Driving Fiber Deeper

By Steven K Richey
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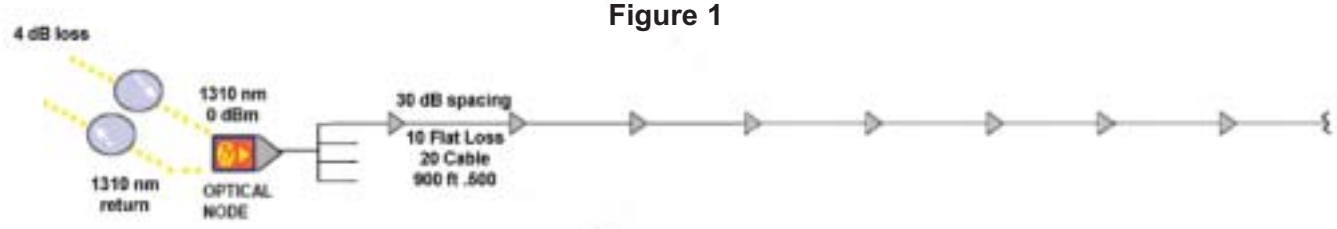
In the last article we talked about the need for the node to be within 2 amps of the customer and in this article we will discuss some innovative ways to accomplish that goal.

We will first look at a simple typical application of a 4 output node, each leg feeding 8 amplifiers with a 1310 nm input at 0 dBm with a fiber loss of 4 dB or a little over 6 miles and a 1310 return as shown in Figure 1.

Figure 1



For this example we are going to assume that this system is fiber poor and does not have any dark fibers available to the node. We are also going to assume that in the RF portion of the plant the amplifiers are spaced at 30 dB with 10 dB of flat loss and 20 dB of .500 or 900 feet between amplifiers.

Now we are ready to see what we can do. Lets begin by replacing the 1310 return Laser with a 1550 return laser in the original node which we will now call Node A and add a WDM and we have freed up one fiber. If we now extend that fiber down to the 6th amplifier and replace it with a new Node, which we will call Node B. This Node will need a 1310 input and a 1550 return just like Node A and then we will need to run the output in both directions and turn amplifier 4 and 5 around along with all of the taps and other passives in between and remove amplifier 3 as shown in Figure 2. You should note that

Figure 2

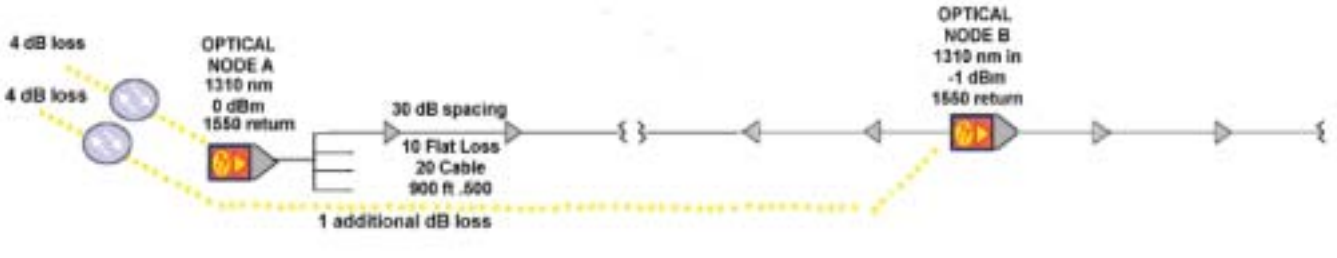


Figure 3

Item	Approximate Cost
1550 NM Return transmitter	$500.00
5000 feet 6 count fiber drop	$802.00
3 ea WDM (Node A & 2 in HE)	$300.00
New Node 1310 in 1550 return with WDM	$699.00
Splitter	$25.00
Return Receiver	$150.00
Total	**$2,476.00**

I have used drop fiber with a .082 messenger for strength. As you will be simply overlashing to existing strand this should be more than adequate and the price of $0.165 per foot is certainly attractive. In the same type of cable you can go up to a 12 count for about $0.30 a foot. On our web site at http://www.4cable.tv/fiber you can find the spec sheets for the cable I used in calculating this article

The previous example could be done for the approximate material cost of:

But as you are aware we have only completed 1 of the four legs of the existing Node A. There are 3 different solutions that we can use. All 3 will require the same action at Node A which is splitting the two incoming fibers into two fibers on one and three on the other so that we now have a total of 5 fibers, one of which feeds the original Node A, as illustrated in Figure 4.

