

Reducing DS3 Access Costs

- DS3 demand continues
 - DS1 to DS3 conversions
 - Businesses defer TDM-to-Ethernet investment
 - Mission-critical and high-security applications
- Challenge: reduce DS3 install costs to preserve more resources for Ethernet
- New Pulsecom O3-3D3D (triple DS3 optical unit) offers a solution
 - Low cost mini-mux alternative
 - Saves fiber
 - Integral DS3 NIUs
 - Hardware and facility 50ms. switch-to-protect
 - Faster turn up

Introduction

DS3 demand is driven by subscriber cost savings, cost avoidance, security concerns and perception by some that TDM still provides optimum performance for voice and video.

Businesses often migrate from multiple DS1s to DS3 to reduce monthly bills as their bandwidth needs increase. Faced with today's economy, other businesses are reluctant to invest in the training and new equipment necessary to make a transition to Ethernet-based services, so they stay with and expand their current equipment.

Some subscribers – particularly those transporting sensitive information – are reluctant to change to Ethernet because of hacking and security concerns. And users with voice and video content may stay with TDM-based DS3s to eliminate any possibility of bandwidth contention.

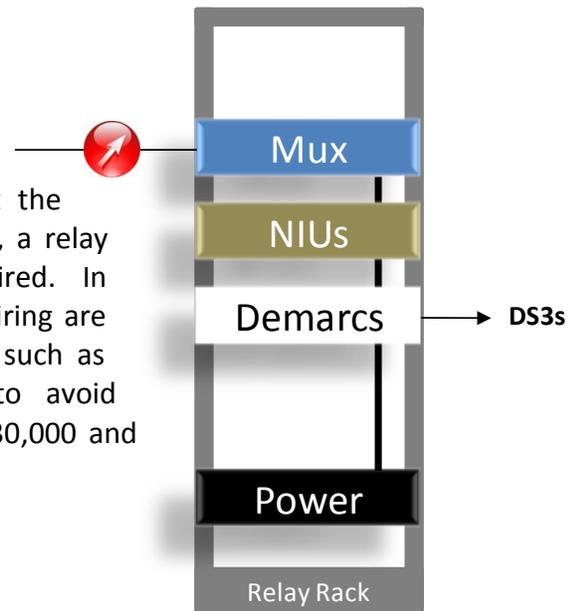
Fortunately, fiber being placed to boost wireless and landline speeds coincidentally passes many businesses previously served only on copper, creating additional opportunities for DS3 revenue.

The Network Challenge

Despite a focus on Ethernet and billions being invested in Ethernet infrastructure, DS3 demand continues. The challenge becomes one of reducing the cost and improving the efficiency of DS3 installs so more resources can be directed to strategic Ethernet programs.

Traditional DS3 Service

Many DS3 circuits are still delivered by placing a mux at the subscriber site. The technology is bulletproof, but the mux, a relay rack, power system and demarcation point wiring are required. In addition, DS3 Network Interface Units (NIUs), shelves and wiring are normally necessary to support remote network diagnostics such as AIS-CI (Alarm Indication Signal – Customer Interface) to avoid unnecessary truck rolls. These installations can approach \$30,000 and system turn up time can take a day or more.

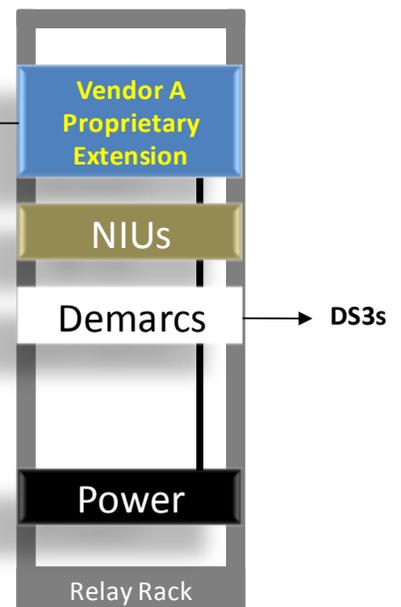


There are vendor-proprietary alternatives that may be less expensive, but these arrangements require a vendor-specific higher-order mux to feed vendor-proprietary boxes at subscriber sites. This solution still usually requires external NIUs for in-band diagnostics to support out-of-region connections as described in greater detail within the OAM section.



