SOLUTIONS

AN OPTIMIZED IP MIGRATION PATHWAY FOR MODEM CIRCUITS

PART 1

THE FUTURE IS HERE

Datatek
APPLICATIONS, INC

INTRODUCTION

Today, many private lines still exist that use antiquated modems connected to a leased link. Because IP networks are becoming ubiquitous, many private lines and their associated modems can be eliminated, and the traffic sent over the Internet or a company's own private internet. In some cases, with the growth of the ubiquity of IP-based applications running on PC's, larger hosts and servers, what is needed is no longer a private link but a single device at the outer edge of an internet that mediates from IP to the native protocol being used by the attached end device.

This paper presents several "before" and "after" scenarios showing the migration from private lines to an internet and the associated cost savings and advantages.

THE PROBLEM AND SOLUTION REQUIREMENTS

The major problems with the private line circuits are that the modems are old, use old technology, and are constantly failing. In addition, there are usually monthly charges for use of the line.

Any solution should provide the following:

1. Provide seamless migration for the protocols handled over the circuit
2. Be cost effective
3. Be efficient
4. Be simple to install and operate
5. Provide isolated ground planes if required
6. Use the existing IP network infrastructure for transport
7. Be reliable and have a low failure rate.
8. Provide optional data encryption
9. Support various speeds and physical layer interfaces

TYPICAL EXISTING TOPOLOGY

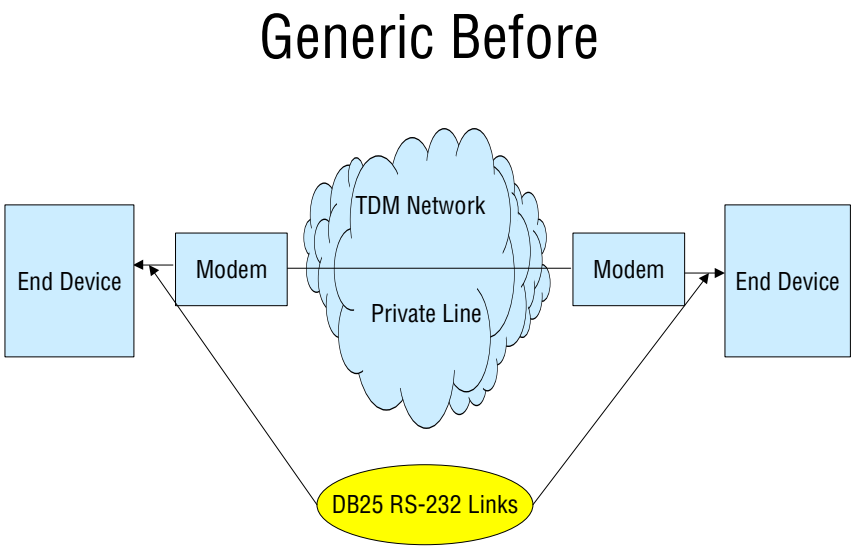

Figure 1

In **Figure 1** above, the typical point-to-point link is depicted. Cabling is required between the modems and the end devices. In addition, where ground plane isolation is required, the modems used must have this as a feature. Depending on what protocols are being handled, different types of modems are needed. For synchronous protocols, synchronous modems are required, for asynchronous protocols, asynchronous modems.