At this point we can go ahead and duplicate the actions we did for Node B and we will have accomplished node plus 2 in

Figure 4

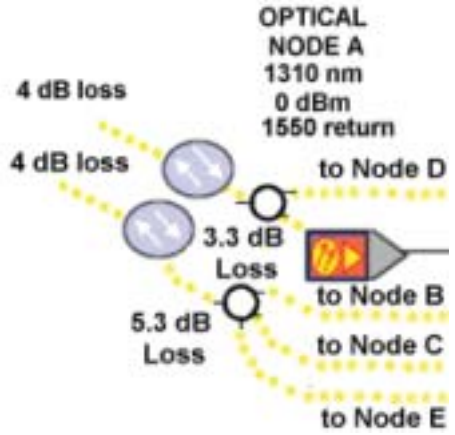


Figure 5

Item	Approximate Cost
Node B (See Figure 3)	$2326.00
3 Additional Nodes	$2097.00
15000 feet 6 count fiber drop	$2406.00
3 Additional Splitters	$75.00
2 Fiber Splitters	$200.00
Total	**$7104.00**

the forward direction and we will have divided the return traffic into two paths, one with 2/5ths of the return traffic and the

Figure 6

Node	Return Wavelength
Node A	1550 nm
Node D	1530
Node B	1550
Node C	15300
Node E	1510

other with 3/5ths of the traffic. In Figure 5 we can look at the costs so far.

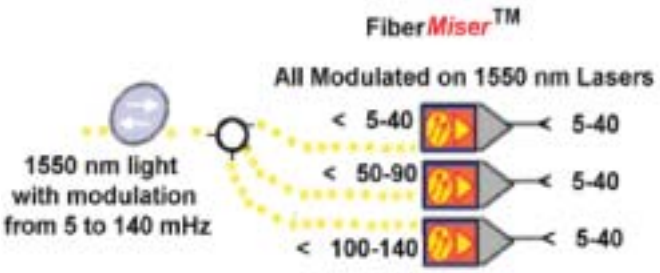
We can stop here and wait for the traffic to increase or we can implement one or the other solutions at this time. The second solution is to replace the return transmitters in three of the nodes with different wavelength light as outlined in Figure 6.

Figure 7

Item	Approximate Cost
6 CWDM	$4,500.00
Wavelength Specific Return Lasers	$450.00 additional
Additional Return Receivers 3 Needed	$450.00
Total	**$5,800.00**

This solution would give you individual returns for each node all on only 2 fibers back to the headend however it is not an inexpensive option. In addition to the cost outlined above

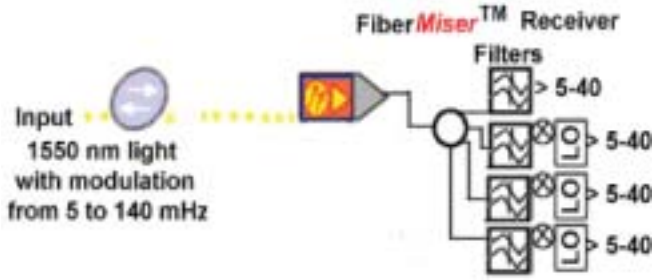
Figure 8



you will need to add the following as outlined in Figure 8.

As I said earlier this is not an inexpensive option, it will cost

Figure 9



almost as much as the original upgrade costs were. But fortunately there is another option. We have developed a solution which we call FiberMiser™ , where the incoming 5-40 mHz

Figure 10

Item	Approximate Cost
ITEM	APPROXIMATE COST
FiberMiser module for Node 3 needed	$600.00
FiberMiser Receiver 2 needed	$1,000.00
Total	**$1,600.00**

signal at each node is either passed as It comes in or is optionally converted to one of three bands, 50-90 mHz, 100-140 mHz, or 150-190 mHz. By doing this you get individual returns from each node without using expensive CWDM components but still using only 1 fiber. Figure 9 is a graphic representation of what we are doing. In this example we are only dividing into 3 bands however it is possible to add the 4th band of 150-*190 mHz.

The head-end receiver receives the modulated 1550 light signal and converts the signals back to a 5-40 mHz signal required by the CMTS as outlined in Figure 9. The cost of the FiberMiser solution is as follows in Figure10.

About The Author

Steven K. Richey, President and CEO of 4Cable TV, has over 42 years of varied CATV experience, including being in charge of repairs at a major manufacturer (Ameco) and former Chief Engineer at CADCO. Prior to founding 4Cable TV, he was VP New Product Development at dB-tronics. He was the owner/operator of 8 CATV systems in Texas and Oklahoma, and has published over 20 technical articles. Steve can be reached at steve.richey@4cable.tv.

The only other cost item we need to address is the headend transmitter. When we started out we had a single output of 4 dBm and now to accommodate all of our additions we will need a transmitter with a single output of 14 dBm or dual outputs at 11 dBm to give us 0 dBm at each node input. We have located an economical source of dual 1310 Laser transmitters with 12.5 dBm available on each output for under $2500 which will do the job nicely . We have more information is available at http://www.4cable.tv/fibertransmiter .

The future of this business is data and the closer we can get fiber to our customers the better off we will be going into the future. What I have attempted to show with this article is that we do not have to be satisfied with the status quo and finances are not the impediment to a high quality system that they once were. In this example we would drive fiber to within 2 amplifiers of our customers and spend less than $12,500.00 in equipment cost. It wasn't too long ago that that was the price of a node. Let's all think and dream our way into the future together. ❑

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