

Fiber Caught **NAPPING** in the OSP

By David Meis

With service providers emphasizing the need to deploy broadband networks faster, cheaper, and with greater reliability than ever before, manufacturers have responded by pursuing innovative solutions that drive down component complexity, installation time and skill requirements – all with one goal: to reduce the cost of deploying broadband networks. Thankfully, the potential to meet that objective has never been greater.

Working Smarter, Not Harder

When analyzing the overall cost to deploy the drop portion of an FTTH network, a major factor is the labor associated with the outside plant (OSP) portion of the system. (See Figure 1.) Newer solutions have been designed to significantly reduce both the installation time as well as the required skill level and experience of the technician installing these products. The result is an attractive reduction in the labor component of the cost picture, which ultimately brightens the business case.

One component in the FTTH network that can potentially benefit from these optimized deployment innovations is the Network Access Point (NAP) terminal. The NAP terminal is typically a small closure that serves as the connection point for subscriber drop cables to the distribution cable. Traditional NAP terminals, whether deployed in aerial or buried applications, have required significant labor time for drop cable installations. Until recently, these installations have also required that skilled splice technicians do the work there.

The very location of the NAP terminal in an FTTH network allows a provider to consider alternative cable choices. One option is to deploy pre-terminated drop cables at the NAP terminal. This strategy can help increase the speed of deploying FTTH while leveraging craft with a lesser skill set than that of splice technicians while reducing the need for craft personnel to re-enter terminals for drop cable installations.

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**Too Much Time
Wasted Snoozing
Away Dollars
at the NAP**

**SIMPLIFYING DROP
PORTIONS OF FTTH
INSTALLATIONS**

To NAP or NID... That's the Question

When moving toward the Network Interface Device (NID) from the NAP terminal, there are several tactics a provider can implement beyond traditional fusion splicing.

When using a drop cable assembly with both ends pre-terminated, the required drop length is estimated during network planning walk-out, with discrete management of excess drop cable slack performed at the customer premises. When both ends of the cable are pre-terminated, there is no need for fusion splicing during drop installation. I&M technicians can handle the entire operation, including drop cable and NID placement. This, in turn, allows splice technicians to be available for higher-level tasks.

There are situations, however, where it makes good sense to have just one end of the drop cable pre-terminated. Factors that influence a provider's range of choices include things such as residential lot density, uniformity, and average drop cable distances. These may dictate that a single-end pre-terminated drop cable is used due to the challenges of accurately assessing those drop cable distances within an acceptable error margin.

Situations that require a wide range of drop lengths can also dictate that OSP craft store pre-terminated drop cable assemblies in a variety of lengths in order to reach all potential subscribers. To improve efficiency in these situations, it makes sense to account for a smaller assortment of single-end pre-terminated drop cable assemblies. At the time of installation, OSP craft personnel can then custom-cut the cable to the appropriate length on the unterminated end of the cable. The wasted single-fiber optical drop cable is, quite literally, pennies on the foot, and is greatly overshadowed by the significant cost savings realized with more optimized solutions for FTTH applications.

A valid concern with single-end pre-terminated drop cables, however, is where to place the pre-terminated end: the NID or the NAP terminal. When a splice technician is required for drop installations, there is significant time saved by not relocating a terminal to a

Network Access Point Terminal Installation

MATERIAL	OPTION 1	OPTION 2	OPTION 3
Traditional Aerial Terminal (8-drop capacity) Includes splice tray, strain-relief hardware, and aerial hanging brackets.	\$150	—	—
Optimized Aerial Terminal (8-drop capacity) Includes splice tray, pigtails, and aerial hanging brackets.	—	\$250	\$250
Material Cost for NAP Terminal Installation	\$150	\$250	\$250
LABOR TASK	TIME IN MINUTES TO PERFORM		
Set cones, raise bucket, bring cable to work area	20	20	20
Prepare terminal, access and install distribution cable	15	15	15
Set-up and fusion splice 8 pigtails (5 min. machine set-up, 3 min. per splice)	—	30	30
Route mid-spanned buffer tube in terminal and route fibers in splice tray	10	10	10
Connect spliced pigtails to pre-terminated drop cable adapters	—	2	2
Close terminal and install on strand	45	45	45
Time Required for NAP Installation (min.)	90	122	122
Technician Loaded Labor Rate (\$/hr.)	\$60	\$60	\$60
Labor Cost for NAP Terminal Installation	\$90	\$122	\$122
TOTAL COST OF NAP INSTALLATION	\$240	\$372	\$372

