TCP Acceleration Option
NetPerformer® System Reference

MEMOTEC
redefining network efficiency

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Memotec Inc.
7755 Henri Bourassa Blvd. West
Montreal, Quebec
Canada H4S 1P7
Tel.: (514) 738-4781
FAX: (514) 738-4436
www.memotec.com

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1.1 About the NetPerformer TCP Acceleration Option

The NetPerformer TCP Acceleration Option permits higher performance on satellite links, extending the feasibility of the TCP/IP protocol to satellite applications. It is offered on the SDM-9220 and SDM-9230 as a licensed software option in NetPerformer version 10.2.x and above.

NOTE: The TCP Acceleration option is not available on the NetPerformer VoIP Gateway product (SDM-9230GW).

Some features of TCP acceleration congestion control are also available as non-configurable features on all NetPerformer base products running V10.2, and can be used on terrestrial networks. Refer to Table 1-1.

1.1.1 Overview

Satellite communications provide an easy and flexible way to globally extend the enterprise network. TCP/IP via satellite can take advantage of an instant communications infrastructure to almost anywhere in the world.

The NetPerformer TCP Acceleration Option handles the obvious problems associated with using TCP/IP, a protocol that was optimized to run on terrestrial networks, in a satellite environment:

- **Link latency:** A satellite network is necessarily comprised of high-delay products, and satellite link bandwidth is not efficiently utilized
- **High error rate:** The potentially higher bit error rate of a satellite results in poor TCP/IP performance
- **Asymmetry:** Satellite links often operate in an asymmetric mode where they receive at a higher data rate than they transmit. The low-rate uplink easily becomes congested.

NOTE: These inherent problems are discussed further on “Problems with TCP/IP in a Satellite Environment” on page 1-3.

The reduced efficiency and Quality of Service (QoS) of the typical satellite link is largely overcome when the TCP Acceleration Option is installed on all NetPerformer units that act as a gateway to the satellite network with a **MODULATOR** satellite connection.

NOTE: The NetPerformer unit may be installed in front of a satellite modem or another router.

1.2 Problems with TCP/IP in a Satellite Environment

1.2.1 Bit Errors

Most networking protocols were designed for use in a **terrestrial environment where the Bit Error Rate (BER) is extremely low** (typically less than 10^{-10}). On a **satellite link, the raw BER is typically much higher** (10^{-2} to 10^{-6}).

Forward Error Correction (FEC) can be used to reduce the BER to an acceptable level. However, the benefit of a lower BER comes at the price of increased complexity and reduced channel capacity. The trade-off factor is equal to the code rate used.

Rather than trying to make the satellite link look like a terrestrial link from a BER perspective, **the NetPerformer solution involves enhancing the TCP/IP protocol** to operate effectively in an environment with a high BER. Turn to "NetPerformer Solutions to TCP/IP over Satellite" on page 1-7 for further information.

1.2.2 Latency

Latency in a terrestrial environment is typically very low. For example, the prorogation time across the North American continent is approximately 30 ms. **Latency to and from a geo-stationary satellite is much higher**: approximately 260 ms each way.

- This means that the Round Trip Time (RTT) via satellite is 520 ms, even excluding any coding delays or terrestrial-based latencies.
- The large discrepancy between terrestrial and satellite RTTs is the main reason why networks cannot be extended to satellite applications efficiently.
- Short of changing orbital parameters, nothing can be done to reduce the RTT. **Protocol enhancement is required to accommodate latency.**

On a satellite link, actual throughput is a function of the window size divided by the RTT. As the RTT increases the throughput decreases, and the link experiences higher bandwidth delays. **To avoid reduced throughput on links with increased bandwidth delays, TCP applications can:**

- **Increase the window size.** Turn to "Window Scaling" on page 1-9.
- **Use a larger buffer for the connections.** This buffer is directly related to the window size.

1.2.3 Asymmetry

Unlike terrestrial networks, **satellite links often operate in asymmetric mode, receiving segments at a higher transmission rate than they transmit**. This is due to two main factors:

- Satellite terminals, especially portable or mobile stations, are often **uplink power limited**.

These stations have a ceiling on their uplink transmit capability, but can receive as many signals on the downlink as the application requires.

- In some cases, the asymmetry of satellite links may simply reflect an asymmetry in the actual data flow between locations.

  For example, many Web servers send out vast quantities of information in response to relatively short requests.

Because of these factors, it is not uncommon for the ratio of downlink to uplink capacity to reach 100 to 1, or even higher.

Uplink/downlink asymmetry is not the ideal environment for the self-clocking mechanism of TCP (see “Latency” on page 1-3):

- Most TCP segments received over the high rate downlink are responded to with an ACK, which is sent over the low rate uplink.
- The low rate link may become congested with ACKs.
- Flow control starts up, reducing the amount of traffic that can be sent over the high rate downlink even though it is not congested itself.

1.3 Other Considerations and Requirements

A number of considerations affect what methods can be used to improve TCP/lP performance over satellite links in a viable way. The NetPerformer solution meets all of these requirements:

1.3.1 Transparency

The NetPerformer TCP Acceleration Option is a transparent solution. A protocol enhancement is considered transparent if it:

- Has no negative impact on performance or connections
- Does not require special procedures to obtain the desired improvement, and can be used without the end user's knowledge
- Does not compromise the integrity of the protocol or its features. For example, a protocol that guarantees end-to-end reliability must continue to provide end-to-end reliability under enhancement.

1.3.2 Backward Compatibility

The NetPerformer TCP Acceleration Option is backward compatible. Backward compatibility requires that:

- The protocol enhancement can work with existing Internet and intranet infrastructures.

  There is no need to change or upgrade your applications to accommodate the enhancement.

- The enhancement is application independent.

