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Access Delay Optimization In Fddi Networks

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Abstract: FiberDistributedDataInterfaceNetworks was specially designed for use with optical fiber media for peer to peer communications.There are many parameters that influence the performance of the network; network latency, target token rotation time, token holding time, frame size and maximum access delay. The maximum access delay, the time between successive transmission opportunities, is bounded for both synchronous and asynchronous traffic.In our analysis, we set the value of TTRT and optimized the value of access delay. It is concludedthat long delays are not desirable and can be avoided by proper setting of network parameters.

Keywords: Maximum Access Delay; Token Rotation Time; Ring Latency; Efficiency.

1. Introduction

FiberDistributedDataNetworks (FDDI) allows backbone applications where computers and workstations connected tolocal area networks (LANs) can exchange data with other LANs or LAN segments.[1]. FDDINetworksareintendedto have two datatransmissionpaths whichprovideredundancy. It can be implemented as a higher speedversionofa token ringandisdesignedtoworkoverfiber.It is basically designed forpeer-to-peercommunicationsbutcancertainlybeusedforthepolled traffic modem.Thebasic principleof thetokenringis thataccesstothe communicationsringisrestrictedtoonemodematatime: modemtransmits its messagearound the ring. Then, once the messagetravelsentirelyaroundthe ring, the modem removes the data from the ring and passes control (the token) to the next modem in line. This is aneffectiveapproachofdata distributing. There are many parameters that influencethe performance of the network; network latency is the one of the parameter. The main feature in network latency is that, time of transmission between the origin and destination should be instantaneous. Practically, there will always be some delay; even transmission is at very high speed i.e. at speed of light.There are some more factors that contribute to network latency. These include transmission, propagation, routers and computer hardware delays. In network latency, transmission refers to the medium used to transmit the information. This may be a phone line, optical fiber and wireless connection etc. Each will contribute different delay. Some may be faster mediums than other. To reduce latency, faster medium are used. The transition delay can also be decreased by increasing the bandwidth and propagation delay can be decreased by increasing the group velocity. In an FDDI network to improve the efficiency important factor is maximum access delay (MAD).The MAD, the time betweensuccessive transmissionopportunities, is bounded for both synchronous and asynchronous traffic. Although the maximumaccess delay for the synchronoustraffic isshort, thatfor asynchronoustraffic can be long dependingupon the network configurationand load. Unlesscareistaken,the accessdelay canbe as longas165seconds. Thismeans thatastation wantingtotransmitasynchronoustraffic maynot geta usable token for165seconds [2]. Such long access delays areclearly not desirableand can beavoided byproper setting ofthe network parametersandconfigurations.

2. Literature Survey:

FDDI token ring network is a well-known concept which provides a guaranteed throughput for synchronous messages and a bounded medium access delay for each node[3]. Because it ensures a medium access delay bound to nodes, but not to messages themselves. The message-delivery delays may exceed the medium-access delay bound even if a node transmits synchronous messages at a rate not greater than the guaranteed throughput. This problem was solved by developing a Synchronous Bandwidth Allocation (SBA) scheme which calculated the synchronous bandwidth essential for each application to satisfy its message-delivery delay requirement [3]. Harry Yuklea [1] discussed about the Fiber Distributed Data Interface as a standard specially designed for use with fiber optic media. The FDDI networks with various possible faults like lost token, link failures, etc. and fault detection and the ring recovery process in case of a failure and the reliability mechanisms provided were studied by R RadhakrishnaPulai*et al*[4]. They recommended a technique to improve the fault detection and ring recovery process. The performance improvement in terms of station queue length and the average delay was compared with the performance of the existing fault detection and ring recovery process through simulation. They also suggest a modification for the physical configuration of the FDDI networks within the guidelines set by the standard to make the network more reliable. It was shown that, unlike the existing FDDI network, full connectivity was maintained among the stations even when multiple single link failures occur. A distributed algorithm was also proposed for link reconfiguration of the modified FDDI network when many successive as well as simultaneous link failures occur. Eitan Altman *et al*[5] analysed the stability of two types of timed-token rings: the existing FDDI token ring protocol and a new variant of the FDDI was proposed. The time constraint mechanism of FDDI guarantees the transmission delay of synchronous traffic: a TTRT being fixed, the FDDI protocol ensures that the token rotation time is always bounded above by twice TTRT. They have considered the

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stability of the asynchronous traffic, for both FDDI and for the new proposed protocol, for which the token rotation time is also bounded by twice TTRT.

