Fiber Optic Services And Products

EYE ON FIBER

REALISTIC JUSTIFICATION OF FIBER TO THE DESK NETWORKS

Executive Summary

This application note provides a method to make a preliminary decision. This decision is to implement fiber to the desk as a means of reducing network cost. This application note looks at two key cost factors that tend to cause FTTD networks to have initial, installed costs that are lower than those of the traditional, hierarchical star, UTP data networks.

When a network incurs the common TR cost of $20,000-$50,000, FTTD networks have an initial installed cost that is lower than that of traditional UTP networks. The rough calculations presented herein indicate that a Fast Ethernet FTTD network will reduce the network cost by a range of $173 to $748 per node. The equivalent range for a Gigabit Ethernet FTTD network is $123 to $448 per node. A mixed Fast/Gigabit Ethernet FTTD network, the most realistic and practical of the options, will reduce network cost by a value between these two ranges.

INTRODUCTION

The savvy network manager will implement new or retrofit data networks in the most cost effective manner possible. Usually, cost effective means lowest initial installed cost. Alternatively, cost effective means lowest life cycle cost. For the purpose of this note, cost effective will mean lowest initial installed cost. If a fiber to the desk (FTTD) network has the lowest initial installed cost, it will, automatically have the lowest life cycle cost.[1]

TWO ARCHITECTURES

In order to determine how to implement his network in a cost effective manner, this savvy manager will be well advised to look at two architectures, the traditional hierarchical star with a horizontal UTP link

and a vertical fiber link and fiber to the desk (FTTD). The initial installed cost comparison of these two network architectures is highly detailed with more than 100 cost factors.[2] Such an analysis is necessary to make a final decision and to accurately estimate savings. However, such an analysis is time consuming for an initial decision to evaluate the potential for cost reduction through FTTD.

TWO KEY COST FACTORS

A simpler method is to examine two of the key cost factors, total telecommunication room (TR) cost and switch port cost. First, lets examine total TR cost. A TR is installed on each floor of a multistory building, or in each wing of a multi-wing building. This TR exists because of the 100 m limitation of UTP.

This total TR cost has two parts. The first cost is the real estate cost. According to commercial real estate managers,[3] this room can have a cost of $100-200/ square foot.[4] The second cost is the cost associated with the network. We will refer to this second cost as support cost. A partial list of such support costs includes provision of power, dedicated environmental control, UPS, surge suppression, fire suppression, and access control. Regardless of the specifics of the list of costs, these costs range from $20,000-$50,000 per room.[5]

This cost supports a number of nodes, such as PCs, network scanners and printers. If the number of nodes supported is 48, the cost per node of the TR is $416.66-$1041.66. This cost is hidden, in that it is necessary but does not appear as a network cost on any network budget. Because this cost is hidden, many network managers are unaware of its impact on decisions.

In addition, the UTP proponents will not include this cost factor in any of their pronouncements. Their reason is obvious.

Let us examine switch port cost. According to a study performed by Corning Inc., the utilization of ports in a traditional network is 70%. That is, of every 100 ports in the switches, only 70 can be used. This port utilization is a consequence of placing switches in the TRs. The switches in the TR connect to only those nodes serviced by that TR.

This same study indicates that port utilization in a FTTD network is 90 %. This increased port utilization results from the fact that all switches are in the same main cross connect room, or central distribution facility. In such a facility, any node can be connected to any switch port.

FIBER REDUCES SWITCH COST

This comparison indicates an important fact: the number of switch ports in an FTTD network will be lower than in a UTP network. This reduction means that fewer switches will be needed in an FTTD network than in a UTP network. If the total loaded switch cost per port is $20, the effective, or real, switch cost is $20/0.7 for a UTP network and $20/0.9 for an FTTD network. Thus, the real cost of a UTP network is $6.34/node higher than that of an FTTD network.

While this value, $6.43, seems small, its impact on total network cost is not. For example, a 9,000 node, UTP network requires 12,857 switch ports. In comparison, a FTTD network requires 10,000 ports. At a

switch cost of $20/port, this difference is $57,140.[6] Most network managers would welcome an opportunity to remove $57,140 in cost from their networks.

REDUCED COST FACTOR FOR FTTD

When we add together the TR cost and the increased cost per switch port, the UTP network has a cost of $423.01 to $1057.52 per node higher than that of an FTTD network.[7]

INCREASED COST FACTOR FOR FTTD

In an FTTD network, the network manager can move UTP switches from TRs to the MCC.[8] He can add fiber optic media converters at the switches and the nodes. The media converters add cost to the FTTD network, but not to the UTP network. This increased cost is $200-$250/node for 100BASE-x links and $300-$600 for 1000BASE-x links.[9] To make a simplified and realistic estimate of the cost advantage of FTTD, we must reduce the cost advantage of the FTTD network by the increased cost factor required by this network. We offset this cost advantage in Tables 1 and 2.

Cost Factor	UTP, $	Fiber, $	Difference, $
TR support	$416.66-$1041.66	0	$416.66-$1041.66
Switch cost increase	$8.57	$2.22	$6.34
Media converters	$0	$200-$250	-$250 to -$300
Net cost reduction with fiber		**$/node=**	**$173 to $748**

Table 1: Fast Ethernet Comparison

Cost Factor	UTP, $	Fiber, $	Difference, $
TR support	$416.66-$1041.66	0	$416.66-$1041.66
Switch cost increase	$8.57	$2.22	$6.34
Media converters	$0	$200-$250	-$300 to -$600
Net cost reduction with fiber		**$/node=**	**$123 to $448**

Table 2: Gigabit Ethernet Comparison

CONCEALED BENEFIT FROM FTTD

The use of media converters enables the network manager to increase bandwidth as needed, instead of providing the same, increased bandwidth to the entire network (a forklift upgrade). As many nodes on a

network do not need or use the full potential bandwidth of the network, this feature results in reduced network cost. As individual nodes require the increased bandwidth of Gigabit Ethernet, the 100BASE-x media converters for those nodes can be replaced with GBE converters. In fact, it is possible to use all three Ethernet speeds in the same media converter chassis.[10] This feature enables fine-tuning of the cost of the FTTD network to the needs of the users. If we assume that 75 % of the nodes require Fast Ethernet and the remainder require Gigabit Ethernet, the net cost reduction will be between $160.50-$673 per node.

