SOLUTIONS

AN OPTIMIZED IP MIGRATION PATHWAY FOR BISYNC NETWORKS

ISSUE 2

THE FUTURE IS HERE

Datatek
APPLICATIONS, INC

Introduction

The early, networked information systems consisted of one or more large servers arranged into a pool with organized display pages. Each page had a unique resource locator address. A network of screen-oriented terminals then would display a page at a time. A user would start navigation through the display pages at a known "home" page, and browse to the subsequent pages. The network itself would be managed by various routing devices that would deliver the message to the server or the terminal device as needed. Addressing was by a unique address at both endpoints. Server- to-Server and Terminal-to-Terminal messaging is possible, but the vast majority of the traffic is Server-to-Terminal. The terminal device would contain sufficient intelligence to allow modification of the page and a submission to the server for further processing.

The description above pertains to the BiSync communications structure, which remains with us today.

In either an IP or BiSync network, a user need not be co-located with the servers, and multiple servers could be used to provide redundant operation. The protocols have changed a little but remain message oriented and data-gram routed. The physical size of the message routing devices has become considerably smaller, but the number of interfaces supported by the routing devices has subsequently been considerably reduced. The throughput of an individual connection has been increased substantially, but is still limited in the aggregate by the server operation. In essence, the basic operation has remained. The primary issue is the integration of IP and BiSync technologies to provide universal access to the services of the BiSync Hosts and to reduce the administration of the evolving network. The focus is not on the applications resident in the mainframe servers, but rather in the modernization of the network and a cost reduction of the terminal devices.

IP networking has become a universal infrastructure underlying virtually all intra-enterprise data communications. This IP revolution has been accompanied by the appearance of new and more flexible kinds of equipment offerings which make it possible to collapse and simplify existing mission-specific distributed networks that work well, yet are increasingly costly to maintain.

The Datatek Applications product family exemplifies and embraces this IP evolution theme, by offering migration solutions from customers' legacy BiSync networks, including their associated peripheral devices, to networks based on IP networking, utilizing newer, flexible and more easily maintainable devices. The key components of the Datatek Applications product family in this IP evolution are the ***DT-4180/DT-4280***, which are multi-protocol access devices and the ***DT-6160 Embedded Network Processor***,[1] which provides several IP gateway functions. In this document, it will be shown how these products work together to simplify and reduce ongoing maintenance costs in BiSync networks. In the network migration from BiSync to IP, these new Datatek Applications products will be introduced in a logical progression as illustrated in the following sections. It is not necessary for all the following steps to be taken. At each step in the network migration, users can halt the progression and be assured that their networks will be stable.

[1] The older DT-6061 and the new DT-6260 Embedded Network Processors can also be used instead of a DT-6160.

A Typical, Existing BiSync Configuration

The following diagram in Fig. 1 will serve as our reference existing configuration.

