Nways 2220 Switch Manager
Version 1.1

Performance Monitoring and Accounting

IBM

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> **Note!**
>
> Before using this information and the product it supports, be sure to read the general information in "Appendix. Notices" on page 83.

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About This Guide

> **Note**
>
> It is assumed that you are familiar with the *2220 Nways BroadBand Switch At a Glance, an Overview*, GA33-0292 and *2220 Nways BroadBand Switch Planning Guide*, GA33-0293. Some of the information in these manuals is necessary to plan your 2220 network and the network management station.

This guide applies to the Nways 2220 Switch Manager, Program Number 5765-D45, used to manage broadband networks based on IBM* 2220 Nways* BroadBand Switches Models 300, 500, and 501 and that implement the IBM Networking BroadBand Services (NBBS).

Who Should Use This Guide

This guide is intended for teleprocessing specialists, system programmers, network administrators and network specialists responsible for preparing the information that will be needed during the installation and integration of the Nways 2220 Switch Manager.

The required knowledge and training depends on the task to be performed. For example, people using the network management station (NMS) must know how to use an IBM RISC System/6000*, POWERstation*, or POWERserver*, depending on the type of station used. In addition, they should be trained on using the IBM AIX/6000* operating system.

Personnel using an Nways Switch configuration station should be experienced users of the IBM OS/2*, running on IBM PS/2* stations or equivalent.

How This Guide Is Organized

This guide is divided into the following chapters and appendixes:

- Chapter 1. Performance Monitoring, explains how to use and modify the control packages that control the performance monitoring collection in a 2220 network, and gives the list of the counters available for performance monitoring.
- Chapter 2. Accounting, explains the principles of the accounting records collection in a 2220 network, gives information on the records structure, and on how to use these records. It also describes the accounting application commands.
- Appendix. Notices includes the product warranty notices and trademark information.
- The following information is included at the back of this manual:
  - The glossary on page 85
  - The bibliography on page 95. Refer to the listed documentation to find more information about the IBM Nways Switch.

Chapter 1. Performance Monitoring

The objectives of this chapter are to explain:

- How the NBBS network resources can be monitored and adjusted to achieve optimum network efficiency.
- The purpose of the control packages and how to use them.
- How to plan for customized control packages starting from the samples delivered with Nways 2220 Switch Manager.
- How to plan for the allocation of control packages to the resources.
- How to plan for the filing of the results and their use.
- Control packages definition.
- Control packages to resources.

Figure 1 gives a schematic view of the facilities provided by the performance monitoring function, and the possible actions the user can take. The diagram shows the possible use of these facilities according to the actions taken by the user, along with an overview the way these facilities are organized.
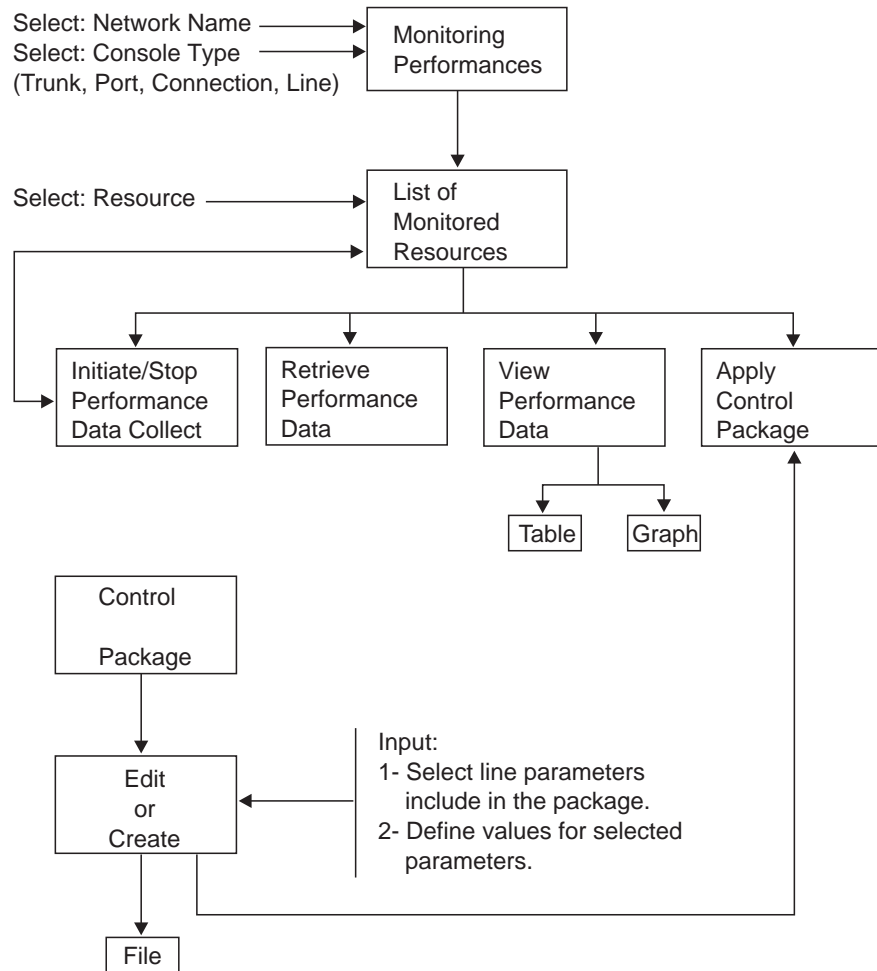
Figure 1. Relationships between Performance Monitoring Tasks

Defining the Control Packages

To define control packages, it is necessary to specify the:

1. Resources to be monitored. To do so, select:

   - A console type: port, trunk, connection, line, and so on.
   - A package according to the type of line or protocol.

2. Parameters to be monitored (counters). There is a wide choice of counters available for every type of resource. A list of the available counters is given in section "Performance Control Packages" on page 8.

3. Threshold value of the selected counters. Thresholds can be defined for the available counters, allowing to record some events under predefined conditions or to trigger a siren.

You may either use the control packages delivered with the Nways 2220 Switch Manager, modify them to better suit your requirements, or create new ones. Average values for usual control package sizes are given in Table 1 on page 3.

Notes:

1. You may only remove parameters from the predefined packages delivered with the Nways 2220 Switch Manager.

2. You may create new control packages by saving an existing one under a different name. Then, edit this new control package.

3. You may save groups of resources in a file and then load those resources as a group from the file.

4. To write sampled data to a log, activate the autologging function.

Creating New Parameters

New parameters are based on existing ones. They are called *derived* parameters. The derived parameters are built by combining existing parameters and functions. The available functions are:

- + (plus)
- − (minus)
- / (divide)
- * (multiply)
- RATE (numerical first derivative). Its value is:

$$RATE = \frac{(Current\ value - Previous\ value)}{(Current\ time - previous\ time)}$$

- EWMA (exponentially weighted mean average). Its value is:

$$EWMA = (Current\ value + Previous\ value) \div 2$$

Allocating the Control Packages

When the control packages have been defined, it is necessary to decide what type of resources are to be monitored. Every monitored resource must be associated with a control package. This can be done either by:

- Defining a default control package to be automatically applied to a given type of resource, or
- Applying a control package to the resource.

Planning for Performance Monitoring Files

Options for Performance Application

The options for the performance application are described in the following file:

`/usr/OV/registration/C/AHAQ/AHAQR`

The parameters for the performance application have to be defined on the station where the performance application is running, either on the server station or on the client station.

The following parameters are available, and default values are given in parentheses:

-siren (non-persist-beep) Defines the frequency and the style of the buzzer used to alert the operator when the threshold for the performance application is reached. The other possible values are:

- `persist-siren1`
- `persist-siren2`.

-data_dir
(`/usr/OV/AHAQ`) Directory for the log files when using auto logging.

-sys_dir
(`/usr/OV/AHAQ`) Directory for the control packages used in the performance applications.

If you change this configuration file, you must exit the NetView user interface to take into account the new parameter values.

File Size

The size of the files depends on the number of:

- Characters per package (`NBcharacters`)
- Resources monitored with this package (`NBresources`)

Calculating the value of the following formula for every package selected and adding the results gives an estimate of the size needed for *one* polling interval:

`NBcharacters x NBresources`

`NBcharacters` value depends on the selected package. Average values are given in Table 1.

Table 1. Average Size of the Performance Packages

Resource Type	Console Type	Package Name	Average Size (number of characters)	Polling Interval (seconds)	Go To
Trunk	Trunk	TRUNK_PKG	1850	600	Table 2 on page 10
		SMALL_PKG	500	180	Table 3 on page 12
		ATM_TRUNK_PKG	1000	600	Table 4 on page 14

Table 1. Average Size of the Performance Packages (continued)

Resource Type	Console Type	Package Name	Average Size (number of characters)	Polling Interval (seconds)	Go To
	Port	FRAME_RELAY_PKG	1600	600	Table 5 on page 17
		HDLC_PKG	800	600	Table 6 on page 19
		DEFAULT_PKG	800	600	Table 7 on page 20
	Atm_Port	Atm_Port	200	600	Table 8 on page 21
		Atm_PVC_SVC_Port	300	600	Table 9 on page 21
	ISDN_Port	ISDN_AL_Counters	800	600	Table 10 on page 24
Connection	**Connection**	CBR_PKG	600	600	Table 12 on page 31
		Frame_Relay_PKG	1600	600	Table 14 on page 34
		HDLC_PKG	1600	600	Table 11 on page 29
		NBBS_Frame_Relay_PKG	1600	600	Table 16 on page 38
		CBR_COMPRESS_PKG	1200	600	Table 13 on page 31
		NBBS_FR_orig_PKG	800	600	Table 17 on page 39
		EXT_Frame_Relay_PKG	2200	600	Table 15 on page 35
	Atm_Connection	Atm_Connection	500	10	Table 18 on page 39
Line	**Line**	PDH1	850	600	Table 19 on page 43
		PDH23	900	600	Table 20 on page 44
		OC3	450	600	Table 21 on page 44

Performance Monitoring Counters

This chapter provides basic information about the data traffic counters supported by the Nways 2220 Switch Manager.

Counters at Network Level

Figure 2 represents two users A and Z, which are connected to two different nodes of an NBBS network. They are exchanging data over the NBBS network. Only two trunks are represented (between A and I, and I and Z), but additional intermediate trunks can exist inside the NBBS network.
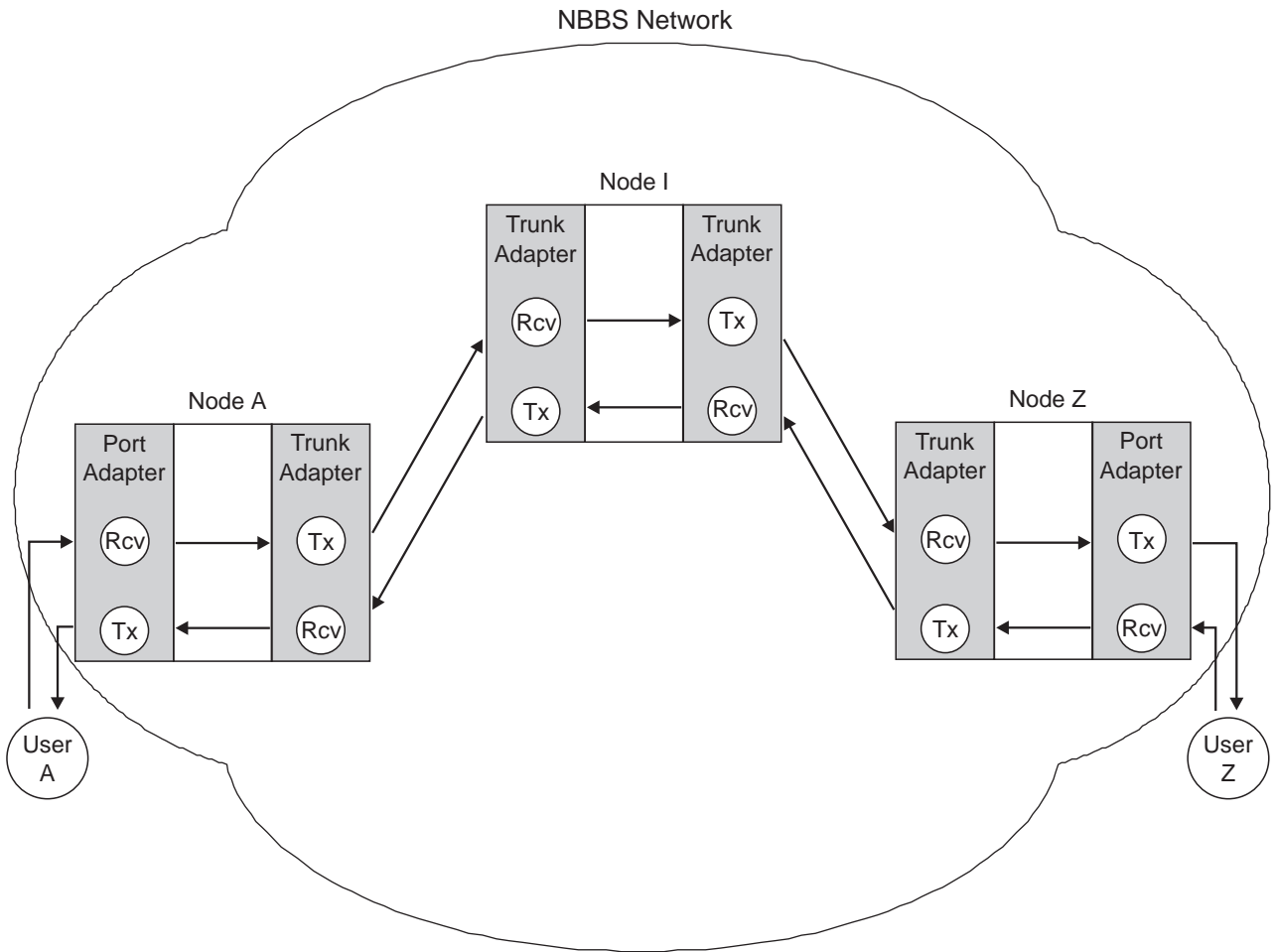
Figure 2. Performance Counters at a Network Level

In a given adapter (trunk or port), A to Z and Z to A traffic does not use the same set of counters.

Counters Terminology

Figure 3 on page 6 shows the terminology used for the performance counters. It shows where the received, discarded, admitted, forwarded, and transmitted counters are located in the adapters.
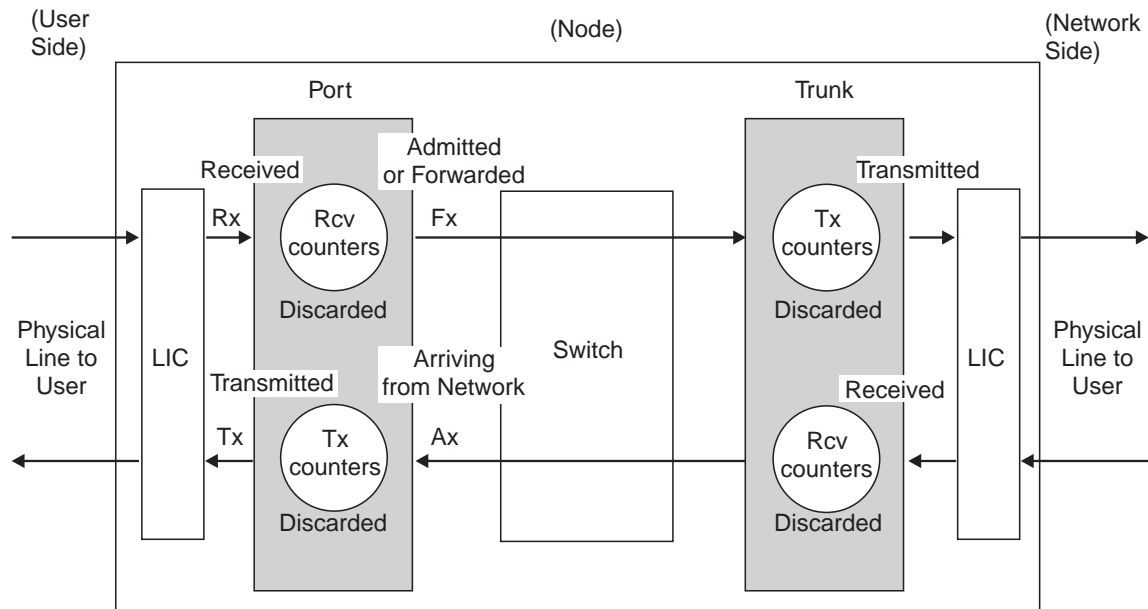
Figure 3. Counters in Adapters

The following convention is used to describe the counters:

- The Rx (receive) counters represent the received traffic on the user side.
- The Tx (transmit) counters represent the transmitted traffic on the user side.
- The Fx (forwarded) counters represent the traffic admitted or forwarded on the network side.
- The Ax (arriving) counters represent the traffic arriving from the network side.

According to the type of the LIC, the *line counters* are collected at the LIC level. These counters are mostly related to line errors and do not log any data traffic.

Counters Details for a Port Adapter

Figure 4 on page 7 shows the details of the counters for a port adapter. It shows the difference between the port level and the connection level.
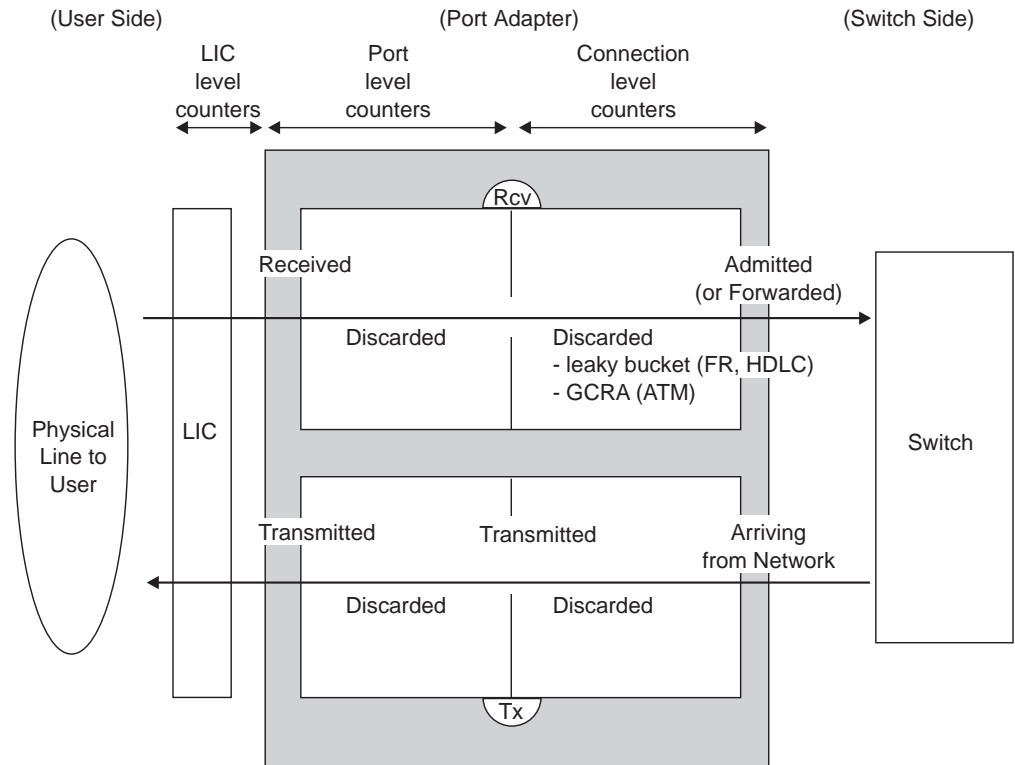
Figure 4. Port Adapter Counters Details

The data flows through two layers:

- A logical port layer that counts the discarded data. The discarded data corresponds to errors detected before being able to identify the involved connection.
- A connection layer which manages traffic control and bandwidth utilization policy. Control is implemented through:
    - Leacky bucket (LB) counters for FR and HDLC.
    - Generic Access Control Rate (GCRA) counters for ATM.