FTTD COST SAVINGS SCALE LINEARLY

Because this analysis is on a per port basis, the savings in Tables 1 and 2 scale linearly. A 1000 node, Fast Ethernet network will have substantial cost savings: $173,000 to $748,000. The same GBE network will have substantial savings of $123,000 to $448,000. Perhaps, substantial is understatement.

THE DETAILED ANALYSIS

A detailed analysis includes consideration of all the other cost factors in both types of networks. This analysis provides a more accurate estimation of the total cost savings. In almost all cases, this analysis will reinforce the conclusions of the simple method presented herein.

SUMMARY OF METHOD

We present a summary of the method in Table 3.

	A	B	C	D	E	F
	Cost Factor					Line total/node
1	TR support	TR cost, $	/	Nodes supported=	=	TR Cost
2	Increased switch cost	Switch cost/ port	/	UTP port utilization	=	UTP port cost
3				Total of reduced cost factors	=	F1+F2
4	Reduced switch cost	Switch cost/ port	/	fiber port utilization	=	Fiber switch cost
5	Media converter	$/end	*	2	=	Media converter cost
6				Total of increased cost factors	=	F4+F5
7				Net savings with fiber	=	F3-F6

				to the desk		

Table 3: Summary Of Method

EXAMPLE OF METHOD

We present an example in Table 4.

	A	B	C	D	E	F
	Cost Factor					Line total/node
1	TR support	$48,000	/	48	=	$1000
2	Increased switch cost	$25	/	0.7	=	$35.71
3				Total of reduced cost factors	=	$1035.71
4	Reduced switch cost	$25	/	0.9	=	$27.78
5	Media converter	$100/end	*	2	=	$200
6				Total of increased cost factors	=	$227.78
7				Net savings with fiber to the desk	=	$807.93

Table 4: Example

PEARSON TECHNOLOGIES FTTD SERVICES

Pearson Technologies offers a number of services related to fiber to the desk network design. All of these services save clients more than the cost of these services. These services include:

¸ Cost comparison

¸ Total network cost

¸ Lowest cost connector installation method

¸ Network component specification development

¸ Network design training

In the cost comparison service, Pearson Technologies identifies the cost factors appropriate to the client network and estimates the actual savings the client can expect from FTTD. This service enables clients

to make a realistic and practical decision to use FTTD. In addition, this service eliminates unpleasant surprises.

In the total network cost service, Pearson Technologies Inc. uses proprietary software to estimate the total installed cost of a network. This service enables clients to accurately estimate cost. This service enables clients to query installation organizations to determine causes of differences from the estimate. These causes can indicate both reasons to accept increased cost and opportunities to reduce cost.

In connector cost calculation, Pearson Technologies provides cost calculations of four connector installation methods. These estimates enable the client to determine the method that provides the lowest total installed cost. The lowest cost connector may not have the lowest total installed cost. Similarly, the connector with the shortest installation time may not have the lowest total installed cost. The subtleties that are not part of advertising determine the total installed cost. Major connector manufacturers have reviewed these calculations without indicating dispute.

In the network component specification, Pearson Technologies Inc. develops detailed specifications that provide the maximum possible network reliability. Based on the current data communication standards, these specifications make explicit those performance parameters than can be overlooked by the supplier and the installer.

In this four part, four-day network design training program, FiberProÅ 5, Successful Fiber Optic Network Design, Pearson Technologies provides fiber network planners with

¸ The knowledge essential for successful design

¸ A detailed, eight step design process

¸ Multiple cost estimation techniques and

¸ Experience in development of a complete design package.

This program enables network planners to achieve a network design with high reliability, low installation cost, and low life cycle cost.

Respectfully submitted for your consideration,

Eric R. Pearson, CPC, CFOS

President

Pearson Technologies Inc.

Pearson Technologies Web Sites

http://www.ptnowire.com http://www.FTTDnow.info

http://www.fiberopticlawsuits.info http://www.sfoi.info

Contact Pearson Technologies Inc.

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[1] Increased bandwidth available from fiber translates to longer life.

[2] Pearson Technologies provides such analysis and comparison as a consulting service.

[3] This range resulted from a survey of building managers and survey of members of the TIA FOLS. Very large cities, such as New York and Chicago have a cost of $200/square foot.

[4] If the network does not use this space, some other group in the organization will.

[5] In a recent discussion, a university network manager indicated his costs were between $35,000 and $50,000. The Getty Museum in Los Angeles has published their cost at $50,000 per TR.

[6] This value is an underestimate of the actual savings. Additional factors such as power consumption and cooling capacity required by these additional 12,857 ports increase the real value.

[7] These values are the sum of the two factors.

[8] Note that the manager does not need to change the switches or software that manages the switches. In addition, these media converter costs are deliberately higher than those that most network managers will pay.

[9] These prices are from a web search for equipment.

[10] Increased bandwidth means increased cost. 10BASE-F converters run approximately $100/pair.