  There is no need to standardize the applications that are used across your organization in order to optimize network extension via satellite. Your current applications will continue to work, even if they include parameters that affect performance in some way.

1.3.3 Network Efficiency

Satellite links are typically more expensive than terrestrial links. This cost factor is offset somewhat by the ability of satellite links to provide instant infrastructure. Nevertheless, network efficiency is of primary concern:

- The satellite link must be used as efficiently as possible

- The protocol enhancement should correct aspects of the protocol that result in inefficient use of the satellite link.

Improved satellite network efficiency is the main advantage of the NetPerformer TCP Acceleration Option.

1.3.4 Network Scalability

The NetPerformer TCP Acceleration Option provides a scalable approach to TCP/IP performance improvement. Through scalability, it is able to:

- Support high transmission rates
- Accommodate a large number of users.

The NetPerformer approach is able to satisfy both short-term needs and projected growth in network size and performance demands.

1.4 NetPerformer Solutions to TCP/IP over Satellite

The NetPerformer TCP Acceleration Option includes the following enhancements that provide a solution to the problems, considerations and requirements discussed earlier ("Problems with TCP/IP in a Satellite Environment" on page 1-3 to "Network Scalability" on page 1-6):

- "TCP Spoofing" on page 1-7
- "Window Scaling" on page 1-9
- "Timestamp" on page 1-9
- "Selective Negative Acknowledgment (SNACK)" on page 1-9
- "Congestion Avoidance and Control" on page 1-10
- "Fast Checksum Calculation" on page 1-11.

NOTE: Some of these solutions are available on all NetPerformer products that run V10.2, without requiring a software license. See "Availability on NetPerformer Products" on page 1-12.

1.4.1 TCP Spoofing

With TCP spoofing, TCP end-to-end connections are broken virtually.

NOTE: The link remains intact at the physical level as a composite of three connections, rather than a single point-to-point connection.

The NetPerformer unit that breaks the connection takes responsibility for delivering the data to its proper destination. This resolves the delays that result from high latency (see "Latency" on page 1-3) and the congestion problems associated with asymmetry (see "Asymmetry" on page 1-3). In this approach:

- A NetPerformer gateway at the outskirts of the satellite portion of the network examines the content of all TCP headers in segments received from the source node. Refer to Figure 1-1.
- This NetPerformer sends spoofed ACKs back to the source node, and takes responsibility for delivering these ACKs successfully.
- It deletes the real ACKs it receives from the satellite destination. This prevents any confusion on the part of the source node.

NOTE: **In NetPerformer V10.2 a maximum of 300 connections can be spoofed,**

depending on the type of license installed (the license can be scaled to the size of your application, and may support a lower maximum number of connections). Any additional connections will use end-to-end TCP, which is the same as routing the traffic with TCP Acceleration disabled.

Through TCP spoofing, the NetPerformer approach:

- Overcomes the effects of the *slow start* algorithm that is used for TCP congestion control
- Still requires "Window Scaling" on page 1-9, described in the next section, to overcome the window size limitations that result from latency.

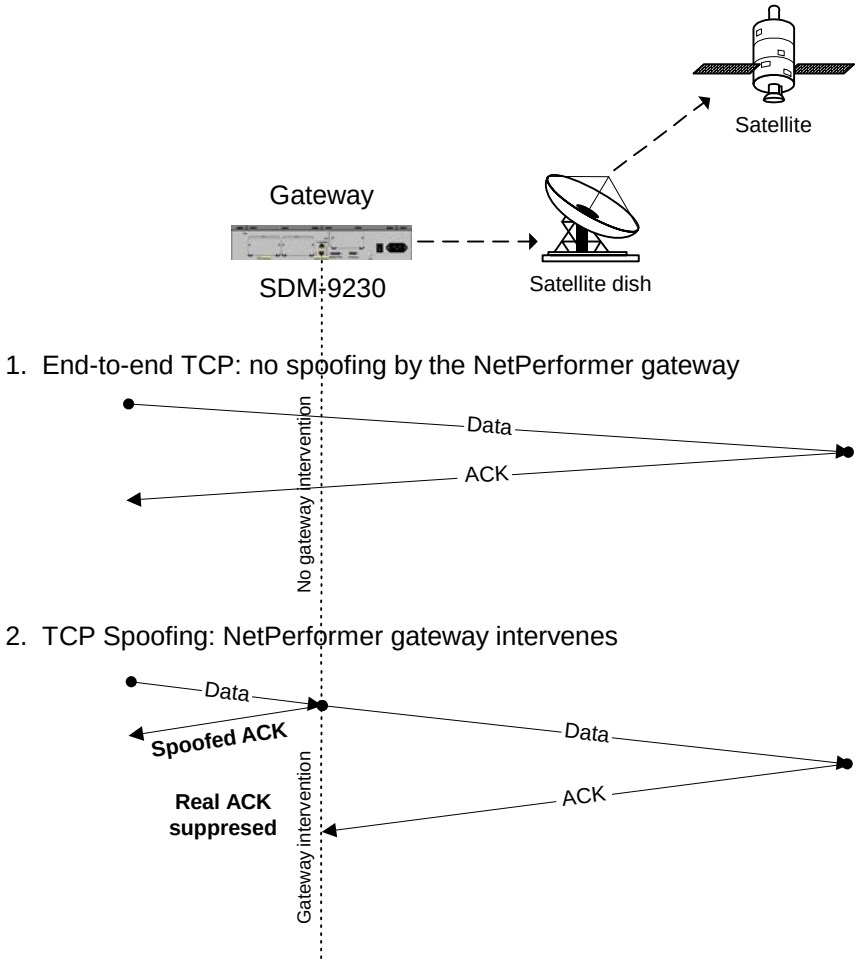

Figure 1-1: NetPerformer Spoofing of TCP Traffic

1.4.2 Window Scaling

Actual TCP performance depends on both the transfer rate and the RTT, together referred to as the *bandwidth delay*. In other words, the bandwidth delay measures the amount of traffic that would "fill the pipe".