Important: There are no CBR port counters. Since there is only one CBR connection per CBR port, to avoid duplication the CBR counters are only supported at a connection level.

Performance Control Packages

This section gives information on the counters that are used by the control packages (delivered with Nways 2220 Switch Manager). There is one section per resource type:

- Trunk
- Port
- Connection
- Line.

In each section, control packages are described in tables which contain:

- List of counters for the control package.
- Information about the counter:

  Attribute
  A native counter.

  Derived
  A counter built by combining native counters and functions available in the performance monitoring (refer to "Chapter 1. Performance Monitoring" on page 1).

- Type of counter: int or real. For ints, the size is given.
- Description for native counters, and expression on which the counter is defined for derived counters.

Trunk Control Packages

A trunk counter is always collected on a trunk adapter and can be collected on each side of the trunk. A `receive side` or a `transmit side` (respectively named `Rcv` and `Tx` in the following tables) is attached to each counter name. The receive and transmit sides are always related to the physical line that is connected to the trunk adapter.
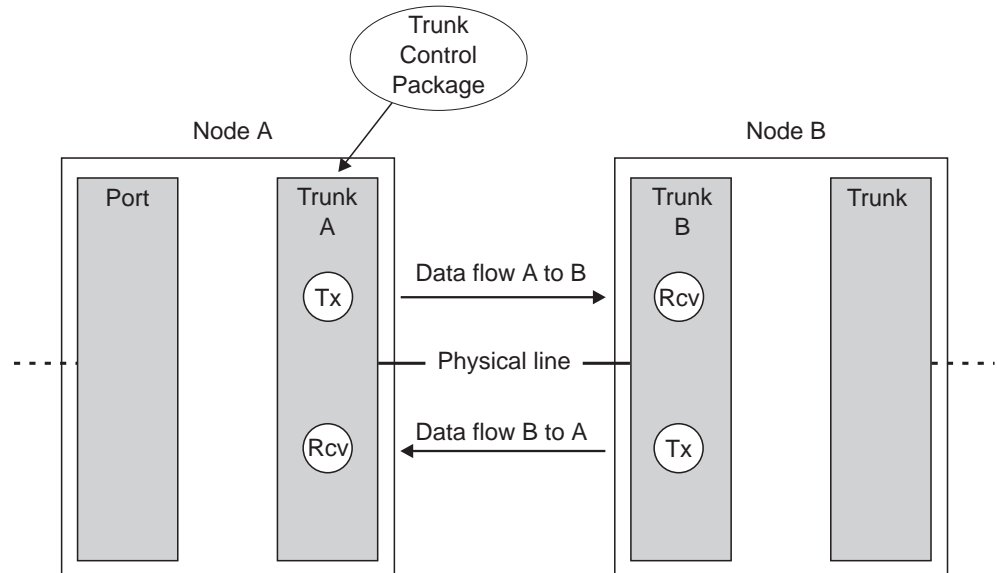
Figure 5. Applying a Trunk Control Package

A trunk control package applies to a trunk adapter and collects both `Tx` and `Rcv` counters. Although those counters are collected through the same package, they apply to two totally different data flows.

Example:

On the trunk adapter A, the total number of network bytes received (`Rcv`) applies to the B to A data flow. The number of non-realtime bytes discarded (`Tx`) applies to the A to B data flow.

According to the counters terminology, the same counters collected on the trunk adapter B apply to the reverse data flows: the total number of network bytes received (`Rcv`) applies to the A to B data flow, and the number of non-realtime bytes discarded (`Tx`) applies to the B to A data flow.

Regular Trunk Control Package

Description:

Table 2 shows the control package for regular trunks.

Table 2. Trunk Control Package (TRUNK_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (Attributes) or Expression (Derived Parameters)	Side
grnNrtBytDsc	T17	attribute	8-byte int	Number of discarded green non-real time bytes	Tx
grnNrtBytThr	T13	attribute	8-byte int	Number of green non-real time bytes gone through	Tx
grnNrtPktDsc	T16	attribute	8-byte int	Number of discarded green non-real time packets	Tx
grnNrtPktThr	T12	attribute	8-byte int	Number of green non-real time packets gone through	Tx
redNrtBytDsc	T15	attribute	8-byte int	Number of discarded red non-real time bytes	Tx
redNrtBytThr	T11	attribute	8-byte int	Number of red non-real time bytes gone through	Tx
redNrtPktDsc	T14	attribute	8-byte int	Number of discarded red non-real time packets	Tx
redNrtPktThr	T10	attribute	8-byte int	Number of red non-real time packets gone through	Tx
ttlGrnPktDsc	TB	attribute	8-byte int	Total number of discarded green packets	Tx
ttlGrnPktThr	T5	attribute	8-byte int	Total number of green packets through	Tx
ttlPktDsc	T7	attribute	8-byte int	Total number of discarded packets	Tx
ttlPktThr	T1	attribute	8-byte int	Total number of packets through	Tx
ttlRedPktDsc	T9	attribute	8-byte int	Total number of discarded red packets	Tx
ttlRedPktThr	T3	attribute	8-byte int	Total number of red packets through	Tx
ttlBadNetHdrPkt	R3	attribute	8-byte int	Total number of packets with a bad network header received	Tx
ttlNetBytRcv	R2	attribute	8-byte int	Total number of received network bytes	Rcv
ttlNetPktRcv	R1	attribute	8-byte int	Total number of received network packets	Rcv
grnRt2BytDsc	T35	attribute	8-byte int	Number of discarded green real-time2 bytes	Rcv
grnRt1BytThr	T21	attribute	8-byte int	Number of green real-time1 bytes gone through	Tx
grnRt1PktThr	T20	attribute	8-byte int	Number of green real-time1 packets gone through	Tx
grnRt2BytThr	T31	attribute	8-byte int	Number of green real-time2 bytes gone through	Tx
grnRt2PktDsc	T34	attribute	8-byte int	Number of discarded green real-time2 packets	Tx
grnRt2PtkThr	T30	attribute	8-byte int	Number of green real-time2 packets gone through	Tx
redRt2BytDsc	T37	attribute	8-byte int	Number of discarded red real-time2 bytes	Tx
redRt2BytThr	T33	attribute	8-byte int	Number of red real-time2 bytes gone through	Tx

Table 2. Trunk Control Package (TRUNK_PKG) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (Attributes) or Expression (Derived Parameters)	Side
redRt2PktDsc	T36	attribute	8-byte int	Number of discarded red real-time2 packets	Tx
redRt2PktThr	T32	attribute	8-byte int	Number of red real-time2 packets gone through	Tx
nonResBytDsc	T43	attribute	8-byte int	Number of discarded non-reserved bytes	Tx
nonResBytThr	T41	attribute	8-byte int	Number of non-reserved bytes gone through	Tx
nonResPktDsc	T42	attribute	8-byte int	Number of discarded non-reserved packets	Tx
nonResPktThr	T40	attribute	8-byte int	Number of non-reserved packets gone through	Tx
totalBytesDiscarded	T8	attribute	8-byte int	Total number of discarded bytes	Tx
totalBytesThrough	T2	attribute	8-byte int	Total number of bytes through	Tx
totalGreenBytesDisc	TC	attribute	8-byte int	Total number of discarded green bytes	Tx
totalGreenBytesThr	T6	attribute	8-byte int	Total number of green bytes through	Tx
ttlRedBytesDisc	TA	attribute	8-byte int	Total number of discarded red bytes	Tx
ttlRedBytesThr	T4	attribute	8-byte int	Total number of red bytes through	Tx
incTrafNotTransInPkt		derived		T7/(T1+T7)	Tx
incTrafNotTransInByt		derived		T8/(T2+T8)	Tx
incGreenTrafNotTran1		derived		TB / (T5+TB)	Tx
incGreenTrafNotTran2		derived		T16 / (T12+T16)	Tx
incGreenTrafNotTran3		derived		T34 / (T30+T34)	Tx
incGreenTrafNotTran4		derived		TC / (T6+TC)	Tx
incGreenTrafNotTran5		derived		T17 / (T13+T17)	Tx
incGreenTrafNotTran6		derived		T35 / (T31+T35)	Tx
incRedTrafNotTranPk1		derived		T9 / (T3+T9)	Tx
incRedTrafNotTranPk2		derived		T14 / (T10+T14)	Tx
incRedTrafNotTranPk3		derived		T36 / (T32+T36)	Tx
incRedTrafNotTranBy1		derived		TA / (T4+TA)	Tx
incRedTrafNotTranBy2		derived		T15 / (T11+T15)	Tx
incRedTrafNotTranBy3		derived		T37 / (T33+T37)	Tx
inSpointTraffic		derived		R3/R1	Rcv

Table 3 on page 12 shows the *small* control package for trunks.

Table 3. Trunk Control Package (SMALL_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
ttlGrnPktDsc	TB	attribute	8-byte int	Total number of discarded green packets	Tx
ttlGrnPktThr	T5	attribute	8-byte int	Total number of green packets gone through	Tx
ttlPktDsc	T7	attribute	8-byte int	Total number of discarded packets	Tx
ttlPktThr	T1	attribute	8-byte int	Total number of packets through	Tx
ttlRedPktDsc	T9	attribute	8-byte int	Total number of discarded red packets	Tx
ttlRedPktThr	T3	attribute	8-byte int	Total number of red packets through	Tx
ttlBadNetHdrPkt	R3	attribute	8-byte int	Total number of packets with a bad network header	Rcv
transRate		derived		RATE(ttlPktThr)	Tx
lossRate		derived		RATE(ttlPktDsc)	Tx
lossPercent		derived		lossRate÷(transRate + lossRate) × 100	Tx

How to Use the Counters:

Note: The following counters must be taken at both ends of the connection. For example, R counters are taken at the origin of the connection and T counters are taken at the destination of the connection, or vice-versa. Due to the delays inherent in accessing counters at both the origin and the destination, these formulas should be used with caution.

Capacity of the Transit Node for a Trunk:

Ratio T1/R1
   Indicates the percentage of incoming traffic transmitted, in packets.

Ratio T2/R2
   Indicates the percentage of incoming traffic transmitted, in bytes.

Ratio T7/(T1+T7)
   Indicates the percentage of incoming traffic not transmitted, in packets.

Ratio T8/(T2+T8)
   Indicates the percentage of incoming traffic not transmitted, in bytes.

Ratios TB/(T5+TB) [for Total Traffic], T16/(T12+T16) [for NRT], T34/(T30/T34) [for RT2]
   Percentage of packets of incoming green traffic not transmitted [per traffic type].

Ratios TC/(T6+TC) [for Total Traffic], T17/(T13+T17) [for NRT], T35/(T31/T35) [for RT2]
   Percentage of bytes of incoming green traffic not transmitted [per traffic type].

Ratios T9/(T3+T9) [for Total Traffic], T14/(T10+T14) [for NRT], T36/(T32/T36) [for RT2] Percentage of packets of incoming red traffic not transmitted [per traffic type].

Ratios TA/(T4+TA) [for Total Traffic], T15/(T11+T15) [for NRT], T37/(T33/T37) [for RT2]
   Percentage of bytes of incoming red traffic not transmitted [per traffic type].

Line Quality:

Ratio R3/R1
Indicates the percentage of incoming spoiled traffic.

Counter R3
An increase in this counter indicates one of the following:

- Line problems
- Intermittent LIC failures (which should also be detected by other means)
- Problems in configuring the routing database on the attached equipment (which would lead to initialization failure).

If no alarm is raised in addition to this counter for the selected interface, this counter can be considered as an indicator of external line quality.

Line Counters
These counters describe the character of incoming traffic.

ATM Trunk Control Package

Description:

Table 4 shows the ATM control package for trunks.

Table 4. ATM Trunk Package (ATM_TRUNK_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
xp3GreenRTBytesThr	T21	attribute	8-byte int	Green realtime bytes through	Tx
xp3XmitATMCells	T1	attribute	8-byte int	Transmitted ATM cells	Tx
xp3RedRTBytesThr	T20	attribute	8-byte int	Red realtime bytes through	Tx
xp3XmitATMOAMCells	T6	attribute	8-byte int	Transmitted ATM OAM cells	Tx
xp3GreenRTBytesDisc	T23	attribute	8-byte int	Green realtime bytes discarded	Tx
xp3DiscATMCells	T2	attribute	8-byte int	Discarded ATM cells	Tx
xp3RedRTBytesDisc	T22	attribute	8-byte int	Red realtime bytes discarded	Tx
rp3RcvATMOAMCells	R3	attribute	8-byte int	Received ATM OAM cells	Rcv
xp3GreenNRTBytesThr	T11	attribute	8-byte int	Green non-realtime bytes through	Tx
xp3RedNRTBytesThr	T10	attribute	8-byte int	Red non-realtime bytes through	Tx
xp3GreenNRTBytesDisc	T13	attribute	8-byte int	Green non-realtime bytes discarded	Tx
xp3RedNRTBytesDisc	T12	attribute	8-byte int	Red non-realtime bytes discarded	Tx
xp3NRBytesThr	T30	attribute	8-byte int	Non-reserved bytes through	Tx
xp3NRBytesDisc	T31	attribute	8-byte int	Non-reserved bytes discarded	Tx
totalBytesDiscarded	T7	attribute	8-byte int	Total bytes discarded	Tx
totalBytesThrough	T3	attribute	8-byte int	Total bytes through	Tx
totalGreenBytesDisc	T8	attribute	8-byte int	Total green bytes discarded	Tx
totalGreenBytesThr	T4	attribute	8-byte int	Total green bytes through	Tx
totalRedBytesDisc	T9	attribute	8-byte int	Total red bytes discarded	Tx
totalRedBytesThr	T5	attribute	8-byte int	Total red bytes through	Tx
totalPacketsThrough	R1	attribute	8-byte int	Received ATM cells	Rcv
ttlBadNetwHeaderPack	R2	attribute	8-byte int	Discarded ATM cells	Rcv
grnNRealTimeBytesThr	R4	attribute	8-byte int	Received PTM bytes	Rcv
redNRealTimeBytesThr	TA	attribute	8-byte int	Discarded PTM bytes	Rcv
incTraffNotTransmit		derived		T7 / (T3+T7)	Tx
incGreenTrafNotTran1		derived		T8 / (T4+T8)	Tx
incGreenTrafNotTran2		derived		T13 / (T11+T13)	Tx
incGreenTrafNotTran3		derived		T23 / (T21+T23)	Tx
incRedTrafNotTran1		derived		T9 / (T5+T9)	Tx
incRedTrafNotTran2		derived		T12 / (T10+T12)	Tx
incRedTrafNotTran3		derived		T22 / (T20+T27)	Tx
incSpoiltTraffic		derived		R2 / R1	Rcv
incOAMTraffic		derived		R3 / R1	Rcv
transmitOAMTraffic		derived		T6 / T1	Tx

How to Use the Counters:

Capacity of the Transit Node for a Trunk:

Ratio T7/(T3+T7)
> Indicates the percentage of incoming traffic not transmitted.

Ratios T8/(T4+T8) [for Total Traffic], T13/(T11+T13) [for NRT], T23/(T21/T23) [for RT]   Percentage of packets of incoming green traffic not transmitted [per traffic type].

Ratios T9/(T5+T9) [for Total Traffic], T12/(T10+T12) [for NRT], T22/(T20/T22) [for RT]   Percentage of packets of incoming red traffic not transmitted [per traffic type].

Line Quality:

Ratio R2/R1
> Indicates the percentage of incoming spoiled traffic.

Line Counters
> These counters indicate the general character of incoming traffic.

OAM Traffic:

Ratio R3/R1
> Indicates the percentage of incoming OAM traffic.

Ratio T6/T1
> Indicates the percentage of transmitted OAM traffic.

Counter R3
> Note that this counter includes OAM cells generated by the network.

Port Control Packages

A port counter is always collected on a port adapter. A `receive side` or a `transmit side` (respectively named `Rcv` and `Tx` in the following tables) is attached to each counter name. The receive and transmit sides are always related to the physical line that is connected to the port adapter.
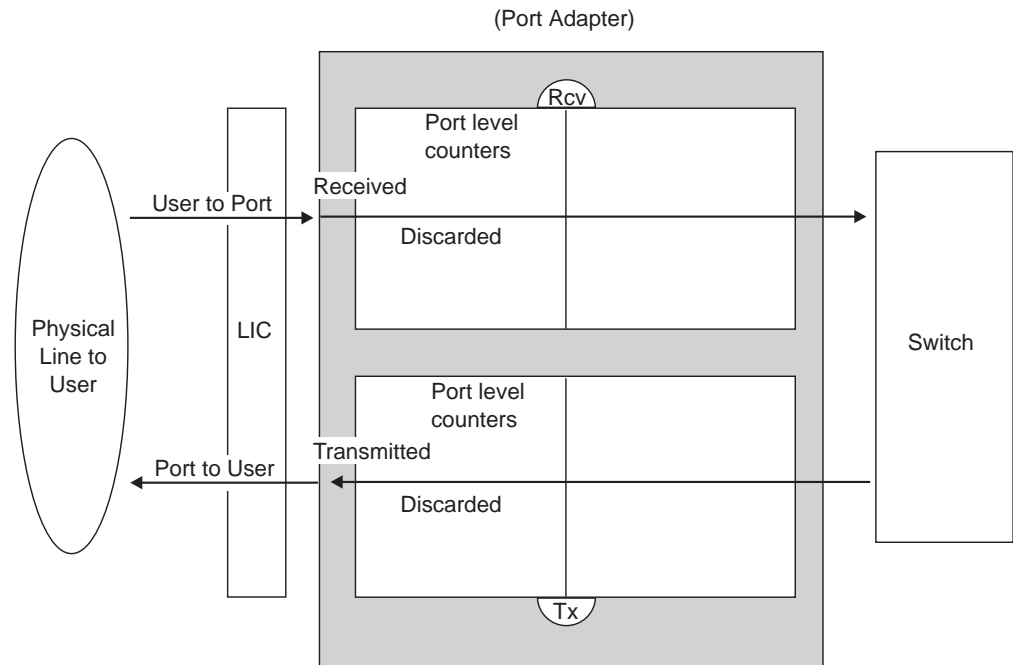
Figure 6. Port Level Counters for Port Control Packages

Example:

In the port adapter on Figure 6, the total number of frames received applies to the *User to Port* data flow, and the total number of frames transmitted applies to the *Port to User* data flow.

About the port counters packages:

- The frame-relay package applies to frame-relay ports starting from the release 4 of the Nways Switch Control Program.
- The HDLC package applies to HDLC ports starting from the release 4 of the Nways Switch Control Program.
- The default package applies to frame-relay and HDLC ports prior to the release 4 of the Nways Switch Control Program.
- The ATM package applies to ATM ports starting from the release 4 of the Nways Switch Control Program.
- The ISDN package applies to ISDN ports starting from the release 5 of the Nways Switch Control Program. This package applies in addition to an HDLC or frame-relay package when ISDN is used.
- There is no constant bit rate (CBR) package since there is only one CBR connection per CBR port. Counters can be collected at connection level (refer to "Connection Control Packages" on page 26).

Frame-Relay Control Package for Ports

Description:

Table 5 shows the frame-relay control package for ports.