Table 1. Network Access Point Terminal Installation Comparison

Drop Cable Installation

MATERIAL	OPTION 1	OPTION 2	OPTION 3
Traditional Optical Drop Cable 150 feet, single fiber	\$20	—	—
Pre-Terminated Optical Drop Cable (1 End) SC/APC connector housed in sealed, hardened connector housing, 150 feet, single fiber	—	\$55	—
Pre-Terminated Optical Drop Cable (2 Ends) SC/APC connectors housed in sealed, hardened connector housings, 150 feet, single fiber	—	\$	\$90
Material Cost for Drop Cable Installation	\$20	\$55	\$90
LABOR TASK	TIME IN MINUTES TO PERFORM		
Set cones, raise bucket, bring terminal to work area for drop cable installation and splicing	20	—	—
Set cones, raise bucket	—	5	5
Prepare terminal (open, locate fiber)	10	—	—
Access and install drop cable	10	—	—
Set-up and fusion splice drop fiber to pigtail	8	—	—
Close terminal, document, and clean up	5	—	—
Connect pre-terminated drop to terminal	—	2	2
Raise bucket, secure terminal to strand	45	—	—
Route and secure drop cable to pole and home	30	30	30
Time Required for NAP Installation (min.)	128	37	37
Technician Loaded Labor Rate (\$/hr.)	\$60	\$60	\$30
Labor Cost for NAP Terminal Installation	\$128	\$37	\$19
TOTAL COST OF NAP INSTALLATION	\$148	\$92	\$109

Table 2. Drop Cable Installation Comparison

Network Interface Device Installation			
MATERIAL	OPTION 1	OPTIONS 2	OPTION 3
Traditional Network Interface Device Includes splice tray, pigtail, SC/APC adapter, drop cable strain-relief hardware	\$44	\$44	----
Optimized Network Interface Device Includes pre-terminated drop cable adapter	----	----	\$40
Slack Storage Device Houses slack for pre-terminated drop cable with both ends connectorized	----	----	\$8
Material Cost for NID Installation	\$44	\$44	\$48
LABOR TASK	TIME IN MINUTES TO PERFORM		
Open NID, locate tray and fiber	3	3	1
Mount slack storage device and NID	----	----	5
Mount NID	5	5	----
Access drop cable end	5	5	----
Set-up and fusion splice drop fiber to pigtail	15	15	----
Strain-relieve drop cable in NID	5	5	----
Route buffer tube to splice tray	2	2	----
Store slack in slack storage device	----	----	3
Connect drop cable to adapter in NID	----	----	1
Close NID, document, clean-up	10	10	10
Time Required for NID Installation (min.)	45	45	20
Technician Loaded Labor Rate (\$/hr.)	\$60	\$60	\$30
LABOR COST FOR NID TERMINAL INSTALLATION	\$45	\$45	\$10
TOTAL COST OF NID INSTALLATION	\$89	\$89	\$58

Table 3. Network Interface Device Installation Comparison

Subscribers	Total Cost and Labor Savings Compared With OPTION 1							
	OPTION 2				OPTION 3			
	Total Cost Savings		Total Labor Savings		Total Cost Savings		Total Labor Savings	
	\$	%	Man-Hrs.	%	\$	%	Man-Hrs.	%
0 - Initial	-\$132	-55%	-1	-36%	-\$132	-55%	-1	-36%
1	-\$76	-16%	1	22%	-\$62	-13%	1	32%
2	-\$20	-3%	3	34%	\$9	1%	3	46%
3	\$36	4%	4	40%	\$80	8%	4	52%
4	\$92	8%	6	42%	\$150	13%	7	55%
5	\$148	10%	7	44%	\$221	15%	9	57%
6	\$204	12%	9	46%	\$291	18%	11	59%
7	\$260	14%	10	47%	\$362	19%	13	60%
8	\$316	15%	12	47%	\$432	20%	15	61%

Table 4. Total Cost and Labor Savings Comparison

Option 1: Traditional solution with fusion splicing of drop cable at both the NAP terminal and the NID.

Option 2: Optimized solution with pre-terminated drop cable at the NAP terminal and fusion splicing of the drop at the NID (single-end pre-terminated drop cable).

Option 3: Optimized solution with pre-terminated drop cable at both the NAP terminal and the NID (both ends of drop cable pre-terminated).

splice environment for the drop installation at the NAP. Placing the pre-terminated end at the NAP allows the terminal to remain securely in place and closed during the drop cable installation. Furthermore, every time a terminal is re-entered to install a subsequent drop cable, there is a risk of interfering with service to other active subscribers being served from that terminal.

A Dream of a Solution

In geographies where labor costs for splice technicians are low, many providers may not feel it's necessary to use pre-terminated cable solutions. Though low labor costs may deter providers from considering alternatives in FTTX drop cable, three additional criteria should be considered as providers determine whether to use a pre-terminated drop cable on one or both ends of the cable:

1. Re-entry is required for drop cable splicing operations.
2. The risk of service interference to other customers served from the terminal is greatly reduced by keeping all required installation tasks exterior to the terminal itself.
3. Since the terminal does not have to be relocated for splicing operations, little time is wasted when replacing the terminal to its installed location (on a strand, in a hand-hole, etc.) once the drop is spliced in and secured.