In high-delay applications such as a satellite link, the size of the window required to fill the pipe can be so high that the 16-bit *Window* field of the TCP header is too small to hold its value. To circumvent this problem the NetPerformer uses window scaling, an extension of the TCP protocol that was introduced in RFC-1323.

- Allows window sizes larger than 2^{16}
- Expands the definition of the TCP window to 32 bits
- Scales the 32-bit value to fit the 16-bit *Window* field of the TCP header.

1.4.3 Timestamp

TCP timeouts and retransmissions depend on the measured Round Trip Time (RTT). However, the RTT must be ignored when packets have been sent more than once.

It is often difficult to get a correct RTT measurement in a noisy environment such as satellite. To circumvent this problem the NetPerformer uses the timestamp option, an extension of the TCP protocol that was introduced in RFC-1323.

- The timestamp option permits accurate RTT measurement for practically every ACK that passes through the gateway.

1.4.4 Selective Negative Acknowledgment (SNACK)

As mentioned in "Bit Errors" on page 1-3, a satellite link has a significantly higher error rate than its terrestrial equivalent. As a result, a larger proportion of transmitted segments are discarded.

TCP uses timeouts to determine when to retransmit a discarded segment. This works satisfactorily when the error rate is fairly low, but can significantly degrade performance when the error rate is high.

TCP has a cumulative acknowledgment scheme in which received segments are acknowledged only if they are at the left edge of the receive window. If a segment is lost, the sender must either:

- Wait one full round trip time to find out what happened to the lost segment
- Retransmit segments that may have been received correctly.

If many segments are lost from a single window of data, the TCP protocol can lose its ACK-based clock. This reduces overall throughput, with sometimes catastrophic results.

The NetPerformer uses an extension of the TCP protocol, Selective Negative Acknowledgment (SNACK -- see Note below), to counter the effects of the TCP cumulative acknowledgment scheme. SNACK is a bandwidth-efficient error recovery mechanism that reduces retransmission time and can convey a lot of information using a small number of bits.

NOTE: Introduced in the Consultative Committee for Space Data Systems (CCSDS) “Blue Book” on *Space Communications Protocol Specification (SCPS) - Transport Protocol*, 714.0-B-1, May 1999.

Rather than notifying the sender about all segments that were received successfully, when SNACK is invoked the receiver provides the sender with:

- A list of missing segments that require retransmission
- The sequence number of the segment up to which no segments were lost.

As a result:

- The sender does not need to retransmit segments that have already been successfully delivered to the receiver
- Missing segments are retransmitted immediately, accelerating overall performance.

The SNACK capability comes with the NetPerformer V10.2 base product and is always available for negotiation, even if TCP Acceleration is not enabled or no software license is entered. Outside of a TCP Acceleration application, SNACK can be useful for:

- Improved speed of the NetPerformer user interface
- Rapid display of real-time statistics
- Faster file downloads
- Faster Telnet access to the console.

1.4.5 Congestion Avoidance and Control

Traffic congestion occurs when several connections are trying to transmit at the same time through their corresponding window. This can result in a higher occurrence of retransmissions, which further congest the connections.

The congestion avoidance and control scheme is an extension of the TCP protocol that controls window size to avoid these unwanted retransmissions. This scheme includes algorithms that manage the following extended TCP features:

- From RFC 2581, *TCP Congestion Control*, April 1999:
  - Slow start
  - Congestion avoidance
  - Fast retransmit
  - Fast recovery.
- From a later research paper:

- Fair share
- Dynamic right-sizing.

These features can be useful for terrestrial and satellite networks alike. For example, Fast Retransmit permits higher speeds:

- If a unit receives 3 identical ACKs after a segment has not been received, it will retransmit automatically.
- If a hole in the segment stream is detected, it can send immediately.

NOTE: **Fast Retransmit comes with the NetPerformer V10.2 base product and is always enabled.** Fast Retransmit is beneficial for all products, and can improve performance of the NetPerformer FTP transmitter.

Fair share and dynamic right-sizing control buffer management in terrestrial and satellite networks. With these algorithms, both the RTT and the available bandwidth are considered in the buffer size decision, which determines the window size. The fair share algorithm ensures that all connections get a fair share of the bandwidth, and redistributes any unused bandwidth to connections that need it the most.

NOTE: **TCP Congestion Control is always enabled on the NetPerformer base product. It is a separately configured feature on a SDM-9220 or SDM-9230 that has been installed with the TCP Acceleration licensed software option.** On these products, TCP congestion control is enabled by default, but can be disabled if the *TCP acceleration* parameter has been set to **YES**. Refer to "TCP acceleration" on page 2-4.

1.4.6 Fast Checksum Calculation

Following RFC-1071, the NetPerformer employs a routine that calculates all checksums using 32 bits instead of 16 bits. In addition, it is able to perform incremental updates, rather than having to recalculate the checksum of the entire segment. This approach speeds up checksum calculation and improves overall processing speed.

1.5 Availability on NetPerformer Products

The various enhancements to the TCP protocol and its processing methods are available on NetPerformer products running V10.2, as follows:

Enhancement	NetPerformer Products	Requires License?	Configurable?
TCP Spoofing	SDM-9220 and SDM-9230 only	YES	NO
Window Scaling	All V10.2 products	NO	NO
Timestamp	All V10.2 products	NO	NO
SNACK	All V10.2 products	NO	NO
Congestion Avoidance and Control	All V10.2 products	NO	YES (with software license only, when TCP Acceleration is enabled)
Fast Checksum Calculation	All V10.2 products	NO	NO

Table 1Availability of TCP Protocol Enhancements in NetPerformer V10.2

Configuring TCP Acceleration

2.1 Before You Configure

The TCP Acceleration option includes a Software Licensing Agreement, which can be found in the product package.