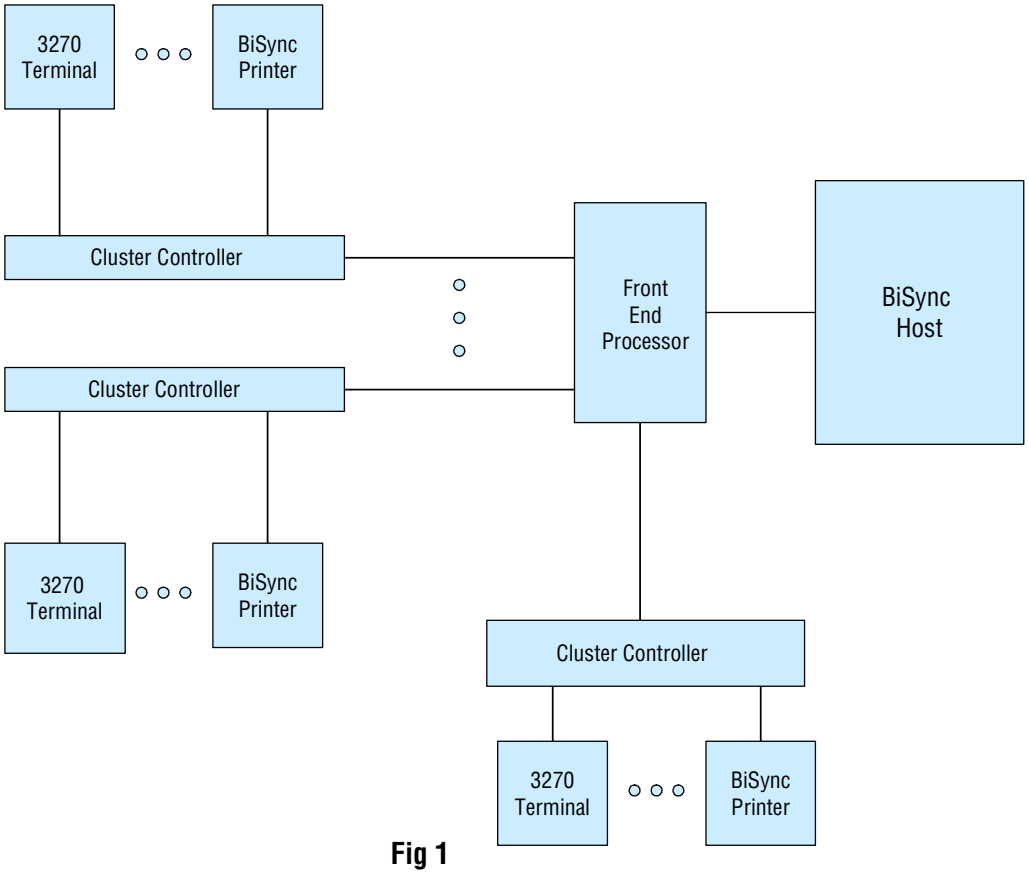

Fig 1

As shown above in Fig. 1, this represents a typical BiSync network with Host, Front End Processor (FEP), Cluster Controllers, dedicated 3270 Terminals, BiSync printers and expensive, leased lines connecting all the components. The BiSync Host is Channel-Connected to the Front-End Processor, which in turn is connected to Cluster Controllers at the maximum synchronous speed of 57.6 Kbps. The goal will be to migrate in a seamless, logical fashion towards an all-IP network, replacing the dedicated TN-3270 Terminals, BiSync printers, Cluster Controllers and leased lines with more cost-efficient, reliable and flexible IP devices. This step-by-step migration is detailed in the following sections.

Replacing Cluster Controllers and Dedicated 3270 Terminals

In the following diagram in Fig.2, this network is in the process of migrating from an all-BiSync environment to an IP-based infrastructure. The BiSync Host is still channel-connected to a Front-End Processor. The Front-End Processor, instead of being attached to Cluster Controllers using dedicated lines, is now attached to the Datatek Applications ***DT-4180/4280*** serial ports. The DT-4180 supports up to 16 Binary Byte Synchronous interfaces, while the DT-4280 supports 32 Binary Byte Synchronous interfaces. For asynchronous protocols, the DT-4180/4280 serial interfaces can operate at speeds up to 115Kbps, which is faster than any present BiSync interface, which is limited to 57.6Kbps. If the BiSync interface is V.35, a Datatek Applications DT-9008 adaptor can be used to make the conversion.

The DT-4180/DT4280 maintains an IP interface with the **IP BiSync Host Interface (IP-BHI) Application**, which resides on the ***DT-6160 Embedded Network Processor***. The IP-BHI Application looks to the BiSync Host like a number of Cluster Controllers. The connection from the DT-4180/DT-4280 to the DT-6160 is over a 10/100 BaseT IP connection.

The typical deployment of the IP-BHI Application is to provide connectivity to each BiSync Host without requiring additional network connections. This is accomplished by locating a DT-4180 or DT-4280 at the site of each Host or group of Hosts. The IP-BHI application interfaces with a BiSync Host through a DT-4180 or DT-4280 and performs Cluster Controller emulation for a multi-point Host line, thus eliminating the need for multiple connections.

