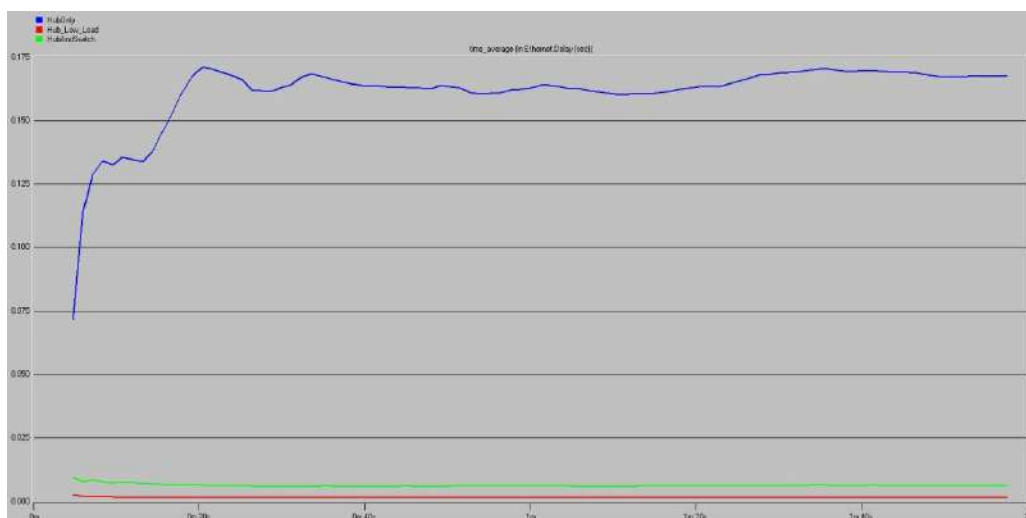
The first thing we can compare is the collision count in the network for both scenarios.



In this 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. This is due to the switches. Switches are able to send information to the node which should receive it when a hub is going to send the information to all nodes. However, in our configuration we have a switch only in the middle of the configuration. Thus, it will send information to the half part of the network. But after that, the hubs will still send the information to several nodes. Thus we have one collision domain in HubOnly scenario composed of 16 nodes. In the HubsandSwitch scenario there are 2 collision domains composed each of 8 nodes.



As expected the traffic received in the HubAndSwitch scenario is just under the traffic received in the HubOnly scenario. The reason is due to the switch which reduces collisions in the network.

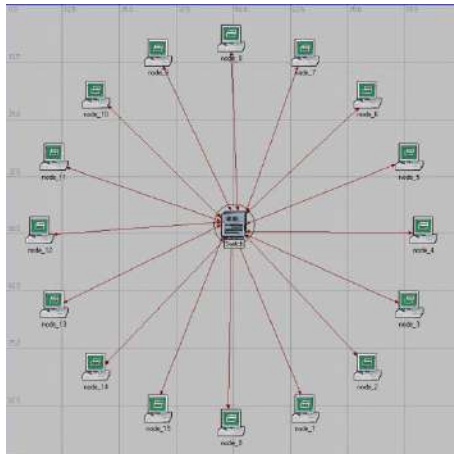


We can observe that the delay for the HubandSwitch scenario is lower, around 17times, than the HubOnly scenario. Thus, the switch gives us the possibility to increase the information sent on the network and in the same time reducing the losses of information.♥♥Bruno Mars ♥♥

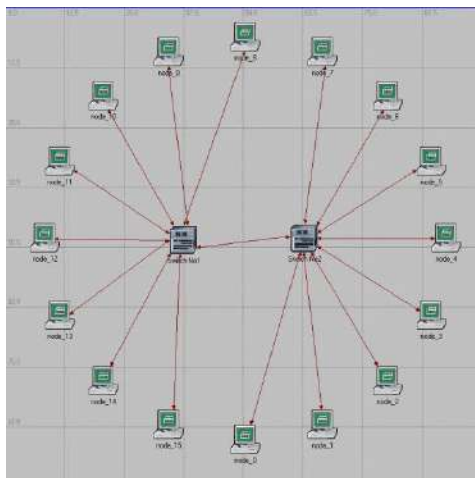
Analysis 3

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.

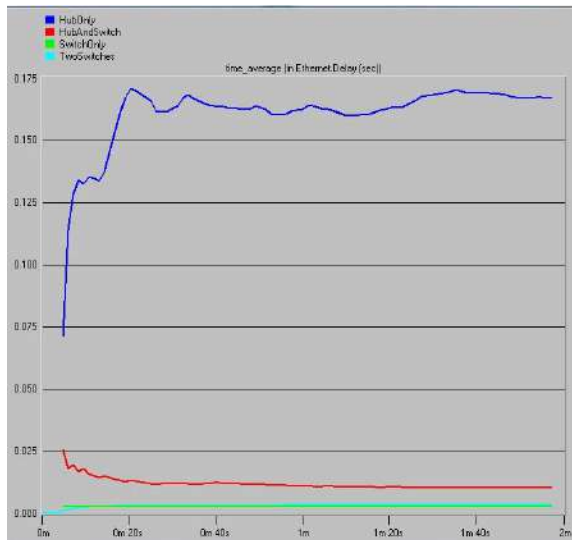
We made two new scenarios: a switch only and another with two switches.



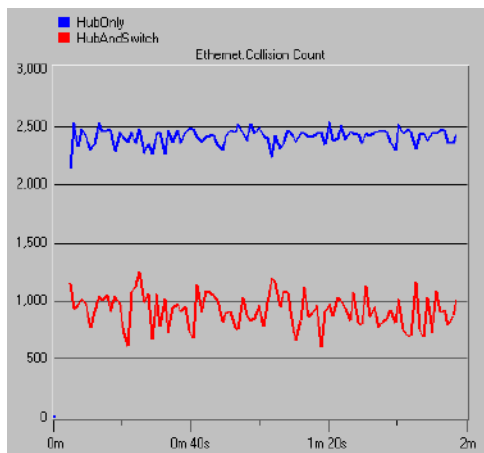
Above the Switch only and below the 2switches.



Now we will compare the delay of both configurations:



We can notice that both scenarios have a closed delay. This delay is around 0.001s which is really closed to the theoretical value. We can observe that the network is never busy and the theoretical delay is respected. We are going to check the collisions count for these configurations.



We can observe that there are no collisions on these networks due to the characteristics of switches. Switches are able to send data to the node which need it and not on all the networks. By this way, we are reducing traffic on the network and consequently its capacity.

Conclusion

In this assignment we studied the influence of many combinations of configurations 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 affect the efficiency of a network. The result is that hubs are not useful due to the collision count they create. This is engendering a loss of information and increasing the traffic on the

network. Switches are not creating collisions. So they more efficient and led to an optimal use of the network.