You must agree to the terms and conditions of this agreement before loading the software. Each NetPerformer unit that serves as a gateway in the TCP Acceleration application requires a separate software license.

The TCP Acceleration option can be loaded on a NetPerformer SDM-9220 or SDM-9230 only.

The TCP Acceleration software must be activated on the NetPerformer unit (an SDM-9220 or SDM-9230 only) before you can configure and use any TCP Acceleration features. This requires entering the TCP Acceleration Software License to the License Profile.

> **NOTE:** **A specific License Profile is valid for a single NetPerformer unit only.**

To prepare for TCP Acceleration configuration you must first:

- Install the NetPerformer SDM-9220 or SDM-9230 unit according to the instructions given in the *Hardware Installation Guide* for the particular product, which is available on the *NetPerformer Documentation CD* (Part No. 161-0692-001).
- Install and activate the TCP Acceleration Option software license, following the procedure provided in the *Software Licensing* chapter of the *Software Installation and Licensing* fascicle of this document series.

  A bundled license, including both the SkyPerformer and TCP Acceleration options, is also available for the NetPerformer base product or a gateway product installed with the PowerCell Option. Both parts of this bundled license are installed at the same time.
- At any time, you can reset the unit configuration to its factory defaults: enter **FS** at the command prompt. The TCP Acceleration Option is reset along with all other areas of the configuration, and all previously defined values are lost.

  When you execute the **FS** command, the NetPerformer unit clears its License Profile and sets the *TCP Acceleration* parameter on all ports, PVCs and SVCs to **NO**. You must:

  - Re-enter the TCP Acceleration Option software license, ***and***
  - Change the *TCP acceleration* parameter on all ports, PVCs and SVCs involved in the application to **YES** (see next section).

2.1.1 Is the TCP Acceleration option already Installed?

To determine whether a NetPerformer unit is already installed with the TCP Acceleration licensed software option, execute any of the following commands:

- Display Parameters (**DP**)
- Display Version (**DV**)
- Display Alarms (**DA**).

These commands include information on any optional software that has already been installed on the unit. The message **TCP acceleration license (AAAA-BBBB-CCCCCCCC-DDDD) enabled on this unit** indicates the software license number. The following line indicates the maximum number of accelerated connections available on the unit.

DP example: with TCP Acceleration enabled

```
SDM-9230>DP
DISPLAY PARAMETERS
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:REDUNDANCY) ? ALL
Wait for <ENTER> after each screen (NO/YES,def:YES) ? NO
NetPerformer SDM-9230 vX.X.X Memotec Inc. (c) 2004
Signaling Engine vX.X.X Memotec Inc. (c) 2004
Console connected on port CSL
TCP acceleration license (AAAA-BBBB-CCCCCCCC-DDDD) enabled on this
unit
 Number of accelerated connections: XXX
...
```

DV example: with TCP Acceleration enabled

```
SDM-9230>DV
DISPLAY VERSION
SDM-9230 vX.X.X Memotec Inc. (c) 2004
Signaling Engine vX.X.X Memotec Inc. (c) 2004
DSP code version: X.X.X
Console connected on port CSL
TCP acceleration license (AAAA-BBBB-CCCCCCCC-DDDD) enabled on this
unit
 Number of accelerated connections: XXX
```

DA example: with TCP Acceleration enabled

```
SDM-9230>DA
DISPLAY ALARMS
SDM-9230 vX.X.X Memotec Inc. (c) 2004
Signaling Engine vX.X.X Memotec Inc. (c) 2004
DSP code version: X.X.X
Console connected on port CSL
TCP acceleration license (AAAA-BBBB-CCCCCCCC-DDDD) enabled on this
unit
 Number of accelerated connections: XXX
...
```

2.2 TCP Acceleration Parameters

Only two parameters are required, but they recur in many areas of the unit configuration.

2.2.1 TCP acceleration

Console	SNMP	Text-based Config
TCP acceleration	ifwanTcpAcceleration	[ifwan] TcpAcceleration
	iflanTcpAcceleration	[iflan] TcpAcceleration
	pvcTcpAcceleration	[pvc] TcpAcceleration
	atmpvcTcpAcceleration	[atmpvc] TcpAcceleration
	atmsvcTcpAcceleration	[atmsvc] TcpAcceleration
	pppoeTcpAcceleration	[pppoe] TcpAcceleration

Table 2-1: TCP acceleration parameters

Set this parameter to **YES** to enable the TCP Acceleration scheme on this element (port, channel, PVC or SVC). **This option is available only on a SDM-9220 or SDM-9230 installed with the TCP Acceleration licensed software option.**

When TCP acceleration is set to **YES**, the connection can take advantage of TCP acceleration control and TCP spoofing, and can be configured for TCP congestion control.

Set this parameter to **NO** to disable TCP Acceleration.

NOTE: TCP acceleration will enhance overall performance even if it is enabled on only one side of the connection. However, **if you want to use TCP acceleration, it is preferable to set the *TCP acceleration* parameter to YES on both sides of the connection**.

Values: NO, YES

Default: NO

2.2.2 TCP congestion control

Console	SNMP	Text-based Config
TCP congestion control	ifwanTcpCongestion-Control	[ifwan] TcpCongestionControl
	iflanTcpCongestion-Control	[iflan] TcpCongestionControl
	pvcTcpCongestion-Control	[pvc] TcpCongestionControl
	atmpvcTcpCongestion-Control	[atmpvc] TcpCongestion-Control
	atmsvcTcpCongestion-Control	[atmsvc] TcpCongestionControl
	pppoeTcpCongestion-Control	[pppoe] TcpCongestion-Control

Table 2-2: TCP congestion control parameters

NOTE: This parameter appears at the NetPerformer console only if the *TCP acceleration* parameter has been set to **YES**. **It is configurable only on a SDM-9220 or SDM-9230 installed with the TCP Acceleration licensed software option.** On other NetPerformer products, congestion control is always enabled, to improve throughput and reduce the number of retransmissions.

