

Vanguard Managed Solutions

Vanguard Applications Ware
IP and LAN Feature Protocols

Serial Protocol over TCP

Notice

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Overview

Introduction

This document describes the Serial Protocol over TCP (SoTCP) software option for the Vanguard products.

■ Note

Applications for serial data traffic only are discussed in this manual. For information on SoTCP supporting Voice over IP (VoIP) applications, refer to the *Multimedia Feature Protocols Manual* (Part Number T0104).

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Glossary of Terms

The following terms appear throughout this document:

- ACP - Adjacent Channel Protocol
- SoTCP - Serial Protocol Over TCP
- SVC - Switched Virtual Circuit
- TCP - Transmission Control Protocol
- UDP - User Datagram Protocol

■ Note

For other technical terms, consult the *Vanguard Applications Ware Technical Glossary*.

About SoTCP

What is SoTCP?

SoTCP is a proprietary protocol that allows a Vanguard to encapsulate and transport serial protocols over the IP network. This feature allows terminal and host devices operating serial protocols to connect and communicate with each other over an IP network. This provides a cost-effective alternative to X.25 WAN connection.

The Transmission Control Protocol (TCP) provides a reliable packet delivery mechanism over which data, from serial access devices, can be routed in an IP network.

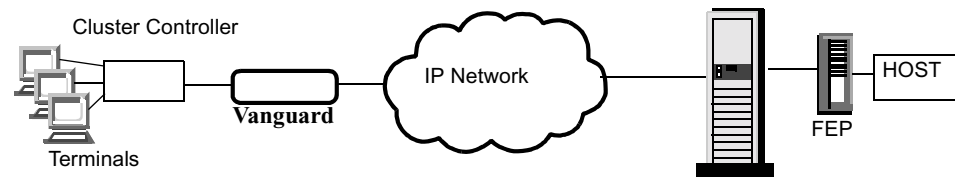


Figure 1. SoTCP Application

Features

Key SoTCP features include:

- Termination and encapsulation of serial protocol data for transport over a TCP/IP network.
- Capability to multiplex switched virtual circuits (SVC) onto a single TCP session.
- Management of multiple TCP sessions.
- Flow control to provide a reliable transport mechanism between the source and destination.
- Use of SoTCP as a backup link. To use SoTCP as a backup link, you must have an SoTCP session configured on the node. It can be an SoTCP session that you are using for other traffic or an SoTCP session configured solely for backup. For additional information, refer to the *Bandwidth Management Manual* (Part Number T0108).
- Use of UDP port numbers for UDP traffic through a firewall. Different UDP port numbers are selected for remote and local nodes so that bi-directional UDP traffic can pass through a firewall. For nodes with older software, both the local and remote nodes may use the same UDP port numbers. To ensure proper functionality of this feature, we recommend that you upgrade both nodes to this software revision.
- Use of UDP port numbers (between 4096 and 4351) for RTP header compression with third party routers that do not support RTP header compression on UDP port numbers below 4096.
 - When using Vanguard devices, both nodes must be upgraded to this software revision to use UDP port numbers between 4096 and 4351 for RTP header compression.
 - For nodes with older software revisions, the UDP port numbers used for RTP header compression are between 1025 and 65534.
 - For additional information regarding RTP Header Compression, refer to the *Vanguard Router Basics Manual* (Part Number T0100-01).

■ **Note**

SNMP management of the SoTCP feature is not supported.

Serial Protocol Support

SoTCP supports the encapsulation of these serial protocols:

- TNPP
- TBOP
- NCRBSC
- X.25
- Burroughs
- IBM 2260
- Datapac 3201
- BSC 2780, 3270, 3780
- BSTD
- SNA PU2/LU0/LU6.2
- SDLC
- SPP
- T3POS
- Voice Port
- APAD
- ATPAD

■ **Note**

SoTCP does not support data and traffic prioritization of serial protocols.

Release and Feature Support

This table lists the features supported for each software release and version of the SoTCP protocol:

Release	5.0.40A, 5.0.68, 5.1.16	5.1M	5.2 and later
SoTCP Version	Version 0	Version 0	Version 1
SVC supported	Data SVC only	Voice SVC only	Data and Voice SVC only
Flow Control	Flow control per TCP session for data.	No flow control of voice packets.	Flow control per SVC session for data. No flow control of voice packets.
SoTCP Packet Types Supported	Call Request Call Accept Clear Request Clear Confirm, Data	Call Request Voice Call Request Call Accept Clear Request Clear Confirm Data (Voice traffic)	Call Request Voice call request Call Accept Clear Request Clear Confirm Data (Voice and Data traffic) Reset Request Reset Confirmation

■ **Note**

When a session is established between nodes running different versions of SoTCP, that session uses the earlier version. The nodes operate with the reduced functionality supported by the earlier version.

Voice calls have only one way audio for twenty-five seconds and then the audio disappears. This is related to node hops. Ensure all intermediate LCONs have "Voice SVC's" enabled under the LCON configuration.

X.25 Interrupt Packets

Release 6.1 and greater supports two X.25 interrupt packet types:

- Interrupt
- Interrupt Confirm

Product Support

All Vanguard products support SoTCP.

Network Topology

Introduction

This section describes a typical network topology for the application of SoTCP.

Network Topology and Node Conventions

Figure 2 illustrates a typical network topology for data traffic.

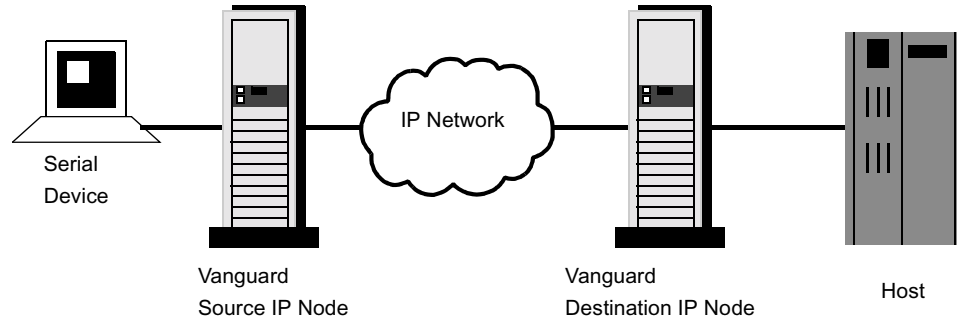


Figure 2. Example Network Topology

These node conventions described refer to Figure 2 and are used throughout this document:

Convention	Description
Serial Device	The serial device sends serial protocol data to the source IP node.
Source IP Node	The source IP node is a Vanguard that: <ul style="list-style-type: none"> • connects directly to the serial device and to the IP network. • encapsulates serial data received from the serial device. • initiates calls to the peer, the destination IP node.
Destination IP Node	The destination IP node is a Vanguard that receives SoTCP packets sent from the source IP node over the IP network. The destination IP node un-encapsulates SoTCP packets and sends serial data to the Host.
Host Device	The host device connects to the destination IP node and receives serial data from it.

SoTCP Operation

Introduction

This section describes the operation of SoTCP protocol.

SoTCP Packet Format

The SoTCP protocol terminates data received from a serial device and prefixes the data with a 3-byte or 4-byte SoTCP header, depending on the version of SoTCP protocol. Figure 3 illustrates the SoTCP packet:



Figure 3. SoTCP Packet Format

The SoTCP header contains information that allows a destination IP node to reconstruct the data packet at the remote end.

Establishing a Call

Introduction

This section describes call establishment. Figure 4 shows the packets exchanged for session and connection establishment and finally, data transfer.

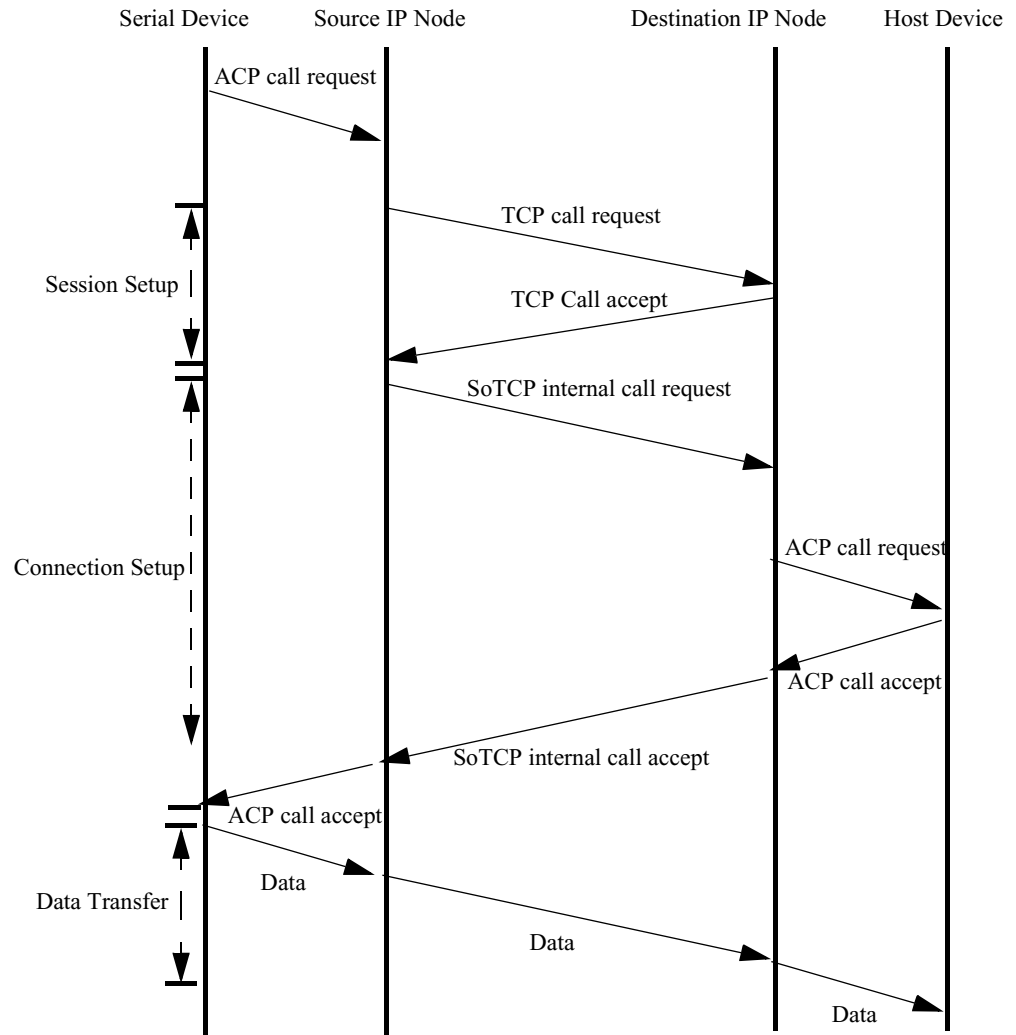


Figure 4. Session and Connection Establishment

Establishing a Session

Before serial data traffic can pass between the serial ports over the network, the source IP node must establish a TCP session with the destination IP node. Each session is uniquely identified by a source IP address, destination IP address, source port number, and destination port number. The source and destination node exchange the following call packets to establish a session:

Step	Packet Transferred	Description
1	ACP Call Request	The serial device sends an ACP (Adjacent Channel Protocol) Call Request to inform the source IP node that it wishes to send data over the network to the host device.
2	TCP Call Request	To open a session, the source IP node sends a TCP call request to the destination IP node.
	TCP Call Accept	The destination IP node responds to the Call Request by sending a Call Accept, and establishes a TCP session.

■ Note

The source IP node always takes the internal IP address if configured, and inserts it into the call request. If the internal IP address is not configured, the IP address of the lowest numbered interface is used. To ensure consistency between the source and destination node exchange, include all possible IP addresses in the mapping table that might be used by a remote destination node.