3. Optimization ofMaximum Access Delay

A simple model to compute the access delay of the FDDI analytically will now be described. It is assumed that there are *n* active stations and that each one has enough frames to keep the FDDI fully loaded. FDDI network with a ring latency of *D* and a TTRT value of *T*, the Maximum Access Delay (MAD) can be given by equation (i). Assume that all stations are idle until $t = D$ when the active stations suddenly get a large (infinite) burst of frames to transmit. When station receives the token and resets its Token Rotation Timer (TRT). If it has nothing to transmit, then it forwarded the token to the next station. At time *t* = *D* station receives the token. Since it now has an infinite supply of frames to transmit, it captures the token and determines that the *TRT* (time elapsed since the last time it received the token) is *D*, and so it can hold the token for the $TTRT - TRT = T - D$interval. Station releases the token, when Token Holding Timer (THT) of station expires.During the cycle, each station waits for an interval of $2T + 2D$ after releasing the token. This interval is the maximum access delay. There are some of the rules which should be followed for the optimization of the performance of FDDI Networks. Main point is, setting the TTRT value, which should be taken into consideration. The token rotation time can be as long as two times the target. On the largest ring, TTRT of 165ms causes a maximum access delay as long as 165 second. So station may have to wait several minutes to receive a usable token. Longer TTRT also results in longer access delay. TTRT limit the access delay. Rings with a large number of stations or smaller extent have a slightly lower efficiency and longer maximum access than those with smaller extents. With the increase in active number of stations efficiency slightly increases but access delay increases.

- The maximum size frame on FDDI is 4500 bytes (0.360 ms).
- The maximum ring latency is 1.773 ms.
- The token time is 0.00088 ms.
- No station should request a TTRT less than Tmin.andTTRT more than Tmax. The default minimum value of Tmax is 165 ms. Assuming that there is at least one station with Tmax=165 ms, the TTRT on a ring cannot be more than this value.

Maximum Access Delay; $MAD = (n - 1)T + 2D$ (i)

Keeping the above point into consideration we have calculated some results shown in figure 1 – 8 usingMatlabSoftware. At first point we have fixed the value of maximum value TTRT to165; number of stations is fixed to 100 and the ring latency of the system is varied as 80, 60, 40, 20, 4, 1.773 ms. These results show the optimized results for the maximum access delay to achieve the better performance when the TTRT value is 165 ms and the ring latency (D) is fixed to 1.773ms. Thus we can optimize the FDDI network by fixing the value of TTRT value to be equal to 165 ms and reducing the ring delay or ring latency to as low as 1.773ms.In this network, there is no effect on MAD due to increase in number of active stations as shown in figures 5-8.

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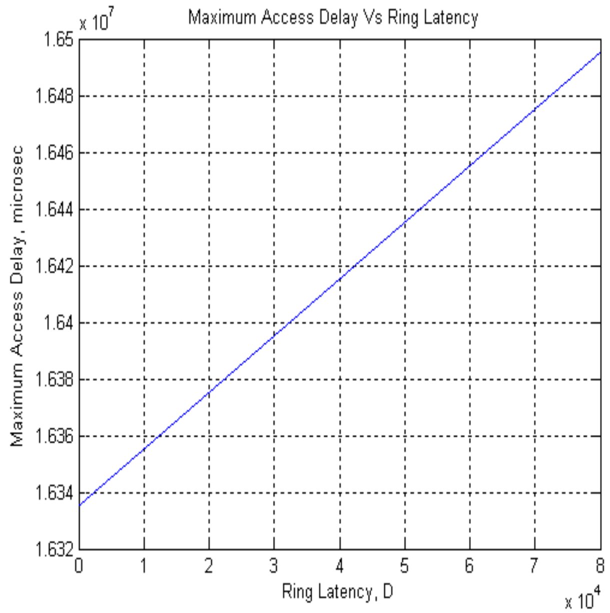