Table 5. Frame-Relay Port Control Package (FRAME_RELAY_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
errFrameRcved	R3	attribute	4-byte int	Number of frames in error received (CRC error)	Rcv
invalidAddressField	R4	attribute	4-byte int	Number of invalid address fields (unknown DLCI)	Rcv
overrunsDetected	R9	attribute	4-byte int	Number of overruns detected	Rcv
totalFramesRcved	R1	attribute	8-byte int	Total number of frames received	Rcv
totalFramesXmited	T1	attribute	8-byte int	Total number of frames transmitted	Tx
underrunsDetected	T3	attribute	4-byte int	Number of underruns detected	Tx
invalidLength	R5	attribute	4-byte int	Number of frames with invalid length	Rcv
totalBytesReceived	R2	attribute	8-byte int	Total number of bytes received	Rcv
totalBytesTransmit	T2	attribute	8-byte int	Total number of bytes transmitted	Tx
totalDEFramesDiscard	R8	attribute	4-byte int	DE frames dropped at port level	Rcv
lmiNetChannelInact		attribute	4-byte int	LMI network channel inactive	
lmiNetProtocolsErrors		attribute	4-byte int	LMI network protocol errors	
lmiNetReliabErrors		attribute	4-byte int	LMI network reliability errors	
lmiUserChannelInact		attribute	4-byte int	LMI user channel inactive	
lmiUserProtocolError		attribute	4-byte int	LMI user protocol errors	
lmiUserReliabErrors		attribute	4-byte int	LMI user reliability errors	
lmiStatusReceivUser		attribute	8-byte int	LMI status received from the user	
lmiStatusTransmUser		attribute	8-byte int	LMI status transmitted by the user	
lmiStatusUpTransUser		attribute	8-byte int	LMI status updated transmitted by the user	
lmiStatusReceivedNet		attribute	8-byte int	LMI status received from the network	
lmiStatusTransmNet		attribute	8-byte int	LMI status transmitted by the network	
lmiStatusUpTransNet		attribute	8-byte int	LMI status update transmitted by the network	
invalidFormat	R6	attribute	4-byte int	Number of frames with invalid EA0/EA1 sequence	Rcv
abortedFrames	R7	attribute	4-byte int	Number of aborted frames	Rcv
linQualityOrConfigPb		derived		R4 / R1	Rcv
linQualityOrEnvMUse		derived		R6 / R1	Rcv
linQualOrAttEquipPb1		derived		R3 / R1	Rcv
linQualOrAttEquipPb2		derived		R5 / R1	Rcv
congestionFailInd1		derived		R9 / R2	Rcv
congestionFailInd2		derived		T3 / T2	Tx

How to Use the Counters:

Incoming Traffic:

Counters R1, R2, R3, R4, R5, R6, R7
> These counters describe the basic character of incoming traffic from connected equipment.

Ratio R1/R4
> An increase in this ratio probably indicates one of the following:
>
> - Line quality problem
> - Configuration problem on the DLCI with the connected equipment
> - Failure in connected equipment.

Ratio R6/R1
> An increase in this ratio probably indicates one of the following:
>
> - Line quality problem
> - Environment misuse, that is, the connected equipment sets EA0 and EA1 incorrectly in relation to the capacity of the 2220 Nways Switch.

Ratios R3/R1 and R5/R1
> An increase in this ratio probably indicates one of the following:
>
> - Line quality problem
> - Problem in the connected equipment.

Transmitted Traffic:

Counters T1 and T2
> These counters describe the basic character of outgoing traffic to connected equipment.

Congestion Failure:

Ratios R9/R2 and T3/T2
> An increase in these ratios indicate an intrinsic congestion problem.

HDLC Control Package for Ports

Description:

Table 6 shows the HDLC control package for ports.

Table 6. HDLC Port Control Package (HDLC_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
abortedFrames	R6	attribute	4-byte int	Number of aborted frames	Rcv
errFrameRcved	R3	attribute	4-byte int	Number of frames in error received (CRC error)	Rcv
frameLengthExceeded	R5	attribute	4-byte int	Number of frames with excessive length	Rcv
invalidAddressField	R4	attribute	4-byte int	Number of invalid address fields	Rcv
overrunsDetected	R7	attribute	4-byte int	Number of overruns detected	Rcv
totalFramesRcved	R1	attribute	8-byte int	Total number of frames received	Rcv
totalFramesXmited	T1	attribute	8-byte int	Total number of frames transmitted	Tx
underrunsDetected	T3	attribute	4-byte int	Number of underruns detected	Tx
totalBytesXmited	T2	attribute	8-byte int	Total number of bytes transmitted	Tx
totalBytesReceived	R2	attribute	8-byte int	Total number of bytes received	Rcv
abortedFramesRate		derived		RATE(abortedFrames)	Rcv
errFramesRate		derived		RATE(errFrameRcved)	Rcv
tooLongFramesRate		derived		RATE(frameLengthExceeded)	Rcv
invalidAddrFieldRate		derived		RATE(invalidAddressField)	Rcv
overrunRate		derived		RATE(overrunsDetected)	Rcv
frameRcvedRate		derived		RATE(totalFramesRcved)	Rcv
frameXmitedRate		derived		RATE(totalFramesXmited)	Tx
underrunRate		derived		RATE(underrunsDetected)	Tx
instOrFailInAttEquPb		derived		R4 / R1	Rcv
attEquipmentPb1		derived		R3 / R1	Rcv
attEquipmentPb2		derived		R5 / R1	Rcv
congestionPb1		derived		R7 / R2	Rcv
congestionPb2		derived		T3 / T2	Tx

Table 7 on page 20 shows the *default* control package for ports.

Table 7. Port Control Package (DEFAULT_PKG) - Frame-relay or HDLC prior to release 4 of Nways Switch Control Program

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
abortedFrames	R6	attribute	4-byte int	Number of aborted frames	Rcv
errFrameRcved	R3	attribute	4-byte int	Number of frames in error received (CRC error)	Rcv
frameLengthExceeded	R5	attribute	4-byte int	Number of frame with excessive length	Rcv
invalidAddressField	R4	attribute	4-byte int	Number of invalid address fields	Rcv
overrunsDetected	R7	attribute	4-byte int	Number of overruns detected	Rcv
totalFramesRcved	R1	attribute	8-byte int	Total number of frames received	Rcv
totalFramesXmited	T1	attribute	8-byte int	Total number of frames transmitted	Tx
underrunsDetected	T3	attribute	4-byte int	Number of underrun detected	Tx
abortedFramesRate		derived		RATE(abortedFrames)	Rcv
errFramesRate		derived		RATE(errFrameRcved)	Rcv
tooLongFramesRate		derived		RATE(frameLengthExceeded)	Rcv
invalidAddrFieldRate		derived		RATE(invalidAddressField)	Rcv
overrunRate		derived		RATE(overrunsDetected)	Rcv
frameRcvedRate		derived		RATE(totalFramesRcved)	Rcv
frameXmitedRate		derived		RATE(totalFramesXmited)	Tx
underrunRate		derived		RATE(underrunsDetected)	Tx

How to Use the Counters:

Incoming Traffic:

Counters R1, R2, R3, R4, R5
> These counters describe the basic character of incoming traffic from connected equipment.

Ratio R4/R1
> An increase in this ratio indicate an installation problem or failure in the connected equipment.

Ratios (R3/R1) and (R5/R1)
> An increase in these ratios indicate a problem in the attached equipment.

Transmitted Traffic:

Counters T1 and T2
> These counters indicate the traffic (in frames and in bytes) transmitted by the network.

Congestion:

Ratios R7/R2 and T3/T2
> An increase in these ratios indicate an intrinsic congestion problem.

ATM Control Package for Ports

Description:

Table 8 shows the ATM control package for ports.

Table 8. ATM Ports Control Package (Atm_Port)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
totalCellsReceived	R1	attribute	8-byte int	Total number of cells received	Rcv
totalOAMCellsRec	R6	attribute	4-byte int	Total number of OAM cells received	Rcv
totalProtocolErrDisc	R4	attribute	4-byte int	Total protocol error discards	Rcv
totalHECErroredCells	R3	attribute	4-byte int	Total HEC errored cells	Rcv
gfcNonZeroCount	R7	attribute	4-byte int	GFC non-zero count	Rcv
totalCellsDiscarded	R2	attribute	4-byte int	Total number of cells discarded	Rcv
totalCellsXmitted	T1	attribute	8-byte int	Total number of cells transmitted	Tx
totalHECErrCellsCorr	R5	attribute	8-byte int	Total HEC error cells corr	Rcv
totalOAMCellsXmitted	T2	attribute	4-byte int	Total number of OAM cells transmitted	Tx
configPbOnVPIVCI		derived		R4 / R1	Rcv
physLineConfigPb		derived		R3 / R1	Rcv
confPbInAttEquip		derived		R7 / R1	Rcv
recoverPbInAtEqOrLi		derived		R5 / R1	Rcv
discCellsForInc Traf		derived		R2 / R1	Rcv
receivOAMTraffFlow		derived		R6 / R1	Rcv
transmOAMTraffFlow		derived		T2 / T1	Tx

Table 9 shows the ATM control package for SVC and PVC ports.

Table 9. ATM Ports Control Package (Atm_PVC_SVC_Port)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
totalCellsReceived	R1	attribute	8-byte int	Total number of cells received	Rcv
totalOAMCellsRec	R6	attribute	4-byte int	Total number of OAM cells received	Rcv
totalProtocolErrDisc	R4	attribute	4-byte int	Total protocol error discards	Rcv
totalHECErroredCells	R3	attribute	4-byte int	Total HEC errored cells	Rcv
gfcNonZeroCount	R7	attribute	4-byte int	GFC non-zero count	Rcv
totalCellsDiscarded	R2	attribute	4-byte int	Total number of cells discarded	Rcv
totalCellsXmitted	T1	attribute	8-byte int	Total cells transmitted	Tx
totalHECErrCellsCorr	R5	attribute	4-byte int	Total HEC error cells corrected	Rcv
totalOAMCellsXmitted	T2	attribute	4-byte int	Total OAM cells transmitted	Tx
atmSVCSSCOPConDisc		attribute	4-byte int	SVC SSCOP connection disconnected	
atmSVCSSCOPConInitFa		attribute	4-byte int	SVC SSCOP Connection Initialization Failure	
atmSVCSSCOPConResync		attribute	4-byte int	SVC SSCOP Connection Resynchronization	
atmSVCSSCOPInvPdus		attribute	4-byte int	SVC SSCOP Invalid PDUs	

Table 9. ATM Ports Control Package (Atm_PVC_SVC_Port) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
atmSVCSSCOPDiscPdus		attribute	4-byte int	SVC SSCOP Discarded PDUs	
atmSVCDetectSetupAtt		attribute	4-byte int	SVC Call Setup Attempts Counter received	Rcv
atmSVCEmitSetupAtt		attribute	4-byte int	SVC Call Setup Attempts Counter transmitted	Tx
atmSVCDetectUnvlRtes		attribute	4-byte int	SVC Number of Route Unavailability received	Rcv
atmSVCEmitUnvlRtes		attribute	4-byte int	SVC Number of Route Unavailability transmitted	Tx
atmSVCDetectUnvlRscs		attribute	4-byte int	SVC Number of Resource Unavailability received	Rcv
atmSVCEmitUnvlRscs		attribute	4-byte int	SVC Number of Resource Unavailability transmitted	Tx
atmSVCDetectCldPtyEv		attribute	4-byte int	SVC Number of Called Party Responsible For Unsuccessful Call received	Rcv
atmSVCEmitCldPtyEv		attribute	4-byte int	SVC Number of Called Party Responsible For Unsuccessful Call transmitted	Tx
atmSVCDetectMsgErrs		attribute	4-byte int	SVC Number of incorrect messages received	Rcv
atmSVCEmitMsgErrs		attribute	4-byte int	SVC Number of incorrect messages transmitted	Tx
atmSVCDetectClgPtyEv		attribute	4-byte int	SVC Number of Calling Party Events received	Rcv
atmSVCEmitClgPtyEv		attribute	4-byte int	SVC Number of Calling Party Events transmitted	Tx
atmSVCDetectTimerExp		attribute	4-byte int	SVC Number of Timer Expires received	Rcv
atmSVCEmitTimerExp		attribute	4-byte int	SVC Number of Timer Expires transmitted	Tx
atmSVCDetectRestarts		attribute	4-byte int	SVC Number of Restart Activity errors received	Rcv
atmSVCEmitRestarts		attribute	4-byte int	SVC Number of Restart Activity errors transmitted	Tx
atmSVCInEstabls		attribute	4-byte int	SVC Number of SVC VCCs established for incoming connections	Rcv
atmSVCOutEstabls		attribute	4-byte int	SVC Number of SVC VCCs established for outgoing connections	Tx
totalActiveConns		attribute	4-byte int	Number of active PVC and SVC connections	
totalSVCActiveConns		attribute	4-byte int	Number of active SVC connections	

How to Use the Counters:

Incoming Traffic:

Counters R1, R2, R3, R4, R5, R6, and R7
These counters describe the character of incoming traffic from the connected equipment.

Ratio R4/R1
An increase in this ratio indicates either:

- A problem on the VPI/VCI with the connected equipment
- A failure in the connected equipment.

Ratio R3/R1

An increase in this ratio indicates a physical line problem.

Ratio R7/R1

An increase in this ratio indicates a configuration problem.

Ratio R5/R1

An increase in this ratio indicates a problem in the attached equipment, on the physical line or on the LIC that has been recovered.

Discard Action:

Ratio R2/R1

This ratio indicates the percentage of discarded cells in incoming traffic.

Transmitted Traffic:

Counter T1

This counter indicates the number of cells transmitted by the interface.

OAM Traffic:

Ratio R6/R1

This ratio indicates the percentage of OAM traffic in the receive flow.

Ratio T2/T1

This ratio indicates the percentage of OAM traffic in the transmit flow.

ISDN Port Control Package

Description:

Table 10 shows the ISDN control package for ports.

Table 10. ISDN Port Control Package (ISDN_AL_Counters)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side
totalReceivedFrames	R1	attribute	8-byte int	Total received frames	Rcv
receivedFCSErrors	R2	attribute	4-byte int	Received FCS errors	Rcv
receivedAborts	R6	attribute	4-byte int	Received aborts	Rcv
rcvdInvalidFormats	R3	attribute	4-byte int	Received invalid formats	Rcv
rcvdNSsequenceErrors	R4	attribute	4-byte int	Received NS sequence errors	Rcv
rcvdNRsequenceErrors	R5	attribute	4-byte int	Received NR sequence errors	Rcv
timerRecovConditions	S3	attribute	4-byte int	Timer recovery conditions	
receivedUnderrun	R7	attribute	4-byte int	Received underrun	Rcv
totalXmittedFrames	T1	attribute	8-byte int	Total transmitted frames	Tx
totalreXmittedFrames	T2	attribute	4-byte int	Total retransmitted frames	Tx
xmitOverrun	T3	attribute	4-byte int	Transmitted overrun	Tx
numberOutgoingCalls	S1	attribute	4-byte int	Number of outgoing calls	
numberIncomingCalls	S2	attribute	4-byte int	Number of incoming calls	
class0CauseErrors	S4	attribute	4-byte int	Class 0 cause errors	
class1CauseErrors	S5	attribute	4-byte int	Class 1 cause errors	
class2CauseErrors	S6	attribute	4-byte int	Class 2 cause errors	
class3CauseErrors	S7	attribute	4-byte int	Class 3 cause errors	
class4CauseErrors	S8	attribute	4-byte int	Class 4 cause errors	
class5CauseErrors	S9	attribute	4-byte int	Class 5 cause errors	
class6CauseErrors	S10	attribute	4-byte int	Class 6 cause errors	
class7CauseErrors	S11	attribute	4-byte int	Class 7 cause errors	
attEquipmentPb1		derived		R2 / R1	Rcv
attEquipmentPb2		derived		R3 / R1	Rcv
attEquipmentPb3		derived		R4 / R1	Rcv
attEquipmentPb4		derived		R5 / R1	Rcv
attEquipmentPb5		derived		R6 / R1	Rcv
congestionFailInd1		derived		R7 / R1	Rcv
congestionFailInd2		derived		T3 / T1	Tx

How to Use the Counters:

Incoming Traffic:

Counters R1, R2, R3, R4, R5, and R6
These counters indicate the character of incoming traffic from the connected equipment.

Ratios R2/R1, R3/R1, R4/R1, R5/R1, and R6/R1
Increases in these ratios indicate problems in the attached equipment.

Transmitted Traffic:

Counter T1
> Traffic (in frames) transmitted by the network.

Congestion:

Ratio R7/R1 and T3/T1
> Increases in these ratios indicate an intrinsic congestion failure (picocode problem).

Signalling Stack Operation:

Counters S1 and S2
> These counters indicate the character of signalling stack traffic.

Counters S4, S5, S6, S7, S8, S9, S10, and S11
> These counters indicate the number of call rejections by cause.

Connection Control Packages

A *connection counter* is always collected on a port adapter and can be collected on each end-point of the connection.
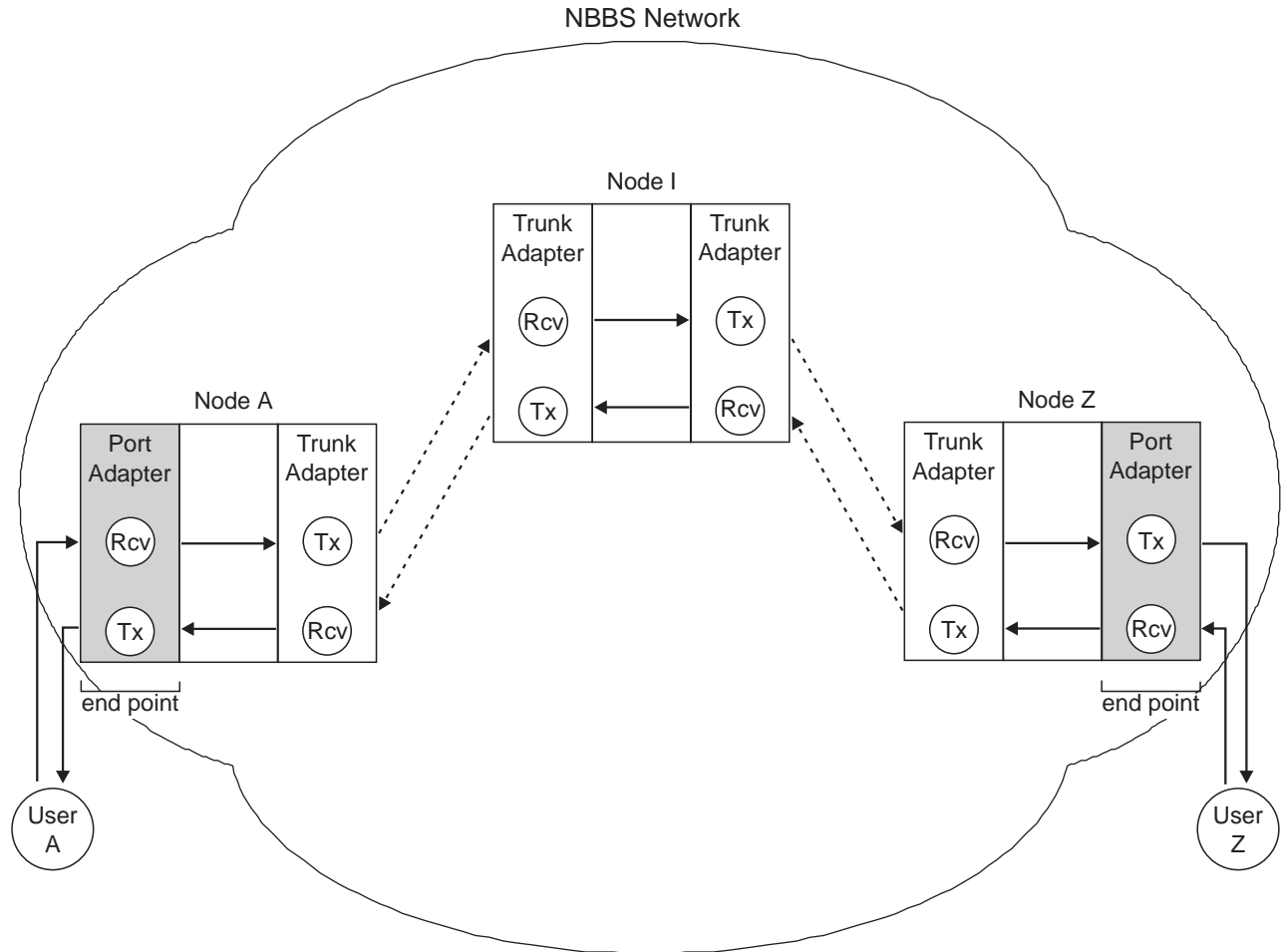
Figure 7. Connection Counters

A `receive side` or a `transmit side` (respectively named `Rcv` and `Tx` in the following tables) is attached to each counter name. The receive and transmit sides are always related to the physical line that is connected to the port adapter. For more information about the terminology used for the connection level counters see the Figure 4 on page 7.

