ADTRAN

The Basics of Internetworking

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Introduction

For small to medium-size businesses, the idea of jumping into internetworking can be a daunting one. The term "internetworking" itself can conjure up images of big, expensive routers, high-speed switches, costly carrier services and major management headaches.

While those images may indeed apply to a large enterprise internetwork supporting tens of thousands of end users, it doesn't have to be the case for the typical small to medium size business. It's helpful, then, to define exactly what internetworking means and how any company can simply and cost-effectively build an internetwork.

Most any business these days has a local-area network, or LAN, that connects multiple PCs in an office to one another and to shared resources such as printers and servers. There comes a time, however, when a single LAN is not enough. Perhaps the company is growing, spreading out to different floors in the same building or opening branch offices, whether they are across town or across the country.

In such cases, you need a way to connect discrete LANs to one another, such that end users whose computers are attached to one LAN can seamlessly communicate with those on another LAN. Simply put, connecting two or more LANs to one another is internetworking.

The manner in which you connect your LANs will depend on your requirements. If it's a matter of connecting a LAN located on one floor of a building to another LAN on the floor just above, a simple switch will likely do the trick. Switches enable multiple LAN segments to be patched together so they are logically one. That means all devices on the LAN are effectively sharing the same bandwidth.

Things get a bit more interesting when you need to connect LANs that are in geographically separate buildings. Now you'll need to bring some form of carrier services into play, to ferry data between locations.

Carrier service options

Here's where the small to medium size business is faced with a number of options. The most common options are leased lines, Frame Relay and Internet services.

A leased line is dedicated bandwidth that users essentially "rent" from a carrier for a fixed monthly fee. That fee will vary depending on the capacity, or bandwidth, of the line - which may range from 56K bit/sec to T1 (1.54M bit/sec) or more – as well as the distance it travels. The beauty of leased lines is that you don't share the line with any other user; the full capacity is yours whenever you want it. Also, it doesn't matter how much or how little you use the line, your monthly price remains the same.

Frame Relay is a newer service that gives users many more options in terms of how much capacity they lease. Users can sign up for a service that provides them a minimum guaranteed amount of capacity, known as the Committed Information Rate (CIR), but allows them to "burst" above that one occasion to the full bandwidth of the connection. For example, a Frame Relay link may have a CIR of 56K bit/sec, but allow, bursts up to T1 speed, to handle the occasional massive file transfer.

Frame Relay services are generally less expensive than private lines, in part because multiple users essentially share the same carrier circuits. Because not all users on a single trunk will send bursts of data at the same time, carriers can oversubscribe their trunks. Customers are still guaranteed they'll have access to whatever their CIR is, and can often burst far above that – all for less money than comparable leased lines.

In the past few years, Internet services have emerged as another viable alternative. This is by far the least expensive scenario, because the user needs only a relatively short connection to an Internet Service Provider (ISP), often a high-speed digital subscriber line (DSL) or a cable modem connection. From there, data rides over circuits that are shared among many Internet users, enabling carriers to offer the service at far less expense. But the very "openness" that makes the Internet an inexpensive option brings with it a major drawback: security. On one hand, users need to ensure that other Internet users can't see their data in transit. There's also the issue of protecting the internal corporate network against attackers that come in via the Internet connection. How to address these security concerns is discussed later in this paper.

Equipment requirements

As with service options, there are a number of equipment choices to make when building an internetwork.

Usually for Frame Relay and leased lines, customers deploy routers. Routers shuttle data from one LAN to another by looking at information contained in the header of each data packet to determine its destination. Routers will vary dramatically in terms of their size, measured in both total bandwidth capacity and in the number of interfaces they offer for attaching LANs and wide-area links. They also vary in terms of function, be it management features or the transport and routing protocols they support.

For the small to medium size business, it's important that any solution be simple to deploy and manage. It also needs to be reliable and cost-effective. ADTRAN™'s new NetVanta™ 3000 Series of access routers offer a feature set that help small to medium size businesses cost-effectively jump into internetworking. The devices are designed to enable branch offices to connect to Frame Relay networks at up to T1 speed – typically more than enough for the average small to medium size business.