Establishing a Connection

After opening a TCP session, the source node must establish an SoTCP connection with the destination IP node. Each TCP session supports multiple connections or SVCs. A unique connection identifier recognizes each connection multiplexed on a TCP session. The source and destination IP nodes exchange the following call packets to establish a connection:

Step	Packet Transferred	Description
1	SoTCP Internal Call Request	The source IP node sends an internal SoTCP call request packet to the destination IP node. The SoTCP call request packet includes a unique connection ID.
2	ACP Call Request	The destination IP node sends an ACP call request to the remote host.
	ACP Call Accept	To accept the call, the host responds with an ACP Call accept packet.
3	SoTCP Internal Call Accept	Once the destination IP node receives the ACP call accept from the remote host, it sends an SoTCP Internal Call Accept to the source IP node. The connection between the nodes is now established.
4	ACP Call Accept	The source IP node sends an ACP Call Accept to the serial device and the serial device may begin to send data to the destination.

■ **Note**

The SoTCP call request and call accept packets also contain credit information used for flow control.

Data Transfer

The source IP node splits data traffic received from the serial device into 2047 bytes sized packets. The SoTCP protocol attaches the three or four byte header to the packet and sends the packets over the TCP channel.

Flow Control

Version 0 of the SoTCP protocol supports flow control on each TCP session only. Packets are stored in a common session queue before being sent to the remote end.

Version 1 of SoTCP protocol supports flow control on each connection. SoTCP Version 1 provides flow control on a per connection basis using a credit-based scheme. Both sides send credits updates at call setup and with every M bit chain of SoTCP packets. The credits advertised indicate the number of ACP packets (each may comprise an M bit chain of SoTCP packets) that the node receives from the remote end. This is based on the node's own receive buffer capacity, which has been fixed at 15 ACP packets per connection.

Call Termination

Introduction

This section describes call termination.

Reasons for Call Termination

Call termination occurs for one or more of these reasons:

- The serial device has no data to send.
- Call establishment failed due to session setup or connection setup problems.
- Failure of TCP session due to problems in the IP network.
- Connection failure due to node boot.
- Exceeding the hop count clears the call.
- Incorrect configuration of a SoTCP destination port.

Packet Exchange

Figure 5 illustrates packets exchanged for call termination originated from the source IP node. This figure illustrates only one example of call termination. Either the source or destination IP node may terminate a call.

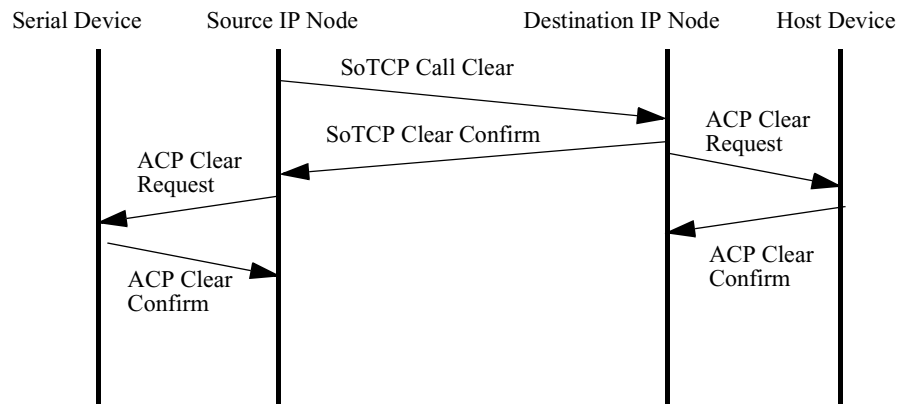


Figure 5. Call Termination Packet Exchange

If the last SVC connection multiplexed on a TCP session is closed, then the TCP session is also closed.

Configuring SoTCP

Introduction

The following sections describes how to configure the SoTCP option. The parameters for the SoTCP option are specified in three records:

- “SoTCP Parameters” on page 12
 - “Route Selection Table Parameters” on page 19
 - “SoTCP Map Table Parameters” on page 20
-

SoTCP Parameters

Navigating the CTP Figure 6 shows the CTP path to the SoTCP specific parameters.

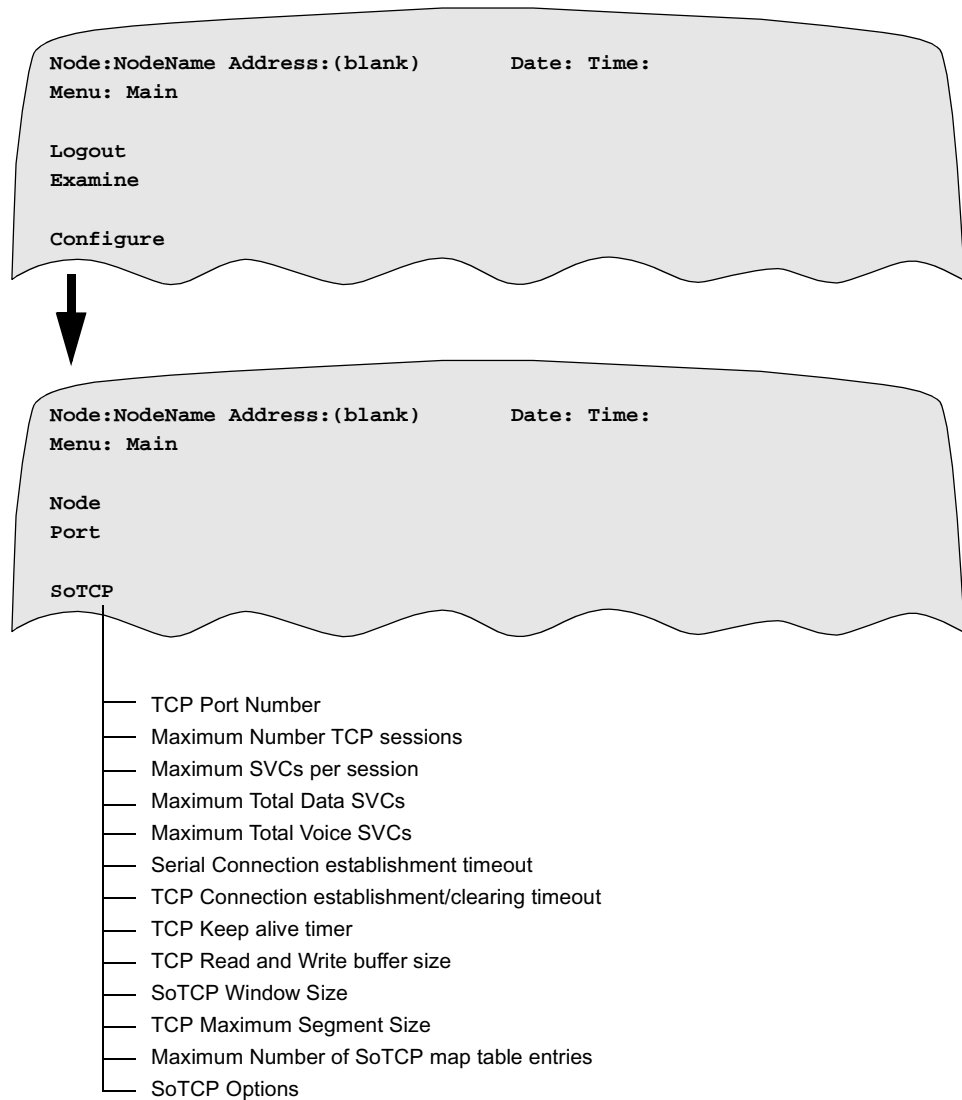


Figure 6. SoTCP Parameters

SoTCP Parameter Descriptions

The SoTCP parameter record contains these parameters:

TCP Port Number

Range	256 to 65535
Default	1099
Description	<p>Specifies the TCP port number at which SoTCP listens for new connections. The remote-end must have the same value configured for this feature to function.</p> <p>■ Note Perform a SoTCP boot for changes to this parameter to take effect.</p>

Maximum Number of TCP Sessions

Range	<p>1 to 40 (for Vanguard 100, Vanguard 200, and 650 products) 1 to 500 (for all other Vanguard products)</p>
Default	1
Description	<p>Specifies the maximum number of TCP sessions allowed through SoTCP. Once the maximum number is reached, no more sessions are established and the “SoTCP-No more TCP sessions” alarm is generated.</p> <p>■ Note Perform a Node boot for changes to this parameter to take effect.</p> <p>■ Note The maximum number of TCP sessions that are actually supported depends on the memory available in the Vanguard node. Refer to “Estimating Memory Consumption” on page 23 to calculate the memory requirements.</p> <p>In addition, although the maximum number of TCP sessions can be set to 40 (for Vanguard 100, 200, and 650) or 500 (for all other Vanguards) the value is scaled down during node initialization. This ensures that SoTCP does not consume more than 25% of the available memory in the Vanguard node. An alarm message indicates the scaled down number of TCP sessions after a node boot: “SOTCP Maximum Sessions Reduced to n - Insufficient Memory.”</p>

Maximum Number SVCs per Session

Range	1 to 50
Default	10
Description	<p>Specifies the maximum number of switched virtual circuits (SVCs) that may be multiplexed on a TCP session through SoTCP. Once the maximum number is reached, no more connections are established and the “SoTCP-n-No more connections to SoTCP” alarm is generated.</p> <p>■ Note Perform a Node boot for changes to this parameter to take effect.</p>

Maximum Total Data SVCs

Range	1 to 1024
Default	10
Description	<p>Specifies the maximum number of data SVCs that may be multiplexed on all TCP connections.</p> <p>■ Note Perform a Node boot for changes to this parameter to take effect.</p>

Maximum Total Voice SVCs (For VoIP Feature only)

Range	0 to 30
Default	0
Description	<p>Specifies the maximum total number of voice SVCs allowed.</p> <p>■ Note Perform a Node boot for changes to this parameter to take effect.</p>

Serial Connection Establishment Timeout

Range	1 to 5100. Specified in 50 ms increments.
Default	100
Description	<p>Specifies the time SoTCP waits for connection establishment with the serial device.</p> <p>When a node receives a call request from a source node, the SoTCP sends a Call Request packet to the serial protocol and waits for a Call Accept packet. If the SoTCP protocol does not receive a Call Accept packet before the serial connection timeout, it sends a Call Clear packet to the source node.</p> <p>Note Perform a SoTCP boot for changes to this parameter to take effect.</p>

TCP Connection Establishment or Clearing Timeout

Range	1 to 5100 (Specified in 50 ms increments)
Default	100
Description	<p>Specifies the time SoTCP waits for the connection establishment or connection clearing with the peer SoTCP protocol.</p> <p>Note Perform a SoTCP boot for changes to this parameter to take effect.</p>

DiffServ Code Point for VoIP Traffic

Range	0 to 63
Default	0
Description	This parameter specifies DiffServ Code Point for marking VOIP packets. "0" means no marking.

TCP Keep Alive Timer

Range	Enabled, Disabled	
Default	Enabled	
Description	Used to enable or disable the TCP Keep Alive Timer. ■ Note Perform a SoTCP boot for changes to this parameter to take effect.	
	<i>If</i>	<i>Then</i>
	enabled	The TCP protocol sends keep alive packets over the network at a one minute interval. If the destination node does not respond to the keep alive packets, the source node clears TCP sessions.
disabled	The TCP protocol does not send keep alive packets over the network.	

TCP Read and Write Buffer Size

Range	1 to 4096
Default	2048
Description	Specifies the size of the read and write buffers that SoTCP posts to TCP. ■ Note Perform a Node boot for changes to this parameter to take effect.


SoTCP Window Size

Range	1 to 63
Default	15
Description	Used to set the window size that SoTCP maintains with its peer. ■ Note Perform a SoTCP boot for changes to this parameter to take effect.

TCP Maximum Segment Size

Range	1 to 1500
Default	536
Description	Used to set the maximum size of the segments sent out by TCP. ■ Note Perform a SoTCP boot for changes to this parameter to take effect.