- Set *TCP congestion control* to **YES** to implement TCP congestion control on this element (port, channel, PVC or SVC). When TCP congestion control is implemented, the congestion avoidance and control mechanisms are activated (refer to "Congestion Avoidance and Control" on page 1-10).

  YES is the default value of the *TCP congestion control* parameter, and the preferred setting for a satellite link.

- Set *TCP congestion control* to **NO** to disable all congestion avoidance and control mechanisms on this element. In this case, the NetPerformer will always use the full window advertised by the remote unit.

NOTE: *TCP congestion control* is not configurable for a PVC set to **FRF.8**, **ATM-MULTIPLEX**, **MULTIPLEX** or **TRANSP** mode.

Values: NO, YES

Default: YES

2.3 Configuration Procedures

TCP Acceleration can be implemented on the following NetPerformer elements:

- **CSL port:** PPP protocol
- **LAN port:** Ethernet protocol
- **WAN port:** PVCR or PPP protocol
- **PPPoE port:** PPP protocol over an Ethernet port
- **PVC:** PVCR or RFC1490 mode
- **ATM PVC:** ATMPPP, ATMPVCR or RFC1483 mode
- **ATM SVC:** ATMPPP, ATMPVCR or RFC1483 mode.

NOTE: Each NetPerformer element that you would like to include in TCP Acceleration must be configured separately for this feature.

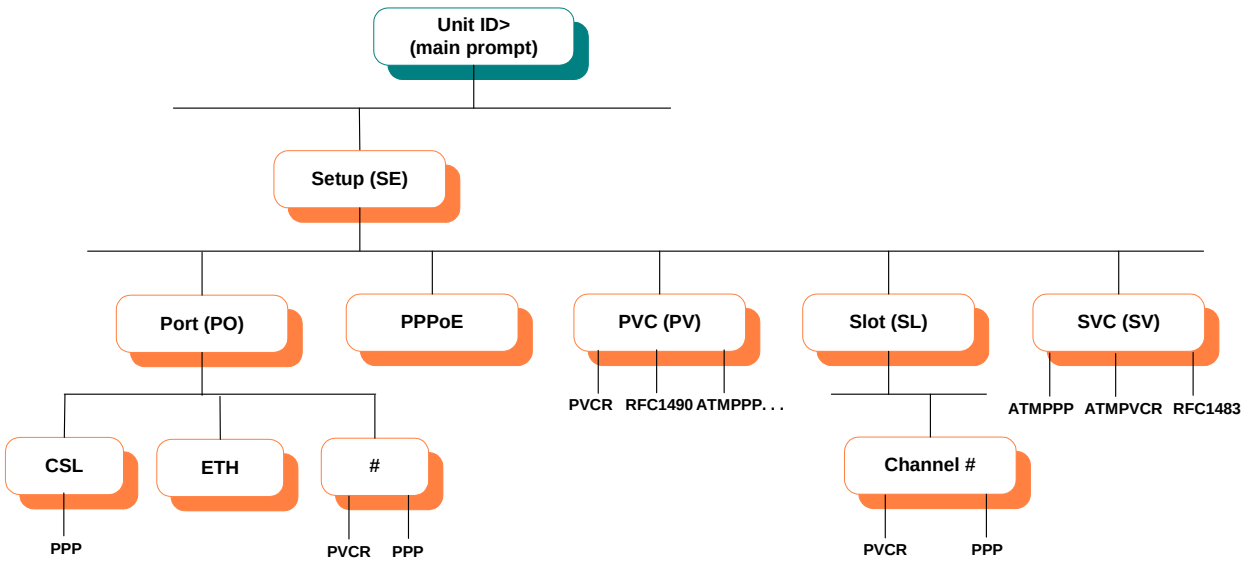

Figure 2-1: TCP Acceleration Configuration Commands in the CLI Tree

2.3.1 Console Port

The console port must be set to the **PPP** protocol.

To configure the console port (CSL) for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **PORT** ↵ **CSL**
2. Set the *Protocol* parameter to **PPP**

3. Set the *TCP acceleration* parameter to **YES**
4. Change the other parameters from their default values, if desired.

```
SDM-9230>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PORT
Port number (ETH1/ETH2/CSL/1,def:ETH1) ? CSL
PORT CSL> Protocol (def:CONSOLE) ? PPP
PORT CSL> Format (def:ASYNC) ?
PORT CSL> Interface.........................AUTO
PORT CSL> Reception flow control (def:NONE) ?
...
PORT CSL> IP multicast active (def:NO) ?
PORT CSL> NAT enable (def:NO) ?
PORT CSL> TCP acceleration (def:NO) ? YES
PORT CSL> TCP congestion control (def:YES) ?
PORT CSL> Filter (def:ALL) ?
```

2.3.2 LAN Port

To configure the LAN port for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **PORT** ↵ **ETH**

   On a NetPerformer product with two Ethernet ports, enter either of the following:

   - **SE** ↵ **PORT** ↵ **ETH1**
   - **SE** ↵ **PORT** ↵ **ETH2**

2. Set the *TCP acceleration* parameter to **YES**
3. Change the other parameters from their default values, if desired.

```
SDM-9230>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PORT
Port number (ETH1/ETH2/CSL/1,def:CSL) ? ETH1
PORT ETH 1> Protocol (def:ETH AUTO) ?
PORT ETH 1> Link integrity (def:YES) ?
PORT ETH 1> LAN speed (mbps) (def:AUTO) ?
...
PORT ETH 1> IP multicast 4 (def:000.000.000.000) ?
PORT ETH 1> NAT enable (def:NO) ?
PORT ETH 1> TCP acceleration (def:NO) ? YES
PORT ETH 1> TCP congestion control (def:YES) ?
PORT ETH 1> VLAN enable (def:NO) ?
...
```

2.3.3 WAN Port

The serial port or digital channel must be set to the **PVCR** or **PPP** protocol.