To drill down further, let's examine the available deployment options based on the installation scenario described below:

- Aerial (strand-mount) NAP terminal and aerial drop cable installation.
- NAP terminal drop capacity is 8 subscriber drop cables (single-fiber drops).
- Terminal is installed on Day 1, with drop cables incrementally added as subscribers randomly take service thereafter, one at a time.
- The NID is mounted externally on the side of the residence. Only the material price of the empty NID housing will be considered. Average drop cable length is 150 feet.
- Splice technician loaded labor rate of \$60 per hour.
- I&M technician loaded labor rate of \$30 per hour.

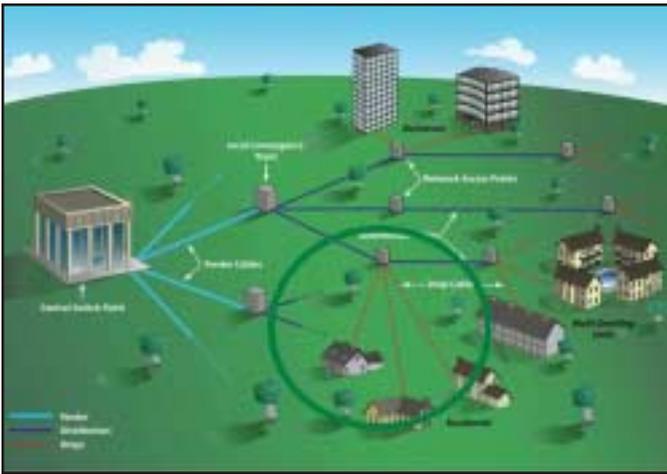


Figure 1. Typical FTTH Network Architecture

Next, let's define three options to model for this comparison:

Option 1 – Traditional solution with fusion splicing of drop cable at both the NAP terminal and the NID.

Option 2 - Optimized solution with pre-terminated drop cable at the NAP terminal and fusion splicing of the drop at the NID (single-end pre-terminated drop cable).

Option 3 – Optimized solution with pre-terminated drop cable at both the NAP terminal and the NID (both ends of drop cable pre-terminated).

“When analyzing the overall cost to deploy the drop portion of an FTTH network, a major factor is the labor associated with the outside plant portion of the system.”

The NAP, the NID, and the Drop Cable

To begin the analysis, we'll break down the material costs and identify the specific labor tasks and average amount of time craft would spend at each of the three key locations within the drop segment: the NAP terminal, the drop cable, and the NID.*

NAP Terminal Analysis - The material costs and labor tasks required for installation at the NAP Terminal are presented in Table 1. Note that the material and labor breakdown is identical for Option 2 and Option 3, as the installation of both of these optimized solutions is independent of the drop cable termination

method at the NID. (Both options feature pre-terminated drop cable ends at the NAP terminal).

As would be expected, the optimized solutions above require a higher initial investment, as they generally include higher-grade products. In addition, it's necessary to have an installation technician perform all pigtail splicing at the time of terminal installation. In Option 1, the accessed distribution fibers are merely routed in the splice tray, in preparation for splicing to the drop cable fiber at a later date when a customer orders service from the provider.

Drop Cable Analysis - Here the benefits of the optimized solutions begin to stand apart from the traditional deployment method. (See Table 2.) The main contributor to this difference is the requirement to relocate the traditional terminal for drop cable installation and splicing. To reiterate, the elimination of terminal re-entry is a key strength that plays heavily in favor of the optimized solutions.

NID Installation Analysis - We'll now compare the installation of the NID at the subscriber's premises. (See Table 3.) For Option 2 and Option 3, the NID housing price includes a pre-terminated drop cable adapter.

Waking Up to Reality

With the material and labor components of each option analyzed, let's now compare the bottom line. Table 4 summarizes the total costs and labor time for each option as a function of the number of subscribers served from the terminal.

A few key findings:

- At full terminal capacity, Option 2

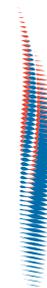
yields 47% labor time savings, with overall cost savings of 15%.

- These savings are achieved with a pre-terminated drop cable having only one end connectorized, installed by the same splice technician that is used in Option 1.
- Moving to Option 3 with a terminal at full capacity, the savings increase to an astonishing 61% reduction in labor time, with total cost savings of 20%.

To put things into perspective, in an FTTH deployment with 10,000 homes passed (by today's standards, a medium-sized deployment), the total cost savings from the drop portion of the network alone are amplified to \$395,000 for Option 2 and \$540,000 for Option 3. The labor savings for this same deployment are truly remarkable, with more than 1,800 man-days of labor saved with Option 2, and more than 2,300 man-days of labor saved with Option 3. With savings of this magnitude, service providers would be well served to give this technology serious consideration.

*Actual time estimates and labor rates for the involved labor tasks have been gathered from several external sources and averaged to lay down the foundation for an objective comparison.

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