Maximum Number of SoTCP map table entries

Range	1 to 500
Default	16
Description	<p>Specifies the maximum number of SoTCP map table entries allowed.</p> <p> Caution Reducing this value defaults the rest of the map table entries.</p> <p>■ Note Perform a SoTCP boot for changes to this parameter to take effect.</p>

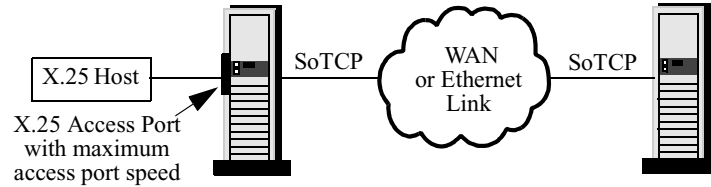
SoTCP Options

Range	NONE, NOLOOPBK, INTIPADDR, INTR_DISABLE
Default	NONE
Description	<p>Lets you select these options for SoTCP:</p> <ul style="list-style-type: none"> • NONE - no option • NOLOOPBK <ul style="list-style-type: none"> – Enable this option to avoid loopback of SoTCP calls. – The remote-end must have the same configuration for this feature to function. – The hop count facility code and the maximum hop count must be configured in the node record. • INTIPADDR - Enables the Internal IP address as Source IP Address in a UDP packet. • INTR_DISABLE - Disable the Interrupt Packet support over SoTCP. <p>Any combination of the above can be specified by summing. For example, NOLOOPBK+INTIPADDR+INTR_DISABLE.</p> <p>■ Note Perform a SoTCP boot for changes to this parameter to take effect.</p>

Input Data Rate for SoTCP Sessions

If the input data rate exceeds a certain limit, SoTCP sessions can disconnect because of loss of IP datagrams in the underlying network and excessive TCP retransmissions. The report “SOTCP-n -TCP session timed out with x.y.z.w” is generated under such conditions.

The input data rate is controlled by the port speed setting on the X.25 access port as shown in the figure (Vanguard 6560):



Input Data Rate for SoTCP Sessions

Maximum Access Port Speed

The maximum access port speed that can be supported by SOTCP varies with the number of SoTCP sessions in place. These tables show the recommended maximum limit on access port speed for a given number of SoTCP sessions:

With intermediate WAN link at 2 Mbps

Access Port Speed	1024 Kbps	768 Kbps	128 Kbps	128 Kbps	80 Kbps	57.6 Kbps
Maximum number of SoTCP sessions	500	250	100	50	10	1

With intermediate Ethernet link

Access Port Speed	1024 Kbps	512 Kbps	384 Kbps	256 Kbps	128 Kbps	128 Kbps
Maximum number of SoTCP sessions	500	250	100	50	10	1



Caution

Exceeding these data transfer rates may cause SoTCP sessions to disconnect. Based on X.25 access port data packet size set to 128 bytes; window sizes set to K=7 and W=15.

When TCP (SOTCP) is heavily loaded, the TCP session will be dropped. This is due to congestion issues when running traffic over Ethernet. TCP is flooding the Ethernet with bidirectional traffic and the CPU usage hits 100%. This delays the consumption of received frames and causes the number of collisions to rise.

Route Selection Table Parameters

Parameters

The following Route Selection Table parameters should be configured:

■Note

Perform a Table boot for changes to these parameters to take effect.

Entry Number

Range	1 to 16
Default	1
Description	Specifies the number used to reference this table record.

Address

Range	0 to 15 digits
Default	(blank)
Description	Specifies the network address for calls routed beyond this node.

Destination #1

Range	0 to 32 alphanumeric characters. Press the SPACEBAR to blank the field.
Default	(blank)
Description	Specifies the destination to which calls are routed. Enter SoTCP.

■Note

In the Route Selection Table, if SOTCP is configured as a destination with a priority other than zero, (Example: Vanguard 6400 Series) the SOTCP destination is always chosen over any other destination regardless of the priority configured for those other destinations.

Be sure you configure the priority for SOTCP destination as zero (unless it is the only possible destination for a particular address in the Route Selection Table).

SoTCP Map Table Parameters

Navigating the CTP Figure 7 shows the CTP path to the SoTCP map parameters.

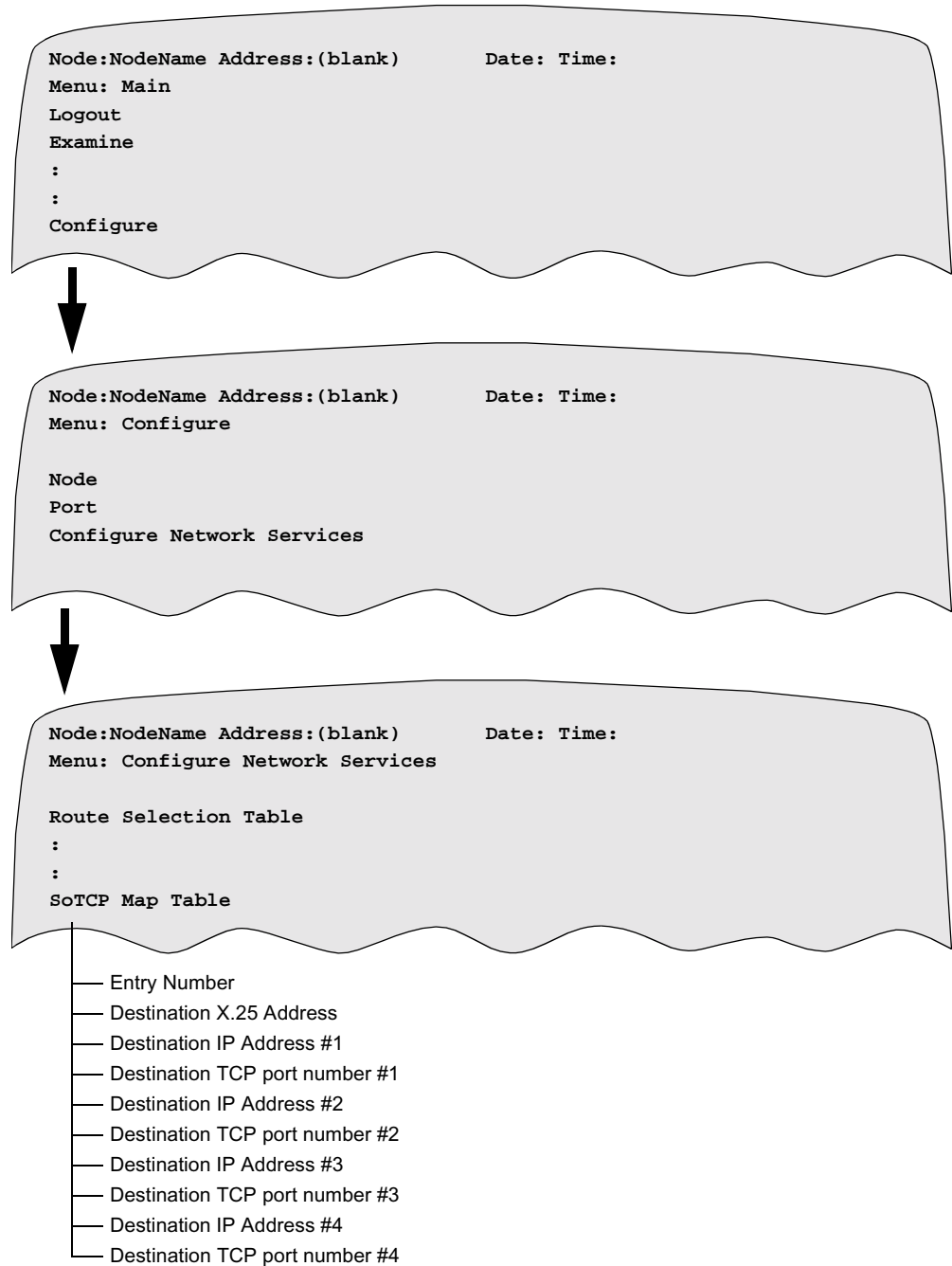


Figure 7. SoTCP Map Table Parameters

Parameters

These SoTCP Map Table parameters should be configured:

■ Note

Perform a Table boot for changes to these parameters to take effect.

Entry Number

Range	1 to 16 for Vanguard 100, 200, and 650 1 to 500 for Vanguard 300, 305, 310 Series, 320, and 34x 1 to 64 for 6500 ^{Plus} 1 to 500 for Vanguard 6400 Series and Vanguard 6520/6560 1 to 2000 for the Vanguard 7300 Series
Default	1
Description	Specifies the number used to reference this table record.

Destination X.25 Address

Range	0 to 15 digits
Default	(blank)
Description	Specifies the network address for calls for which TCP sessions must be established. The wildcard (*) character may be used. Press the SPACEBAR to blank the field. ■ Note Perform a Node record and Table boot for changes to this parameter to take effect.

Destination IP Address

Range	X.X.X.X. (Where X is between 0 and 255)
Default	0.0.0.0
Description	Specifies the unicast IP address of the node to which calls are routed. Calls with a network address corresponding to this entry establish a TCP session with this destination. You may configure up to four destination IP addresses for each destination X.25 address. This allows a user to specify alternate destination IP addresses to connect to the same destination X.25 address. ■ Note Perform a Node record and Table boot for changes to this parameter to take effect.

Destination TCP Port Number

Range	0, 256 to 65535
Default	0
Description	<p>Specifies the destination TCP port number of the node that is used to establish different TCP sessions a the remote.</p> <p>■ Note Perform a Node record and Table boot for changes to this parameter to take effect.</p>

Estimating Memory Consumption

Introduction

Prior to configuring SoTCP, it may be helpful to estimate the SoTCP memory consumption. The tables and calculations provided in this section help the network planner determine if the memory in the node is sufficient to configure a particular number of SoTCP sessions and connections.

Checking Free Memory Available

Check the Node Statistics to determine the free memory available. To increase memory for the Vanguard, install DRAM SIMM. For more information on installing SIMM modules, refer to the *Vanguard Daughtercard Installation Manual* (Part Number T0020).

SoTCP Parameters Effecting Memory Consumption

These SoTCP parameters effect memory consumed by the node:

<i>For each increase in this parameter</i>	<i>Memory Consumption is</i>	<i>Description</i>
Maximum Total Data SVC	456 bytes	Maximum number of SVCs allowed to go through all TCP connections
Maximum Total Voice SVC	456 bytes	Maximum number of voice SVCs allowed to go through all TCP connections
Maximum SVCs per session	40 bytes	Maximum number of SVCs multiplexed on a TCP link through SoTCP
Maximum Number of TCP Sessions	5000 bytes	Maximum number of TCP sessions allowed through SoTCP

Memory Consumption Formula

Use this formula to determine the memory consumed for the configured SoTCP parameters:

$$\begin{aligned} &\text{Memory required or consumed} = \\ &(\text{Maximum Number of TCP Sessions} \times 5000) + \\ &(\text{Maximum Number of TCP Sessions} \times \text{Maximum SVCs per session} \times 40) + \\ &(\text{Maximum Total Data SVC} \times 456) + (\text{Maximum Total Voice SVC} \times 456) \end{aligned}$$

Example

In this example, the formula is used to determine the extra memory required for the SoTCP parameters shown in the table.

Parameter	Default SoTCP Parameter Setting	Proposed SoTCP Parameter Setting	Increase
Maximum Total Data SVC	10	20	10
Maximum SVCs per session	10	15	5
Maximum Number of TCP Sessions	1	11	10

Extra memory required to configure the proposed parameter settings =
(Maximum Number of TCP Sessions x 5000) +
(Maximum Number of TCP Sessions x Maximum SVCs per session x 40) +
(Maximum Total Data SVC x 456)
Extra memory required = (10 x 5000) + (10 x 5 x 40) + (10 x 456) = 56560 bytes

Memory Consumption During Session Establishment

Each TCP session establishment consumes approximately 2128 bytes of memory in addition to memory required for configuration. SoTCP connection establishment consumes no additional memory. For example, additional memory for establishing 10 sessions is 21280 bytes.