Figure 1: Maximum Access Delay vs Ring Latency for T=165ms and D=80ms

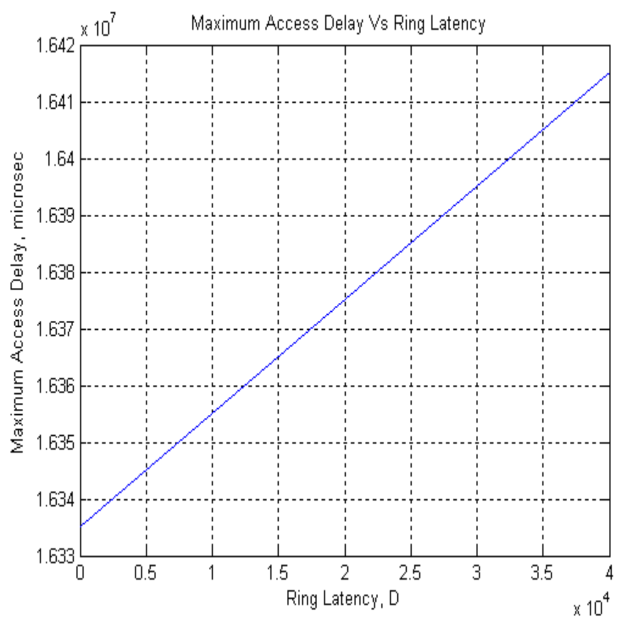

Figure 2: Maximum Access Delay vs Ring Latency for T=165ms and D=40ms

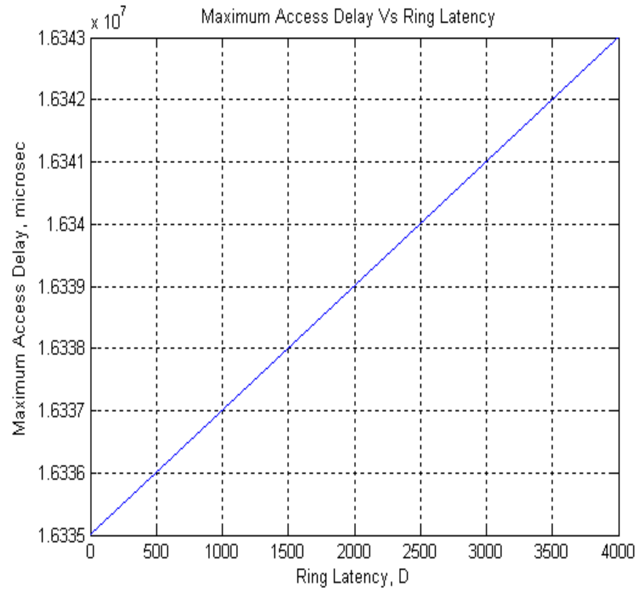

Figure 3: Maximum Access Delay vs Ring Latency for T=165ms and D=4ms

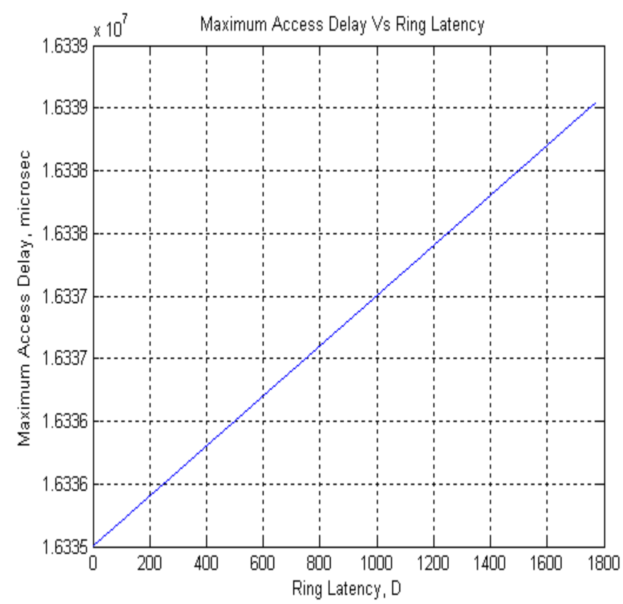

Figure 4: Maximum access delay vs Ring latency for T=165ms and for optimized latency

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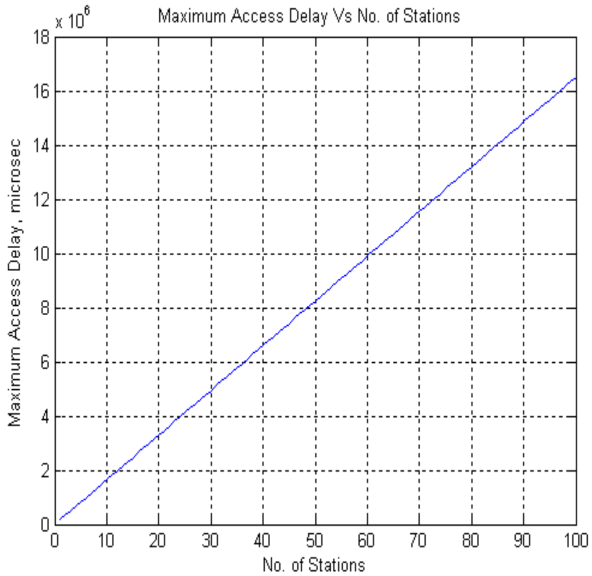