At configuration time, the parameters of a connection are mainly defined on one end-point. This end-point is the initiator or origin side of the connection and it corresponds to the Potential Connection (PCO). See Figure 8 on page 27.

The other connection end-point is the completor or destination side and corresponds to the Virtual Connection (VCO).
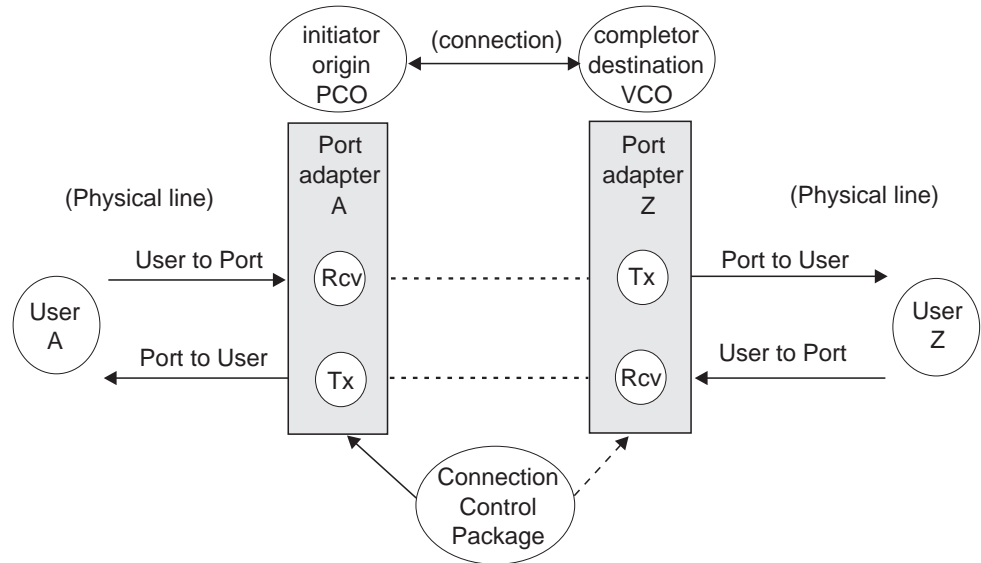
Figure 8. Applying Connection Control Package

Several connection packages are available to collect the connection counters. According to the package, the counters are collected on one end-point or on both end-points of the connection. Some restrictions may apply according to the level of the Nways Switch Control Program.

For connection control packages that applies to both end-points of a connection, the counters are collected on both end-points and a prefix (orig_ or dest_) is added to each counter name:

- orig_ counters apply to the PCO side of the connection.
- dest_ counters apply to the VCO side of the connection.

Example:

On Figure 8 the orig_total bytes received applies to the *User to Port* data flow on PCO side, and the dest_total bytes received applies to the *User to Port* data flow on VCO side. The orig_total bytes transmitted applies to the *Port to User* data flow on PCO side.

Available connection packages:

- The CBR package applies to CBR connections without compression. It applies to both end points.
- The CBR_COMPRESS package applies to CBR connections with compression. It applies to both end points.
- The Atm_Connection package applies to ATM connection starting from the release 4 of the Nways Switch Control Program. It applies to one end point only.
- The HDLC package applies to HDLC connections starting from the release 4 of the Nways Switch Control Program. It applies to both end points.
- The NBBS_Frame_Relay package applies both to frame-relay and HDLC connections prior to the release 4 of the Nways Switch Control Program. It manages connections end to end, and applies to both end points.
- The Frame_Relay package applies to frame-relay connections starting from the release 4 of the Nways Switch Control Program. It manages connections at one end only: it applies to one end point.

- The NBBS_FR_orig package applies to frame-relay connections coming from a node running a Control Program prior release 4, and going to a node running a Control Program at release 4 or higher. The side at the lower level of code is managed by the NBBS_FR_orig package, and the other side by the Frame_Relay package.
- The EXT_Frame_Relay package applies to frame-relay connections starting from the release 5 with PTF IP21154 of the Nways Switch Control Program. It manages connections end to end, and applies to both end points.

HDLC Connection Control Package

Description:

Table 11 shows the HDLC control package for connections.

Table 11. HDLC Connection Control Package (HDLC_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_queBytDsc	R4	attribute	8-byte int	Bytes discarded by leaky bucket policing	Rcv	
orig_quePktDsc	R3	attribute	8-byte int	Packets discarded by leaky bucket policing	Rcv	PCO
orig_ttlFrnBytRcv	R2	attribute	8-byte int	Total foreign bytes received	Rcv	
orig_ttlFrnBytXmt	T2	attribute	8-byte int	Total foreign bytes transmitted	Tx	
orig_ttlFrnFrmRcv	R1	attribute	8-byte int	Total foreign frames received	Rcv	
orig_ttlFrnFrmXmt	T1	attribute	8-byte int	Total foreign frames transmitted	Tx	PCO
orig_ttlGrnPktThr	F2	attribute	8-byte int	Total green packets through	Rcv	
orig_ttlPktThr	F1	attribute	8-byte int	Total packets through	Rcv	
orig_ttlRedPktThr	F3	attribute	8-byte int	Total red packets through	Rcv	
orig_meanBitRate		attribute	8-byte int	Mean bit rate	Rcv	
orig_peakBitRate		attribute	8-byte int	Peak bit rate		PCO
orig_meanBurstLength		attribute	8-byte int	Mean burst length	Rcv	
dest_queBytDsc	R4	attribute	8-byte int	Bytes discarded by leaky bucket policing	Rcv	
dest_quePktDsc	R3	attribute	8-byte int	Packets discarded by leaky bucket policing	Rcv	VCO
dest_ttlFrnBytRcv	R2	attribute	8-byte int	Total foreign bytes received	Rcv	
dest_ttlFrnBytXmt	T2	attribute	8-byte int	Total foreign bytes transmitted	Tx	
dest_ttlFrnFrmRcv	R1	attribute	8-byte int	Total foreign frames received	Rcv	
dest_ttlFrnFrmXmt	T1	attribute	8-byte int	Total foreign frames transmitted	Tx	VCO
dest_ttlGrnPktThr	F2	attribute	8-byte int	Total green packets through	Rcv	
dest_ttlPktThr	F1	attribute	8-byte int	Total packets through	Rcv	
dest_ttlRedPktThr	F3	attribute	8-byte int	Total red packets through	Rcv	
dest_meanBitRate		attribute	8-byte int	Mean bit rate	Rcv	
dest_peakBitRate		attribute	8-byte int	Peak bit rate		VCO
dest_meanBurstLength		attribute	8-byte int	Mean burst length	Rcv	
origIncDiscardTraf1		derived		orig R3 / orig R1	Rcv	
destIncDiscardTraf1		derived		dest R3 / dest R1	Rcv	
origIncDiscardTraf2		derived		orig R4 / orig R2	Rcv	
destIncDiscardTraf2		derived		dest R4 / dest R2	Rcv	
origPackAdmToNetw		derived		orig F1 / orig R1	Rcv	
destPackAdmToNetw		derived		dest F1 / dest R1	Rcv	
origGreenPckAdToNet		derived		orig F2 / (orig F1 + orig R3)	Rcv	
destGreenPckAdToNet		derived		dest F2 / (dest F1 + dest R3)	Rcv	

Table 11. HDLC Connection Control Package (HDLC_PKG) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
origRedPckAdmitToNet		derived		orig F3 / (orig F1 + orig R3)	Rcv	
destRedPckAdmitToNet		derived		dest F3 / (dest F1 + dest R3)	Rcv	
origTxTrafficByNetw		derived		orig T1 / dest R1	Rcv	
destTxTrafficByNetw		derived		dest T1 / orig R1	Rcv	
origTraffDropped1		derived		(dest R1 - orig T1) / dest R1	Rcv	
destTraffDropped1		derived		(orig R1 - dest T1) / orig R1	Rcv	
origTraffDropped2		derived		(dest F1 - orig T1) / dest F1	Rcv	
destTraffDropped2		derived		(orig F1 - dest T1) / orig F1	Rcv	

How to Use the Counters:

Incoming Traffic:

Ratios R3/R1 and R4/R2
> Percentage of overcommitted (discarded) traffic from the connected user.

Ratio F1/R1
> Percentage of packets admitted to the network for a given user.

Ratio F2/(F1+R3)
> Percentage of green packets admitted to the network for a given user.

Ratio F3/(F1+R3)
> Percentage of red packets admitted to the network for a given user.

Effect of the Network on Traffic:

Note: The following counters must be taken at both ends of the connection. For example, R and F counters are taken at the origin of the connection and T counters are taken at the destination of the connection, or vice-versa. Due to the delays inherent in accessing counters at both the origin and the destination, these formulas should be used with caution.

Ratio T1/R1
> Percentage of traffic transmitted by the network.

Ratio (R1–T1)/R1
> Percentage of traffic dropped due to:
>
> • Overcommitted traffic sent over the network by the user (leaky-bucket process)
> • Continuous or intermittent failure inside the network
> • Insufficient network capacity.

Ratio (F1–T1)/F1
> Percentage of traffic dropped due to:
>
> • Continuous or intermittent failure inside the network
> • Insufficient network capacity.
>
> This ratio is valid only when the frame size on this connection is less than 2Kb.

CBR Connection Control Packages

Description:

Table 12 shows the CBR control package for connections. CBR connection counters are used in the following areas when compression is involved:

- Port adapter in reception flow (that is, received traffic).
- Port adapter in transmission flow (that is, transmitted traffic).
- Voice processor in transmission flow to the network (that is, traffic to be compressed).
- Voice processor in reception flow from the network (that is, traffic to be decompressed).
- Trunk adapter in reception flow from the network.
- Trunk adapter intransmission flow to the network.

Table 12. CBR Connection Control Package (CBR_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_PlyOutBufOvrrun	T3	attribute	4-byte int	Playout buffer overruns detected	Tx	PCO
orig_PlyOutBufUndrun	T4	attribute	4-byte int	Playout buffer underruns detected	Tx	
orig_seqGapRcv	T2	attribute	4-byte int	Sequence gaps received	Tx	
orig_ttlBytRcv	R1	attribute	4-byte int	Total number of bytes received	Rcv	
orig_ttlBytXmit	T1	attribute	4-byte int	Total number of bytes transmitted	Tx	
orig_peakBitRate		attribute	4-byte int	Bit rate		
dest_PlyOutBufOvrrun	T3	attribute	4-byte int	Playout buffer overruns detected	Tx	VCO
dest_PlyOutBufUndrun	T4	attribute	4-byte int	Playout buffer underruns detected	Tx	
dest_seqGapRcv	T2	attribute	4-byte int	Sequence gaps received	Tx	
dest_ttlBytRcv	R1	attribute	4-byte int	Total number of bytes received	Rcv	
dest_ttlBytXmit	T1	attribute	4-byte int	Total number of bytes transmitted	Tx	
dest_peakBitRate		attribute	4-byte int	Bit rate		

Table 13 shows the CBR *compression* control package for connections.

Table 13. CBR Compression Connection Control Package (CBR_COMPRESS_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_PlyOutBufOvrrun	T3	attribute	4-byte int	Playout buffer overruns detected	Tx	PCO
orig_PlyOutBufUndrun	T4	attribute	4-byte int	Playout buffer underruns detected	Tx	
orig_seqGapRcv	T2	attribute	4-byte int	Sequence Gaps received	Tx	
orig_ttlBytRcv	R1	attribute	4-byte int	Total bytes received	Rcv	
orig_ttlBytXmit	T1	attribute	4-byte int	Total bytes transmitted	Tx	
orig_peakBitRate		attribute	4-byte int	Bit Rate		

Table 13. CBR Compression Connection Control Package (CBR_COMPRESS_PKG) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
dest_PlyOutBufOvrrun	T3	attribute	4-byte int	Playout buffer overruns detected	Tx	VCO
dest_PlyOutBufUndrun	T4	attribute	4-byte int	Playout buffer underruns detected	Tx	
dest_seqGapRcv	T2	attribute	4-byte int	Sequence Gaps received	Tx	
dest_ttlBytRcv	R1	attribute	4-byte int	Total bytes received	Rcv	
dest_ttlBytXmit	T1	attribute	4-byte int	Total bytes transmitted	Tx	
dest_peakBitRate		attribute	4-byte int	Bit Rate		
orig_ttlcmprsBytRcv	V1	attribute	4-byte int	Total compressed bytes received	Rcv	PCO
orig_ttlcmprsBytXmit	N1	attribute	4-byte int	Total compressed bytes transmitted	Tx	
orig_ttlGrnPktRcv	V2	attribute	4-byte int	Total green packets received	Rcv	
orig_ttlGrnPktXmit	N2	attribute	4-byte int	Total green packets transmitted	Tx	
orig_ttlRedPktRcv	V3	attribute	4-byte int	Total red packets received	Rcv	
orig_ttlRedPktXmit	N3	attribute	4-byte int	Total red packets transmitted	Tx	
dest_ttlcmprsBytRcv	V1	attribute	4-byte int	Total compressed bytes received	Rcv	VCO
dest_ttlcmprsBytXmit	N1	attribute	4-byte int	Total compressed bytes transmitted	Tx	
dest_ttlGrnPktRcv	V2	attribute	4-byte int	Total green packets received	Rcv	
dest_ttlGrnPktXmit	N2	attribute	4-byte int	Total green packets transmitted	Tx	
dest_ttlRedPktRcv	V3	attribute	4-byte int	Total red packets received	Rcv	
dest_ttlRedPktXmit	N3	attribute	4-byte int	Total red packets transmitted	Tx	
origNbOfCompTrByt		derived		orig N1 / orig R1		
destNbOfCompTrByt		derived		dest N1 / dest R1		
origNbOfCompRcvByt		derived		orig V1 / orig T1		
destNbOfCompRcvByt		derived		dest R1 / dest T1		
origSuccTxViaNetw		derived		orig V1 / dest N1		
destSuccTxViaNetw		derived		dest V1 / orig N1		
origSuccTxForRedPkt		derived		orig V3 / dest N3		
destSuccTxForRedPkt		derived		dest V3 / orig N3		
origSuccTxForGreenPkt		derived		orig V2 / dest N2		
destSuccTxForGreenPkt		derived		dest V2 / orig N2		
origTrafDropByNetw1		derived		(dest N1 - orig V1) / dest N1		
destTrafDropByNetw1		derived		(orig N1 - dest V1) / orig N1		
origTrafDropByNetw2		derived		(dest R1 - orig T1) / dest R1		
destTrafDropByNetw2		derived		(orig R1 - dest T1) / orig R1		

How to Use the Counters:

Note: The following counters must be taken at both ends of the connection. For example, R and N counters are taken at the origin of the connection and T and V counters are taken at the destination of the connection, or vice-versa. Due to the delays inherent in accessing counters at both the origin and the destination, these formulas should be used with caution.

Compression (Voice Services):

Ratio N1/R1
>This ratio indicates the percentage of compressed bytes in received traffic.

Ratio V1/T1
>This ratio indicates the percentage of compressed bytes in transmitted traffic.

Effect of Network Behaviour on Traffic:

Counter T2
>An increase in this counter indicates a network problem.

With Voice Services:

Ratio V1/N1
>Indicates the percentage of successful transmission through the network.

Ratio V3/N3
>Indicates the percentage of successful transmission of red packets through the network.

Ratio V2/N2
>Indicates the percentage of successful transmission of green packets through the network.

Ratio (N1–V1)/N1
>Indicates the percentage of traffic dropped by the network due to:
>
>- Continuous or intermittent failure inside the network
>- Insufficient network capacity
>- Local congestion.

Counter T3
>Indicates a clock synchronization problem.

Counter T4
>Indicates the amount of silence or idle detected.

Without Voice Services:

Ratio (R1–T1)/R1
>Indicates the percentage of traffic dropped by the network due to:
>- Continuous or intermittent failure inside the network
>- Insufficient network capacity
>- Local congestion.

Counter T4
>Indicates a clock synchronization problem.

Frame-Relay Connection Control Packages

Description:

Table 14 shows the frame-relay control package for connections.

Table 14. Frame-Relay Connection Control Package (Frame_Relay_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
totBytesReceived	R2	attribute	8-byte int	Total number of bytes received	Rcv	(1)
totFramesAboveBCRec	R4	attribute	8-byte int	Total number of frames above BC received	Rcv	
totFramesReceived	R1	attribute	8-byte int	Total number of frames received	Rcv	
totFramesTransmitted	T1	attribute	8-byte int	Total number of frames transmitted	Tx	
totBECNFramesInit	T4	attribute	4-byte int	BECN set and transmitted	Tx	
totFECNFramesInit	T5	attribute	4-byte int	FECN set and transmitted	Tx	
totDEFramesReceived	R3	attribute	8-byte int	Number of frames received with DE	Rcv	(1)(2)
totFramesAboveBERec	R5	attribute	4-byte int	Number of frames received above BE	Rcv	
totFramesAboveBETran	T6	attribute	4-byte int	Number of frames transmitted above BE	Tx	
totDEFramesXmited	T3	attribute	8-byte int	Number of frames transmitted with DE	Tx	
totalBytesAboveBCXmit	A2	attribute	8-byte int	Total number of bytes above BC transmitted	Tx	
totalFramesAboveBCXmit	A1	attribute	8-byte int	Total number of frames above BC transmitted	Tx	
totBytesTransmitted	T2	attribute	8-byte int	Total number of bytes transmitted	Tx	(1)
totFramesAboveBCFwd	F2	attribute	4-byte int	Red frames admitted to transfer	Rcv	
totFramesForwarded	F1	attribute	4-byte int	Red and green frames admitted to transfer	Rcv	
totDEFramesCongDisc	R6	attribute	4-byte int	Number of frames discarded with DE set received above BE	Rcv	

(1) The end-point is PCO or VCO, depending on where the performance monitoring is started.

(2) The value of T6 is always 0 because no frame above burst in excess is transmitted.

Note: For the Frame_Relay_PKG package, only one set of counters is reported, depending on which node the performance application is started.

To collect the counters on both connection end-points, you must start the performance application on each end-point.

How to Use the Counters:

See "How to Use the Counters" on page 36.

Extended Frame-Relay Connection Control Package

Description:

Table 15 shows the extended frame-relay control package for connections.