Example SoTCP Configuration

Introduction

This section provides examples on how to configure two Vanguards for SoTCP application.

■ Note

Use default settings for parameters that are not specified in the tables.

Recommended Sequence for Configuration

The following table describes the recommended sequence to configure a Vanguard for SoTCP. Refer to the the specific figure for the list of configurable parameters for each configuration example.

Step	Description
1	Configure the Node Record.
2	Configure the Serial Port and serial port parameters.
3	LAN and IP Parameters: <ul style="list-style-type: none"> • Configure the LAN Port. • Enable the Router Interface State. • Configure IP Parameters. • Configure IP Interfaces.
4	Configure the Route Selection Table.
5	SoTCP Parameters: <ul style="list-style-type: none"> • Configure the SoTCP Record. • Configure the SoTCP Map Table.

SDLC over SoTCP Configuration

Description Figure 8 shows the parameters configured for each Vanguard to support SDLC traffic over SoTCP.

Implementation Notes This example uses two Vanguard 6560s. This application is supported on all Vanguard products.

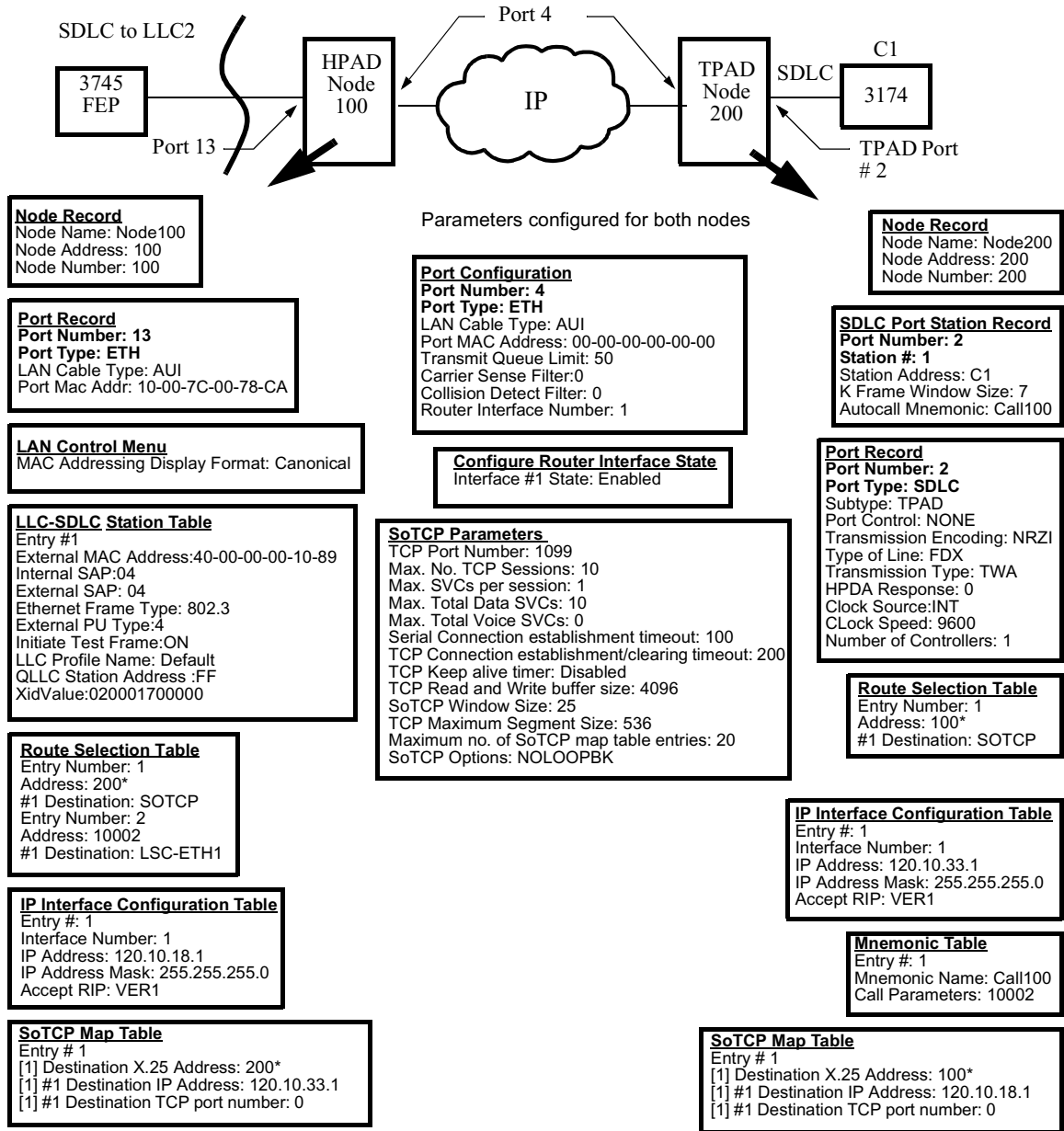


Figure 8. SDLC over SoTCP Configuration Example

TBOP over SoTCP Configuration

Description

The configuration example in Figure 9 and Figure 10 illustrates how SoTCP can transport TBOP traffic over an Ethernet or Token Ring LAN.

Implementation Notes

When connecting TBOP ports over SoTCP, note that:

- This example application uses two Vanguard 6520s. For an Ethernet LAN application, you can also configure this example application on the Vanguard 7300 Series, Vanguard 6560, Vanguard 6400, Vanguard 320, Vanguard 34x, and Vanguard 312. For a Token Ring LAN, you can configure this example on the Vanguard 6560 and Vanguard 305.
 - Both Vanguard nodes must have the same TCP Port Number configured in the SoTCP Record. This is required for call establishment between the nodes.
 - Configure autocalling to establish and maintain calls. In this configuration example, the TBOP port on Node 100 is configured with autocall mnemonic enabled to call TBOP port on Node 200.
 - Real time traffic, such as video traffic over TBOP, should not be sent over SoTCP connection. TCP supports flow control and error recovery which may cause video traffic to lose its real time characteristics.
-

Example SoTCP Configuration

Example - Ethernet LAN Figure 9 illustrates TBOP traffic transported by SoTCP over an Ethernet LAN.

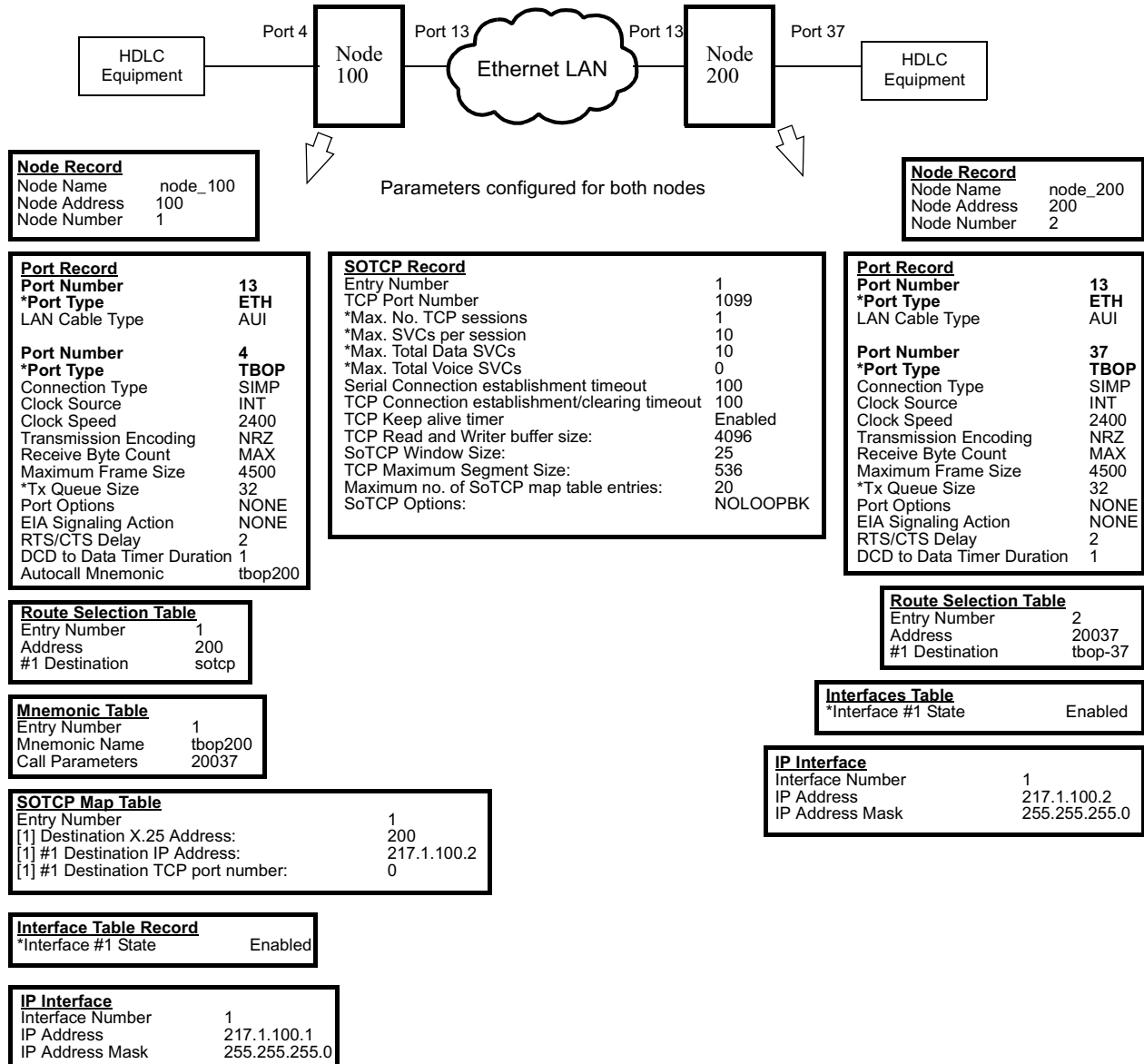


Figure 9. TBOP over SoTCP on an Ethernet LAN

Example - Token Ring LAN

Figure 10 illustrates TBOP traffic transported by SoTCP over a Token Ring LAN.