To configure a built-in serial port for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **PORT**
2. Select the *Port number*
3. Set the *Protocol* to **PVCR** or **PPP**
4. Set the *TCP acceleration* parameter to **YES**
5. Change the other parameters from their default values, if desired.

```
SDM-9230>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PORT
Port number (ETH1/ETH2/CSL/1,def:ETH1) ? 1
PORT 1> Protocol (def:PVCR) ? PVCR
PORT 1> Interface.............................DTE-V35
PORT 1> Clocking mode (def:EXTERNAL) ?
...
PORT 1> IP multicast active (def:NO) ?
PORT 1> NAT enable (def:NO) ?
PORT 1> TCP acceleration (def:NO) ? YES
PORT 1> TCP congestion control (def:YES) ?
PORT 1> IPX RIP (def:DISABLE) ?
...
```

To configure a serial port on the Dual Serial interface card for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **SLOT**
2. Select the *Slot number*
3. Select the *Channel number*
4. Set the *Protocol* to **PVCR** or **PPP**
5. Set the *TCP acceleration* parameter to **YES**
6. Change the other parameters from their default values, if desired.

To configure a digital data channel for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **SLOT**
2. Select the *Slot number*
3. Enter **LINK**
4. Set the *Status* to **ENABLE**
5. Set the *Signaling mode* to **NONE**
6. Press **<Esc>**
7. Enter **CHANNEL**

8. Select the *Channel number*
9. Set the *Protocol* parameter to **PVCR** or **PPP**
10. Set the *TCP acceleration* parameter to **YES**
11. Change the other parameters from their default values, if desired.

```
SDM-9230>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? SLOT
SLOT> Slot number (1,def:1) ? 1
Item (LINK/CHANNEL,def:LINK) ? CHANNEL
SLOT> Channel Number (101-124/ALL,def:101) ? 101
PORT 101> Protocol (def:OFF) ? PVCR
PORT 101> Timeslot (def:1) ?
PORT 101> Number of consecutive timeslots (1-24,def:1) ?
...
PORT 101> IP multicast active (def:NO) ?
PORT 101> NAT enable (def:NO) ?
PORT 101> TCP acceleration (def:NO) ? YES
PORT 101> TCP congestion control (def:YES) ?
PORT 101> IPX RIP (def:DISABLE) ?
...
```

2.3.4 PPPoE Port

To configure a PPPoE port for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **PPPOE**
2. Select the *PPPoE number*
3. Set the *Mode* to **CLIENT**
4. Specify the *LAN port*
5. Define the following **PPPOE** parameters:
   - *AC Name*
   - *Service Name*
   - *PPP User*
6. Set the *TCP acceleration* parameter to **YES**
7. Change the other parameters from their default values, if desired.

```
9230-1>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
```

```
def:PORT) ? PPPOE
PPPoE number (1-32,def:1) ?
PPPoE 1> Mode (def:OFF) ? CLIENT
PPPoE 1> LAN port (def:ETH1) ? ETH2
PPPoE 1> AC Name (def:) ? ANK2-CTRLPSTDOL
PPPoE 1> Service Name (def:) ?
PPPoE 1> PPP User (def:NONE) ? 1
PPPoE 1> Silent (def:SEND REQUEST) ?
PPPoE 1> LCP timeout (seconds) (1-255,def:3) ?
PPPoE 1> LCP retries, 255 = forever (0-255,def:255) ?
PPPoE 1> Negotiate MRU (def:NO) ? YES
PPPoE 1> Proposed MRU (256-1492,def:1492) ?
PPPoE 1> Use MRU proposed by peer (def:NO) ? YES
PPPoE 1> Maximum accepted MRU from peer (256-1492,def:1492) ?
...
PPPoE 1> IP multicast active (def:NO) ?
PPPoE 1> NAT enable (def:NO) ?
PPPoE 1> TCP acceleration (def:NO) ? YES
PPPoE 1> TCP congestion control (def:YES) ?
PPPoE 1> Filter (def:ALL) ?
```

2.3.5 PVC

NOTE: A PVC on the NetPerformer base product must be set to **PVCR** or **RFC1490** mode. On a product installed with the ATM licensed software option, the PVC may also be set to **ATMPPP**, **ATMPVCR** or **RFC1483** mode.

To configure a PVC for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **PVC**
2. Select the *PVC number*
3. Set the *Mode* to **PVCR**, **RFC1490**, **ATMPPP**, **ATMPVCR** or **RFC1483**

NOTE: **ATMPPP**, **ATMPVCR** and **RFC1483** are available with the ATM option only.

4. Set the *TCP acceleration* parameter to **YES**
5. Change the other parameters from their default values, if desired.

```
SDM-9230>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PVC
PVC number (1-300,def:1) ?
```

```
PVC 1> Mode (def:RFC1490) ?
PVC 1> Port (def:1) ?
PVC 1> DLCI address (0-1022,def:100) ?
PVC 1> Committed Information rate (4000-6144000,def:2048000) ?
PVC 1> Burst Information rate (4000-6144000,def:2048000) ?
PVC 1> Remote unit name (def:EST) ?
PVC 1> IP address (def:000.000.000.000) ?
PVC 1> Subnet mask (number of bits) (0-32,def:8) ?
{255.000.000.000}
PVC 1> NAT enable (def:NO) ?
PVC 1> TCP acceleration (def:NO) ? YES
PVC 1> TCP congestion control (def:YES) ?
PVC 1> Frame size (128-8192,def:1500) ?
```

2.3.6 SVC

NOTE: The SVC must be an ATM SVC set to **ATMPPP**, **ATMPVCR** or **RFC1483** mode.