Table 15. Extended Frame-Relay Connection Control Package (EXT_Frame_Relay_PKG)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_ttlBytRcv	R2	attribute	8-byte int	Total bytes received	Rcv	PCO
orig_ttlFrmAbvBCRec	R4	attribute	8-byte int	Total frames above BC received	Rcv	
orig_ttlFrmRcv	R1	attribute	8-byte int	Total frames received	Tx	
orig_ttlFrmXmit	T1	attribute	8-byte int	Total frames transmitted	Tx	
orig_ttlBECNFrmInit	T4	attribute	4-byte int	Total BECN frames initiated	Tx	
orig_ttlFECNFrmInit	T5	attribute	4-byte int	Total FECN frames initiated	Tx	
orig_ttlDEFrmRcv	R3	attribute	8-byte int	Total DE frames received	Rcv	PCO
orig_ttlFrmAbvBERec	R5	attribute	4-byte int	Total frames above BE received	Rcv	
orig_ttlFrmAbvBEXmit	T6	attribute	4-byte int	Total frames above BE transmitted	Tx	
orig_ttlDEFrmXmit	T3	attribute	8-byte int	Total DE frames transmitted	Tx	
orig_ttlBytAbvBCXmit	A2	attribute	8-byte int	Total bytes above BC transmitted	Tx	
orig_ttlFrmAbvBCXmit	A1	attribute	8-byte int	Total frames above BC transmitted	Tx	
orig_ttlBytXmit	T2	attribute	8-byte int	Total bytes transmitted	Tx	PCO
orig_ttlFrmAbvBCFwd	F2	attribute	8-byte int	Total frames above BC forwarded	Rcv	
orig_ttlFrmFwd	F1	attribute	8-byte int	Total frames forwarded	Rcv	
orig_ttlDEFrmConDisc		attribute	4-byte int	Total DE frame congestion discards	Rcv	
orig_ttlBytFwd		attribute	8-byte int	Total bytes forwarded	Rcv	
dest_ttlBytRcv	R2	attribute	8-byte int	Total bytes received	Rcv	VCO
dest_ttlFrmAbvBCRec	R4	attribute	8-byte int	Total frames above BC received	Rcv	
dest_ttlFrmRcv	R1	attribute	8-byte int	Total frames received	Rcv	
dest_ttlFrmXmit	T1	attribute	8-byte int	Total frames transmitted	Tx	
dest_ttlBECNFrmInit	T4	attribute	4-byte in	Total BECN frames initiated	Tx	
dest_ttlFECNFrmInit	T5	attribute	4-byte int	Total FECN frames initiated	Tx	
dest_ttlDEFrmRcv	R3	attribute	8-byte int	Total DE frames received	Rcv	VCO
dest_ttlFrmAbvBERec	R5	attribute	4-byte int	Total frames above BE received	Rcv	
dest_ttlFrmAbvBEXmit	T6	attribute	4-byte int	Total frames above BE transmitted	Tx	
dest_ttlDEFrmXmit	T3	attribute	8-byte int	Total DE frames transmitted	Tx	
dest_ttlBytAbvBCXmit	A2	attribute	8-byte int	Total bytes above BC transmitted	Tx	
dest_ttlFrmAbvBCXmit	A1	attribute	8-byte int	Total frames above BC transmitted	Tx	
dest_ttlBytXmit	T2	attribute	8-byte int	Total bytes transmitted	Tx	
dest_ttlFrmAbvBCFwd	F2	attribute	8-byte int	Total frames above BC forwarded	Rcv	VCO
dest_ttlFrmFwd	F1	attribute	8-byte int	Total frames forwarded	Rcv	
dest_ttlDEFrmConDisc		attribute	4-byte int	Total DE frame congestion discards	Rcv	
dest_ttlBytFwd		attribute	8-byte int	Total bytes forwarded	Rcv	
origIncomTraffic		derived		orig R3 / orig R1	Rcv	

Table 15. Extended Frame-Relay Connection Control Package (EXT_Frame_Relay_PKG) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
destIncomTraffic		derived		dest R3 / dest R1	Rcv	
origIncomTrafficOverBC		derived		orig R4 / (orig F1 + orig R5)	Rcv	
destIncomTrafficOverBC		derived		dest R4 / (dest F1 + dest R5)	Rcv	
origIncomTrafficOverBE		derived		orig R5 / (orig F1 + orig R5)	Rcv	
destIncomTrafficOverBE		derived		dest R5 / (dest F1 + dest R5)	Rcv	
origMeanSizeOfRcvFra		derived		orig R2 / orig R1	Rcv	
destMeanSizeOfRcvFra		derived		dest R2 / dest R1	Rcv	
origGreenBytAdmitNet		derived		orig R2 * (orig F1 - orig F2) / (orig F1 + orig R5)		
destGreenBytAdmitNet		derived		dest R2 * (dest F1 - dest F2) / (dest F1 + dest R5)		
origRedBytAdmitNetw		derived		orig R2 * orig F2 / (orig F1 + orig R5)		
destRedBytAdmitNetw		derived		dest R2 * dest F2 / (dest F1 + dest R5)		
origMeanSizeOfRcvPkt		derived		orig R2 / (orig F1 + orig R5)		
destMeanSizeOfRcvPkt		derived		dest R2 / (dest F1 + dest R5)		
origOverComTrafInByt		derived		orig A2 / dest R2		
destOverComTrafInByt		derived		dest A2 / orig R2		
origOverComTrafInFra		derived		orig A1 / dest R1		
destOverComTrafInFra		derived		dest A1 / orig R1		
origTraffDropInBytes		derived		(orig R2 - dest T2) / orig R2		
destTraffDropInBytes		derived		(dest R2 - orig T2) / dest R2		
origTraffDropInFram1		derived		(orig R1 - dest T1) / orig R1		
destTraffDropInFram1		derived		(dest R1 - orig T1) / dest R1		
origTraffDropInFram2		derived		(orig F1 - dest T1) / orig F1		
destTraffDropInFram2		derived		(dest F1 - orig T1) / dest F1		

How to Use the Counters:

Incoming Traffic:

Ratio R3/R1
> Percentage of incoming flagged traffic from the connected user.

Ratio R4/(F1+R5)
> Percentage of incoming traffic over BC from the connected user.

Ratio R5/(F1+R5)
> Percentage of incoming traffic over BE from the connected user. This also represents the percentage of incoming traffic dropped at the access due to policing.

Ratio R2/R1
> Mean size of received frames.

Traffic Admitted to the Network:

R2×(F1−F2)/(F1+R5)
>Percentage of green bytes admitted to the network for a given user.

R2×F2/(F1+R5)
>Percentage of red bytes admitted to the network for a given user.

R2/(F1+R5)
>Mean size of received packet.

Network Action on the Traffic:

Note: The following counters must be taken at both ends of the connection. For example, R and F counters are taken at the origin of the connection and A and T counters are taken at the destination of the connection, or vice-versa. Due to the delays inherent in accessing counters at both the origin and the destination, these formulas should be used with caution.

A2/R2 Percentage of overcommitted traffic (in bytes) transmitted through the network.

A1/R1 Percentage of overcommitted traffic (in frames) transmitted through the network.

Ratio (R2−T2)/R2
>Percentage of traffic (in bytes) dropped by the network due to:
>
>- Overcommitted traffic sent over the network by the user
>- Continuous or intermittent failure inside the network
>- Insufficient network capacity.

Ratio (R1−T1)/R1
>Percentage of traffic (in frames) dropped by the network due to:
>
>- Overcommitted traffic sent over the network by the user
>- Continuous or intermittent failure inside the network
>- Insufficient network capacity.

Ratio (F1−T1)/F1
>Percentage of traffic (in frames) dropped by the network due to:
>
>- Continuous or intermittent failure inside the network, including egress port
>- Insufficient network capacity.
>
>This ratio is only valid when the frame size on this connection is less than 2Kb.

NBBS Frame-Relay Connection Control Packages

Description: Table 16 shows the NBBS frame-relay control package for connections.

Table 16. NBBS Frame-Relay Connection Control Package (NBBS_Frame_Relay_PKG)

Counter Name	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_queBytDsc	attribute	8-byte int	Bytes discarded by leaky bucket policing	Rcv	
orig_quePktDsc	attribute	8-byte int	Packets discarded by leaky bucket policing	Rcv	
orig_ttlFrnBytRcv	attribute	8-byte int	Total foreign bytes received	Rcv	PCO
orig_ttlFrnBytXmt	attribute	8-byte int	Total foreign bytes transmitted	Tx	
orig_ttlFrnFrmRcv	attribute	8-byte int	Total foreign frames received	Rcv	
orig_ttlFrnFrmXmt	attribute	8-byte int	Total foreign frames transmitted	Tx	
orig_ttlGrnBytThr	attribute	8-byte int	Total green bytes through	Rcv	
orig_ttlGrnPktThr	attribute	8-byte int	Total green packets through	Rcv	PCO
orig_ttlPktThr	attribute	8-byte int	Total packets through	Rcv	
orig_ttlNetBytThr	attribute	8-byte int	Total network bytes through	Tx	
orig_ttlNetPktThr	attribute	8-byte int	Total network packets through	Tx	
orig_ttlRedBytThr	attribute	8-byte int	Total red bytes through	Rcv	
orig_ttlRedPktThr	attribute	8-byte int	Total red packets through	Rcv	
orig_meanBitRate	attribute	8-byte int	Mean bit rate	Rcv	PCO
orig_peakBitRate	attribute	8-byte int	Peak bit rate		
orig_meanBurstLength	attribute	8-byte int	Mean burst length	Rcv	
dest_queBytDsc	attribute	8-byte int	Bytes discarded by leaky bucket policing	Rcv	
dest_quePktDsc	attribute	8-byte int	Packets discarded by leaky bucket policing	Rcv	
dest_ttlFrnBytRcv	attribute	8-byte int	Total foreign bytes received	Rcv	VCO
dest_ttlFrnBytXmt	attribute	8-byte int	Total foreign bytes transmitted	Tx	
dest_ttlFrnFrmRcv	attribute	8-byte int	Total foreign frames received	Rcv	
dest_ttlFrnFrmXmt	attribute	8-byte int	Total foreign frames transmitted	Tx	
dest_ttlGrnBytThr	attribute	8-byte int	Total green bytes through	Rcv	
dest_ttlGrnPktThr	attribute	8-byte int	Total green packets through	Rcv	
dest_ttlPktThr	attribute	8-byte int	Total packets through	Rcv	VCO
dest_ttlNetBytThr	attribute	8-byte int	Total network bytes through	Tx	
dest_ttlNetPktThr	attribute	8-byte int	Total network packets through	Tx	
dest_ttlRedBytThr	attribute	8-byte int	Total red bytes through	Rcv	
dest_ttlRedPktThr	attribute	8-byte int	Total red packets through	Rcv	
dest_meanBitRate	attribute	8-byte int	Mean bit rate	Rcv	VCO
dest_peakBitRate	attribute	8-byte int	Peak bit rate		
dest_meanBurstLength	attribute	8-byte int	Mean burst length	Rcv	

Table 17 on page 39 shows the frame relay-control package for the connection origin.

Table 17. NBBS Frame-Relay Origin Connection Control Package (NBBS_FR_orig_PKG)

Counter Name	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
orig_queBytDsc	attribute	8-byte int	Queued bytes discarded	Rcv	
orig_quePktDsc	attribute	8-byte int	Queued packets discarded	Rcv	
orig_ttlFrnBytRcv	attribute	8-byte int	Total foreign bytes received	Rcv	PCO
orig_ttlFrnBytXmt	attribute	8-byte int	Total foreign bytes transmitted	Tx	
orig_ttlFrnFrmRcv	attribute	8-byte int	Total foreign Frames received	Rcv	
orig_ttlFrnFrmXmt	attribute	8-byte int	Total foreign Frames transmitted	Tx	
orig_ttlGrnBytThr	attribute	8-byte int	Total green bytes through	Rcv	
orig_ttlGrnPktThr	attribute	8-byte int	Total green packets through	Rcv	PCO
orig_ttlPktThr	attribute	8-byte int	Total packets through	Rcv	
orig_ttlNetBytRcv	attribute	8-byte int	Total network bytes received	Tx	
orig_ttlNetPktRcv	attribute	8-byte int	Total network Packet received	Tx	
orig_ttlRedBytThr	attribute	8-byte int	Total red bytes through	Tx	
orig_ttlRedPktThr	attribute	8-byte int	Total red packets through	Tx	
orig_meanBitRate	attribute	real	Mean bit rate	Rcv	PCO
orig_peakBitRate	attribute	real	Peak bit rate		
orig_meanBurstLength	attribute	real	Mean burst length	Rcv	

Note: This package applies on the PCO end-point of a connection when this end-point is running a level of the Nways Switch Control Program lower than Version 1 Release 4.

ATM Connection Control Package

Description:

Table 18 shows the ATM control package for connections.

Table 18. ATM Connection Control Package (Atm_Connection)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
totalCellsReceived	R1	attribute	8-byte int	Total number of cells received	Rcv	
totalCellsXmitted	T1	attribute	4-byte int	Total number of cells transmitted	Tx	
totalOAMCellsReceive	R10	attribute	8-byte int	Total number of OAM cells received	Rcv	(*)
totalOAMCellsXmitted	T5	attribute	4-byte int	Total number of OAM cells transmitted	Tx	
totalCLP0PolDisc	R3	attribute	4-byte int	Total CLP0 policing discards	Rcv	
totalCLP1PolDisc	R5	attribute	4-byte int	Total CLP1 policing discards	Rcv	
totalEFCICellsRec	R9	attribute	8-byte int	Total EFCI cells received	Rcv	
totalCellsMarked0to1	R6	attribute	4-byte int	Total cells marked 0to1	Rcv	
totalCellsDiscarded	R7	attribute	4-byte int	Total number of cells discarded	Rcv	
totalCLP0CellsRec	R2	attribute	8-byte int	Total CLP0 cells received	Rcv	(*)
totalCLP1CellsRec	R4	attribute	8-byte int	Total CLP1 cells received	Rcv	
totalCLP0CellsXmit	T2	attribute	8-byte int	Total CLP0 cells transmitted	Tx	

Table 18. ATM Connection Control Package (Atm_Connection) (continued)

Counter Name	Label	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)	Side	End Point
totalCLP1CellsXmit	T3	attribute	8-byte int	Total CLP1 cells transmitted	Tx	
ttlCellsDiscNotDTPol	R8	attribute	4-byte int	Total number of cells discarded (not due to policing)	Rcv	
ttlCellsDiscDueTCong	T4	attribute	4-byte int	Total number of cells discarded (due to congestion)	Tx	(*)
totalCellsForwarded	F1	attribute	8-byte int	Total number of cells forwarded	Rcv	
totalCLP0CellsFwd	F2	attribute	8-byte int	Total CLP0 cells forwarded	Rcv	
totalCLP1CellsFwd	F3	attribute	8-byte int	Total CLP1 cells forwarded	Rcv	
traffFlagForDisc		derived		R4 / R1	Rcv	
incTrafFlagWCongInd		derived		R9 / R1	Rcv	
OAMTrafficReceived		derived		R10 / R1	Rcv	
cellsAcceptForTx		derived		F1 / R1	Rcv	
CLP0CellsAdmToNetw		derived		F2 / F1	Rcv	
CLP1CellsAdmToNetw		derived		F3 / F1	Rcv	
cellsDiscByPolicing		derived		(R7 - R8) / R1	Rcv	
CLP0CellsDiscByPol		derived		R3 / R2	Rcv	
CLP1CellsDiscByPol		derived		R5 / R4	Rcv	
overComTrafAccWCLP		derived		R6 / R2	Rcv	

(*) The end-point is PCO or VCO, depending on where the performance monitoring is started.

Note: For the Atm_Connection package, only one set of counter is reported depending on which node the performance application is started.

To collect the counters on both connection end-points, start the performance application on each end-point of the connection.

How to Use the Counters:

Note: The following counters must be taken at both ends of the connection. For example, R and F counters are taken at the origin of the connection and T counters are taken at the destination of the connection, or vice-versa. Due to the delays inherent in accessing counters at both the origin and the destination, these formulas should be used with caution.

Incoming Traffic:

Ratio R4/R1
This ratio indicates the percentage of traffic coming from the connected user that is flagged for discard.

Ratio R9/R1
This ratio indicates the percentage of incoming traffic flagged with the congestion indicator.

Ratio R10/R1

> This ratio indicates the percentage of OAM traffic received from the connected user.

Traffic Admitted to the Network:

Ratio F1/R1

> This ratio indicates the percentage of cells accepted for transmission.

Ratio F2/F1

> This ratio indicates the percentage of CLP0 cells admitted to the network for a given user.

Ratio F3/F1

> This ratio indicates the percentage of CLP1 cells admitted to the network for a given user.

Ratio (R7−R8)/R1

> This ratio indicates the percentage of cells discarded by policing for a given user.

Ratio R3/R2

> This ratio indicates the percentage of CLP0 cells discarded by policing for a given user.

Ratio R5/R4

> This ratio indicates the percentage of CLP1 cells discarded by policing for a given user.

Ratio R6/R2

> This ratio indicates the percentage of overcommitted traffic accepted, when CLP tagging is enabled.

Network Action on Traffic:

Ratios (R1−T1)/R1 [for Total Traffic], (R2−T2)/R2 [for CLP0], (R4−T3)/R4 [for CLP1] These ratios indicate the percentage of traffic [total traffic, CLP0, and CLP1] dropped due to:

- Overcommitted traffic sent over the network by the user (leaky bucket process)
- Continuous or intermittent failure inside the network
- Insufficient network capacity
- Local congestion.

Ratios (F1−T1)/F1 [for Total Traffic], (F2−T2)/F2 [for CLP0], (F3−T3)/F3 [for CLP1] These ratios indicate the percentage of traffic [total traffic, CLP0, and CLP1] dropped by the network due to:

- Continuous or intermittent failure inside the network
- Insufficient network capacity
- Local congestion.

Transmission Access on Traffic:

Ratio T4/F1

> This ratio indicates the percentage of traffic dropped by the transmission access due to local congestion at the port side.

Line Control Packages

This section describes the counters offered in the line control packages.

- **Defect counters**: several types of defects on a line can activate alarms in the adapter. For example, an out of frame (OOF) defect activates a loss of frame (LOF) alarm. Each alarm has a setting and a clearing time which can be modified. The following counters are reported:
  - `Loss of signal (LOS) defect`: a loss defect occurs when some positive or negative pulses are missing in the line signal.
  - `Alarm indication (AIS) defect`: an AIS defect occurs when the received signal includes only 1's during a predefined time.
  - `Out of frame (OOF) defect`: an OOF defect occurs if the receiver cannot synchronize on the frames (the frame bit alignment error is higher than a predefined level).
  - `Severely errored frame (SEF) defect`: an SEF defect occurs as an SOF defect but under less severe conditions.
- **Near-end performance counters on T1 lines in extended superframe (ESF) format**: These counters are updated every second according to the information determined by the near-end error registers (signal received from the remote node). The following counters are reported:
  - `Errored seconds - line`: gives the number of seconds where either a bipolar violation (BVP), an excessive zeros (EXZ), or a LOS defect occurs.
  - `Code violation - path`: gives the number of cycle redundancy checking (CRC) errors (degree six).
  - `Errored seconds - path`: gives the number of seconds where either a CRC error, a controlled slip (CS), an AIS, or an SEF defect occurs.
  - `Severely errored seconds - path`: gives the number of seconds where either 320 CRC errors, an AIS, or a SEF defect occurs.
  - `SEF-AIS seconds - path`: gives the number of seconds where either a SEF or an AIS defect occurs.
  - `Unavailable seconds - path`: gives the number of seconds where the path is unavailable.
- **Far-end performance counters on T1 lines in extended superframe (ESF) format**: These counters are updated according to the information reported by the far-end error registers (signal received from the remote node). Every second a performance test report is sent to the near-end. This report includes information on far-end errors. The following counters are available:
  - `ES-LFE`: gives the number of seconds where at least a bipolar violation (BVP) error occurs.
  - `CV-PFE`: gives the number of CRC errors (degree six, seven possible levels).
  - `ES-PFE`: gives the number of seconds where either a BVP, a SEF, or a CS error occurs.
  - `SES-PFE`: gives the number of seconds where either a SEF, or more than 320 CRC error occur.
  - `SEFS-PFE`: gives the number of seconds where at least a SEF occurs.
  - `UAS-PFE`: gives the numbr of seconds where the path is unavailable.
- **Performance counters on T1 lines in superframe (SF) format**: There is only near-end information in SF format. CRC errors are replaced by framing errors (FE) with a trigger at eight (instead of 320 for CRC errors).