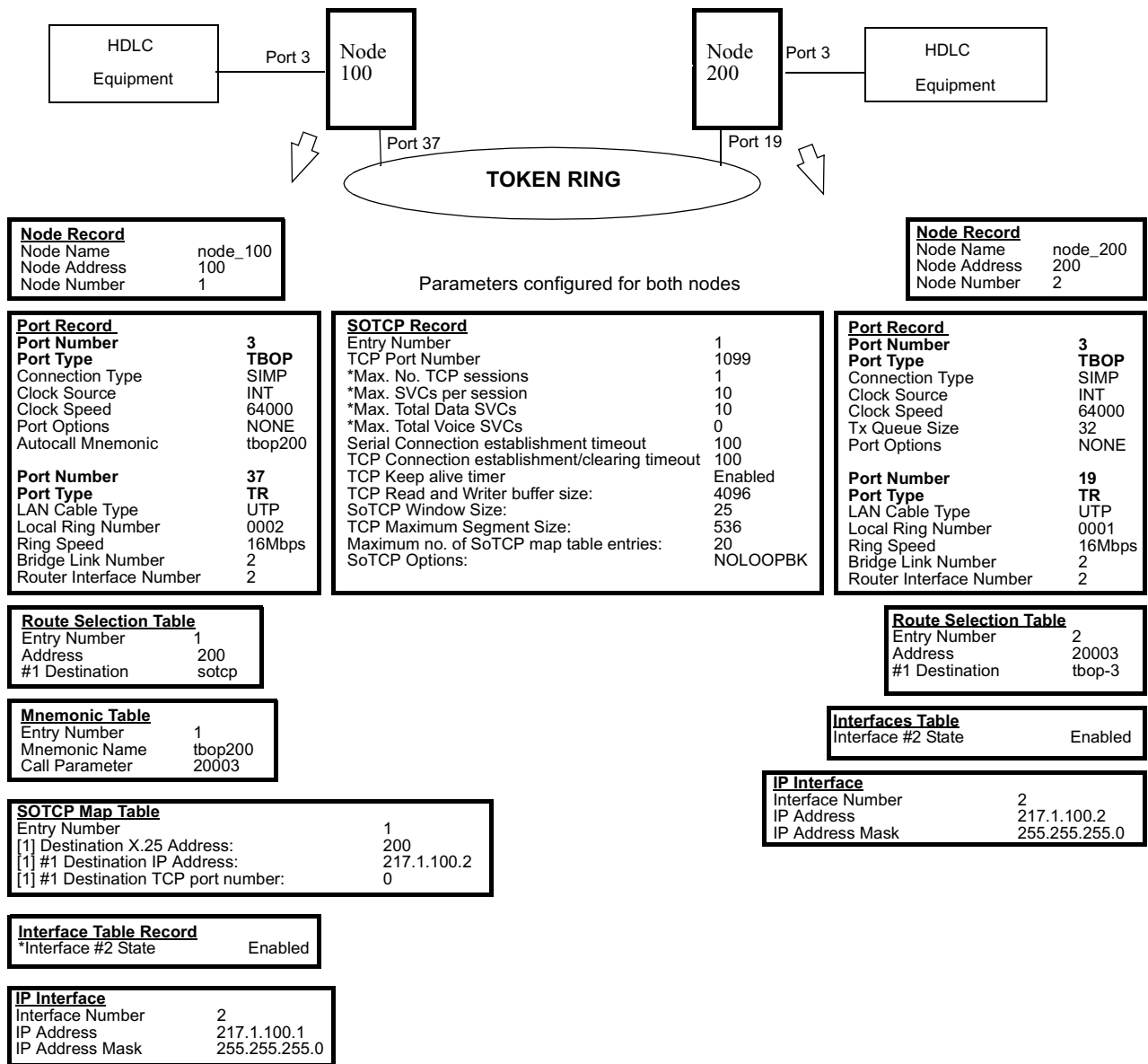


Figure 10. TBOP over SoTCP on a Token Ring LAN

T3POS Traffic over SoTCP Configuration

Description

The configuration example provided in Figure 11 and Figure 12 illustrates how SoTCP encapsulates T3POS traffic for transport over a multilink PPP ISDN link. As shown in Figure 11 and Figure 12, the Vanguard node supports both SoTCP and Ethernet LAN traffic over the multilink PPP connections.

■Note

For more information on multipoint PPP over ISDN, refer to the PPP Manual found in the *Vanguard Basic Protocols Manual* (Part Number T0106).

Implementation Notes

The following should be noted when configuring T3POS traffic over SoTCP:

- This example application uses two Vanguard 6520s. You can also configure this example on all Vanguard products.
- Data traffic from T3POS port is encapsulated by the SoTCP module.
- Traffic from the T3POS terminal or the LAN triggers the multilink PPP connection.
- The X.25 host cannot initiate calls because bidirectional PPP authentication is not configured in this example.
- PPP connection can be triggered by IP traffic from node 200 but not from node 100.

■Note

For more information on bidirectional PPP authentication, refer to the PPP manual found in the *Vanguard Basic Protocols Manual* (Part Number T0106).

Example

The tables in Figure 11 list the port records and ISDN parameters. Figure 12 lists PPP, IP, and SoTCP parameters.

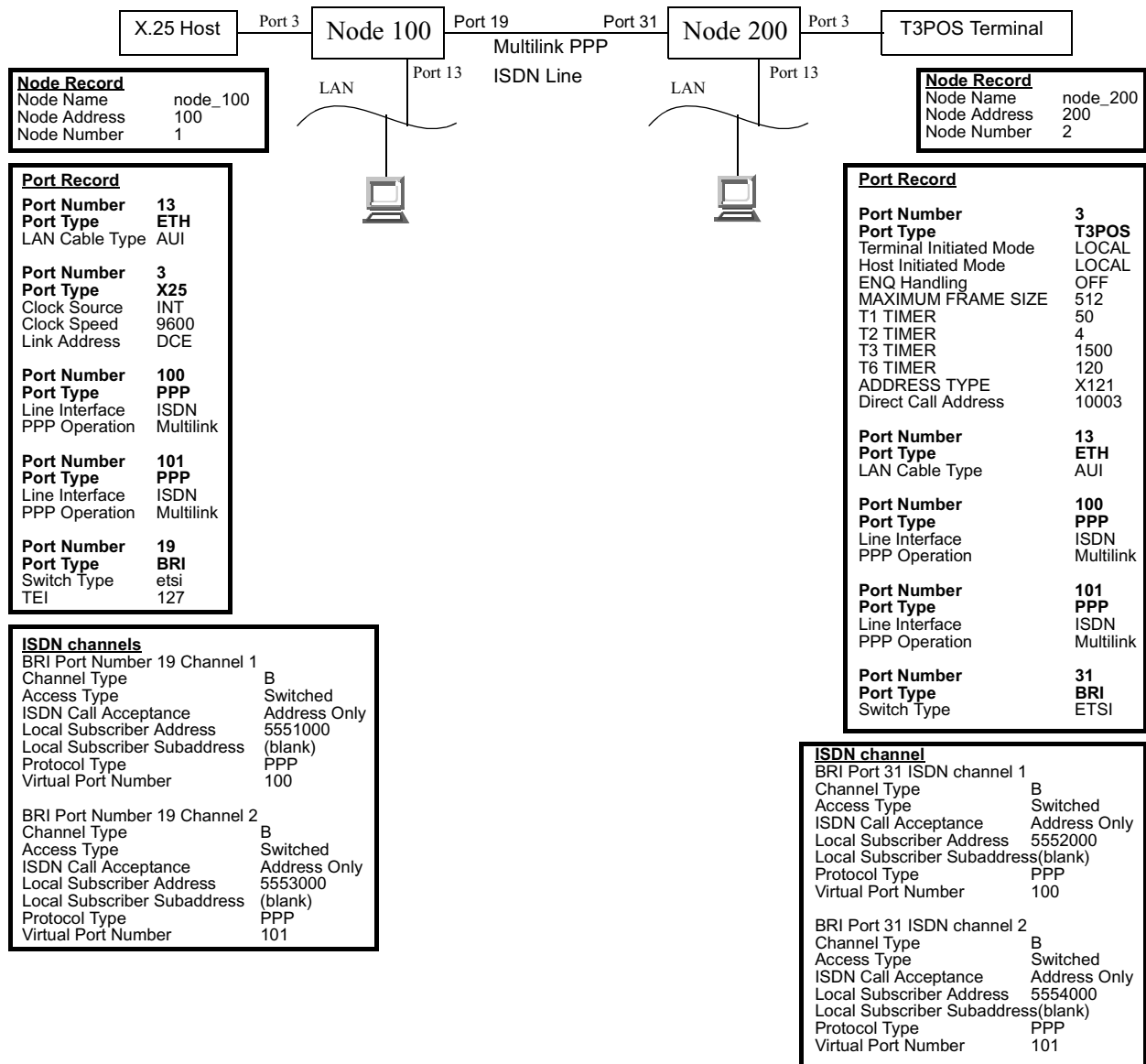


Figure 11. T3POS Traffic Transported via SoTCP Over a Multilink PPP ISDN Line

Example SoTCP Configuration

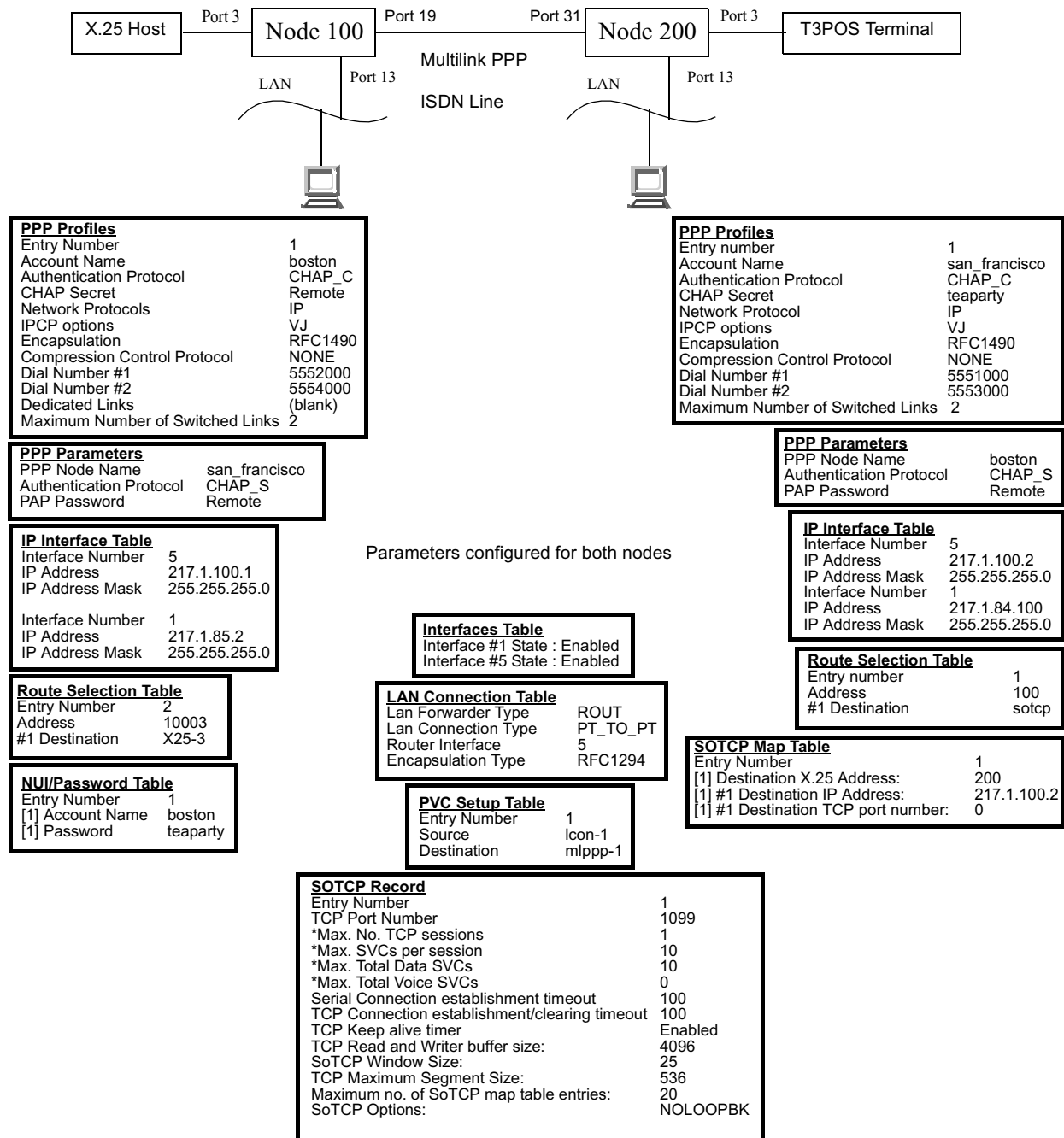


Figure 12. T3POS Traffic transported via SoTCP over a Multilink PPP ISDN Line - continued

IBM 2260 Traffic and Voice Traffic Over SoTCP

Description

In the configuration shown in Figure 13 and Figure 14, the Vanguard nodes support voice and IBM 2260 data traffic over SoTCP. A leased line running synchronous PPP connects Node 100 and Node 200.

Implementation Notes

This example application uses two Vanguard 6520s. You can also configure this example on all Vanguard products supporting IBM 2260 and voice ports.