FUTURE TOPOLOGY – GENERAL SOLUTION

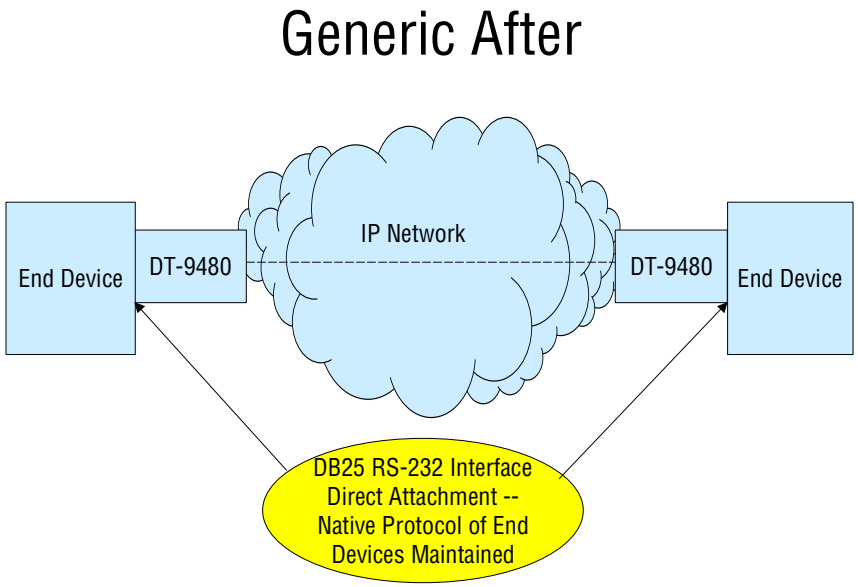

Figure 2

In **Figure 2** above, the modems and private line have been eliminated. Instead, a pair of Datatek DT-9480's is used as access points to the IP network. The DT-9480 is a single user port, multi-protocol device that mediates and/or terminates legacy protocols for interface with an IP network. Each DT-9480 is connected to the IP network through its RJ45 port via a CAT5 Ethernet cable to a 10/100 BaseT network interface, such as a hub or etherswitch. The DT-9480 is directly connected to the end device via its DB25 connector and is secured using two thumbscrews. No intervening cable is needed. The DT-9480 takes up no more space than a standard RS-232 connector. No ground plane issues exist because Ethernet is being used

Closed-User-Group (CUG) security is available on the DT-9480 to shield the end devices from unauthorized access by other devices.

Network management of the DT-9480 is accomplished via telnet through the IP network to the unit, subject to CUG security. An SNMP proxy-agent and corresponding MIB are incorporated into the DT-9480. Extensive measurement and diagnostic capabilities are built in. Software in the DT-9480 can be upgraded from a remote location, if required, via the IP network while the DT-9480 is operating and processing data.

The end devices continue to communicate with each other through the IP network using their native protocols. The DT-9480 can transport many different protocols via an IP network. These native protocols include asynchronous, many variants of X.25 and BX.25, HDLC, SDLC, E2A, REDAC (two different types used by the electric power industry), Raw (no Telnet RFC encapsulation), and others. The handling of all the

protocols has been optimized to account for high latency present in an IP network. The IP network can be a wired network, a wireless network, a satellite network, or any combination of the three. Data encryption can be optionally enabled. The cryptography key selection is dynamic and automatic.

The RS-232 port speeds that are supported are: up to 115.2 Kbps for asynchronous protocols and up to 57.6 Kbps for synchronous ones.

The DT-9480 is powered either by direct 48 V DC, a separate AC-to-DC power brick, or can acquire its power via the Ethernet (Power Over Ethernet standard: IEEE 802.3af).

The DT-9480s are very low cost and reliable. They are currently being used in various critical applications in several telephone companies and in an electric power utility.

Besides the DT-9480, Datatek offers the DT-4284, a unit with four RJ45 user ports and one 10/100 BaseT Ethernet port. It has the same capabilities as the DT-9480. Each user port is independent of the other user ports, so each can be running its own protocol and at its own desired speed. Datatek also offers two other products that support additional capabilities and protocols besides those described above, such as the many variants of the BiSync protocol. These are the 16-user port DT-4180 and 32-user port DT-4280. Each user port is functionally equivalent to one 9480 port except for feature packages which are described later. In addition, Datatek plans to introduce a new unit called the DT-4281 that has a single user port and can support speeds up to 2 Mbps (E1 rate). Besides an RS-232 interface, the DT-4281 will support V.35/V.11 and RS-422 over an RS-530 interface. Its Ethernet interface will support 10/100 BaseT, and will use an RJ45 connector and a CAT 5 Ethernet cable to connect to an IP network.

