

TCP/IP Direct Connect

TCP/IP Direct Connect allows the Windows NT TCP/IP stack to establish static point-to-point linkage to TCP/IP stacks on IBM or compatible mainframes over a high-speed channel (Parallel or ESCON). TCP/IP applications running on a Windows NT Server can realize significant throughput and performance improvements by replacing Local Area Network (LAN) attachments to the mainframe with channel attachments using TCP/IP Direct Connect.

TCP/IP Direct Connect is a Network Driver Interface Specification (NDIS) compliant Windows NT driver that can be optionally installed with EnterpriseExpress Adapters. TCP/IP Direct Connect presents the EnterpriseExpress Adapter as a standard Network Interface Card (NIC) to Windows NT.

This approach allows the two environments to work as one and exchange data at the highest possible rates without affecting network usage. This new paradigm is commonly known as 3-tier client/server computing. High-demand resource applications like Enterprise Resource Planning (SAP R/3, PeopleSoft, etc.) or Business Intelligence (that require access to mainframe resident data) can now be deployed on channel-attached Windows NT Server without concern for adversely affecting network performance.

Servers running NT and acting as application servers can now be directly channel-attached to mainframes using Parallel or ESCON channel adapters. Direct channel attachment is by far the most strategic, high-performance, reliable, and cost justifiable way to realize NT-to-mainframe communications. With up to 220(+) Mbps throughput capability of dual ESCON channel connections (which is 5 times faster than an Ethernet LAN), the Windows NT server essentially becomes a co-processor to the mainframe, with both systems enjoying rapid data access and bi-directional data interchange. Directly channel-attaching a Server running NT to a mainframe eliminates delays imposed by intermediate controllers [e.g. 37xx FEPs] and LANs. Channel-attachment also provides unparalleled performance, robust resilience, and better overall management.

Detail Specifications

Turning a Windows NT Server into a High-Performance Intranet Controller for Your Mainframe
The EnterpriseExpress Adapter/ESCON provides a PCI-to-ESCON connection between your Windows NT Server and your IBM or compatible Mainframe (Figure 1).

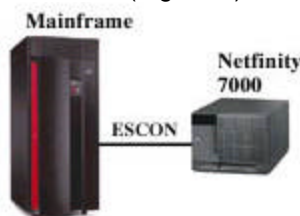


Figure 1. ESCON Attached Windows NT Server

Once connected, there are a number of SNA and TCP/IP connection types supported across this 17 Mbyte/sec. link. The EnterpriseExpress Adapter/ESCON ships with a CD-ROM that provides adapter drivers for both Windows NT and NetWare. Data Link drivers are included for the industry's leading SNA gateways including IBM's Communications Server for Windows NT, Microsoft's SNA Server, and Novell's Netware for SAA.

Today, in addition to this type of connectivity, most mainframe installations are increasingly interested in TCP/IP implementation and connecting the Intranet and Internet to their enterprise systems to access their legacy data and applications.

This is where the EnterpriseExpress Adapter/ESCON offers capabilities not found in other channel-attach products, TCP/IP Direct Connect and the Multi-Path Channel (MPC+) drivers. These two extremely valuable Windows NT drivers are available each EnterpriseExpress Adapter/ESCON (MPC+ is a separately priced option).

TCP/IP Direct Connect

The TCP/IP Direct Connect establishes a virtual point-to-point connection between the TCP/IP stacks of a Windows NT server and a mainframe. The TCP/IP Direct Connect driver was developed to be Network Driver Interface Specification (NDIS) compliant. As such, the TCP/IP Direct Connect allows the EnterpriseExpress Adapter/ESCON to appear to Windows NT exactly like any other Network Interface Card (NIC).

Windows NT is capable of performing "static routing" via its IP Forwarding feature. As its name implies, IP Forwarding "routes" IP data between LAN adapters (i.e. Ethernet to Token-Ring). Since the ESCON adapter with TCP/IP Direct Connect appears as a standard NIC, NT will "route" data from the LAN to the ESCON adapter and subsequently to the mainframe. The benefit is that any workstation on the network can gain immediate Telnet and FTP access to applications and files on the mainframe.