Note

For more information on configuring VoIP and the Voice Port, refer to the *Multimedia Feature Protocols Manual* (Part Number T0104). For more information on configuring IBM 2260 Protocol refer to the *IBM 2260 Protocol Manual* (Part Number T0101-04).

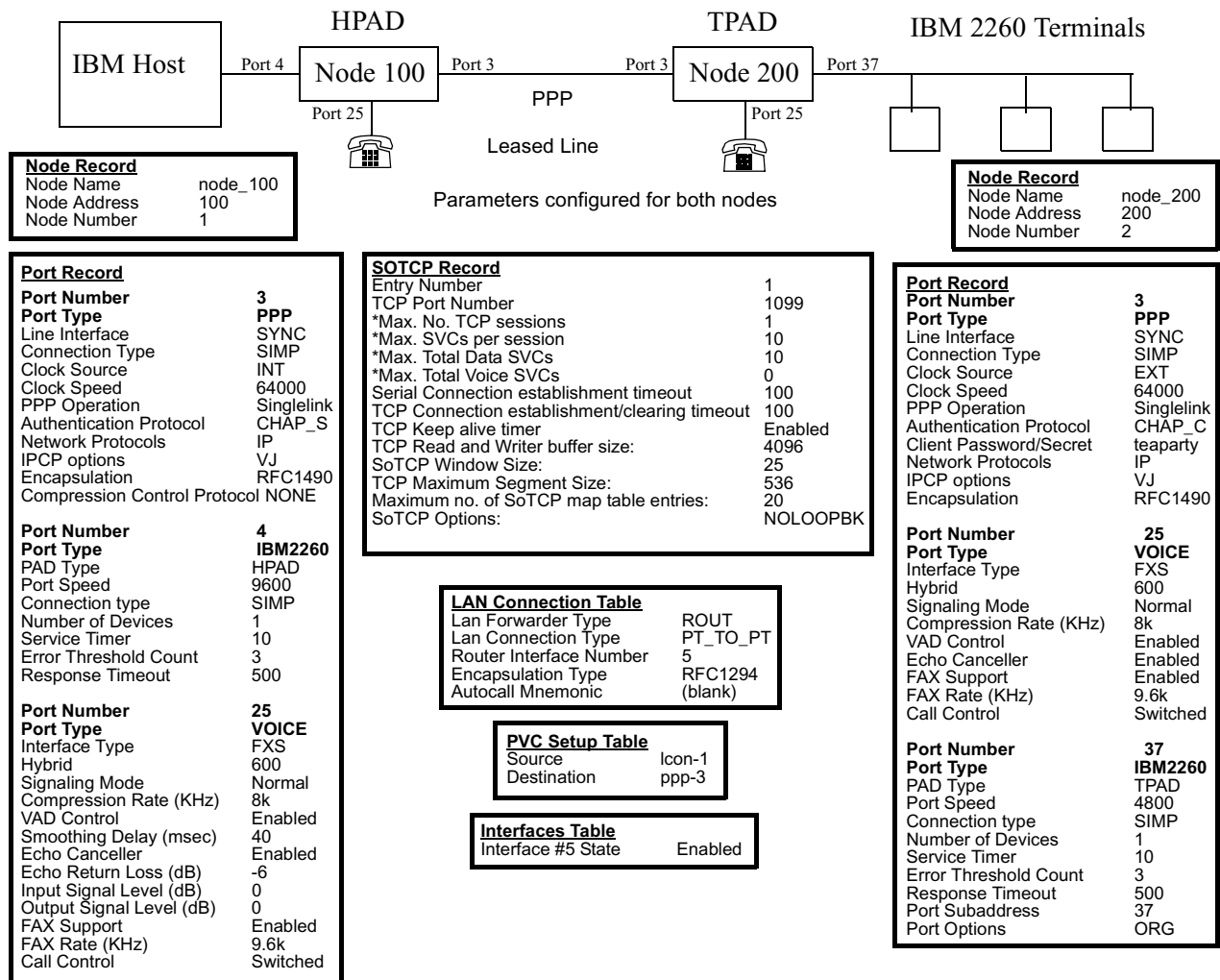


Figure 13. IBM 2260 Traffic over SoTCP

Example SoTCP Configuration

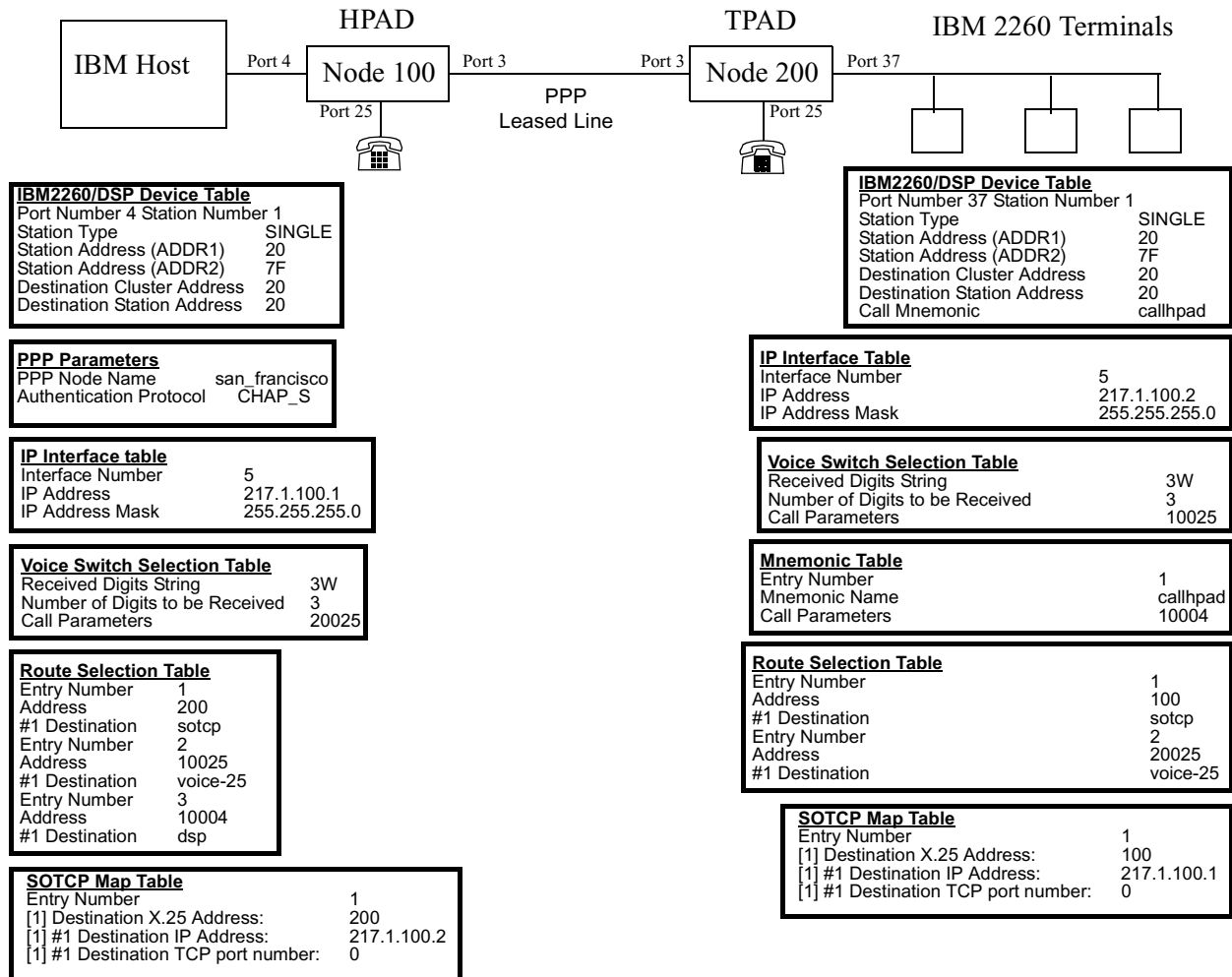


Figure 14. IBM 2260 Traffic over SoTCP - continued

X.25 Traffic over SoTCP

Description	In this example, two X.25 hosts are connected to Vanguard 100 nodes. The Vanguard 100 nodes are connected by a leased line running the SLIP protocol.
Implementation Notes	<p>Note these things when you are configuring X.25 traffic over SoTCP as shown in Figure 15:</p> <ul style="list-style-type: none">• This example application uses two Vanguard 100s. You can also configure this example on all Vanguard products and the 6500^{Plus}.• X.25 traffic is encapsulated in SoTCP.• RFC 1294 is used for encapsulating the SoTCP/IP traffic over SLIP.• Both Vanguard nodes should have the same TCP Port Number configured in the SoTCP Record. This is required for call establishment between the nodes. <p>■ Note Slim IP (SIP) or Switched IP can be used for the Vanguard 100, 200, or 6500^{Plus}. For more information refer to the <i>IP Routing Manual</i> (Part Number T0100-03).</p>
Example	Figure 15 lists the configurable parameter records and tables to support X.25 traffic over SoTCP.

Example SoTCP Configuration

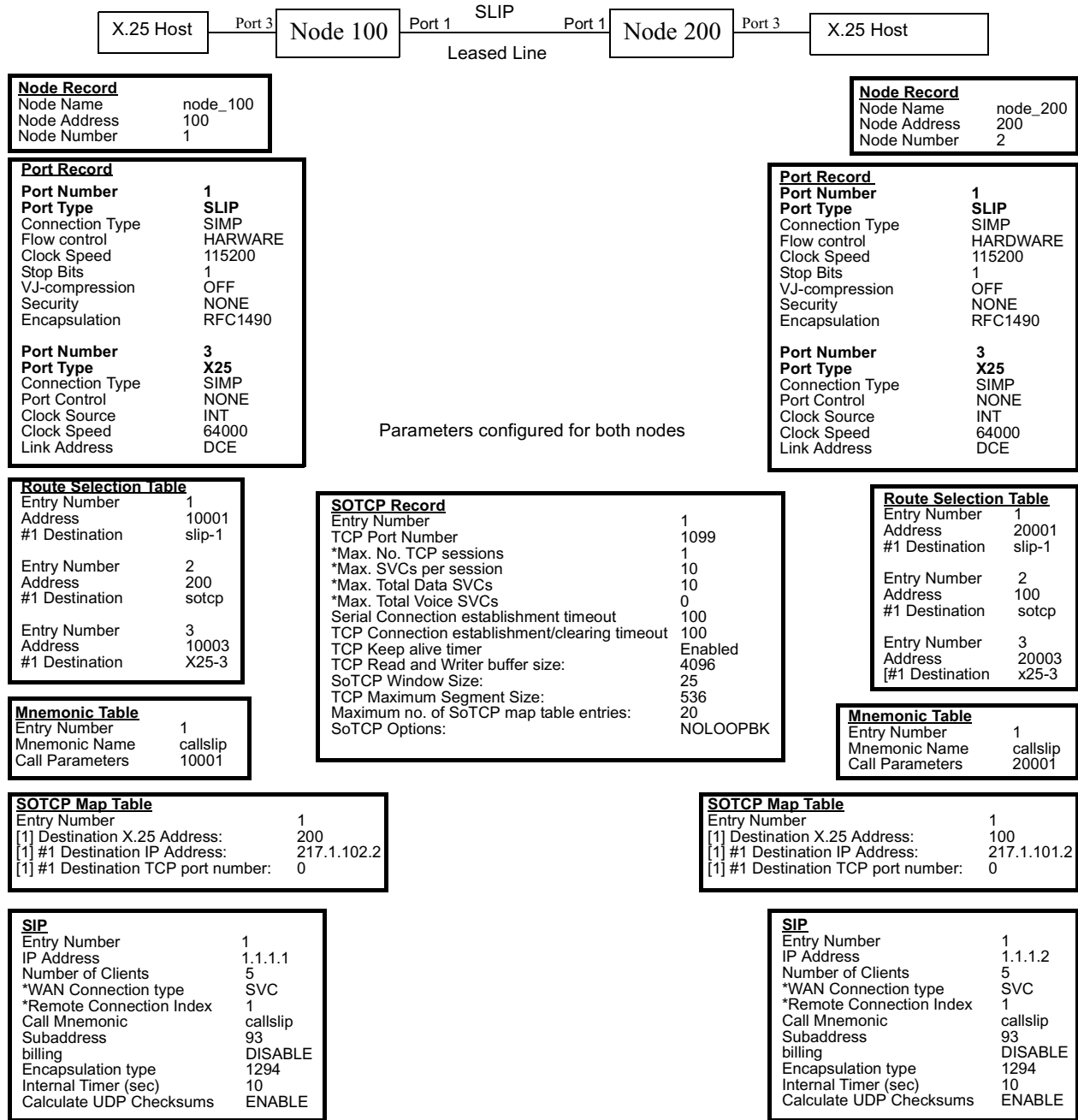


Figure 15. X.25 traffic over SoTCP

Datapac 3201 Traffic over SoTCP with Protocol Priority

Description

The illustrations in this section show two Vanguard 6520 nodes carrying Datapac 3201 traffic over SoTCP. Protocol priority is configured to prioritize the traffic from SoTCP, IP and other traffic.