To configure an SVC for TCP Acceleration:

1. At the NetPerformer command line prompt, enter the menu sequence: **SE** ↵ **SVC**
2. Select the *SVC number*
3. Set the *Mode* to **ATMPPP**, **ATMPVCR** or **RFC1483**

NOTE: **ATMPPP**, **ATMPVCR** and **RFC1483** are available with the ATM licensed software option only.

4. Set the *TCP acceleration* parameter to **YES**
5. Change the other parameters from their default values, if desired.

```
9360>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/SVC/USER/VLAN,
def:GLOBAL) ? SVC
SVC number (1-300,def:1) ?
SVC 1> Mode (def:OFF) ? ATMPVCR
SVC 1> SVC Destination address
(def:00000000000000000000000000000000000000000000) ?
SVC 1> Local Address (def:00000000000000) ?
SVC 1> Type (def:DEDICATED) ?
SVC 1> Call Delay (1-255,def:5) ?
SVC 1> Call Retry Delay (1-255,def:10) ?
```

```
SVC 1> Peak cell rate (PCR) (0-4679,def:1000) ?
SVC 1> Payload information rate is 384000 bps
SVC 1> Total information rate is 424000 bps
SVC 1> Remote unit name (def:) ?
SVC 1> Timeout (msec) (1000-30000,def:1000) ?
SVC 1> Number of retransmission retries (1-1000,def:100) ?
SVC 1> Compression (def:YES) ?
SVC 1> IP address (def:000.000.000.000) ?
SVC 1> Subnet mask (number of bits) (0-32,def:8) ?
{255.000.000.000}
SVC 1> IP RIP (def:V1) ?
SVC 1> IP RIP TX/RX (def:DUPLEX) ?
SVC 1> OSPF (def:DISABLE) ?
SVC 1> IP multicast active (def:NO) ?
SVC 1> NAT enable (def:NO) ?
SVC 1> TCP acceleration (def:NO) ? YES
SVC 1> TCP congestion control (def:YES) ?
SVC 1> IPX RIP (def:DISABLE) ?
SVC 1> IPX SAP (def:DISABLE) ?
SVC 1> IPX network number (def:00000000) ?
SVC 1> Filter (def:ALL) ?
SVC 1> Maximum number of voice channels (0-10000,def:10000) ?
SVC 1> Maximum Voice Channels If High Priority Data (0-
10000,def:10000) ?
SVC 1> Cell Packetization (def:YES) ?
```

2.4 Monitoring TCP Acceleration

The following areas of the NetPerformer console command set provide information on how TCP Acceleration is affecting your network:

- To view information about received and transmitted packets, use the IP option of the Display Counters (**DC**) command. These statistics are not specifically related to TCP Acceleration, but can they help you determine what is happening at the IP layer.
- Take a traffic capture with the Start Capture (**STC**) and View Capture (**VC**) commands. A port capture decodes the TCP/IP segments, which lets you trace the connection.

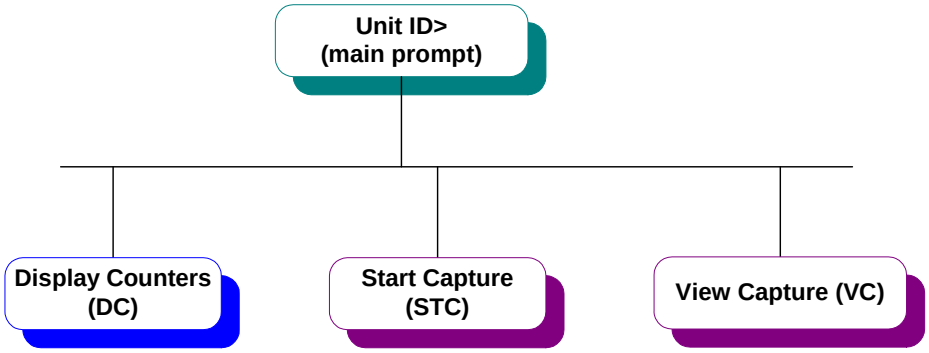

Figure 2-2: TCP Acceleration Statistics and Capture Commands in the CLI Tree

3

Application Example

3.1 Connecting to a Remote Site

In the example below, the NetPerformer at the remote site (Kujuak) accesses the Internet using a satellite link to the NetPerformer at the central site (Montreal).

