Addressing the network needs of carriers deploying DSL technology.
Expand Your DSL Opportunities.

DSL is key to business success, from sustaining and growing market share to additional revenue opportunities such as video. Choosing the right solution for your network can be overwhelming. ADTRAN has the expertise and the solutions you need to grow your DSL opportunities.

Answers for Difficult Network Questions.

Integrated DLC or DSLAM? Pre-provisioned or truck roll per subscriber addition? ADSL2, ADSL2+, ADSL2++, or VDSL? Can video be deployed from the existing network? What about HDTV? How much bandwidth is enough? ADTRAN can help. With our years of experience in loop plant, combined with our expertise in leading edge technologies, we can assist you in making decisions that are right for your network.

Integrated DLC or DSLAM – Which is more cost-effective?

DSL equipment costs have continued to fall, creating wider opportunities for DSL service offerings. The cost to provision the DSL service, including the truck dispatch to connect the service, has become a more significant cost factor in overall service delivery. ADTRAN has examined DSL implementation alternatives that consider both hardware and provisioning costs with the goal of developing effective network strategies with our customers.

In existing networks, consider an adjunct DSLAM. In networks where POTS service already exists, DSL can be added with the placement of an adjunct DSLAM. The adjunct DSLAM is an attractive alternative in existing applications since the DLC has already been purchased and paid for. In greenfield applications where both POTS and DSL must be purchased, the costs of an integrated or pre-provisioned solution may be more compelling and is worth consideration.

If POTS already exists, use a DSLAM and roll the truck. An integrated DLC can be significantly more costly than a DSLAM, even with a truck dispatch to activate DSL subscribers. DSL take rates must exceed 40% to 50% before any cost advantage is gained with an integrated DLC approach. An adjunct DSLAM provisioned for every POTS port will eliminate the dispatch and still may offer cost advantages over an integrated DLC solution.
In new developments or rehab, use the DLC or DSLAM. For facility rehab or new construction that requires new POTS services anyway, the cost advantages of the truck roll approach diminish. A pre-provisioned DLC or DSLAM gains cost advantages at DSL take rates of 20% to 30%.

Whether you roll a truck or pre-provision DSL in your network, the adjunct DSLAM represents one of the most cost-effective solutions to providing DSL across the network for today’s Internet and tomorrow’s video applications.

Overall Cost Analysis for DSL in Existing Network

Incremental DSLAM lines represent adjunct DSLAM and truck dispatch. Pre-provisioned curves represent DSL on every POTS port with no truck dispatch. Graph results based on conservative industry estimates. To calculate the cost points for your network, visit our website at www.adtran.com/dslcalculator
Video Over DSL

Can you cost-effectively meet the rising demand for Internet access while building an infrastructure that supports video? Up to now it has been difficult and expensive, but three enabling standards may significantly reduce the costs associated with the "triple play". By implementing these standards in their broadband networks, service providers will have a significant advantage over current solutions that do not offer the cost and competitive benefits of industry standards.

ADSL2+. A sustainable video offering requires DSL bandwidths approaching 20 Mbps. ADSL2+, combined with 2-pair subscriber loop bonding and advanced video compression, can deliver three channel HDTV-based programming across most of a network designed within CSA guidelines. While VDSL offers single pair access at video bandwidths, it is constrained to short loops, requiring re-engineering to place loop electronics within 3 kft of the subscriber. ADSL2+ extends the downstream frequency spectrum used in ADSL from 1.1 to 2.2 MHz and has become an ITU standard, with commercially available products in the near term.

2-Pair Subscriber Loop Bonding. With the introduction of DSL and cellular phones, access line growth has been negative, freeing copper pairs. The addition of a pair to the household from the DSLAM can reduce the need to re-engineer the network for video applications by extending the effective range of a competitive video service. While 2-pair bonding can be accomplished using proprietary techniques, it limits the service provider to a single vendor and eliminates the "best of breed" attributes that standards afford through competition. Standards efforts are underway and will be applicable to existing and future DSL technologies.
Compression Algorithms. Although small-scale, standard definition video service can be deployed using MPEG2 compression, the advent of MPEG4 AVC/H.264 and other advanced compression techniques provides the increased quality and the reduced data rates that dramatically change the economics of providing a competitive video service. Industry experts expect commercially available implementation of these coding techniques by the end of 2004. The introduction of newer compression algorithms will impact equipment decisions such as the set top box, for example, in whether to offer a current solution that cannot be upgraded or to deliver video service with the latest compression technology.