- **Performance counters on E1 lines**: E1 lines only have one format (multiframe) available. There is no far-end report. Counter definitions are those used for T1 ESF format (the CRC is degree four instead of six).

Three packages are available for collecting line counters, depending on the LIC type:
- PDH1
- PDH23
- OC3.

In particular, the following LICs do not support the line counters:
- LIC511
- LIC512
- LIC517
- LIC522
- LIC530.

Table 19 shows the control package for PDH1 lines.

Table 19. PDH1 Line Control Package (PDH1)

Counter Name	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)
ErrSecLine	attribute	4-byte int	Errored seconds - line
CvPath	attribute	4-byte int	Code violation - path
SasPath	attribute	4-byte int	SEF AIS seconds - path
UasPath	attribute	4-byte int	Unavailable seconds - path
AsPath	attribute	4-byte int	AIS seconds - path
SesPath	attribute	4-byte int	Severely errored seconds - path
CvPathFarEnd	attribute	4-byte int	CV path far-end
UasPathFarEnd	attribute	4-byte int	UAS path far-end
SesPathFarEnd	attribute	4-byte int	SES path far-end
EsPathFarEnd	attribute	4-byte int	ES path far-end
ErrSecLineFarEnd	attribute	4-byte int	Errored second line far-end
LosDefects	attribute	4-byte int	LOS defects
AisDefects	attribute	4-byte int	AIS defects
OofDefects	attribute	4-byte int	OOF defects
SefDefects	attribute	4-byte int	SEF defects
EsPath	attribute	4-byte int	Errored seconds - path

Notes:

1. The LIC514 supports the following counters: UasPath, SesPath, ErrSecLineFarEnd, LosDefects, AisDefects, OofDefects, and SefDefects. It supports the EsPath counter by counting the CRC errors, AIS, and SEF defects (controlled slip is not counted).
2. The LIC514 supports the following counters in T1 extended superframe (ESF) mode and J1: CvPath, EsPathFarEnd, SesPathFarEnd, and UasPathFarEnd. These counters are not supported in T1 superframe (SF) mode.

3. LIC515 and LIC516 support the following counters: UasPath, SesPath, LosDefects, AisDefects, OofDefects, and SefDefects. They support the EsPath counter by counting the CRC errors, AIS, and SEF defects (controlled slip is not counted).

Table 20 shows the control package for PDH23 lines.

Table 20. PDH23 Line Control Package (PDH23)

Counter Name	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)
ErrSecLine	attribute	4-byte int	Errored seconds - line
LosSecLine	attribute	4-byte int	LOS seconds - line
CvPath	attribute	4-byte int	Code violation - path
SasPath	attribute	4-byte int	SEF AIS seconds - path
UasPath	attribute	4-byte int	Unavailable seconds - path
EsPath	attribute	4-byte int	Errored seconds - path
SesPath	attribute	4-byte int	Severely errored seconds - path
AsPath	attribute	4-byte int	AIS seconds - path
CvPathFarEnd	attribute	4-byte int	Code violation - path far-end
SasPathFarEnd	attribute	4-byte int	SEF AIS seconds - path far-end
UasPathFarEnd	attribute	4-byte int	Unavailable seconds - path far-end
EsPathFarEnd	attribute	4-byte int	Errored seconds - path far-end
SesPathFarEnd	attribute	4-byte int	Severely errored seconds - path far-end
ErrSecTypA_Path	attribute	4-byte int	Errored seconds type A - path
ErrSecTypB_Path	attribute	4-byte int	Errored seconds type B - path
ErrSecTypC_Path	attribute	4-byte int	Errored seconds type C - path
BurstySeconds	attribute	4-byte int	Bursty seconds

Notes:

1. The LIC513 in C-bit mode supports the following counters: EsLine, SasPath, UasPath, AsPath, CvPathFarEnd, EsPathFarEnd, and SasPathFarEnd.
2. The LIC523 supports the following counters: UasPath, SesPath, ErrSecTypA_Path, and ErrSecTypB_Path.

Table 21 shows the control package for OC3 lines.

Table 21. OC3 Line Control Package (OC3)

Counter Name	Attribute or Derived	Type	Description (attributes) or Expression (derived parameters)
CvPath	attribute	4-byte int	Code violation - path
UasPath	attribute	4-byte int	Unavailable seconds - path
SesPath	attribute	4-byte int	Severely errored seconds - path
CvPathFarEnd	attribute	4-byte int	Code violation - path far-end
UasPathFarEnd	attribute	4-byte int	Unavailable seconds - path far-end
SesPathFarEnd	attribute	4-byte int	Severely errored seconds - path far-end
EsPathFarEnd	attribute	4-byte int	Errored seconds - path far-end
EsPath	attribute	4-byte int	Errored seconds - path

Notes:

1. The following counters are supported: CvPath, UasPath, SesPath, and EsPath.

2. PathFarEnd counters are not supported.

3. `CvPath`: Path code violations (CVs) are bit interleaved parity (BIP) errors detected at the path layer of the incoming signal. The CV counter is incremented for each bit error detected. CVs are collected using the BIP-8 in the B3 byte of the path overhead.

4. `UasPath`: Path unavailable seconds. This is a measure (in seconds) of the time where the path is unavailable.

5. `SesPath`: A SES path is a second during which a high bit error rate (BER higher than 10 power -7) is detected, or during which AIS or LOP state has been entered.

6. `EsPath`: An ES path is a second during which at least one CV occured, or during which AIS or LOP state has been entered.

Chapter 2. Accounting

This chapter:
- Explains what must be configured to enable collection of accounting data about a connection
- Explains how to retrieve accounting records
- Explains the different types of accounting connection data
- Gives the reasons for accounting record creation
- Describes the structure of the accounting file.

For the commands that you can use for the accounting application, refer to "Accounting Application Commands" on page 75.

Planning for Accounting at the Nways 2220 Switch Manager Level

Accounting information is bufferized in the NAS of the Nways Switches for the accounting-enabled connections. When the contents of the buffer in an NAS reaches 50% of the buffer size, the Nways Switch Control Program sends an unsolicited notification to the Nways 2220 Switch Manager which retrieves the records and stores them on the network management station hard disk. To avoid any loss of accounting information, the Nways Switch Control Program keeps the records in the NAS buffer until it receives a successful transfer acknowledgment.

To enable this mechanism you must:

1. Reserve some disk storage on the network management station for the accounting file for each Nways Switch that you want accounting information for. The storage size depends on the number of accountable connections that are started or terminated (accounting information for an average connection generates approximately 512 bytes of records). Bandwidth adaptation and connection rerouting generate additional records. For example, for 10 000 accounting events (such as start, stop, bandwidth adaptation, or connection reroute) per day, you need 5 MB of disk space per day.

   The NAS buffer is a circular closed file. This file is on a dedicated partition of the NAS disk. Depending on the size of the partition defined at the 2220 installation, you have to regularly retrieve the accounting records from the NAS. The size of the file may vary from 20 MB to 100 MB depending on the size of the NAS disk at installation time. In the previous example, if the file is of 50 MB, you must perform at least a retrieve every 10 days (5 MB per day).

2. Define the potential connection with the accounting parameter set to YES.

3. From the Nways 2220 Switch Manager, enable the accounting record collection at one of the following levels:

   - For all NBBS networks that are managed by the Nways 2220 Switch Manager. This includes any networks that may later join its management domain.

   - For a selected set of 2220 networks. This includes any Nways Switches that may later join one of the specified networks.

   - For a selected set of Nways Switches. This only gives connection data about the ends of connections that originate or terminate in the specified Nways Switches. This only gives you accounting data about one end of a connection.

   Generally, you would do accounting at one of the higher levels.

4. Define:

   - Where on the network management station you want to keep the accounting file. The default directory is:

     `/usr/NWAYS/log`

     You may specify any other directory.

   - The name of the log files that contain accounting records. The default is `NBBS_acct_record_log`

   - The time interval between the automatic retrievals. The default is 120 minutes.

   Use the `nways_config_acct` command to modify the default values. See "nways_config_acct" on page 81.

A notification is sent to the Nways 2220 Switch Manager when the buffer is 50% full.

The log files are flat files suitable for processing by your accounting and billing interface applications.

Planning for Accounting at the Nways Switch Control Program Level

During the configuration, NCT requests whether accounting should be yes or no for every potential connection. Accounting must be planned in advance at initial configuration to avoid further configuration updates on connections that would not have been accounting-enabled.

Connection Data

Accounting files are made up of one or more *connection records.* There is one record from the initiator side and one record from the completor side for each monitored connection.

In each accounting record there are a variable number of *connection vectors*, each containing data fields about one aspect of the connection being described in the record.

This section describes the types of the connection records. They are grouped according to:

1. The type of record
2. The reason for creating the record.

Types of Connection Data

Basic Record Information
- Reason for record creation
- *abArc* name. It is an alphanumeric string that you must choose during network configuration. It is used by the Nways 2220 Switch Manager as the connection identifier.
- Network Connection Correlator (NCC). It is an internally generated number used by the NBBS network as the connection identifier.
- Time the record was created.

Static Data

This type of connection information always remains the same for the life of the connection. It is defined by you, or automatically by the Nways Switch Configuration Tool Version 2 during configuration or activation of the connection. The static data is made up of:

- The date and time of connection start (as seen from this end-point)
- The foreign traffic type
- The traffic mode
- The connection type
- The initial peak bit rate in the initiator completor direction
- The initial mean bit rate in the initiator to completor direction
- The initial mean burst length in the initiator to completor direction
- The initial peak bit rate in the completor to initiator direction
- The initial mean bit rate in the completor to initiator direction
- The initial mean burst length in the completor to initiator direction
- The initial non-NBBS traffic descriptors (if applicable)
- The node name of the initiator
- The port name of the initiator
- The network connection end-point (NCE) of the initiator
- The node name of the completor
- The port name of the completor
- The NCE of the completor

- The identifier of source in the foreign network
- The identifier of target in the foreign network
- The QoS of connection in the initiator to completor direction
- The QoS of connection in the completor to initiator direction. The QoS data is made up of:
  - The admission delay
  - The bandwidth adjustment supported
  - The reduced bandwidth on connection setup supported
  - The connection security supported
  - The delay category of the traffic carried (that is, reserved real time, reserved non-real time, and non-reserved)
  - The end-to-end transfer delay
  - The error packet ratio
  - The holding priority
  - The maximum number of hops
  - The non-disruptive path switching capability
  - The packet loss ratio
  - The requesting priority.
- The local connection identifier (for frame relay)
- The virtual circuit number (for frame relay)
- The circuit emulation service (CES) digital echo cancelation indicator
- The CES voice treatment.

Dynamic Data

This type of information is about a connection that either:

- Changes over time (for example, resource usage or a counter value at the instant of data collection).
- Is the result of one of several possible reasons (for example, the reason for ending a connection).

The dynamic data is made up of:

- The date and time of the connection end (as seen from this end-point)
- The reason for the terminating connection (for example, any sense code associated with connection termination).
- The connection equivalent capacity for each link in the initiator to completor direction. The parameters are the equivalent capacity, link buffer capacity, and loss probability.
- The connection equivalent capacity for each link in the completor to initiator direction.
- The connection metric or traffic descriptor in the initiator to completor direction. The parameters are the peak bit rate, average bit rate, and average burst duration.
- The connection metric or traffic descriptor in the completor to initiator direction.
- the connection path in the initiator to completor direction.
- The connection path in the completor to initiator direction.
- The connection setup duration.
- The periods of time for which the connection was unavailable.

- Counters for non-real time (non-CES) traffic through a port:
  - From a user device:
    - Total foreign bytes received
    - Total foreign frames received
    - Green bytes into the NBBS network
    - Green packets into the NBBS network
    - Red bytes into the NBBS network
    - Red packets into the NBBS network.
  - To a user device:
    - Total network bytes received
    - Total network packets received
    - Total foreign bytes transmitted
    - Total foreign frames transmitted.
- Error counters for non-real time traffic:
  - Total network bytes discarded
  - Total network frames discarded
  - Specific traffic counters are included according to the type of protocol access agent used by the connection: CES, HDLC, or frame relay.
- For real time (CES) traffic:
  - Total bytes received (into the NBBS subnet)
  - Total bytes transmitted (out of the NBBS subnet)
  - Sequence gaps received
  - Playout buffer underruns detected
  - Playout buffer overruns detected.

Reason for the Record Creation

Connection records contain different data depending on whether they were created in the connection initiator or in the connection completor.

Note: The fields present in a record refer to current data about the connection. For example, if a record is created because of a path change, the path included in that record is the *new* path. The previous path is in the previous connection record.

In the Initiator Nways Switch

The reasons for creating a connection record and the data types (refer to "Types of Connection Data" on page 51) included in each record sent from the connection initiator are:

- Connection initiation:
  - Basic record information. All fields are present.
  - Static data. All fields are present except:
    - Completor port name
    - Completor NCE
    - NBBS traffic descriptors in the completor to initiator direction.

    The following fields are present under certain conditions:

- Local connection identifier (for frame relay connections)
- Virtual circuit number (for frame relay connections)
- Non-NBBS traffic descriptors (if they were used to establish the connection).
  - Dynamic data. The following fields are present:
    - Connection path in initiator to completor direction
    - Counters, to establish a baseline for counters that are not reset to zero.
- Connection termination:
  - Basic record information. All fields are present.
  - Dynamic data. The following connection termination data is present:
    - End of connection date and time (as seen from this end-point).
    - Reason for terminating connection (for example, any sense code associated with connection termination).

  All other supported fields that apply to the initiator to completor path are present.

  Note: "Supported fields" refers to the fact that the following data is optional:
  - Connection equivalent capacity
  - Error counters
  - Period of time for which a connection was unavailable.
- When the operator requests accounting data collection:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the initiator to completor path are present.
- For a scheduled periodic collection:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the initiator to completor path are present.
- When bandwidth, in either direction, is changed:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the initiator to completor path are present.

  The amount of change necessary to trigger a record creation is set in the potential connection definition.
- When a connection is rerouted:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the initiator to completor path are present.
- When Nways 2220 Switch Manager issues a start accounting command and connections exist with accounting enabled in their potential connections:
  - Basic record information. All fields are present.
  - Static data. All fields are present except the completor port name and completor NCE and NBBS traffic descriptors.
  - Dynamic data. Connection path in the initiator to completor direction

In the Completor Nways Switch

The reasons for creating a connection record and the data types (refer to "Types of Connection Data" on page 51) included in each record sent from the connection completor are:

- Connection initiation:
  - Basic record information. All fields are present.
  - Static data. The following fields are present:
    - Node name of initiator
    - Node name of completor
    - Port name of completor
    - NCE of completor
    - Identifier of source in foreign network
    - Identifier of target in foreign network
    - Local connection identifier (only for frame relay)
    - Virtual circuit number (only for frame relay)
    - Initial peak bit rate in the completor to initiator direction
    - Initial mean bit rate in the completor to initiator direction
    - Initial mean burst length in the completor to initiator direction.
  - Dynamic data. The following fields are present:
    - Connection path in initiator to completor direction
    - Counters, to establish a baseline for counters that are not reset to zero.
- Connection termination:
  - Basic record information. All fields are present.
  - Connection termination characteristics. All fields are present.
  - Dynamic data. The following connection termination data are present:
    - End of connection date and time (as seen from this end-point).
    - Reason for terminating connection (for example, any sense code associated with connection termination).

    All other supported fields that apply to the initiator to completor path are present.
- When the operator requests accounting data collection:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the completor to initiator path are present.
- For a scheduled periodic collection:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the completor to initiator path are present
- When bandwidth, in either direction, is changed:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the completor to initiator path are present.

    The amount of change necessary to trigger a record creation is set in the potential connection definition.

- When a connection is rerouted:
  - Basic record information. All fields are present.
  - Dynamic data. All supported fields that apply to the completor to initiator path are present.
- When the Nways 2220 Switch Manager issues a start accounting command and connections exist with accounting enabled in their potential connections:
  - Basic record information. All fields are present.
  - Static data. The following fields are present:
    - Node name of initiator
    - Node name of completor
    - Port name of completor
    - NCE of completor
    - Identifier of source in foreign network
    - Identifier of target in foreign network
    - Local connection identifier (only for frame relay)
    - Virtual circuit number (only for frame relay).
- Dynamic data. Connection path in completor to initiator direction.

Accounting Application Planning: Records and Vectors

The structure of the accounting data is explained in "Record and Vector Structure".

Using the keys described in section "Description of Connection Vectors for Accounting" on page 58, your accounting application can choose among all the records, and among the connection vectors, the data fields that it needs.

Record and Vector Structure

Connection Records

Each connection record in an accounting file begins with a 4-byte length field followed by a 2-byte key of X'0001'. The length field includes the six bytes of length and key fields.

Note: The connection records can appear in any order in the accounting file.

Connection Vectors

Each connection record, consists of a variable number of vectors (see Figure 9):

- The *first two* bytes form the *length* field value. This is the total length of the record (including the 2-byte length field).
- The *third* byte is the *key* field, which describes the type of connection vector it is.
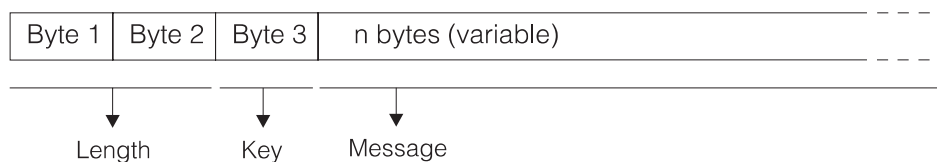- The *remaining* bytes are the *code points* which contain statistics and other information about the connection.

Figure 9. A Connection Vector

The vectors can appear in any order in the records. Depending on the type of connection involved, certain vectors may not be in a record. Your accounting application may have to sort the vectors in a record to find the particular information that it needs.

In the vectors:
- All character bytes are in ASCII (IBM code table 819).
- All number bytes are octal strings (the binary string is the actual number).
- Numbers are written with the most significant figure (byte) first.

Starting with the third byte, the vectors are described in detail in "Description of Connection Vectors for Accounting" on page 58.

Description of Connection Vectors for Accounting

The connection vectors are described in this appendix, starting with their *third* byte (the key field).

Key = X'01' - Name of the Nways Switch that Sent the Record

Record length: Variable.

Byte   Description

3 to n Name of the Nways Switch that sent the record. The name is encoded as an ASCII character string (IBM 1134-819 code set).

Key = X'02' - Date and Time that the Record Was Created

This vector is present in every record.

Record length: 28 bytes.