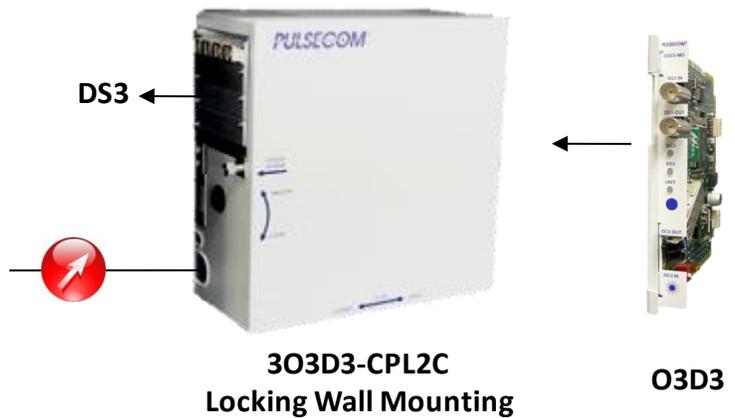
Central Office

From a network perspective, these constraints and added complexity add to the administrative effort, installed cost and installation time. This proprietary approach may be able to support facility protection but may not have the redundant hardware capability required in certain mission-critical applications. Another consideration: if the necessary "feeder mux" is not available, service must be either denied or provided with the expensive traditional mux approach.



Subscriber

When only one DS3 is needed and/or protection switching is not required, a third and less expensive solution is Pulsecom's O3D3 OC3-to-DS3 unit. Tens of thousands of O3D3s have been deployed, but costs for this solution increase when multiple DS3s are required and, in multiple-DS3 applications, the O3D3 may be less fiber efficient. Still, for many businesses moving from several DS1s to a single DS3 or in DS3 backhaul applications, the O3D3 is a cost effective approach.

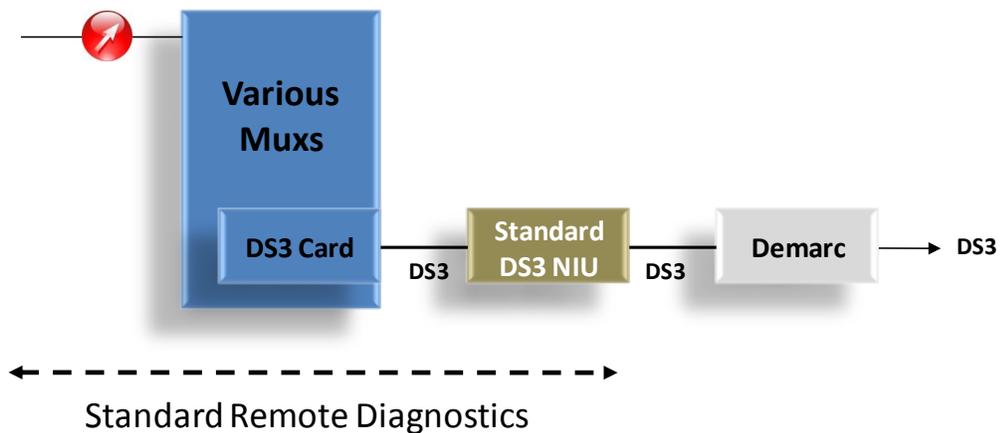


OAM

Legacy DS3 access solutions provide necessary Operations, Administration and Maintenance (OAM) capabilities for their intended applications.

Two relatively recent changes have imposed additional OAM needs. The first is nation-wide consolidation of test centers. Truly remote and, critically, *uniform* diagnostic capabilities are necessary to enable the efficiencies of centralization.