PROTOCOL TRANSPARENCY AND MIGRATION TO IP

As stated above, the DT-9480, the DT-4284, the DT-4180, the DT-4280, and the DT-4281 can transport the native protocol of the end devices transparently across an IP network. A typical example is shown in **Figure 3** below for X.25.

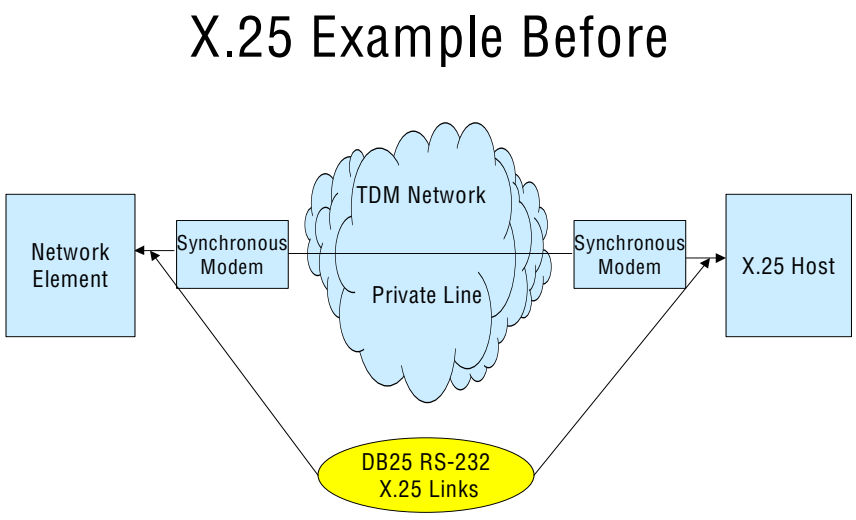

Figure 3

With the advent of the Internet and emphasis on IP, many modern hosts no longer support direct X.25 interfaces. Instead, the host interface is IP over Ethernet. Host applications are being rewritten or upgraded to support IP. However, the end device on the other end of the circuit, which will be called a network element in this discussion, may not be able to be upgraded to IP. It may not be cost effective to do so, or there may be no suitable IP-based replacement. Hence, the need exists for a mediation device to handle the translation from X.25 to IP. The DT-9480, DT-4284, DT-4180, and DT-4280, and the forthcoming DT-4281 fulfill this need.

In **Figure 4** below, only one DT-9480 is needed and that is connected to the network element. That DT-9480 has become the functional IP endpoint in the network. It is no longer an X.25 endpoint from the perspective of the host.

The DT-9480 has built into it several software feature packages, one of which is the X25PAD package. This package provides an X.25 to IP PAD service analogous to older X.25 to asynchronous PAD service. Each virtual circuit (VC) on the X.25 port of the network element is then accessible by the IP host via its own unique IP socket. The X.25 feature package can also provide support for X.25 Pass-Through for VC aggregation, Record Boundary Preservation (RBP) protocol, RFC 1006 ISO interfaces used with FTAM, and other specialized variants. No change is required in the network element. The network interface change from X.25 to IP is transparent to the network element. The only change is in the host software. New hosts no longer have legacy interfaces but now support IP interfaces. The application software running on the host may require only IP or may allow X.25 over IP. The X25 feature package on the Datatek products supports both modes.

