Analysis &Estimation of QoS Parameters on LAN Fundamental technologies based on OPNET

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ABSTRACT
The performance assessment of a network can be centered on fixed parameters like throughput and delay and others. The technology performances deal with auser’s number or nodes in addition to confirmed generation parameters. The purposes of this work is to estimate and explore the performances of throughput concentrated on traffic received, downloaded objects and pages as well as delay & load based on most basic technologies: Ethernet besides FDDI. By simulating two scenarios, first one contain 10 nodes with the other of 20 nodes. The effect of numerous network configurations on created scenarios were examined with a network simulator OPNET. The concluded diagrams offer the Ethernet throughput be greater than at FDDI due to their abilities for filtering errors and avoid collisions, while FDDI load and delay which experienced at these networks can be considered less than Ethernet if an equal number could be utilized. At last, the effect of the downloaded objects and pages for Ethernet network with 10 & 20 nodes are explained and proves as greater than that for 10 & 20 nodes for FDDI networks.

Keywords: Ethernet, FDDI, QoS parameters (throughput, delay, load), OPNET.

1- INTRODUCTION
Networks can be wired or Wireless connection, they have been grown-up like weed over the past few decades provided that steps for the paths of networks access resources. Thus, it is animated for having perfect and a consistent common platform to assist networks. Network with a wired connection provides a protected and faster ways of connectivity. The wired Ethernet’s performances are with a high sensitivity for the sum of operators, load contribution, and a link of transmission, whereas wireless connections are also identical sensitivity to the users, load offering in addition to physical characteristics, data bit rate, size of packets and so on[1].

2.1 Ethernet Technology
Ethernet is a technology for local area which deals with flexibility, fairly inexpensive, practically fast, in addition to be considered very common technology utilized in best applications [2]. Ethernet was initially advanced by Digital Equipment Corporation (DEC), Xerox, and Intel with a consistent by IEEE group as an 802.3. It was intended to be a ‘broadcast’ systems, which means, the station may be transmit message to another one at whatever time. The response is came only from a station that a message was sent. A technology of common Ethernet contain many types, like a thick wire represented by 10 Base-5, thin wire signified by 10 Base-2, Ethernet over UTP denoted by 10 Base-T, Ethernet over Optical fiber for 10 Base-FL, finally 100 base-T among others[3]. The Total forms of Ethernet utilize a protocol of Media Access Control (MAC) titled CSMA/CD for controlling each devices may be used for transmitting data to any network, beside these systems may do so [4].

2.2 FDDI
The FDDI identified for Fiber Distributed Data Interface which requires a 100-Mbps token passing, dual-ring LAN utilizing optical fiber cable. It is commonly applied as one of backbone technologies for higher speed due to its backing for great bandwidths as well as larger distances compared with copper [5].

FDDI utilizes an architecture of dual rings using traffic for each ring to flow in reverse directions which known as counter rotating. The dual ring consists of primary ring in addition to secondary. Through the standard operations, the primary ring can be utilized for transmitting data, with a secondary rests idle. The purposing of primary of the dual ring is for providing agreater reliability and
strength. Figure 1 explains the rotating counter of FDDI primary and secondary rings.

![FDDI Primary and Secondary Rings with Rotating Counter](image)

Fig. 1 FDDI primary and secondary rings with rotating counter.

There are three topologies can be applied by FDDI: Ring, Star and Tree. All of them may be shared for a large and strong network (up to 400 nodes or more) with several benefits over any other network where to avoid their disadvantages [6]. Four types of cables may be utilized with FDDI: first, Multimode Optical Fiber Cable which can be covered a distance to about 2 km, second, Singlemode Optical Fiber Cable which covering distance round to 10 km, IBM Category 1 STP that has a distance of maximum of 100m, and Set 5 UTP that an FDDI utilizes couple rings used for tolerances fault and can operate for connecting every node or may be employers within a network. Any rings can transmitted data with an opposite direction for other one. Commonly, a primary ring transmits data whereas a secondary ring may be idle. If a break is found in the ring, thus a primary ring will be enclosed for the secondary one with nodes or else users that adjacent for break therefore bypass the fault so outcomes with complete or unbroken rings [7]. Also, a couple rings may be utilized for transmitting data simultaneously to enhance speed of a network with maximum distance double of 100m [8].

3. Network Simulation Performances:

A two models of network, the Ethernet as well as FDDI are simulated based on an assistance of OPNET IT modeler, Guru Academic Edition 17.5. A simulation methodology utilizes a simulator of OPNET for modeling the network. OPNET considers confident simulator for communication system established by OPNET technology [9]. Both scenarios have been simulated with two various scenarios, a first scenario with 10 nodes, whereas a second scenario with 20 nodes being assessed. The concept accompanied with using two different types of scenarios to create enhanced consequence to a network by compared the traffic’s analyses in addition to downloaded objects and pages. Different metrics are compared like load, throughput, and delay with these two different scenarios, all results of them are associated with graphs as seen in the figures (2, 3, 4, 5).
Fig 2: Ethernet Scenario 1 Network for 10 Nodes.