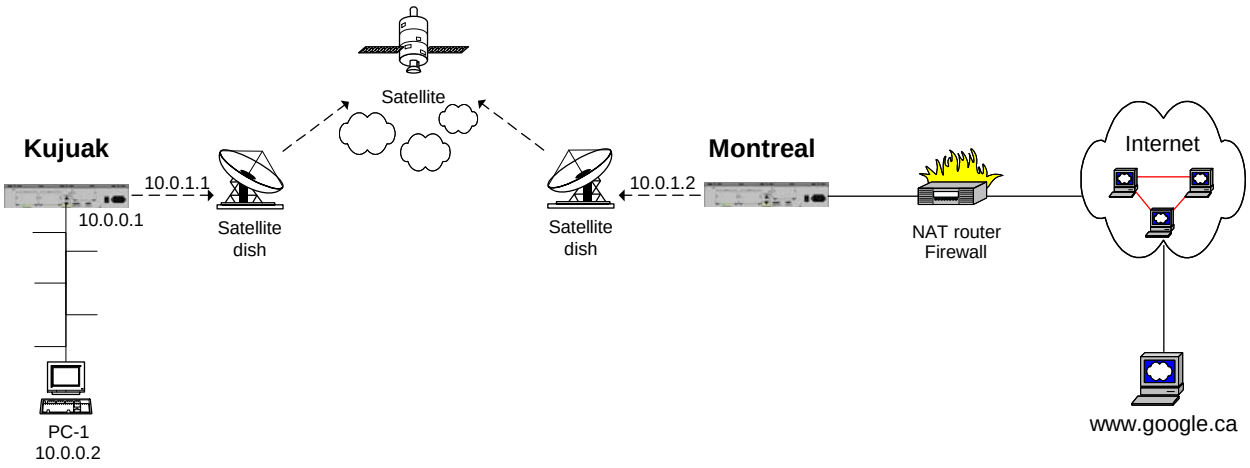

Figure 3-1: TCP Acceleration Application Example

- Both WAN ports (Kujuak and Montreal WAN 1) are configured with the FR-USER protocol
- An RFC1490 PVC is set up at each location, and TCP Acceleration is implemented on each PVC
- TCP connections are automatically spoofed if they are sent or received at a connection where TCP Acceleration is activated.

The configuration of the RFC1490 PVCs is as follows:

```
KUJUAK>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PVC
PVC number (1-300,def:1) ? 1
PVC 1> Mode (def:RFC1490) ? RFC1490
PVC 1> Port (def:1) ? 1
PVC 1> DLCI address (0-1022,def:100) ? 100
PVC 1> Committed Information rate (4000-6144000,def:2048000) ?
PVC 1> Burst Information rate (4000-6144000,def:2048000) ?
PVC 1> Remote unit name (def:) ? MONTREAL
PVC 1> IP address (def:000.000.000.000) ? 10.0.1.1
PVC 1> Subnet mask (number of bits) (0-32,def:8) ? 24
PVC 1> NAT enable (def:NO) ?
PVC 1> TCP acceleration (def:NO) ? YES
PVC 1> TCP congestion control (def:YES) ?
PVC 1> Frame size (128-8192,def:1500) ?
...
PVC 1> BRG connection (def:NO) ? YES
```

```
...
PVC 1> Filter (def:ALL) ?


MONTREAL>SE
SETUP
Item (BRIDGE/CALLER ID/CLASS/CUSTOM/FILTER/GLOBAL/HUNT/IP/IPX/MAP/
PHONE/
PORT/PU/PPPOE/PPPUSER/PVC/REDUNDANCY/SCHEDULE/SLOT/USER/VLAN,
def:PORT) ? PVC
PVC number (1-300,def:1) ? 1
PVC 1> Mode (def:RFC1490) ? RFC1490
PVC 1> Port (def:1) ? 1
PVC 1> DLCI address (0-1022,def:100) ? 100
PVC 1> Committed Information rate (4000-6144000,def:2048000) ?
PVC 1> Burst Information rate (4000-6144000,def:2048000) ?
PVC 1> Remote unit name (def:) ? KUJUAK
PVC 1> IP address (def:000.000.000.000) ? 10.0.1.2
PVC 1> Subnet mask (number of bits) (0-32,def:8) ? 24
PVC 1> NAT enable (def:NO) ?
PVC 1> TCP acceleration (def:NO) ? YES
PVC 1> TCP congestion control (def:YES) ?
PVC 1> Frame size (128-8192,def:1500) ?
...
PVC 1> BRG connection (def:NO) ? YES
...
PVC 1> Filter (def:ALL) ?
```

With this configuration, all TCP connections from PC-1 to the Internet are processed using three real TCP connections. The intervening connections are entirely transparent to PC-1, which the user perceives as being directly connected to the Internet site. In fact, the NetPerformer units in Kujuak and Montreal spoof the connection twice.

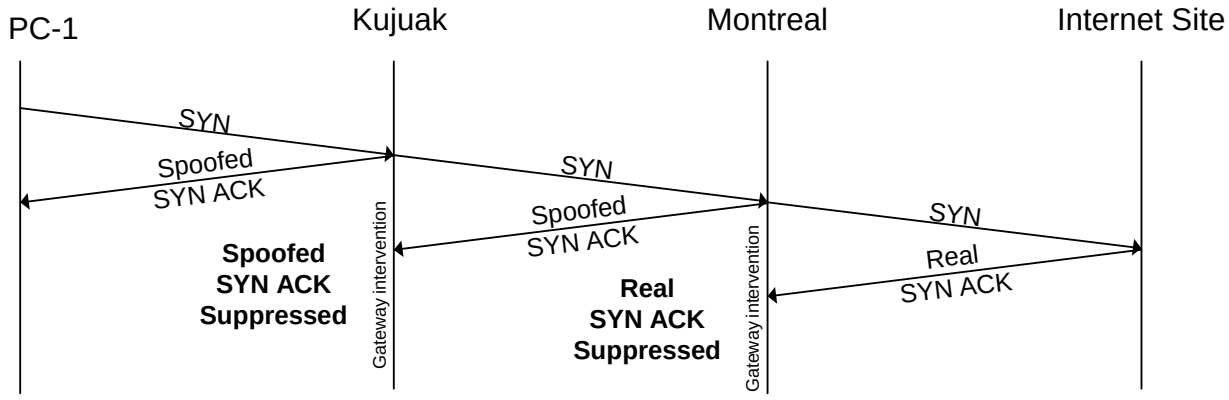

Figure 3-2: Establishment of Connections using TCP Spoofing

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Contact Memotec:

tel.: +1-514-738-4781
e-mail: MemotecSupport@memotec.com

7755 Henri Bourassa Blvd. West
Montreal, Quebec | Canada H4S 1P7 www.memotec.com

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