The dedicated TN-3270 terminals in the original BiSync network have been replaced in the network diagram in Fig. 2 by general-purpose PCs running TN-3270 Client software. These PCs with TN-3270 Client software need to interact with a TN-3270 Server Application on the BiSync Host. A **TN-3270 Server Application** has been developed by Datatek Applications that will operate on the DT-6160 Embedded Network Processor to duplicate the Server function on the Host. The TN-3270 Server Application may be on the same DT-6160 as the IP-BHI Application or on a different DT-6160 entirely. Users have full access to all Host services by utilizing the PC-based TN-3270 Client software as if they were connected to a genuine 327x series terminal device. The IP-BHI Application provides an interface to the TN-3270 Server Application.

In the network diagram in Fig. 2, a TN-3270 Client makes a connection to the BiSync Host using the IP address of the DT-6160 plus the TCP port assigned to the TN-3270 Server Application that is assigned to that line on the BiSync Host. Multiple TN-3270 Clients call the same IP address and TCP port number. The maximum number of simultaneous TN-3270 Clients is a configurable option within the TN-3270 Server Application.

The TN-3270 Server Application can be configured to distribute TN-3270 Clients over multiple BiSync lines connected to one or more BiSync Hosts. Each BiSync line must be callable by its own IP address and TCP port number, e.g. via the IP-BHI Application. When multiple Hosts are configured, the TN-3270 Server Application allocates new sessions to Hosts round-robin. If a Host fails to answer a call for a new session, it is removed from the round-robin allocation. Any Host so removed is periodically monitored until it successfully answers a test call (tried every 70 seconds), whereupon it is made eligible for allocation to client sessions. The DT-6160 software distributes the calls from the TN-3270 Clients to the single address in a round-robin fashion to the desired set of BiSync lines.

The IP-BHI and TN-3270 Server Applications on a DT-6160 are required to provide the connectivity described above. If two DT-6160s are used, then each may be configured to support a single application. If a single DT-6160 is used, a two-application configuration is required. Multiple copies of the TN-3270 Server Application running on the same DT-6160 are used to support large numbers of clients. A single DT-6160 running multiple copies of the TN-3270 Server Application may be configured to serve up to 3000 TN-3270 Clients using a shared IP address and TCP port. Multiple copies of the IP-BHI Application are used to support multiple Binary Byte Synchronous lines. A single DT-6160 may support up to 5 different simultaneous applications, although the maximum number of copies of all applications remains fixed at 30[2].

At this point, the network is now stable. In this step in the network migration, the IP-BHI and TN-3270 Server Applications are installed on one or more DT-6160s and the Cluster Controllers, dedicated TN-3270 terminals and leased lines associated with the original BiSync network have been removed. The remaining legacy BiSync printers can be concentrated on a few Cluster Controllers, as shown in Fig.2, in preparation for the next optional step – the removal of the remaining Cluster Controllers and BiSync printers and their replacement by cheaper and more universal ASCII printers.