Byte   Description

3 to 27
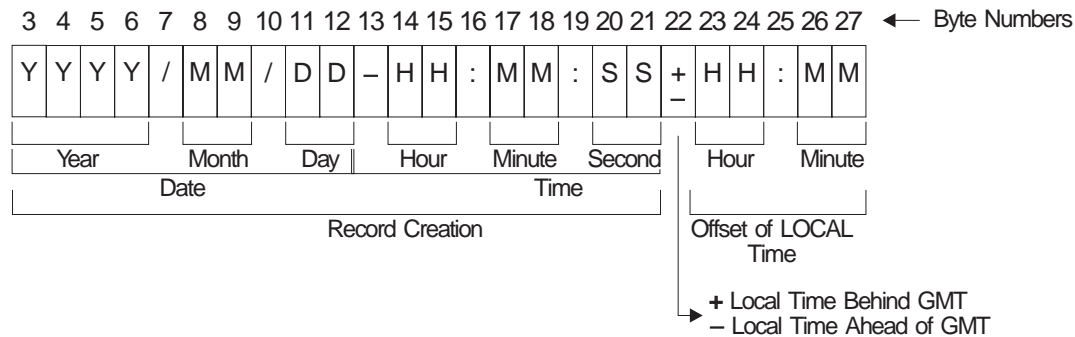Date and time that the record was created. See Figure 10.

Figure 10. Date and Time Format

The / (slash), – (dash), and : (colon) are separators.

The + or – in byte 24 indicates that the local time is either ahead of Greenwich Mean Time (GMT) time (– sign) or behind GMT time (+ sign).

Key = X'03' - Connection Record Characteristics

This vector is present in every record.

Record length: Variable.

Byte   Description

3   This field explains why the record was created:

   X'00'   Connection initiation.

   X'01'   Operator request.

X'02'   Significant bandwidth change.

X'03'   Connection reroute.

X'04'   Periodic collection.

X'05'   Connection termination.

X'06'   Data collection initiation.

X'07'   Connection re-initiation due to a recovery situation.

X'08'   Internal box error caused connection termination. The record is possibly incomplete.

4   Explains why a connection request flowed. The code points used are those from the Connection Request (X'2C3E') generalized data stream (GDS) variable with the exception of the X'00'. A code point of X'00' indicates that no connection request indication is included.

5 to 8   Network connection correlator for this connection. It is an internally generated number used by the NBBS network as the connection identifier.

9 to 33

Time the record was created at the agent. Refer to "Key = X'02' - Date and Time that the Record Was Created" on page 58 for the date and time format.

34, 35   Reserved.

36 to End

Specification of the connection by its *arcId* value. It is an ASCII character string (IBM 1134-819 code set) chosen by you during network configuration and used by the Nways 2220 Switch Manager as the connection identifier.

Key = X'04' - Connection Start Characteristics

This vector is present in the first record created for a connection in the initiator (originating) Nways Switch. This vector is not present in the case of a connection re-initiation (that is, if a connection was running and failed but is re-initialized due to an error recovery scenario). This condition is indicated by an X'03' vector with an X'07' code in the reason field.

Record length: 6 bytes.

Byte   **Description**

3   Foreign traffic type as specified by the value of the *foreignTrafficType* attribute of the *abPort* object.

4   Traffic mode as specified by the value of the *trafficMode* attribute of the *abArc* object.

5   Connection type:

X'00'   Permanent virtual circuit (PVC).

X'01'   Switched virtual circuit (SVC).

Key = X'05' - NBBS End-Point Identifiers

This vector is present in the first record created for a connection by both the initiator (originating) and completor (destination) Nways Switches.

Record length: Variable.

Byte   **Description**

3   Length (i) of the name of the initiator (originating) Nways Switch.

4 to (4+i-1)
Initiator name (ASCII string).

(i+4)   Length (j) of the name of the completor (destination) Nways Switch.

(i+5) to (i+5+j-1)
Completor name (ASCII string).

(i+j+5)   Length (k) of the local port name.

(i+j+6) to (i+j+6+k-1)
Local port name (ASCII string).

(i+j+k+6)
Length (m) of the local network connection end-point identifier (NCE ID).

(i+j+k+7) to (i+j+k+7+m-1)
Local NCE ID. The octet string value of the *networkConnectionEnd pointId* attribute of the *abConnection* object at this connection end-point.

Key = X'06' - Foreign Network End-Point Identifiers

This vector is present in the first record created for a connection by both the initiator (originating) and completor (destination) Nways Switches.

Record length: Variable.

Byte   **Description**

3 to 4   Type of foreign network source resource. This is the octet string value of the *sourceResourceIdType* attribute of the *abArc* object that is an abstraction of this connection.

5 to 6   Length (i) of the foreign network source resource identifier

7 to (7+i-1)
The value of the *sourceResourceId* attribute of the *abArc* object that is an abstraction of this connection.

(i+7) to (i+8)
Type foreign network target resource. This is the octet string value of the *targetResourceIdType* attribute of the *abArc* object that is an abstraction of this connection.

(i+9) to (i+10)
Length (j) of the foreign network target resource identifier.

(i+11) to (i+11+j-1)
The value of the *targetResourceIdType* attribute of the *abArc* object that is an abstraction of this connection.

Key = X'07' - Outgoing (Origin to Destination) QoS Parameters

This vector is present in the first record created for a connection in the initiator (originating) Nways Switch when the parameters can completely specify the QoS for the connection in the origin to destination direction.

Record length: 30 bytes.

Byte   Description

3   Connection security required:

     X'00'   No.

     X'01'   Yes.

4   Non-disruptive path switching required:

     X'00'   No.

     X'01'   Yes.

5   Admission control may request adjustment of the bandwidth of this connection:

     X'00'   No.

     X'01'   Yes.

6   Bandwidth may be reduced to establish a connection:

     X'00'   No.

     X'01'   Yes.

7 to 10
     Error packet ratio (IEEE format, 4-byte floating point).

11 to 14
     Packet loss ratio (IEEE format, 4-byte floating point).

15 to 18
     End-to-end transfer delay (microseconds: IEEE format, 4-byte floating point).

19 to 22
     Admission delay (microseconds: IEEE format, 4-byte floating point).

23 to 26
     Maximum number of hops (4-byte unsigned integer).

27   Delay priority traffic class where:

     X'01'   Real time 1 (RT1).

     X'02'   Real time 2 (RT2).

     X'03'   Non-real time (NRT).

     X'04'   Best effort.

28   Holding priority (integer in the range of 0 to 64).

29   Requesting priority (integer in the range of 0 to 64).

Key = X'08' - Incoming (Destination to Origin) QoS Parameters

This vector is present in the first record created for a connection in the completor (destination) Nways Switch when the parameters in this vector can completely specify the QoS for the connection in the destination to origin direction.

Record length: 30 bytes.

Byte   Description

3 to 29

Same as the fields of the X'07' vector except that these values describe the QoS parameters in the destination to origin direction.

Key = X'0A' - Virtual Circuit Information

This vector is present in the first record created for a connection supporting a frame relay virtual circuit by both the initiator (originating) and completor (destination) Nways Switches.

Record length: 11 bytes.

Byte   Description

3 to 6   Local connection identifier (4-byte integer).

7 to 10

Virtual circuit number (4-byte integer).

Key = X'0C' - Traffic Descriptor

This vector is present in:

- The first record created for a connection in the initiator Nways Switch
- Every record created after a significant bandwidth change.

A significant bandwidth change is any change greater than the percentage specified in the Bandwidth sensitivity field of the accounting parameters (X'1D') control vector.

Record length: 15 bytes.

The following values are related to the connection for which this end-point is responsible. These values are relevant only when r, m, and b parameters are provided for the bandwidth management. In other cases, that are specific to the protocol used, the values are set to zero.

Byte   Description

3 to 6   Peak bit rate of the connection for the path this endpoint is responsible for.

7 to 10

Mean bit rate of the connection for the path this endpoint is responsible for.

11 to 14

Mean burst rate of the connection for the path this endpoint is responsible for.

Note: All of these fields are IEEE format, 4-byte floating point numbers.

Key = X'0E' - Non-Real-Time Traffic Counters

This vector is present in every record reporting non-real-time traffic. The first record containing this vector in each end-point of a connection must convey the counts before there is any traffic over the connection. This provides a baseline for counters that are not reset.

Record length: 83 bytes.

Byte   Description

3 to 10
> Total foreign bytes received.

11 to 18
> Total foreign frames received.

19 to 26
> Green bytes through (not supported, all bits set to zero).

27 to 34
> Green packets through.

35 to 42
> Red bytes through (not supported, all bits set to zero).

43 to 50
> Red packets through.

51 to 58
> Total network bytes received (not supported, all bits set to zero).

59 to 66
> Total network packets received (not supported, all bits set to zero).

67 to 74
> Total foreign bytes transmitted.

75 to 82
> Total foreign frames transmitted.

Note: All of these fields are 8-byte integer.

Key = X'0F' - Non-Real-Time Error Counters

This vector is present, if supported by the agent, in every record that is reporting non-real-time traffic. The first record containing this vector in each end-point of a connection must convey the counts before there is any traffic over the connection. This provides a baseline for counters that are not reset.

Record length: 35 bytes.

Byte   Description

3 to 10
> Total network bytes discarded (8-byte integer). This is the number of bytes successfully transmitted across the network, but not sent to a foreign network (not supported, all bits set to zero).

11 to 18
> Total network frames discarded (8-byte integer). This is the number of frames that had been successfully transmitted across the network, but could not be recreated (not supported, all bits set to zero).

19 to 26
> Total queue bytes discarded (8-byte integer).

27 to 34
> Total queue packets discarded (8-byte integer).

Key = X'11' - Connection Termination Characteristics

This vector is present in the last record created for a connection by both the initiator (originating) and completor (destination) Nways Switches.

Record length: 8 bytes.

Byte   Description

3   Disconnect reason. The code points used are those from the Connection Request (X'2C3E') generalized data stream (GDS) variable with the exception of the X'00'. A code point of X'00' indicates no disconnect reason is present.

4 to 7   Why the connection has terminated. This vector is present if and only if the Sense Data (X'7D') control vector flowed during connection termination.

Key = X'12' - Adaptation Limits

This vector is present in the first record created for a connection in the initiator (originating) Nways Switch, if adaptation limits are used.

Record length: 19 bytes.

Byte   Description

3 to 6   Minimum bandwidth of the connection, initiator (originating) to completor (destination) direction.

7 to 10

          Maximum bandwidth of the connection, initiator to completor direction.

11 to 14

          Minimum bandwidth of the connection, completor to initiator direction.

15 to 18

          Maximum bandwidth of the connection, completor to initiator direction.

Note: All of these fields are IEEE format, 4-byte floating point numbers.

Key = X'13' - Network Traffic Received Counters

This vector is present, if supported by the access agent, in every record reporting traffic count for a connection supporting non-real-time traffic. The first record containing this vector in each endpoint of a connection must convey the count before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 35 bytes.

Byte   Description

3 to 10

          Total green bytes received.

11 to 18

          Total red bytes received.

19 to 26

          Total green packets received.

27 to 34
> Total red packets received.

Note: All of these fields are 8-byte integer.

Key = X'14' - Continuous Bit Rate (CBR) Specific Characteristics

This vector is present in the first record created for a connection in the initiator (originating) Nways Switch, if the connection supports CBR traffic.

Record length: 5 bytes.

Byte   Description

3   Digital echo cancellation required:

> **X'00'**   No.
>
> **X'01'**   Yes.

4   Voice treatment as specified by the value of the compression subfield in the voice context sensitive control vector (CSVC) in the Export generalized data stream (GDS) variable.

Key = X'15' - Real-Time Traffic Counters

This vector is present in every record reporting real-time traffic.

The first record containing this vector in each end-point of a connection must convey the counts before there is any traffic over the connection. This provides a baseline for counters that are not reset.

Record length: 31 bytes.

Byte   Description

3 to 6   Total playout buffer overruns (4-byte integer).

7 to 10
> Total playout buffer underruns (4-byte integer).

11 to 14
> Total sequence gaps received (4-byte integer).

15 to 22
> Total bytes received (8-byte integer).

23 to 30
> Total bytes transmitted (8-byte integer).

Key = X'16' - CBR Compression Counters

This vector is present, if supported by the access agent, in every record reporting traffic counts for a connection supporting CBR traffic. The first record containing this vector in each endpoint of a connection must convey the counts before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 51 bytes.

Byte   Description

3 to 10

> Total compressed bytes received: the total number of bytes received in protocol data units that were in compressed format.

11 to 18

> Total compressed bytes transmitted: the total number of bytes transmitted in protocol data units that were in compressed format.

19 to 26

> Total green packets through: the total number of bytes of all traffic types which were delivered and were within the connection's reserved bandwidth rate.

27 to 34

> Total red packets through: the total number of real-time and non-realtime bytes which were delivered over and above the reserved bandwidth rate.

35 to 42

> Total green packets received: the total number of bytes in packets received in protocol data units that were within the traffic contract.

43 to 50

> Total red packets received: the total number of bytes in packets received in protocol data units that were within the traffic contract.

Key = X'20' - Frame-Relay Initial Traffic Descriptors

This vector is present in the first record created for a connection in the origin node, if frame-relay native mode is used for this connection.

Record length: 31 bytes.

Byte   Description

3 to 6 Access rate.

7 to 10

> Committed burst size incoming.

11 to 14

> Committed information rate incoming.

15 to 18

> Excess burst size incoming.

19 to 22

> Committed burst size outgoing (not supported, all bits set to zero).

23 to 26

> Committed information rate outgoing (not supported, all bits set to zero).

27 to 30

> Committed burst size outgoing (not supported, all bits set to zero).

Note: All of these fields are IEEE format, 4-byte floating point numbers.

Key = X'21' - Frame-Relay Connection Counters

This vector is present in every record that is reporting traffic counts for a connection supporting frame relay traffic. This provides a baseline for counters that are not reset.

Record length: 71 bytes.

Byte   **Description**

3 to 6   Errored frames received (4-byte integer, not supported, all bits set to zero).

7 to 14
> Total bytes above BC received (8-byte integer, not supported, all bits set to zero).

15 to 22
> Total bytes above BC transmitted (8-byte integer).

23 to 30
> Total bytes received (8-byte integer).

31 to 38
> Total bytes transmitted (8-byte integer).

39 to 46
> Total frames above BC received (8-byte integer).

47 to 54
> Total frames above BC transmitted (8-byte integer).

55 to 62
> Total frames received (8-byte integer).

63 to 70
> Total frames transmitted (8-byte integer).

Key = X'22' - Frame-Relay Congestion Counters

This vector is present in every record that is reporting traffic counts for a connection supporting frame relay traffic. The first record containing this vector in each endpoint of a connection must convey the counts before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 11 bytes.

Byte   **Description**

3 to 6   Total BECN frames initiated (4-byte integer).

7 to 10
> Total FECN frames initiated (4-byte integer).

Key = X'23' - Frame-Relay Discard Counters

This vector is present in every record that is reporting traffic counts for a connection supporting frame relay traffic.

Record length: 27 bytes.

Byte   **Description**

3 to 6   Total DE frames congestion discards (4-byte integer).

7 to 14
> Total DE frames received (8-byte integer).

15 to 18
> Total DE frames received in error (4-byte integer, not supported, all bits set to zero).

19 to 26
> Total DE frames transmitted (8-byte integer).

Key = X'24' - Frame-Relay Excess Counters

This vector is present, if supported by the agent, in every record that is reporting traffic counts for a connection supporting frame-relay traffic. The first record containing this vector in each endpoint of a connection must convey the counts before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 11 bytes.

Byte   Description

3 to 6 Total frames above BE received (4-byte integer).

7 to 10
> Total frames above BE transmitted (4-byte integer).

Key = X'25' - Frame-Relay Forwarded Counters

This vector is present in every record that is reporting traffic counts for a connection supporting frame relay traffic.

Record length: 35 bytes.

Byte   Description

3 to 10
> Total bytes forwarded on the connection by the Nways Switch or the frame handler (8-byte integer, not supported, all bits set to zero).

11 to 18
> Total bytes above BC forwarded on the connection by the Nways Switch or the frame handler (8-byte integer).

19 to 26
> Total frames above BC forwarded on the connection by the Nways Switch or the frame handler (8-byte integer).

27 to 34
> Total frames forwarded on the connection by the Nways Switch or the frame handler (8-byte integer).

Key = X'30' - Asynchronous Transfer Mode (ATM) Initial Traffic Descriptors

This vector is present in the first record created for a connection in the origin node if ATM native mode is used for this connection.

Record length: Variable

Byte   Description

3 to 6 First ATM traffic descriptor parameter in the origin to destination direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the origin to destination direction.

7 to 10

First ATM traffic descriptor parameter in the destination to origin direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the destination to origin direction.

11 to 14

Second ATM traffic descriptor parameter in the origin to destination direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the origin to destination direction.

15 to 18

Second ATM traffic descriptor parameter in the destination to origin direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the destination to origin direction.

19 to 22

Third ATM traffic descriptor parameter in the origin to destination direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the origin to destination direction.

23 to 26

Third ATM traffic descriptor parameter in the destination to origin direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the destination to origin direction.

27 to 30

Fourth ATM traffic descriptor parameter in the origin to destination direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the origin to destination direction.

31 to 34

Fourth ATM traffic descriptor parameter in the destination to origin direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the destination to origin direction.

35 to 38

Fifth ATM traffic descriptor parameter in the origin to destination direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the origin to destination direction.

39 to 42

Fifth ATM traffic descriptor parameter in the destination to origin direction. Whether the parameter is to be used in the traffic description is determined by the value of the ATM traffic descriptor type in the destination to origin direction.

43   Length (=i) of the ATM traffic descriptor type in the origin to destination direction.

44 to (44+i-1)

ATM traffic descriptor type origin to destination. Specified as an object identifier expressed as an ASCII character string drawn from the set {0,1,2,3,4,5,6,7,8,9,.}

i+44 Length (=j) of the ATM traffic descriptor type in the destination to origin direction.

(i+45)-(i+45+j-1)
ATM traffic descriptor type destination to origin. Specified as an object identifier expressed as an ASCII character string drawn from the set {0,1,2,3,4,5,6,7,8,9,.}

Key = X'31' - ATM Virtual Channel and Virtual Path Connection Characteristics

This vector is present in the first record created for a connection, in each of the origin and destination nodes (for connections supporting ATM traffic).

Record length: 12 bytes.

Byte   **Description**

3   Connection endpoint type. The following codes apply:

      X'00'   Virtual channel.

      X'01'   Virtual path.

4   Policing function supported for control of received traffic. The following codes apply:

      X'00'   Policing function is not supported.

      X'01'   Policing function is supported.

5 to 8 Shaper speed. For example, the maximum speed at which a workstation may accept data (IEEE 4-byte floating point number).

9   Shaping function supported for transmitted traffic. The following codes apply:

      X'00'   Shaping function is not supported

      X'01'   Shaping function is supported

10   ATM receive QoS class. For example, the ATM traffic pattern associated with this connection endpoint for the receive direction specified as an integer (0 to 255).

11   ATM transmit QoS class. For example, the ATM traffic pattern associated with this connection endpoint for the transmit direction specified as an integer (0 to 255).

Key = X'32' - ATM Connection Counters

This vector is present in every record that is reporting traffic counts for a connection supporting ATM traffic.

Record length: 75 bytes.

Byte   **Description**

3 to 6 Total cells discarded (4-byte integer).

7 to 14
Total cells received (8-byte integer).

15 to 22
> Total cells transmitted (8-byte integer).

23 to 30
> Total cells loss priority 0 (CLP0) cells received (8-byte integer).

31 to 38
> Total cells loss priority 1 (CLP1) cells received (8-byte integer).

39 to 46
> Total CLP0 cells transmitted (8-byte integer).

47 to 54
> Total CLP1 cells transmitted (8-byte integer).

55 to 62
> Total explicit forward congestion indication (EFCI) cells received (4-byte integer).

63 to 66
> Operation, administration, and maintenance (OAM) cells received (4-byte integer).