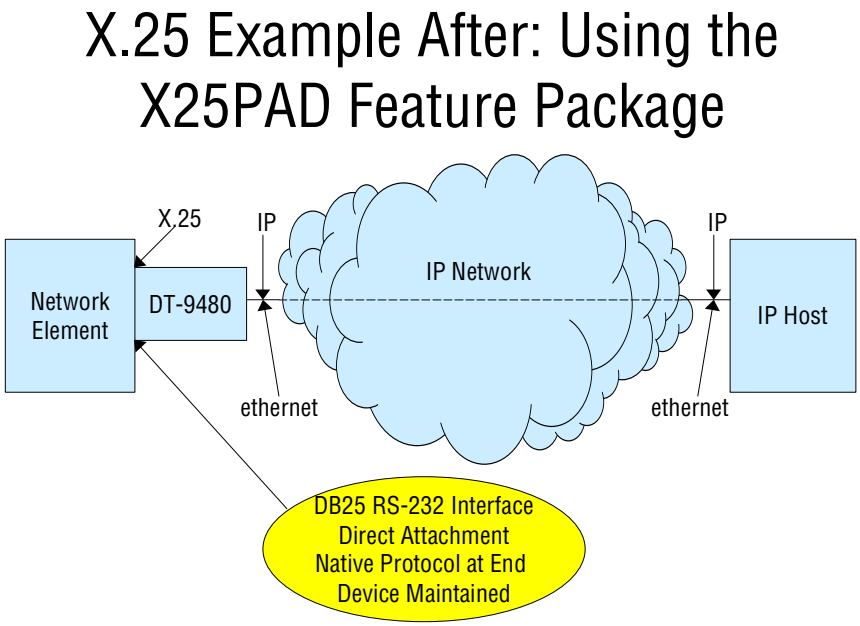

Figure 4

Bridged Modem Circuits and Their Migration to IP

The DT-9480 and DT-4284 have other feature packages besides X25PAD. They are the REDAC Head-of-Bridge (REDHOB) package, which provides support for both varieties of the REDAC 70 protocol used by the

electric power industry, and the E2A Head-of-Bridge (E2AHOB) package, which provides support for the E2A protocol used by the telephone companies for remote alarming of transmission equipment. Both of these packages eliminate the need for bridged networks. The use of DT-9480's in this mode greatly simplifies a network topology, increases reliability, and reduces troubleshooting time and associated costs. Additional enhancements to existing feature packages or new feature packages can be developed as required in order to satisfy your network's particular needs[1].

In order to illustrate the benefits of a virtual bridged network versus a physical one, in **Figure 5** below, a typical bridged E2A or REDAC network is shown. Note that when one of the remote modems or links fails, every modem and its associated end device that is below the failed modem or link is isolated from the head-end. In addition, finding the bad link or modem from the host on the head-end may be time-consuming and costly.

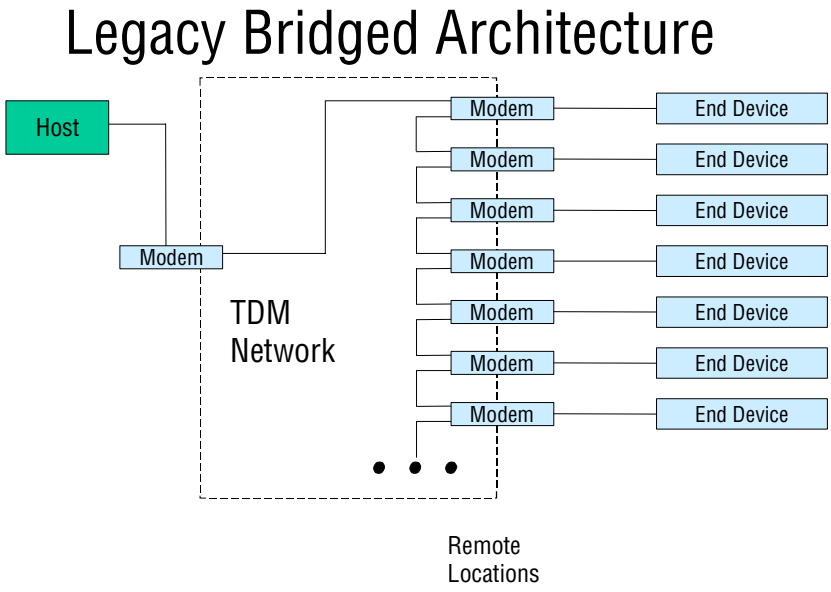

Figure 5

All the complexity that is shown in **Figure 5** above can be eliminated with the DT-9480 as shown in **Figure 6** on the next page. When one remote link or modem fails, the others are unaffected since this network is now a *virtual,* bridged network. The network is less complex, easier to maintain, easier to expand, uses new technology, and hence is less costly.

[1] The DT-4180, DT-4280, and DT-4281 do not have the E2AHOB and REDHOB feature packages currently.