Implementation Notes

Both nodes connect to a frame relay network and FRI ports must be configured for each node. Node 100 polls the 3201 controller for traffic and establishes a call with the X.25 host on detection of traffic activity from the 3201 controller. Note the these things about this implementation:

- This example application uses two Vanguard 6520. You can also configure this example on all Vanguard products.
- SoTCP routes the calls to the X.25 host.
- Each node is also connected to an Ethernet LAN.
- Protocol priority is enabled so that 35% of bandwidth is reserved for SoTCP traffic, 65% of bandwidth for IP traffic, and 5% of bandwidth for other traffic.

■ Note

For more information on configuring protocol priority, refer to the *Protocol Priority Manual* (Part Number T0100-09).

Example SoTCP Configuration

Example

Figures 16, 17, and 18 list the configurable parameter records and tables to support Datapac 3201 traffic over SoTCP with protocol priority.

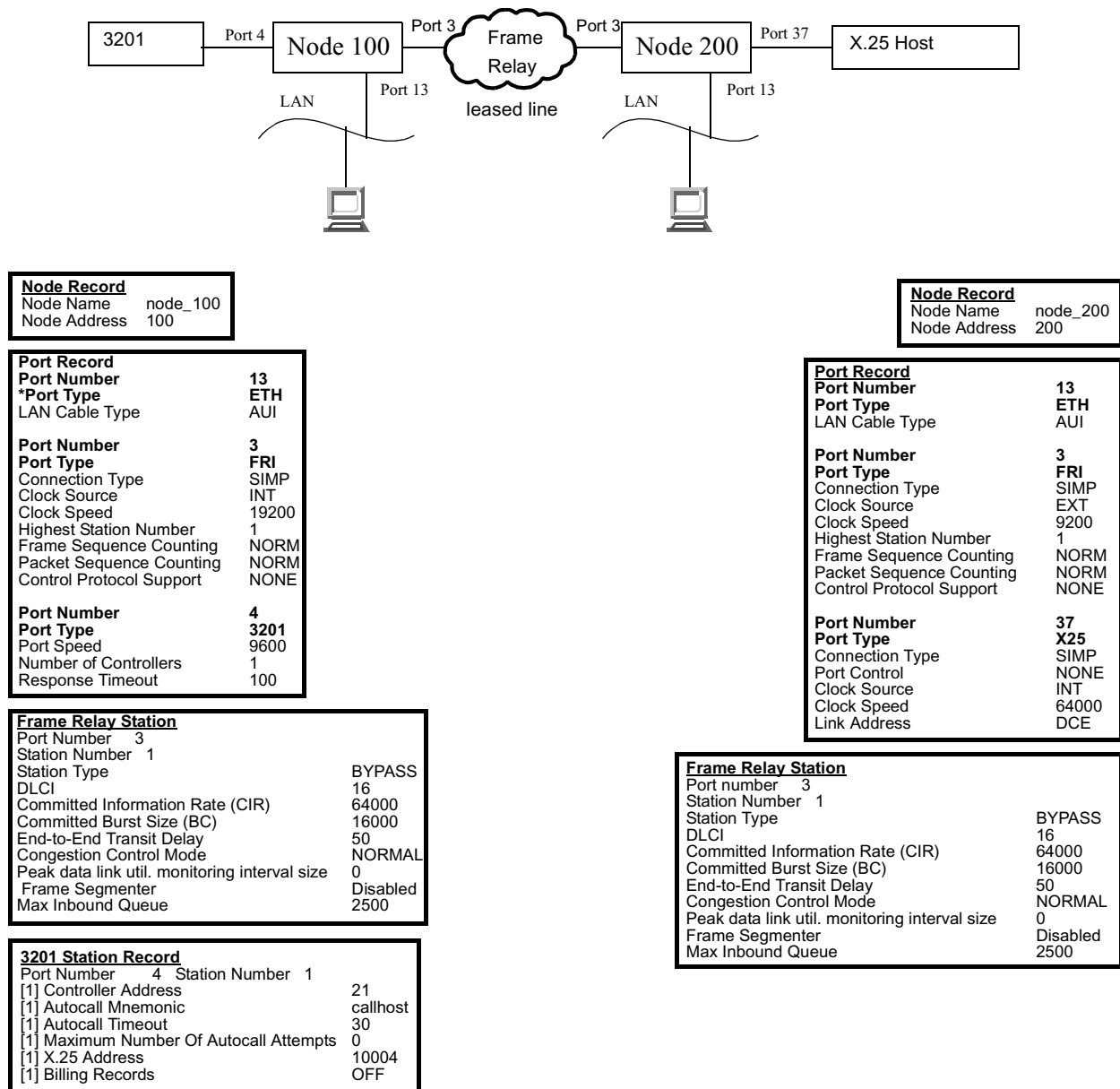
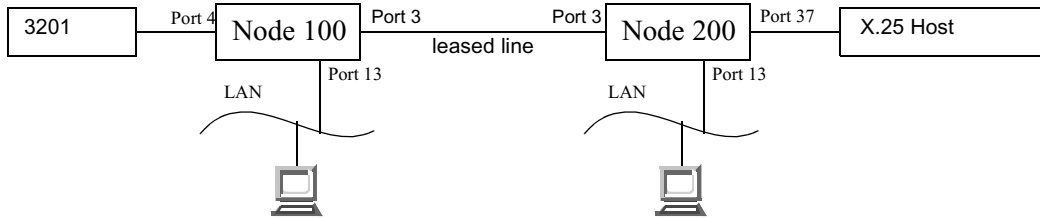


Figure 16. IBM 3201 traffic over SoTCP with Protocol Priority

Example SoTCP Configuration



Protocol Priority Profile Table	
Entry Number	1
Protocol Type	IP
Source IP Address	217.1.100.1
[Source IP Address Mask	255.255.255.0
Destination IP Address	217.1.100.2
Destination IP Address Mask	255.255.255.0
Protocol Number	6
Source Port Number(s)	0
Destination Port Number(s)	1099
Order of Match	1
Traffic Class	HIGH
Protocol Type	IP
Source IP Address	217.1.85.0
Source IP Address Mask	255.255.255.0
Destination IP Address	217.1.84.0
Destination IP Address Mask	255.255.255.0
Protocol Number	0
Order of Match	11
Traffic Class	MEDIUM
#3 Protocol Type	NONE
% of Expedite Traffic Class Packets	100
% of High Traffic Class Packets	35
% of Medium Traffic Class Packets	60
% of Default Traffic Class Packets	5

Protocol Priority Profile Table	
Entry Number	1
#1 Protocol Type	IP
#1 Source IP Address	217.1.100.2
#1 Source IP Address Mask	255.255.255.0
#1 Destination IP Address	217.1.100.1
#1 Destination IP Address Mask	255.255.255.0
#1 Protocol Number	6
#1 Source Port Number(s)	0
#1 Destination Port Number(s)	1099
#1 Order of Match	1
#1 Traffic Class	HIGH
#2 Protocol Type	IP
#2 Source IP Address	217.1.84.0
#2 Source IP Address Mask	255.255.255.0
#2 Destination IP Address	217.1.85.2
#2 Destination IP Address Mask	255.255.255.0
#2 Protocol Number	0
#2 Order of Match	11
#2 Traffic Class	MEDIUM
#3 Protocol Type	NONE
% of Expedite Traffic Class Packets	100
% of High Traffic Class Packets	35
% of Medium Traffic Class Packets	60

IP Interface Table	
Interface Number	5
IP Address	217.1.100.1
IP Address Mask	255.255.255.0
Accept RIP	VER1
Interface Number	1
IP Address	217.1.85.2
IP Address Mask	255.255.255.0

IP Interface Table	
Interface Number	5
IP Address	217.1.100.2
IP Address Mask	255.255.255.0
Interface Number	1
IP Address	217.1.84.2
IP Address Mask	255.255.255.0

Mnemonic Table	
Entry Number	1
Mnemonic Name	callhost
Call Parameters	20037

Route Selection Table	
Entry number	1
Address	100
[#1 Destination	sotcp
Entry Number	2
Address	20037
[#1 Destination	x25-37

Route Selection Table	
Entry number	1
Address	200
[#1 Destination	sotcp

SOTCP Map Table	
Entry Number	1
[1] Destination X.25 Address:	100
[1] #1 Destination IP Address:	217.1.101.2
[1] #1 Destination TCP port number:	0

SOTCP Map Table	
Entry Number	1
[1] Destination X.25 Address:	200
[1] #1 Destination IP Address:	217.1.102.2
[1] #1 Destination TCP port number:	0

Figure 17. 3201 traffic over SoTCP with Protocol Priority - continued

Example SoTCP Configuration

Parameters configured for both nodes

Interfaces Table	
*Interface #1 State	Enabled
*Interface #5 State	Enabled

LAN Connection Table	
Lan Forwarder Type	ROUT
Lan Connection Type	PT_TO_PT
Router Interface Number	5
Encapsulation Type	CODEX
Autocall Mnemonic	(blank)
LCON Queue Limit	16000
Billing Records	OFF
Traffic Priority	LOW-AND-PROTOCOL

PVC Setup Table	
Entry number	1
Source	lcon-1
Destination	fri-3s1

SOTCP Record	
Entry Number	1
TCP Port Number	1099
*Max. No. TCP sessions	1
*Max. SVCs per session	10
*Max. Total Data SVCs	10
*Max. Total Voice SVCs	0
Serial Connection establishment timeout	100
TCP Connection establishment/clearing timeout	100
TCP Keep alive timer	Enabled
TCP Read and Writer buffer size:	4096
SoTCP Window Size:	25
TCP Maximum Segment Size:	536
Maximum no. of SoTCP map table entries:	20
SoTCP Options:	NOLoopBK

Figure 18. 3201 traffic over SoTCP with Protocol Priority - continued

Statistics

Introduction

This section describes the statistics available for the SoTCP option.

Types of Statistics

You can generate these statistics:

- SoTCP statistics
- Detailed SoTCP statistics

Navigating the CTP

Figure 19 shows the CTP path to the SoTCP statistics.