Fig 3: FDDI Scenario 1 Network for 10 Nodes

Fig 4: Ethernet Scenario 2 Network for 20 Nodes.
Ethernet scenario
A first scenario, Ethernet model is simulated with duplex link. The Ethernet 16_ switch is used for connecting 10 nodes to a essential switch type performing intelligent functions such as filters and (Ethernet16_ switch) by used 100 BaseT link. This preventing collisions if the information could bypass link would be utilized to confirm designing of along with nodes. The used parameters for generating Ethernet 100-Mbps that provides a fast speed equal to 100mbps, the supporting of a switch to use up to seen in table 1. 16 interfaces, with a data rate of 100 mbps and

Table 1: Ethernet Traffic Generation Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start time (seconds)</td>
<td>Constant (1.0)</td>
</tr>
<tr>
<td>ON State Time</td>
<td>Exponential (100.0)</td>
</tr>
<tr>
<td>OFF State Time</td>
<td>Exponential (0.0)</td>
</tr>
<tr>
<td>Interarrival Time</td>
<td>Exponential (0.02)</td>
</tr>
</tbody>
</table>

FDDI scenario
According to the same first scenario, FDDI FDDI link. A usage of FDDI link is formed by employing 10 nodes with a for connecting any operator to a switch of 16 ports to center connection of (Fddi 16_layer_switch) by an procedure an FDDI ring’s connection at 100 mbps.

Table 2: FDDI Traffic Generation Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start time (seconds)</td>
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<tr>
<td>OFF State Time</td>
<td>Exponential (0.0)</td>
</tr>
<tr>
<td>Interarrival Time</td>
<td>Exponential (0.02)</td>
</tr>
<tr>
<td>Packet Size</td>
<td>Exponential (1024)</td>
</tr>
</tbody>
</table>

4.1 Result analysis for throughput
Throughput of the network can be defined as the average amount of the effective message transfer over the channel of communication [10]. It can be measured with bits/seconds (bit/s or bps) as well as with data packets/second or packets per times slot.

It can be perceived from figures (6, 7, 8, 9) that a throughput or traffic received for FDDI be 2.4 packets/sec and for Ethernet is 1.2 packets/sec in...
addition the throughput (traffic sent) for FDDI is 9 packets/sec and for Ethernet is 5 packets/sec that means the throughput for FDDI is more than ethernet for 10 nodes, as node increases from 10 node to 20 node then the throughput (traffic received and traffic sent) for ethernet is more than FDDI. That’s denote with FDDI, when further traffic are generating, the amount of collisions will be increased and consequently the throughput is lowered. The Throughput could be high at Ethernet due to a technology of CSMA/CD be applied for filtering and preventing collisions.

Fig. 6 : average throughput(traffic received) for 10 nodes (scenario 1)

Fig. 7 : average throughput(traffic sent)

Fig. 8 : average throughput(traffic received) for 20 nodes (scenario 2)

Fig. 9 : average throughput(traffic sent)

4.2 Analysis result of delay

The delay scheme for FDDI in secs can be appeared at Fig10, within a red color and with a blue color for Ethernet. It’s noticed that FDDI delay at 10 nodes can have lower value, about 0.0026 secs as matched with Ethernet delay which is about 0.0 secs, if the nodes is increased from 10 nodes to 20 nodes the delay in FDDI is equal 0.003 secs if related to Ethernet’s delay (0.092 secs) as shown in fig11. An indication gives that, the FDDI speed runs at high compared with Ethernet. A result
furthermore proves that FDDI will be better at challenging applications represented by a requirement for transferring large data amounts within a short time amounts. In spite of deliveries of data cannot be promising when collisions are restricted to be happened.

4.3 Result analysis for load:

A load for FDDI and Ethernet (packets/sec) can be seen at fig. 12 with red color and blue color respectively. Again FDDI load at 10 nodes is lowered than Ethernet (2.6 packets/sec as compared to 5.2 packets/sec). However with nodes are increased (10 nodes to 20), the FDDI load equals 2.5 packets/sec and Ethernet load matches 5.7 packets/sec as presented in fig. 13. This specifies the operation of Ethernet load will be high as related to the FDDI.

4.4 Downloaded objects and pages

Downloaded objects between Ethernet and FDDI for 10 and 20 nodes can be seen after simulating them for two scenarios, first the effect of downloaded objects can be seen in fig. 14, and a results show that the downloaded objects for Ethernet network with 20 nodes is greater than that for 20 nodes for FDDI network with same connection for network with 10 nodes for Ethernet network and FDDI network respectively.
Fig. 14 Downloaded objects network model Fig. 15 Downloaded pages network between Ethernet and FDDI for 10 & 20 nodes

Downloaded pages between FDDI and Ethernet for 10 nodes & 20 nodes after simulating them for 10 & 20 networks can be shown in fig. 15 which demonstrates the effect of downloaded pages and proves that, the downloaded pages for Ethernet network with 20 nodes is in max rate than that for 20 nodes for FDDI network and the same result for network with 10 nodes for Ethernet network and FDDI network respectively.

Conclusions

Different Network Scenarios considered in this research obviously rely on evaluating and investigating the behavior technologies for Ethernet as well as FDDI. Various parameters plus influences were applied and many QoS observations prepared with metrics of throughput, load and delay. It can be clearly concluded that technology of Ethernet will be better if throughput maybe considered due to their abilities for filtering errors in addition to avoid collisions. Nevertheless, FDDI can be considered preferable and appropriate at large networks if delay setting for considerations. On the other hand, the downloaded objects and pages for Ethernet network with 10 & 20 nodes are greater than that for 10 & 20 nodes for FDDI networks. Finally, the technology of FDDI is faster, the Ethernet parameter of throughput be higher with large networks.

References