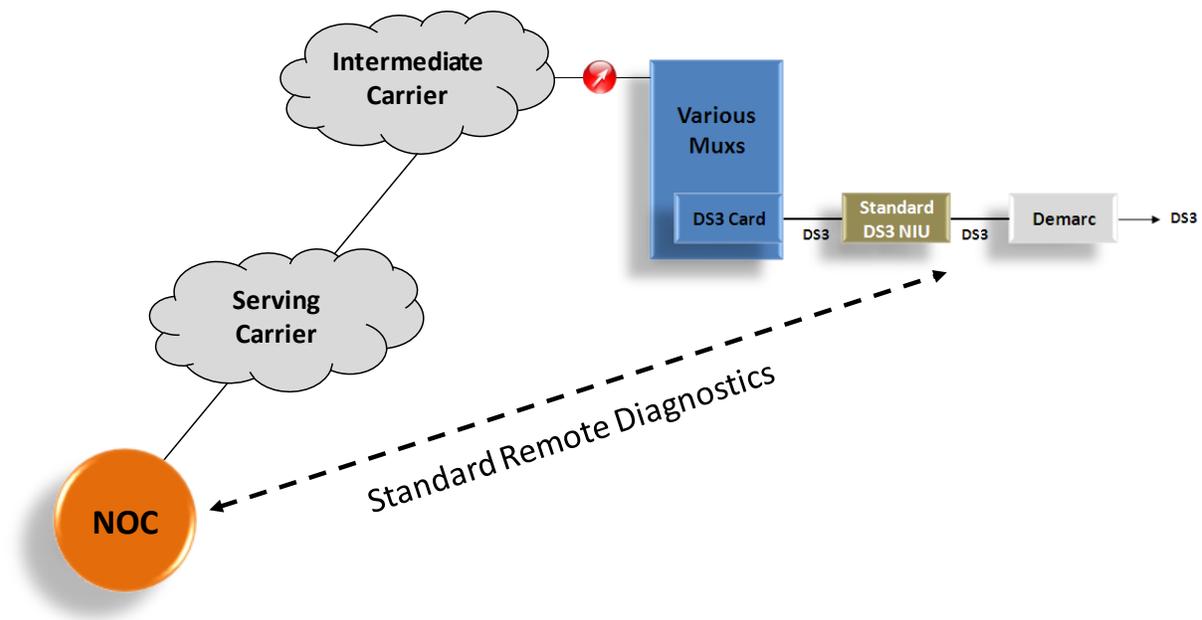
With multiple generations of equipment from multiple vendors, add-on Network Interface Units (NIUs) have been used to achieve consistent remote diagnostics such as in-band loopbacks, Network Performance Report Messaging (NPRM) and information provided by AIS-CI, AIS, RAI-CI and RAI messages that determine if a problem is on the subscriber-side or the network-side of the demarc. It is common to find a DS1 NIU installed on the drop side of a DS1 circuit, and common to find a DS3 NIU installed on the drop side of a DS3 circuit. These NIUs add cost and complexity, but they're less expensive than a truck roll.



The second issue is the need for diagnostics on circuits that move through more than one carrier as well as the need for diagnostics on subscriber private lines. Traditionally, Network Operation Centers (NOCs) have access to CO LANs to inspect and utilize “out of band” SONET, NGDLC, etc. performance data and maintenance capabilities.

“Out of band” refers to information in, for example, SONET overhead rather than within the SONET DS1, DS3, etc. payload. Out-of-band diagnostics have the advantage of providing circuit visibility without disrupting circuit operation but out-of-band information cannot always be accessed.

CO LAN access may not be available from intermediate carriers, and subscribers are not granted access to CO LANs. Here again NIUs provide a solution. NIUs offer in-band diagnostics including *payload* overhead versus out-of-band performance information. For example, DS1 circuits (the payload) with ESF framing include performance information within the DS1 just as DS3 circuits (the payload) with C-bit framing carry performance information within the DS3. NIU maintenance capabilities include in-band (payload) loopbacks and diagnostics so that both carriers and private-line subscribers can verify remote connectivity without a truck roll – even if the circuit goes through more than one carrier.