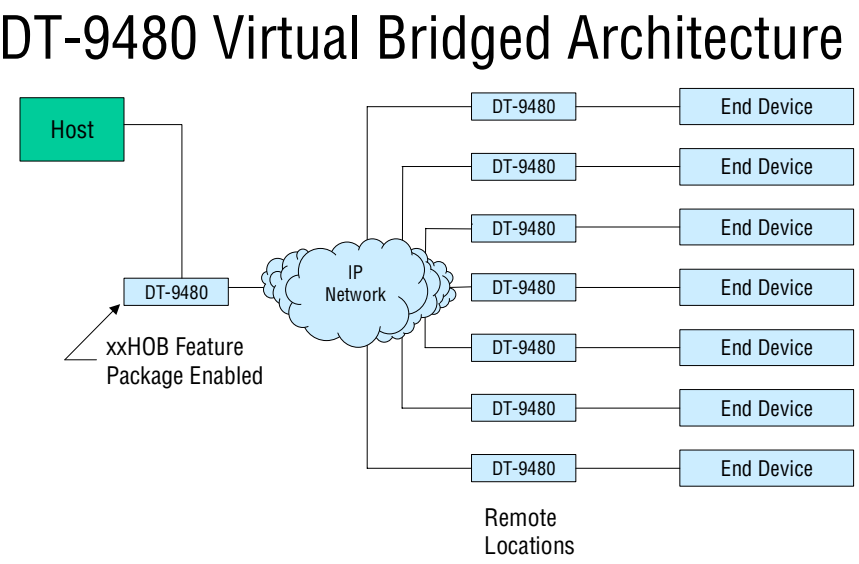

Figure 6

In **Figure 6**, the DT-9480 connected to the host uses one of the "Head-of-Bridge" feature packages. The remote units, which are connected to the end devices, i.e. the tributaries, do not require the feature package but are running the "built-in" protocol, either the E2A or REDAC protocol.

With respect to expansion and its cost, adding an additional end device and remote DT-9480 to the network above costs *one fourth* of the cost to add a bridge circuit and modem. Also, based on customer input, each segment of a 1200 baud multi-drop line, like that shown in **Figure 5,** has a monthly leasing cost as much as a T1 link. When deployed in a network configuration as shown in **Figure 6**, the DT-9480 has a payback period of less than one month.

CONCLUSIONS

Three innovative methods have been described for replacement of antiquated and failing modems using the DT-9480's or ports on other Datatek products:

1. One using a pair of DT-9480's with no changes required in either end device.
2. The second using only a single DT-9480 providing mediation and termination of a native protocol (X.25 in the given example) and requiring changes in the host interface but not in the "network element".
3. A third replacing a bridged network, vastly simplifying its topology, resulting in less complexity and hence less costly administration, troubleshooting, and expansion. The payback period for migrating to this new technology is approximately one month or less.

All of these solutions allow the easy, swift, and economical migration to new networking and IP technologies while maintaining transparency to the network elements. The solutions provide the needed interface to legacy equipment for new hosts that no longer support the older legacy interfaces. These solutions reduce the complexity of the network and reduce costs.

SUGGESTED READING

The following documents are available from the Datatek web site: www.datatekcorp.com.

Document	Scope
DT-9480 – DT-4180 – DT-4280 – DT-4281 – DT-4284 Multiple Protocol Integrated Access Device User's Manual	Describes the equipment installation and configuration of the DT-xx8x products including the command set, hardware specifications, and SNMP MIB. Included are several examples in the appendices of use of these products and their associated cabling.
DT-9480 Brochure	Highlights of the DT-9480 Features and Uses
DT-4281 Brochure	Not yet available except by contacting Datatek Applications, Inc.
DT-4284 Brochure	Highlights of the DT-4284 Features and Uses
DT-4180 Brochure	Highlights of the DT-4180 Features and Uses
DT-4280 Brochure	Highlights of the DT-4280 Features and Uses
DT-4xxx Comparison Chart	Side-by-side comparison of all the DT-xx8x and DT-4xxx Datatek products

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