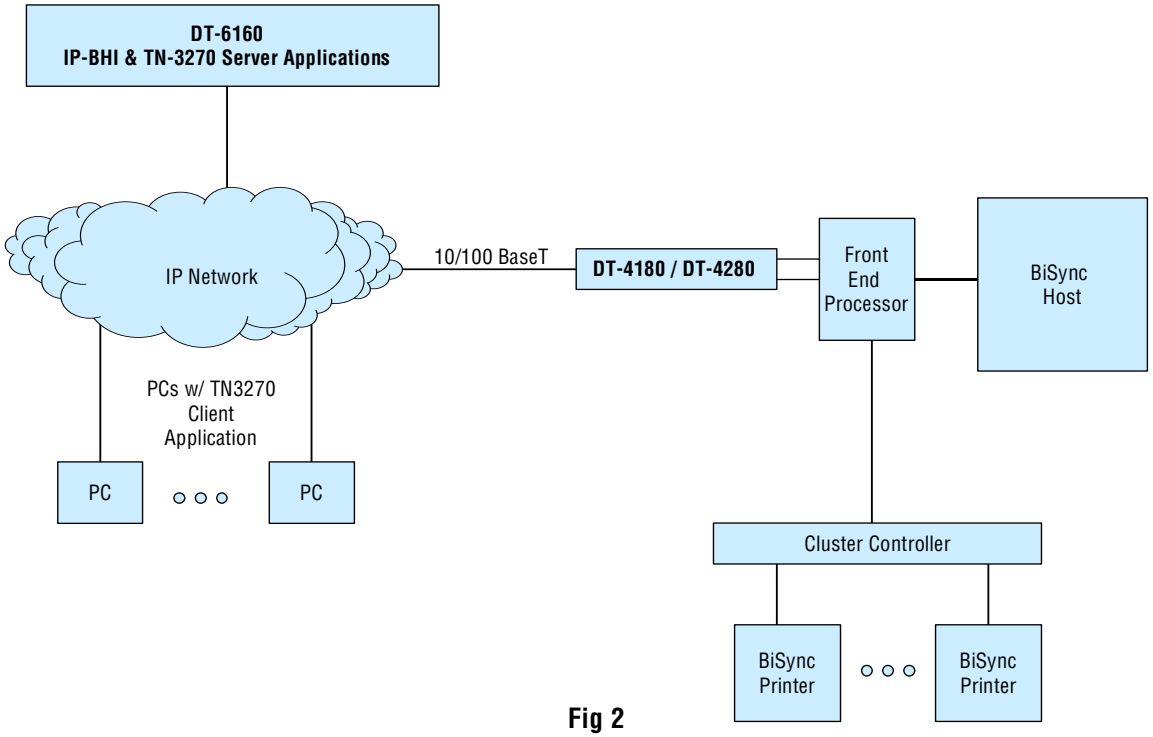

Fig 2

[2] The DT-6260 can support 48 copies of applications, with a maximum of 5 different applications.

Replacing BiSync Printers and Cluster Controllers

The next step in the seamless migration from a BiSync network to an IP infrastructure involves replacement of the dedicated BiSync printers and associated Cluster Controllers with cheaper and more universal ASCII printers. As shown below in Fig. 3, the Cluster Controller, BiSync printers and leased lines from Fig. 2 have been removed and replaced with a Datatek Applications DT-4180/DT-4280, ASCII printers and an IP network connection. In this new configuration, the removed components have been replaced by a connection from the BiSync Host through the IP network to the **BiSync to ASCII Printer Application (IP-B2APRT)** on the DT-6160 Embedded Network Processor. Permitting the PC-based TN-3270 Clients to continue issuing print requests, the Cluster Controller BiSync printer is being emulated by the IP-B2APRT application driving a dedicated ASCII printer.

There is a second connection running from the IP-B2APRT Application back through the IP network to the DT-4180/DT-4280, which now supports conventional ASCII printers through its serial port interfaces. Besides the fact that only one type of printer is now being used, printers have been consolidated into fewer locations, yielding a reduction in overall operations and maintenance costs.

The IP-B2APRT Application supports multiple ASCII printers. A TCP session exists for each ASCII printer connection. This TCP connection is originated by the IP-B2APRT Application where the IP address and port number of the ASCII printer port are configured through the IP-B2APRT Application Console.

A TCP session exists for the **BHI Application** connection to the BiSync Host for a particular printer. The TCP connection is originated by the IP-B2APRT Application. The BHI Application IP Address and port number are configuration options available through the IP-B2APRT Application Console. The connection between the IP-B2APRT Application and the ASCII printer is permanent and dedicated. This maintains the legacy interface, but precludes sharing a print device by multiple users. The next optional step in the IP progression resolves this problem.