Figure 5: Maximum Access Delay vs No. of Stations for T=165ms and D=80ms

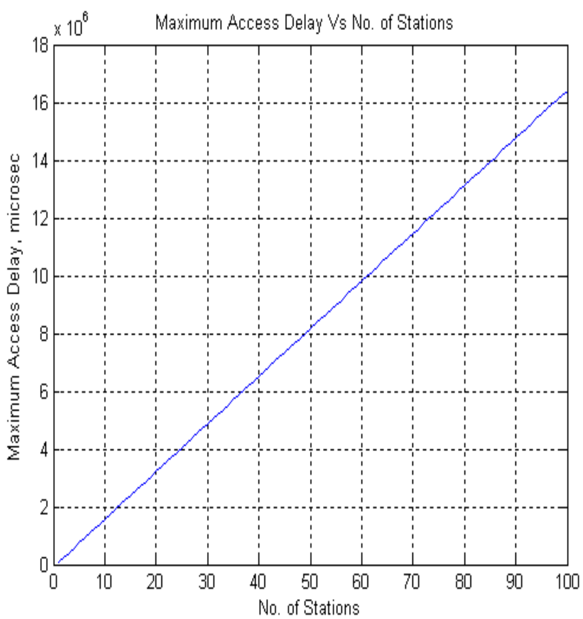

Figure 6: Maximum Access Delay vs No. of Stations for T=165ms and D=40ms

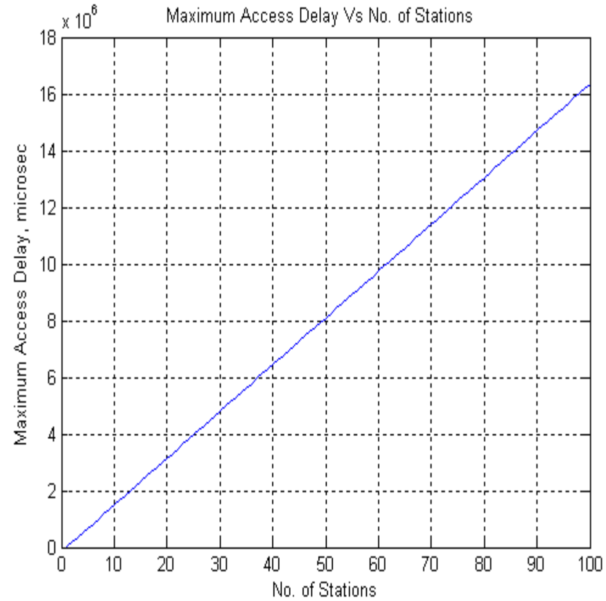

Figure 7: Maximum Access Delay vs No. of Stations for T=165ms and D=4ms

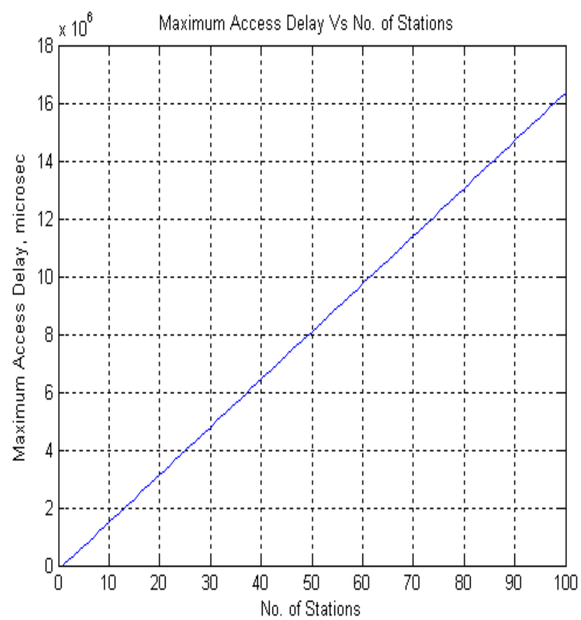

Figure 8: Maximum access delay vs No. of Stations for T=165ms and for optimized latency

The results shown in figure 1 – 8 show the relationship of the Maximum access delay with ring latency and number of stations. We have fixed the value of TTRT to its maximum value which is optimized to 165ms and varied the value of ring latency and reduced its value from 80ms to 4ms and then 1.773 ms which is the optimized value of ring latency. The TTRT value,optimized value of ring latency and optimizedvalue of maximum access delay has optimized the results to make the efficient FDDI network. The synchronous stations should request a TTRT value of one half the required service intervals. TTRT should allow at least one maximum size frame along with the synchronous time allocation, if any.

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4. Conclusions:

In this paper we have analyzed the performance of the FDDI systems depending on the various parameters and optimized the value of maximum access delay. Results conclude that efficiency of the FDDI network can be increased by controlling the ring latency and by minimizing it. Result shows the relationship between Maximum access delay with ring latency and the number of stations. This optimization technique results in improved performance of the FDDI Networks. TTRT should allow at least one maximum size frame along with the synchronous time allocation.

REFERENCES

[1]. Harry YUKLEA, “An FDDI Overview: Some Questions Answered”, Computer Networks and ISDN Systems Vol. 19, pp. 228-232, 1990.

[2]. R.Jain, “Performance analysis of FDDI”, Digital Technical Journals, Vol. 3, No.3, 1991.

[3]. Qin Zheng, “Synchronous Bandwidth Allocation in FDDI Networks,” Mitsubishi Electric Research Laboratories, TR93-16, 1993

[4]. R. RadhakrishnaPulai, A. Hardi and A Selvarajan, “Improving fault detection and reliability in FDDI networks”, Computer Communications, Vol. 15, No 9, pp. 587,1992.

[5]. Eitan Altman and Zhen Liu, “on the stability of timed token rings”, Performance Evaluation an international Journal-Elsevier, Vol. 26,No. 2, pp. 19-234, 1996.