Figure 2. Multi-homed Windows NT Server

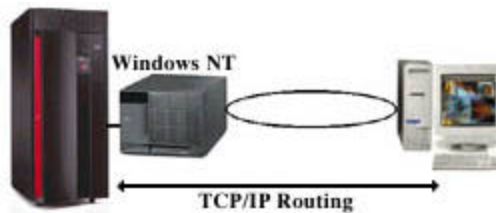
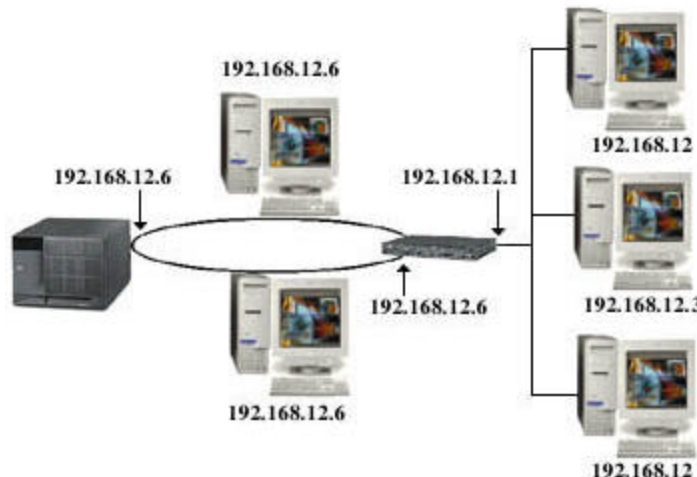


Figure 3 shows a simple network made up of two sub-networks connected by a router. A single Windows NT server is installed on the Token-Ring. Windows NT, 95, or 98 is installed in all workstations.

Figure 3. A Simple TCP/IP Network



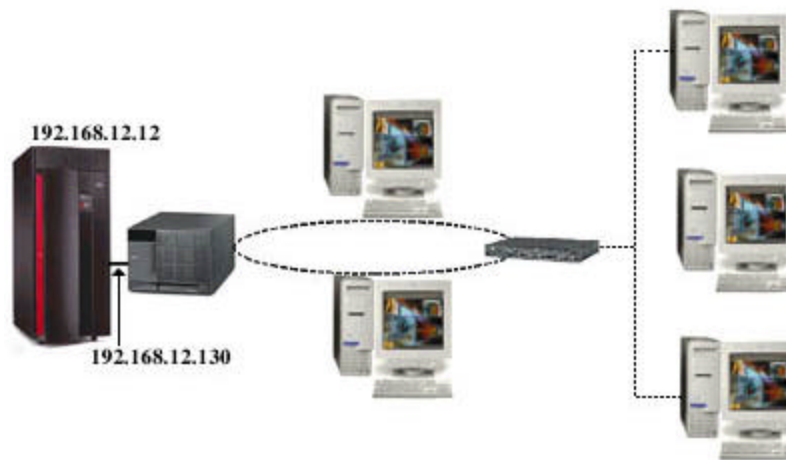
An IP subnet mask of 255.255.255.192 is being used to allow for 4 subnets with IP addresses as follows:

- Subnet 0 192.168.12.1 - 192.168.12.62
- Subnet 1 192.168.12.65 - 192.168.12.126
- Subnet 2 192.168.12.129 - 192.168.12.190
- Subnet 3 192.168.12.193 - 192.168.12.254

As shown, the Ethernet segment makes up Subnet 0 and the Token-Ring makes up subnet 1. Subnets 2 and 3 are currently not used. The router's Ethernet port is assigned an IP address in Subnet 0 and the Token-Ring port is assigned an address in Subnet 1.

Workstations on the Ethernet LAN are configured with their Default Gateway set to 192.168.12.1. Workstations and the server on the Token-Ring have their Default Gateway set to 192.168.12.65. Adding a TCP/IP link to a mainframe from the server in this environment is easy and straightforward. Figure 4 shows how the network might look after an ESCON adapter with TCP/IP Direct Connect has been installed.

Figure 4. Adding ESCON and TCP/IP Direct Connect to Network



Notice that a new IP address has been assigned to the TCP/IP Direct Connect (192.168.12.130) and to the Mainframe (192.168.12.129). The TCP/IP Direct Connect address and the Mainframe address must both be in the same subnet in order for Windows NT TCP/IP to establish static routing with the mainframe and be able to send TCP/IP traffic across the link. If the mainframe were in a different subnet than the TCP/IP Direct Connect, TCP/IP would incorrectly attempt to identify an IP address for a gateway in order to get to the mainframe.

Notice also that these two addresses are in their own subnet, Subnet 2, which was unused before the ESCON adapter was installed. This is an important point to this example. As long as the server's LAN adapter (192.168.12.68) is in a separate subnet from the TCP/IP Direct Connect, Windows NT will automatically build a static route to move IP traffic between adapters when Enable IP forwarding is turned on (in TCP/IP Properties). However, if the TCP/IP Direct Connect and LAN adapter are in the same subnet, moving packets between the two would require a bridging function, which Windows NT Server does not perform.

To complete the network configuration a static route would be added to the router between the Ethernet and Token-Ring LANs that re-directs all traffic destined for 192.168.12.129 (the mainframe) to 192.168.12.68 (the server).