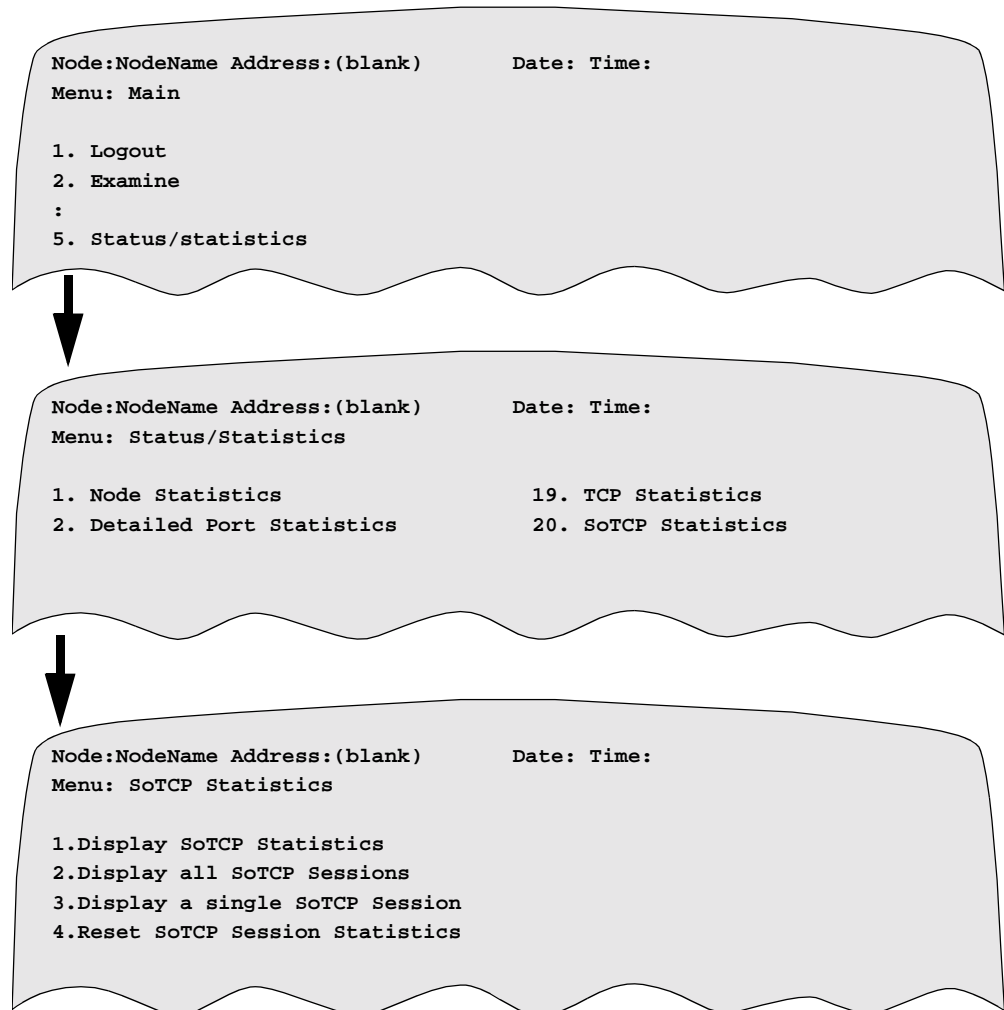


Figure 19. Statistics Screen

SoTCP Statistics

Example

Figure 20 shows the SoTCP statistics screen.

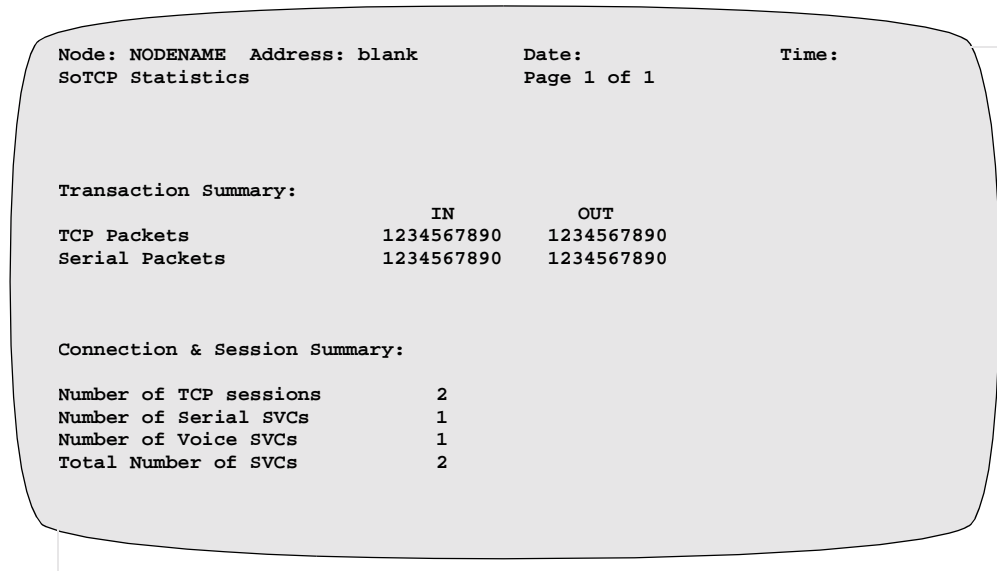


Figure 20. SoTCP Statistics

Description

The following table describes the screen attributes shown in Figure 20.

<i>Item</i>	<i>Description</i>
TCP packets IN	Total number of packets received by SoTCP from TCP.
TCP packets OUT	Total number of packets transmitted by SoTCP to TCP.
Serial Packets IN	Total number of packets received by SoTCP from the serial protocol.
Serial Packets OUT	Total number of packets transmitted by SoTCP to the serial protocol.
Number of TCP sessions	Total number of active TCP sessions.
Number of Serial SVCs	Specifies the number of serial data SVCs on all TCP sessions.
Number of Voice SVCs	Specifies the number of voice SVCs on all TCP sessions.
Total number of SVCs	Total number of serial SVCs.

Examples

Figure 21 shows the Display all SoTCP sessions screen.

```

SOTCP Detailed Statistics                                     Page: 1 of 1

```

Sess	Local IP	L-TCP	Remote IP	R-TCP	L-UDP	R-UDP
1	10.10.10.4	1099	10.10.10.2	1024	0	0
2	0.0.0.0	0	0.0.0.0	0	0	0
3	0.0.0.0	0	0.0.0.0	0	0	0
4	0.0.0.0	0	0.0.0.0	0	0	0
5	0.0.0.0	0	0.0.0.0	0	0	0
6	0.0.0.0	0	0.0.0.0	0	0	0
7	0.0.0.0	0	0.0.0.0	0	0	0
8	0.0.0.0	0	0.0.0.0	0	0	0
9	0.0.0.0	0	0.0.0.0	0	0	0
10	0.0.0.0	0	0.0.0.0	0	0	0
11	0.0.0.0	0	0.0.0.0	0	0	0
12	0.0.0.0	0	0.0.0.0	0	0	0
13	0.0.0.0	0	0.0.0.0	0	0	0
14	0.0.0.0	0	0.0.0.0	0	0	0
15	0.0.0.0	0	0.0.0.0	0	0	0

L-Local, R-Remote

Figure 21. Display All SoTCP Statistics

Figure 22 shows Page 1 of the Display a single SoTCP session screen.

```

SOTCP Detailed Session Statistics                             Page: 1 of 2

```

Session : 1 of 50
SOTCP version : 1
Number of SVCs : 2
Status : Wait Hdr

	IP Address	TCP Port	UDP Port
Local:	10.10.10.4	1099	0
Remote:	10.10.10.2	1025	0

Transaction Summary:

	IN	OUT
Characters :	366	6289
Serial packets :	30	34

Out of Sequence Packets Discarded: 0

Figure 22. Display A Single SoTCP Session -Page 1

Figure 23 shows Page 2 of the Display a single SoTCP session screen

```

Node: SOTCP400 Address: 400 Date: 31-JUL-2002 Time: 14:41:57
SOTCP Detailed Session Statistics Page: 2 of 2

Session: 1 of 50
Local : IP Address: 10.10.10.4 TCP Port : 1099 UDP Port : 0
Remote : IP Address: 10.10.10.2 TCP Port : 1025 UDP Port : 0

SVC Statistics
ID Chars IN Chars OUT Pkts IN Pkts OUT Status Type Uptime
0 270 153 5 3 DATA TXFR Data 0:00:49
1 6397 16 19 16 DATA TXFR Data 0:00:25
    
```

Figure 23. Display A Single SoTCP Session -Page 2

Description

The following table describes the screen attributes shown in Figure 22 and Figure 23.

Item	Description
TCP session	Specifies the TCP session.
SoTCP version	Specifies the version of SoTCP running on this session.
Destination IP address	Specifies the IP address of the destination node.
Destination TCP port number	Specifies the TCP port number of the destination node.
Number of SVCs (current)	Specifies the total number of SVCs which are transported through this TCP session.
Number of SVCs (maximum)	Specifies the maximum number of SVCs that are transported through this TCP session.

Item	Description
Status	<p>Specifies the current state of the session. These messages apply to connection status:</p> <ul style="list-style-type: none"> • Start • Idle • Wait Hdr • Wait Data • Abort • Data TXFR • BLOCK FRM TCP • BLOCK FRM SER • BLOCK TWO WAYS <p>BLOCK FRM TCP, BLOCK FROM SER, and BLOCK TWO WAYS indicate that the connection is in data transfer state but has been blocked in the mentioned direction(s). This provides flow control state information for the user.</p>
UDP Port Number	Specifies the UDP Port Number of the node.
Characters IN/OUT	Specifies the total number of characters received or transmitted by this TCP session.
Serial packets IN/OUT	Specifies the total number of packets received or transmitted by this TCP session.
Out of Sequence Packets Discarded	Specifies the number of packets received on the UDP port with an invalid sequence number. Packets with a invalid sequence number are discarded.
Connection ID	Connection identifier of the multiplexed SVC.
Type	Specifies the type of traffic, data or voice.
Uptime	Time elapsed since call establishment.

Troubleshooting Guidelines for SoTCP Configuration

Introduction

This section outlines troubleshooting tips when configuring SoTCP.

■ **Note**

Not all alarms are listed in this section. Detailed SoTCP alarms and report descriptions are provided in the *Alarms and Reports Manual* (Part Number T0005).

Troubleshooting Tips

The table lists some troubleshooting tips for alarms or events you may encounter:

<i>If</i>	<i>Then the following Alarm is generated</i>	<i>Alarm Description</i>	<i>Action</i>
IP address is not reachable	IP. n no rte x.x.x.x --> n.n.n.n dsc ■ Note The Vanguard only generates this report if “Unusual Operations” is enabled under the Configure Router -->Event menu.	This alarm is generated on the source node (x.x.x.x) and indicates that n.n.n.n is the unreachable destination IP address.	Ensure that the IP address has been configured on the destination node, and that the routers in the path are properly configured and running.
Wrong TCP Port Number is specified	On the source node the following alarms are generated: TCP: State trnstn to CLOSED 1.1.1.1 --> 1.1.1.2 dst port 1098 src prt 1024 TCP: TCP cnn clsd frgn hst 1.1.1.1 lcl hst 1.1.1.2 On the destination node the following alarms are generated: TCP rcvd pkt 1.1.1.2 --> 1.1.1.1. dst port 1098 TCP snd rst to hst 1.1.1.2	TCP reports are generated only if Diagnostic Filter parameter under TCP configuration is set to INFO.	Check the TCP port number in the SoTCP record on the source and destination nodes.

<i>If (continued)</i>	<i>Then the following Alarm is generated</i>	<i>Alarm Description</i>	<i>Action</i>
No more circuits are available to a destination	SoTCP-n- No more connection	n indicates the session number. This alarm is generated when <ul style="list-style-type: none"> • the maximum number of SVCs per session limit is exceeded • the maximum number of data SVCs or voice SVCs is exceeded 	Check the configured number of SVCs and the number of SVCs that are currently active.
There is not enough memory in the node to open a new TCP session	SoTCP-n-TCP Active open failed with X.X.X.X	n indicates the TCP session number.	Check the heap statistics to ensure that there is enough memory to support more TCP sessions. Refer to “Estimating Memory Consumption” on page 23 for more information on memory consumption.

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