ADSL
- G.992.1 standard June 1999
- Frequency range: 138 kHz to 1.1 MHz downstream
  25 kHz to 138 kHz upstream
- Operates over POTS

ADSL2
- G.992.3 standard May 2003
- Incremental improvement over ADSL
- Single-ended test support

ADSL2+
- Latest ADSL standard G.992.5
- Higher downstream mode
  - Extended downstream frequency range to 2.2 MHz
  - Operates over POTS
- Extended reach mode (READSL)
  - Objective of 192/128 kbps on 1500 ohm loops
- Higher upstream mode
  - Over POTS -frequency range 25 to 276 kHz upstream
  - No POTS -25 to 138 kHz or 25 to 276 kHz upstream

ADSL2++
- Standard under consideration
- Bridges ADSL2+ and VDSL technologies

VDSL
- DMT VDSL adopted by T1E1.4 for North America
- Frequency Plan 998: 22/3 Mbps @ 5 kft
  10/10 Mbps @ 3.5 kft
- Currently short reach, eventually combined with ADSL technologies for extended reach

Today’s DSL technologies offer similar performance at CSA limits, but techniques such as 2-pair bonding can dramatically increase the effective range of a video service. ADTRAN is committed to establishing industry standards that improve overall system cost and performance. Total Access systems are designed with the flexibility to offer the benefits of emerging technologies while remaining the industry’s most cost-effective solutions for DSL access.

*Graph does not reflect implementation loss. Performance can vary as a function of noise and PSD assumptions.
ADTRAN Total Access DSLAM Systems

The Total Access 3010 has become the DSLAM standard for large and small LECs throughout the industry. Cost-effective and compact, the high-density Total Access 3010 has created DSL expansion opportunities in areas that were previously considered uneconomical. With the realization of its power and flexibility, the Total Access 3010 is increasingly becoming the standard for high-density applications as well, providing the low initial deployment costs and growth potential lacking in traditional DSLAM platforms. The Total Access 3010 HDX architecture brings new advantages to Central Office capacity concerns. ADTRAN’s High Density eXpansion architecture keeps expansion costs in check by allowing shelf-by-shelf growth, coupling low initial costs with per port costs that actually decrease as systems are added. A single HDX architecture can support up to 1056 DSL ports with a common network interface and IP address.

Small Offices and Remote Terminals.

Line counts, cost, available space, and DSL take rates influence the proper choice of DSLAM solutions. ADTRAN offers the right DSL solution for any combination of factors with the Total Access 3010 and 1200 series of DSLAMs. The Total Access 3010 provides up to 176 DSL interfaces and is available in integrated and external splitter shelf configurations using the Total Access 3060. For lower density areas, the Total Access 1200 offers 24 DSL ports in a single rack unit of space, with expansion capabilities to 96 ports. The modularity of both systems offers numerous alternatives for network, subscriber, and switching interfaces.
IMA/ATM Aggregation. Many DSLAMs utilize multiple E1s to transport user data toward the centralized switch or router to interface the Internet. Multiple E1 interfaces can exhaust the port capacity of the router long before any router processing limitations are reached, causing expensive, inefficient usage of network resources. The Total Access 3010 is commonly used throughout the industry to aggregate up to 88 E1s into a single DS3 or STM-1 interface, minimizing router port requirements and increasing system efficiency. The Total Access 3010 can provide subscriber access through ADSL, SHDSL, and E1 interfaces while simultaneously providing IMA aggregation services.

IP/Ethernet. Combining core IP network access with the cost and transmission advantages of DSL creates additional coverage and revenue opportunities. Interfacing the Total Access 1250 with the Internet through LAN access is a simple, effective solution for campus and multi-dwelling environments.

Outside Plant. To ensure entire network coverage, ADTRAN created DSL solutions that extend DSLAM functionality beyond the CO and RT. The Total Access 1100 Series of OSP DSLAMs and Total Access 1000 are self-contained, environmentally hardened DSLAMs that can be mounted on a pedestal or pole. Express, span or locally powered, these DSLAMs are also a low-cost enclosure solution for cross-box and DLC retrofits.

**DSL Solutions Fit Your Network**

*From low line count, existing network applications to high density Central Office, and greenfield opportunities, ADTRAN has a Total Access DSLAM solution that is right for your network.*
Visit www.adtran.com/dslams for more information on ADTRAN's DSL delivery solutions that are right for your network and maximize your current infrastructure.