The DT-6160 is shown in Fig. 3 hosting 3 different Applications – the IP-BHI, TN-3270 Server and IP-B2APRT. The DT-6160 can support up to 5 separate Applications simultaneously. However, for redundancy and capacity considerations, it may not be practical to support all the Applications on a single DT-6160.

At this point, the network is now stable. In this step of the BiSync to IP network migration, three goals have been achieved: elimination of legacy BiSync printers in favor of more universal ASCII printers, elimination of legacy Cluster Controllers in favor of the more reliable and flexible DT-4180/DT-4280 and the elimination of costly BiSync leased lines in favor of connection to the IP network infrastructure.

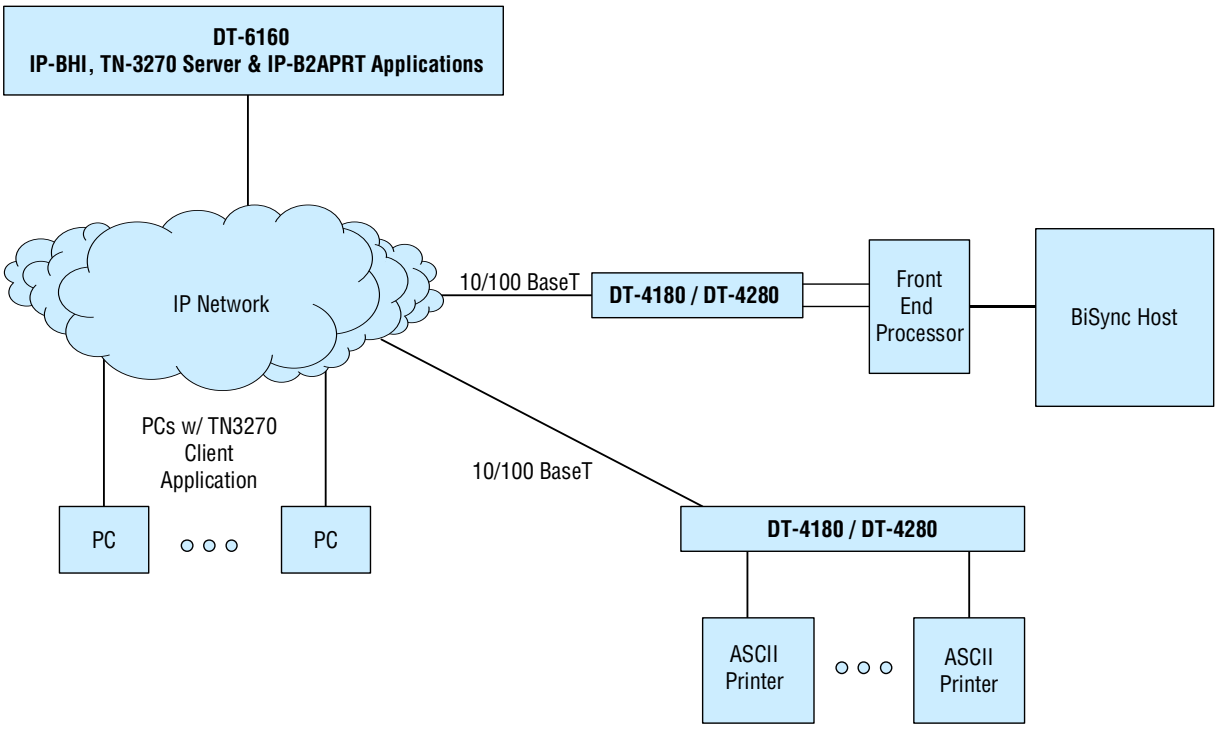

Fig 3

Time-Sharing a Single Printer

At this point in the network migration, a number of ASCII printers continue to operate, each dedicated to a different legacy device, such as a Host or PC client. In contrast, many modern Host applications use RFC1179 print spooling to enable sharing of a common printer. The **IP-SPOOL Application** for the DT-6160 Embedded Network Processor provides that same functionality for the dedicated printer interfaces of these legacy systems.[3] The diagram below in Fig. 4 shows how this can be implemented for our reference network, taking advantage of the DT-6160 already being used for other applications.