ADTRAN offers two models in the NetVanta 3000 Series, the standalone NetVanta 3200 and the rackmount 3205. Both are modular devices that support a single 10/100BaseT Ethernet connection on the LAN side and hold one of four different Network Interface Module (NIMs) for the WAN side: 56/64K, T1/Fractional T1 (FT1), T1/FT1 with a DSX-1 voice interface, and a serial NIM.

Each NIM holds an optional Dial Backup Interface Module (DIM) that supports an ISDN Basic Rate Interface (BRI) or an analog modem connection for disaster recovery, should the primary link fail.

Users can mix and match NIMs depending on their requirements at each location. For example, a headquarters site may need the full T1 connection to a Frame Relay network while branch locations need only a 56K Frame Relay connection. Or, users can employ the NIM with integrated DSX-1 support, enabling them to carry voice traffic over their Frame Relay link and drop it off to a local PBX, thereby saving on telephony charges.

The devices are also "Internet-ready", with support for features including an integrated stateful inspection firewall, network address translation (NAT) and DHCP client and server. Firewalls protect users against unauthorized Internet intruders

while NAT allows users to conserve IP addresses by hiding all internal IP addresses behind one "public" address. DHCP simplifies the administration of IP addresses.

Finally, the NetVanta 3000 routers employ a familiar Command Line Interface (CLI), which is immediately recognized by an experienced router administrator. That means NetVanta administrators won't require retraining or costly certifications.

Building a VPN

Customers that want to employ Internet services instead of Frame Relay or private lines will likely want to build a Virtual Private Networking (VPN). VPNs solve the security problem inherent with using the Internet, by enabling users to build private "tunnels" through the Internet that connect two or more locations. All data sent through the tunnels is encrypted, so that even if an intruder manages to capture your data packets while on the public Internet, they will be unintelligible.

ADTRAN offers the NetVanta 2000 Series of VPN/Security gateways that address requirements for large corporate host locations, mid-size branch offices, and small office/home office (SOHO) applications. The Series is complemented by the NetVanta VPN Client, a software-based VPN with a personal firewall for laptops and personal computers, allowing for secure remote access to the corporate network.

All the products support VPN tunneling based on the IPSec standard, which promotes interoperability with other vendors' VPN products. The NetVanta 2000 Series has been certified by the VPN Consortium, a leading industry authority on VPNs. This certification testifies to NetVanta's interoperability with other leading VPN products *(see www.vpnc.org)*.

No matter which internetworking route you choose, you'll benefit from ADTRAN's unmatched warranty. Whereas most other vendors offer maybe a one-year hardware warranty and even less on software, ADTRAN backs its routers and VPN products for a full five years.

As ADTRAN expands its offerings in the internetworking arena, it brings to the table a history of success in the network equipment business. Customers that are rightfully concerned about the health of their equipment providers can take comfort in the fact that ADTRAN has 17 consecutive years of profitability – no mean feat given recent turbulent times. With its established and loyal distribution channels and finely-tuned service and support organization, you can be sure ADTRAN will stand behind its router and VPN products over the long haul.

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About ADTRAN™

ADTRAN, Inc. is an established supplier of advanced transmission products for today's expansive telecommunications networks. Widely deployed in carrier, CLEC, enterprise, and global networks worldwide, ADTRAN products support all major digital technologies including fiber, T3, T1, E1, wireless T1/E1, ATM, Frame Relay, VPN, SHDSL, SDSL, HDSL, HDSL2, ISDN, and DDS. According to Gartner/Dataquest and IDC, ADTRAN has gained the leading market position in enterprise integrated access devices and HDSL, while maintaining its leadership position for the fourth year in a row in T1 and subrate DSU/CSUs, Frame Relay/DDS extension, and ISDN extension. ADTRAN equipment serves the major Incumbent Local Exchange Carriers, interexchange carriers, ISPs, Competitive Local Exchange Carriers, international service providers, public and private enterprises, and original equipment manufacturers.

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