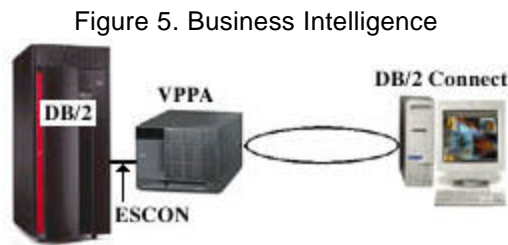
Since all workstations on both LANs define the router as their default gateway, they will go to the router when they want to attach to the mainframe (because the mainframe and workstations are in different subnets). Workstations on the Ethernet LAN will automatically be forwarded to the server by the static route information in the router tables.

For workstations on the token-ring, the router will see that the server and workstation are in the same subnet and send an Internet Control Message Protocol (ICMP) Route message to the workstation to update its route information. Future packets destined for the mainframe will be sent directly from the workstation to the server (192.168.12.68).

In most existing networks today, it will not be necessary to update the TCP/IP configuration on the workstations in order to allow them to connect to the mainframe using an ESCON adapter with TCP/IP Direct Connect. Most workstations already point to an existing router and/or server as a default gateway and that will be all that is needed.

The one notable exception to that rule is a single-segment LAN with no gateways. In that unlikely situation it may be necessary to modify the TCP/IP Properties for all workstations requiring access to the mainframe through the TCP/IP Direct Connect gateway.

Once TCP/IP Direct Connect is installed and configured, all clients and servers have TCP/IP access to the mainframe. TN3270 and FTP applications running on the client gain immediate access to applications and files on the System/390. Additionally, TCP/IP applications, such as IBM's DB/2 Enterprise Connect, can be distributed to any server and client in the network. Enterprise Resource Planning (such as SAP, PeopleSoft) and Business Intelligence (e.g. Data Warehousing, Data Marts, etc.,) applications, which rely on DB/2 Connect to retrieve data from the mainframe's DB/2 database, will gain improved performance through the ESCON channel (Figure 5).



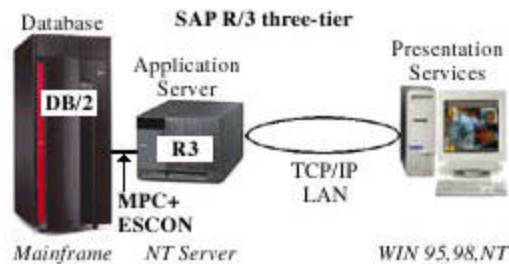
Multi-Path Channel (MPC+)

If TCP/IP Direct Connect is not enough to convince you that this is the way to connect your network to the mainframe, then perhaps MPC+ will help win you over.

MPC+ is an IBM strategic technology, which offers an ultra-reliable, high-performance channel protocol that significantly reduces mainframe CPU cycles consumed while performing channel operations. MPC+ in OS/390 offers support for both TCP/IP and SNA communications.

The MPC+ driver is available (a separately priced option) with the EnterpriseExpress Adapter/ESCON and works with OS/390 Version 2 Release 4 and above. It provides support for TCP/IP User Defined Protocol (UDP) applications and has been certified with SAP's R/3 solution for the System/390. SAP R/3 for the System/390 is a three-tiered business applications solution where the System/390 is the database server, a Windows NT Server runs the SAP R/3 applications and the network attached client runs presentation services (Figure 6). The EnterpriseExpress Adapter/ESCON with MPC+ allows specialized database access routines provided as part of the SAP R/3 for System/390 solution to access DB/2 across the ESCON channel using UDP protocols.

Figure 6. SAP R/3 for System/390



To support SAP R/3 in this fashion MPC+ is used as a data link for TCP/IP Direct Connect. Together they provide High-Speed Access Services (HSAS) (formerly referred to as High-Performance Data Transport (HPDT) for UDP) across the channel. Finally, by combining these features with the IP forwarding capability of Windows NT Server, it becomes possible to distribute the SAP R/3 applications themselves to any NT Server in the network. The data requests are then routed back to the ESCON-attached server for resolution. (Figure 7).

Figure 7. Distributing SAP R/3



Conclusion

At first glance, the EnterpriseExpress Adapter/ESCON includes support for market leading SNA gateway products like Communications Server for Windows NT, SNA Server, and NetWare for SAA. However, the EnterpriseExpress Adapter/ESCON does not stop there.

Available with every EnterpriseExpress Adapter/ESCON are the TCP/IP Direct Connect and MPC+ drivers, which allow the mainframe to communicate with Windows NT in point-to-point fashion using TCP/IP.

The key to the TCP/IP Direct Connect driver is that it was designed to be Network Driver Interface Specification (NDIS) compliant. This presents the ESCON adapter as a standard Network Interface Card (NIC) to Windows NT. The net result is that any application that is running on a Windows NT Server and uses TCP/IP as its protocol can gain access to mainframe resident data. MPC+ permits you to combine the bandwidth of two or more separate ESCON channel connections into a single transmission group. This feature not only provides high-performance throughput and error free transmissions but also provides automatic fail-over in the event one of the ESCON connections are lost.

If you have a System/390 class mainframe and are building corporate Intranets, you really cannot afford to ignore this emerging technology.