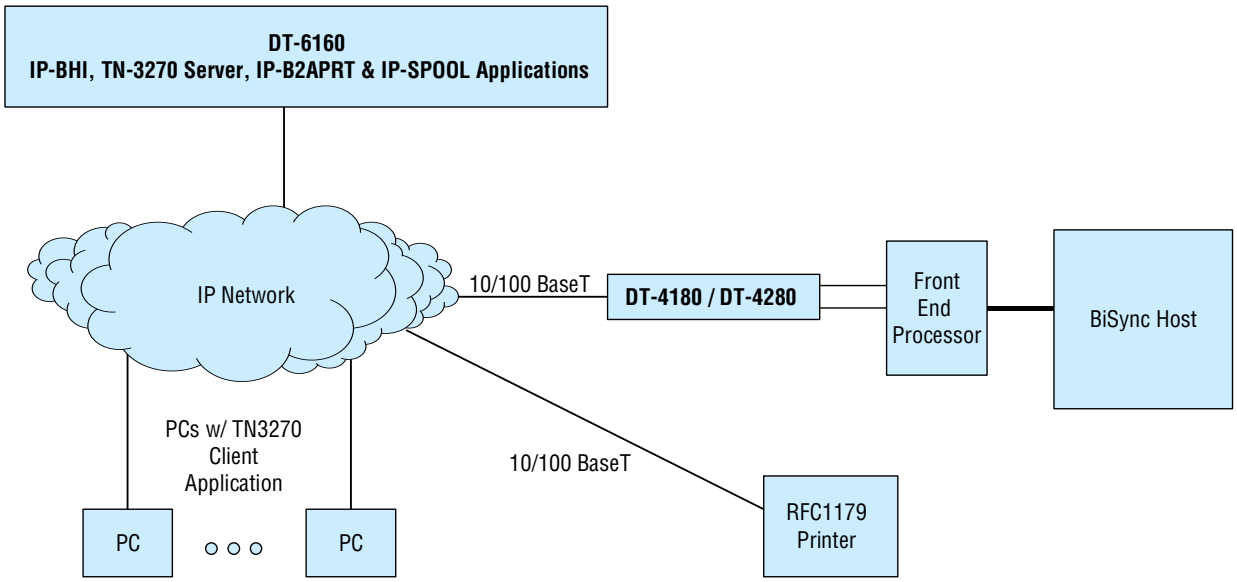

Fig 4

Each of the PC-based TN-3270 Clients still has a permanent connection to a "virtual printer", through the IP-SPOOL Application on the DT-6160. The **IP-B2APRT Application**, which is handling print jobs from the BiSync Host, is likewise connected to the IP-SPOOL Application. When data arrives on one of these "virtual printer" connections, it is first spooled by the IP-SPOOL Application for a user-defined capture interval and is then forwarded to the shared printer. Similarly, to allow the TN-3270 Clients to continue printing via the IP-B2APRT Application, the latter now has a connection to its own virtual printer through the IP-SPOOL Application. The IP-SPOOL Application forwards data to

[3] Some users have dedicated stand-alone devices, which implement print spooling. The solution described in this document would eliminate the need for such a device, by migration of the print-spooling function to the ***DT-6160***, a multi-use device.

the same, shared printer via the RFC1179 protocol over IP. This is a temporary connection, to allow other IP-SPOOL Application users or Hosts access to the same, shared printer. Other Hosts accessing the shared printer do not need to implement or use the RFC1179 protocol in order to print to it. A single DT-6160 running multiple copies of the IP-SPOOL Application may support up to 30 shared virtual printers.