NIUs are important for centralized access, out of region connections and private lines, but they add to complexity, cost and turn-up time.

A New Generation DS3 Solution

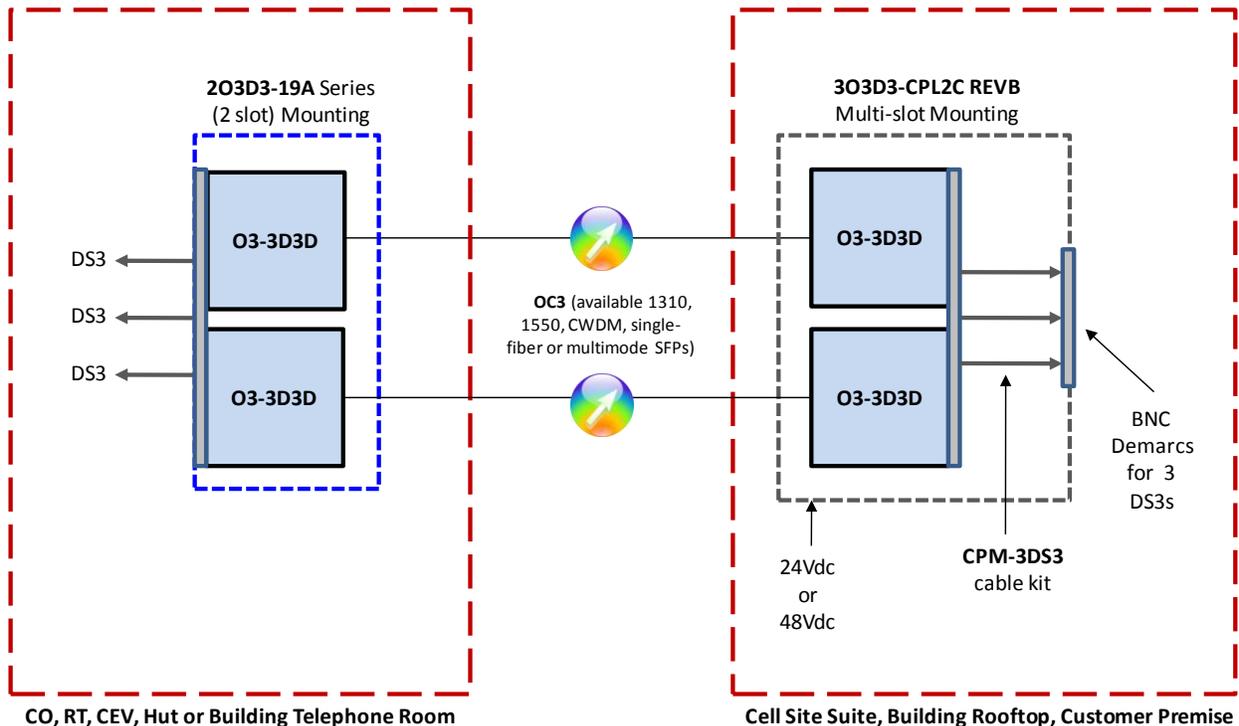
Each of the legacy DS3 access issues noted above – cost, time, proprietary network constraints, fiber efficiency - are addressed with the Pulsecom O3-3D3D.

The O3-3D3D is similar to the O3D3, but rather than delivering one DS3 from an OC3 facility, the O3-3D3D delivers one, two or three DS3s. Both units use the same OC3 SFP optical transceivers: single fiber, CWDM, traditional 1310nm/1550nm or (for high-rise applications) multimode. Both units can be deployed in 400-mechanics mountings such as the 1.75" high 2-slot 2O3D3-19A 19"/23" rack mounted shelf and 3O3D3-CPL2C locking wall mounting. Both units meet GR-3108-CORE Class 3 criteria for use in harsh environments and operate from 24Vdc or -48Vdc power supplies.

Unlike the O3D3, however, the O3-3D3D also supports hardware and facility switch-to-protect as shown below when deployed in 2O3D3-19A REV B or 3O3D3-CPL2C REV B mountings to improve resiliency and reduce costs. In addition, the O3-3D3D has three built-in and state-of-the-art DS3 NIUs with NPRM, in-band and FEAC loopbacks plus AIS, AIS-CI, RAI and RAI-CI diagnostics to eliminate the need for external DS3 NIUs. Finally, the O3-3D3D can support three DS3s over one fiber using economical single-fiber SFP transceivers, or up to 24 DS3s over one fiber pair using CWDM transceivers.



Typical Switch-to-Protect Configuration



COST ADVANTAGES

When it's possible to use existing mountings, power and SFP optics, returning an O3D3 to PICS and growing from one DS3 to 3 DS3s can be done for a net subscriber equipment cost of under \$375 for each additional DS3 and in less than 5 minutes.

In new installations that require three DS3s, the O3-3D3D with SFP transceiver can be less than half the cost of three O3D3 units equipped with SFPs.

In a subscriber-site mission-critical application that requires hardware and facility switch-to-protect, a pair of O3-3D3D units with SFPs in an existing 2O3D3-19A 1.75" high rack mounting is less than 15% of the cost of a conventional mux installation and includes the necessary built-in DS3 NIUs.

DEPLOYMENT FLEXIBILITY AND SIMPLICITY

Based upon an industry-standard Type 400 mechanics design used by subscriber-side T1 NIUs, the O3-3D3D plugs into thousands of existing Pulsecom 2O3D3-19A shelves and 3O3D3-CPL2C locking wall mountings. Since many of these existing mountings are already carrying DS1s, the O3-3D3D provides an instant upgrade to DS3 when subscribers decide to consolidate DS1s into one or more DS3 circuits.

Like the O3D3, the O3-3D3D does not depend upon a particular network-side higher order mux or DCS. Simple, fast and non-proprietary bookend installations are easy to administer and universally compatible.

The O3-3D3D can also be deployed in existing Westell CP528 OSP demarc enclosures by using the Pulsecom CSSI upgrade kit. Over 200,000 of these Westell 8-slot CellPak systems are in use at cell sites and businesses. After a 30 minute CSSI field installation, a CP528 can support optically fed DS1s (using Pulsecom's 12 DS1 O3-12D1 card), DS3s (using the O3D3 or O3-3D3D) and/or GigE (using Pulsecom's SuperG which manages 8Gb of native Ethernet bandwidth to deliver optical GigEs, electrical 10/100/1000BT Ethernet drops and 12 DS1s).

FIBER EFFICIENCY

With a single fiber SFP, the O3D3 can deliver 1 DS3 over 1 fiber. The O3-3D3D can deliver 3. Alternately, using an external 1310/1550 coupler, the O3-3D3D can deliver 3 DS3s by using 1550nm SFPs and "riding on top" of existing 1310nm circuits used by legacy equipment like FLM-150s or DDM-2000s. CWDM optics permit eight O3-3D3Ds to carry up to 24 DS3s over one fiber pair.

Conclusion

Cost savings, cost avoidance, security concerns and perception by some that TDM provides optimum performance for voice and video are all factors driving on-going demand for DS3

circuits. The challenge is to find a way to deliver DS3s more efficiently so that funds can be funneled to strategic Ethernet build outs.

Today's DS3 architecture is based on use of often expensive legacy equipment that can require NIU work-arounds for OAM support, restrict DS3 availability and consume too much fiber.

Pulsecom's O3-3D3D overcomes the cost, time, flexibility and fiber issues and builds in OAM capabilities to meet today's network demands, leverage DS3 revenue streams and preserve resources.

About Pulsecom

Part of \$2.5B Hubbell Incorporated (NYSE: HUB.A, HUB.B), Pulsecom has designed and manufactured network innovations in the United States for almost 50 years. Pulsecom optical access equipment has proven to be more reliable, more cost effective and better able to leverage existing infrastructure, and miniaturization has led to more nimble installations and optimized network architectures.