The network is now stable. This step in the BiSync to IP network migration has accomplished its goal of reducing the number of printers in use in the network. Several dedicated ASCII printers have been replaced by a shared RFC1179-capable printer, thus reducing maintenance costs and increasing printer flexibility. The DT-4180/DT-4280 associated with the ASCII printers may be kept in place to support other network components or it may be redeployed elsewhere in the network.

Redundancy and Reliability

All Applications that reside on the DT-6160 Embedded Network Processor may take advantage of its redundancy infrastructure (an optional 1+1 sparing arrangement) to enhance its reliability. If the DT-6160 were to fail, the spare would immediately take over automatically and assume the public IP address of the set. It should be noted that Applications do not need to change or even be made aware of whether the DT-6160 is operating in duplex or simplex mode. Network engineering considerations may preclude putting more than 1 or 2 separate Applications on a DT-6160, but regardless of the final configuration, using the DT-6160 sparing arrangement can protect any and all Applications. In this manner, all Applications and components described above in the BiSync to IP network migration may be fully protected.

Conclusions

In this document, new ways to reduce complexity and ongoing expenses associated with the operation of a BiSync network have been demonstrated. Instead of using a dedicated printer for each legacy device, the **IP-SPOOL Application** implements an RFC1179 print spooling function on behalf of those devices in a manner that is transparent to them, so a single RFC1179-capable printer can be shared. The **TN-3270 Server Application** allows legacy 3270 terminals to be replaced by PCs running TN-3270 Client software. The **IP-B2APRT Application** converts BiSync printer jobs to ASCII output compatible with the **IP-SPOOL Application**, thus allowing the replacement of Cluster Controllers and legacy BiSync printers. Finally, the **IP-BHI Application**, by eliminating the need for Cluster Controllers, enables BiSync Host migration to an IP network architecture. Many leased lines used for connecting the BiSync legacy components are also eliminated by migration to an IP network, resulting in higher reliability and lower maintenance costs.

Thus a complex BiSync legacy network can be seamlessly migrated in a series of steps to a modern IP network infrastructure consisting of fewer pieces of equipment, that are newer, smaller, inherently more reliable, more capable and less expensive. These new network components are all easily configured and remotely administrable.

Suggested Reading

The following documents are resident at http://www.datatekcorp.com .

Document	Scope
DT-6160 Platform User's Manual	Describes the DT-6160 Embedded Network Processor infrastructure and command set. This includes configuration information, hardware specifications and SNMP MIB support. The DT-6160 is the infrastructure on which the Virtual Console shall reside.
DT-4180/DT-4280 User's Manual	Describes the DT-4180 and DT-4280 multi-protocol access devices. The DT-4180/DT-4280 is used as the interface for physical serial connections to the Binary Byte Synchronous Host. The DT-4180 provides 16 connections and the DT-4280 provides 32 connections.
DT-6XXX BHI Application User' s Manual	Describes the operation and configuration of the IP-BHI Application for the DT-6160. The IP-BHI Application is used to mediate the BiSync Host polling and set up connectivity with other applications.
DT-6XXX TN-3270 Server Application User's Manual	Describes the operation and configuration of the TN-3270 Server Application for the DT-6160. The TN-3270 Server Application is used to interface with the TN-3270 Client software. The TN-3270 Server Application then interfaces with the IP-BHI Application to access the BiSync Host.
DT-6XXX IP-B2APRT Application User's Manual	Describes the operation and configuration of the IP-B2APRT Application for the DT-6160. The IP-B2APRT Application enables migration from TN-3270 series Binary Byte Synchronous printers to Asynchronous printer interfaces. Allows inexpensive ASCII printers to be used as an output device instead of Control Unit (CU) connected 3xxx series printers.
DT-6XXX IP-SPOOL Application User's Manual	Describes the operation and configuration of the IP-SPOOL Application for the DT-6160. The IP-SPOOL Application permits replacement of multiple ASCII printers with one RFC1179 virtual printer.
DT-6XXX Redundant Operation White Paper	Describes the method of operating the DT-6160 in a 1+1 sparing configuration for redundancy.

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