67 to 70
> OAM cells transmitted (4-byte integer).

71 to 74
> OAM errored cells received (4-byte integer, not supported, all bits set to zero).

Key = X'33' - ATM Marked Cells Counters

This vector is present in every record that is reporting traffic counts for a connection supporting ATM traffic.

Record length: 35 bytes.

Byte   Description

3 to 6   Total cells marked 0 to 1 (4-byte integer).

7 to 10
> Total cell loss priority 0 (CLP0) buffer discards (4-byte integer, not supported, all bits set to zero).

11 to 14
> Total CLP0 line discards (4-byte integer, not supported, all bits set to zero).

15 to 18
> Total CLP0 policing discards (4-byte integer).

19 to 22
> Total cell loss priority 1 (CLP1) buffer discards (4-byte integer, not supported, all bits set to zero).

23 to 26
> Total CLP1 line discards (4-byte integer, not supported, all bits set to zero).

27 to 30
> Total CLP1 policing discards (4-byte integer).

31 to 34
> Total explicit forward congestion indication (EFCI) cells transmitted (4-byte integer, not supported, all bits set to zero).

Key = X'34' - ATM Extra Discard Counters

This vector is present in every record that is reporting traffic counts for a connection supporting ATM traffic. The first record containing this vector in each endpoint of a connection must convey the counts before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 11 bytes.

Byte   Description

3 to 6   Total cells discarded not due to policing by the Nways Switch (4-byte integer).

7 to 10
Total cells discarded due to congestion by the Nways Switch (4-byte integer).

Key = X'35' - ATM Cells Forwarded Counters

This vector is present in every record that is reporting traffic counts for a connection supporting ATM traffic. The first record containing this vector in each endpoint of a connection must convey the counts before any traffic has flowed over the connection. This provides a baseline for counters that are not reset.

Record length: 27 bytes.

Byte   Description

3 to 10
Total cells forwarded on the connection by the Nways Switch.

11 to 18
Total CLP0 cells forwarded on the connection by the Nways Switch.

19 to 26
Total CLP1 cells forwarded on the connection by the Nways Switch.

Note: All of these fields are 8-byte integer.

Key = X'41' - ISDN Calling Party Traffic Descriptors

This vector is present in every record that is reporting traffic counts for a connection supporting ISDN traffic.

Record length: Variable.

Byte   Description

3   Calling party type, octet 3 of the calling party number information element.

4   Calling party screening, octet 3a of the calling party number information element.

5   Length of the calling party number.

6 to n   Calling party number, a maximum of 20 digits of the calling party number.

Key = X'42' - ISDN Called Party Traffic Descriptors

This vector is present in every record that is reporting traffic counts for a connection supporting ISDN traffic.

Record length: Variable.

Byte   **Description**

3   Called party type, octet 3 of the called party number information element.

4   Reserved.

5   Length of the calling party number.

6 to n Called party number, a maximum of 20 digits of the called party number.

Key = X'43' - ISDN Bearer Capability Traffic Descriptors

This vector is present in every record that is reporting traffic counts for a connection supporting ISDN traffic.

Record length: 4 bytes.

Byte   **Description**

3   Bearer mode, octet x of the bearer capability information element. Values for this byte may be:

> **x0x'01'**
> Circuit mode, speech, MU-law
>
> **x0x'02'**
> Circuit mode, audio 3.1kHz, MU-law
>
> **x0x'03'**
> Circuit mode, speech, A-law
>
> **x0x'04'**
> Circuit mode, audio 3.1kHz, A-law
>
> **x0x'05'**
> Circuit mode, unrestricted digital info
>
> **x0x'06'**
> Circuit mode, restricted digital info
>
> **x0x'07'**
> Circuit mode, audio 7kHz
>
> **x0x'08'**
> Circuit mode, videotelephony
>
> **x0x'09'**
> Call independent.

Key = X'44' - ISDN Facility Usage Descriptors

This vector is present in every record that is reporting traffic counts for a connection supporting ISDN traffic.

Record length: 4 bytes.

Byte   **Description**

3   Adapter line number.

4   Channel usage, a descriptor indicating the call capability of the channel(s) (2 = incoming setup only. 3 = outgoing setup only. 4 = bidirectional setup).

Accounting Application Commands

This section describes the accounting application commands that must be issued from an AIX command line interface on the network management station.

nways_list_acct_enabled

Purpose

This command displays the list of networks or nodes (Nways Switches) for which accounting is enabled.

Format

```
►►──nways_list_acct_enabled ─┬──────────────────────────────────┬──►◄
                             │      ┌──────────┐                 │
                             ├─ -nbbs ──────────────────────────┤
                             │                                   │
                             ├─ -network ──┬── network_name ──┬──┤
                             │             └◄─────────────────┘  │
                             │        ┌◄─────────────────┐       │
                             └─ -node ──┬── node_name ──┬─────────┘
                                        └◄──────────────┘
```
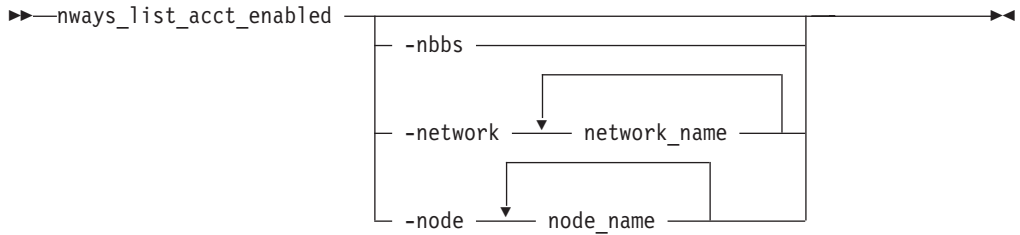
Parameters

-nbbs
> Tells you if accounting is enabled for NBBS and lists the network(s) for which accounting is enabled. This is the default option.

-network
> Lists the specified networks for which accounting is enabled and the nodes of these networks for which accounting is enabled.

-node
> Lists the specified nodes for which accounting is enabled.

Comments

You can not specify more than one option in a command line.

nways_start_acct

Purpose

This command starts the accounting application for the specified NBBS networks or specified Nways Switches (nodes).

Format

```
►►──nways_start_acct ─┬─────────────────────────────────────┬──────────────────►◄
                      │   ┌─ -nbbs ─┐                        │
                      ├─ -network ──┬──◄── network_name ──┬──┤
                      │             └──────────────────────┘  │
                      │             ┌──────────────────────┐  │
                      └─ -node ─────┴──◄── node_name ───────┘
```
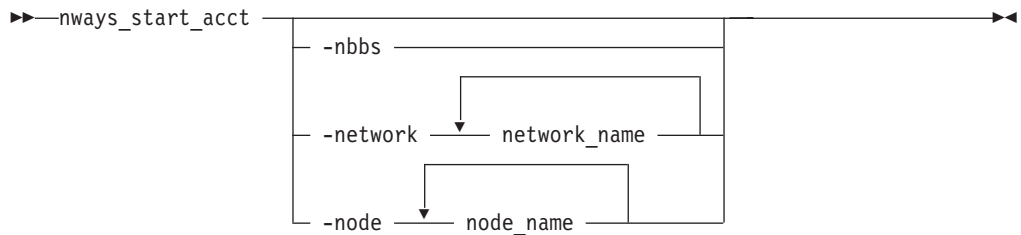
Parameters

-nbbs
   Starts the accounting for all managed nodes. This is the default option.

-network
   Starts the accounting for all nodes in the specified networks.

-node
   Starts the accounting only for the specified nodes.

Comments

You can start the collection on individual nodes or networks. Accounting can also be started at the NBBS protocol level.

Starting a network collection means that the collection is started on every node in the network and on every node that joins the network.

Starting the collection at the NBBS protocol level means that:
- All the networks that are later added to the management domain are automatically accounting-enabled.
- All the nodes in the network or that join the network are also accounting-enabled.
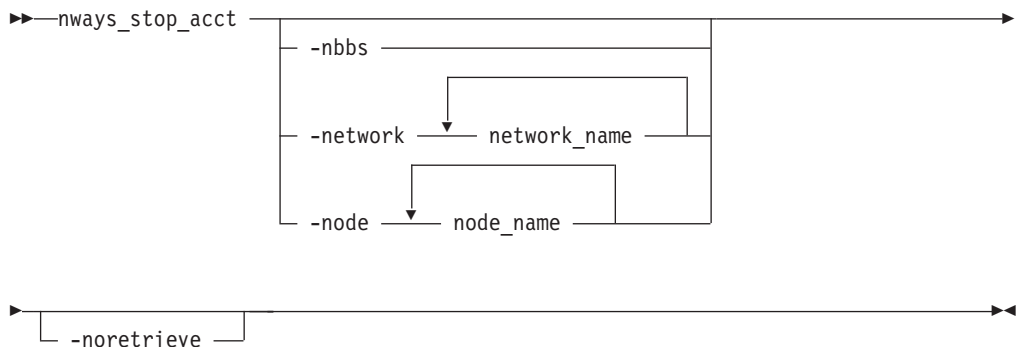
nways_stop_acct

Purpose

This command stops the accounting for the specified NBBS networks or specified Nways Switches (nodes).

You can stop the collection of accounting data at any time. When stopping the collection, you can decide:
* To retrieve the data and record it into a file
* Not to retrieve the data and therefore lose it.

Format

```
►►──nways_stop_acct──┬──────────────────────┬──────────────────────►
                     │   ┌─ -nbbs ─┐        │
                     │   ├─ -network ──┬─ network_name ─┤
                     │   └─ -node ──┬─ node_name ─┘     │
                     └──────────────────────┘

►──┬───────────────┬──────────────────────────────────────────►◄
   └─ -noretrieve ─┘
```

Parameters

-nbbs
　　Stops the accounting for all managed nodes. This is the default option.

-network
　　Stops the accounting for all nodes in the specified networks.

-node
　　Stops the accounting for the specified nodes only.

-noretrieve
　　Specifies that accounting data is not to be retrieved from the specified targets. If this option is not specified, accounting data is retrieved from all nodes specified by the other option and for which accounting is enabled.

Comments

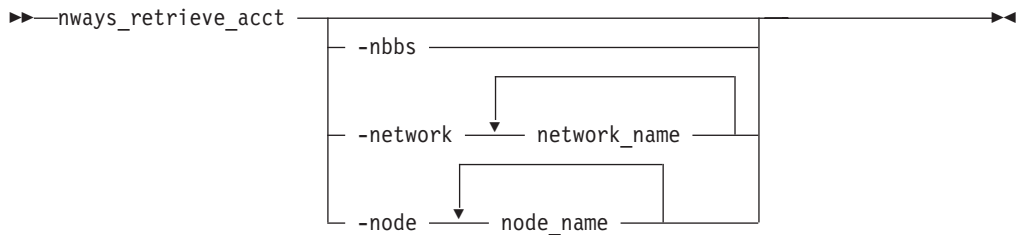The -noretrieve option can be used with any other option.

nways_retrieve_acct

Purpose

This command retrieves accounting data for the specified NBBS networks or specified Nways Switches (nodes).

Data can be automatically or manually retrieved. In case of automatic retrieval, data is retrieved at regular periods. You specify the period when preparing the data retrieval. Refer to the `nways_config_acct` command ("nways_config_acct" on page 81).

Format

```
>>--nways_retrieve_acct --+------------------------------+-------><
                          |                              |
                          +-- -nbbs --------------------+
                          |                              |
                          |           <--------------+   |
                          +-- -network --+-- network_name --+
                          |                                  |
                          |           <--------------+       |
                          +-- -node --+-- node_name --+------+
```

Parameters

-nbbs
Retrieves the accounting data from all the managed nodes for which accounting is enabled. This is the default option.

-network
Retrieves the accounting data from all nodes in the specified networks for which accounting is enabled.

-node
Retrieves accounting data from the specified nodes if accounting is enabled for them.

Comments

You can not specify more than one option in a command line.

nways_snapshot_acct

Purpose

This command asks the NASs (Nways Switch administration stations) of the specified nodes to record accounting data for all the connections for which accounting is enabled.

When you use the `nways_snapshot_acct` command, the generated *intermediate data* are recorded in the accounting log file. To retrieve the data use the `nways_retrieve_acct` command (refer to "nways_retrieve_acct" on page 79).

Format

```
►►──nways_snapshot_acct ──── -node ──┬──► node_name ──┬── -timeout ── time ──────►◄
                                     └◄─────────────┘
```
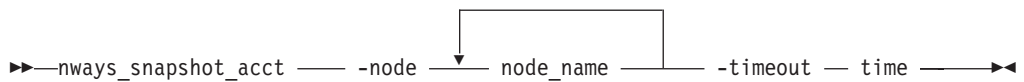
Parameters

-node
> Asks the NASs of the specified nodes to record accounting data for all the accounting-enabled connections.

-timeout
> If no response is received from the adapter during the time specified (in minutes), the command is terminated.

Comments

You can monitor the intermediate accounting:
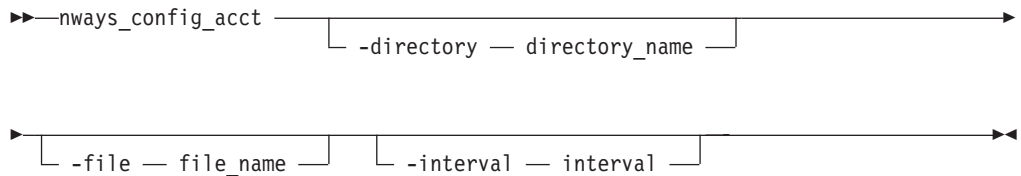
- Manually by issuing the `nways_snapshot_acct` command on the command line.
- Automatically by writing an AIX script shell to schedule the execution of the `nways_snapshot_acct` command. To do so, you can use an AIX scheduling mechanism such as the `at` or `crontab` command. For more information about these commands, enter `man at` and `man crontab`, or refer to the AIX documentation.

nways_config_acct

Purpose

This command sets the configuration parameters used by the accounting application.

Format

```
►►──nways_config_acct ──────────────────────────────────────────────────►
                          └─ -directory ── directory_name ─┘

►─────────────────────────────────────────────────────────────────────►◄
    └─ -file ── file_name ─┘   └─ -interval ── interval ─┘
```

Parameters

-directory

Specifies the directory where the accounting log file is stored. The default directory is: /usr/NWAYS/log

If this option is omitted, the directory of the server from which NetView was invoked is used as the default directory for the accounting log file.

Note: You must use the -directory and -file options together if you want to change the directory name.

-file

Specifies the name of the accounting log file. The default name is: NBBS_acct_record_log

If this option is omitted, no changes are done for both the directory and the accounting log file names.

Note: If you do not specify the -directory option when using the -file option, the name of the accounting log file is changed and the name of the directory is reset.

-interval

Specifies the interval (in minutes) between automatic retrieval of accounting data. The default value is 120 minutes.
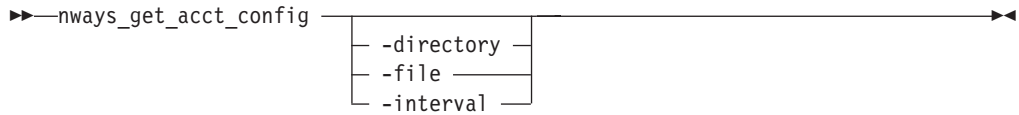
Specifying a negative value turns off the automatic retrieval. A value of zero is ignored, and the interval value is unchanged.

nways_get_acct_config

Purpose

This command shows the configuration parameters used by the accounting application.

Format

```
►►──nways_get_acct_config ──┬──────────────┬──────────────────────────────►◄
                            ├─ -directory ─┤
                            ├─ -file ──────┤
                            └─ -interval ──┘
```

Parameters

-directory
Displays the current default directory for the accounting log file.

-file
Displays the current name of the accounting log file.

-interval
Displays the current interval (in minutes) used between two automatic retrievals of accounting data.

Comments

You can not specify more than one option in a command line.

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Glossary

The following are the abbreviations and technical terms used in the 2220 Nways Switch library.

2220. The IBM 2220 Nways BroadBand Switch (also called Nways Switch) is a fast packet switch enabling high-speed communications over a broadband network. It implements the functions of the IBM Networking BroadBand Services (NBBS) architecture.

2220-300. 2220 Nways Switch Model 300.

2220-500. 2220 Nways Switch Model 500.

2220-501. 2220 Nways Switch Model 501.

2220 NSM. 2220 Nways Switch Manager

AAL. ATM adaptation layer.

ABR. Availability bit rate. A best effort service with a minimum bit rate and a maximum cell loss value.

ac. Alternating current.

access services. Functions that are performed by a port adapter of the IBM 2220 Nways BroadBand Switch to:
- Support the attachment of external user devices through port lines
- Prepare user data packets
- Control the input traffic on port lines
- Manage line protocols.

active remote connector (ARC). A connector that supplies the electrical and physical interfaces between a line interface coupler type 511 (LIC511) in an Nways Switch subrack and data circuit-terminating equipment (DCE) or data terminal equipment (DTE). ARCs are housed in line connection boxes (LCBs).

adapter. An Nways Switch module that can be used, depending on its hardware type and the code that it runs, as:

    Control point adapter
    Port adapter
    Trunk adapter
    Voice server adapter.

A trunk or port adapter is associated with a line interface coupler (LIC). A voice server adapter can be associated with a voice server extension (VSE).

ADPCM. Adaptive differential pulse code modulation.

AIS. Alarm indicator signal.

AIX. Advanced Interactive Executive.

alarm and power control (APC). In an Nways Switch, a module that connects the NAS, reports alarms, and controls the power supplies.

Alert Manager. An application that processes the SNA alerts received from IBM 3746s operating in IP mode.

AMI. Alternate mark inversion.

ANSI. American National Standards Institute.

APC. Alarm and power control (module).

AR. Access rate.

ARC. Active remote connector.

asynchronous transfer mode (ATM). A high-speed, connection-oriented switching and multiplexing protocol that transmits different types of traffic (voice, video, and data) simultaneously.

ATM. Asynchronous transfer mode.

ATMAn. ATM adapter type n (module).

ATM adaptation layer (AAL). In ATM devices, a set of protocols that adapt non-ATM devices to an ATM network. There are several classes of ATM adaptation layers which represent the main traffic types (for example, data, voice, and video).

ATM network interface. A logical resource generated by the Nways Switch Control Program to provide access services to a physical ATM port or trunk line. An ATM network interface sets up and maintains predefined ATM virtual connections.

AT&T. American Telephone & Telegraph (Company).

B8ZS. Bipolar eight-zero substitution.

Bc. Burst committed.

Be. Burst in excess.

bearer service profile (BSP). A set of parameters that defines a type of ISDN traffic (speech, audio, data, or video). One BSP is associated with each ISDN numbering plan table.

BECN. Backward explicit congestion notification.

B-ICI. Broadband inter-carrier interface.

BMI. Byte multiplexer interface.

BNC. Bayonet Niell-Concelman.

bps. Bit per second.

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bridge. A functional unit that interconnects two local area networks. A bridge works at the data link level (layer 2) of the OSI reference model.

broadband network. A network that uses a large frequency band to transport different kinds of traffic (such as coded voice, video, and data) at the same time.

BS. Bearer services.

BSC. Binary synchronous communication.

BSP. Bearer service profile.

BT. Burst tolerance.

bursty. Refers to transmission at variable bit rate where the time between data transmissions is not always the same.

CAC. Connection admission control.

CAS. Channel associated signaling.

CBR. Constant bit rate.

CCS. (1) Common channel signaling (2) Change control server (also called CC server).

CDB. Configuration database.

CDV. Cell delay variation.

CDVT. Cell delay variation tolerance.

cell loss priority (CLP). A priority bit in the ATM cell header. When set, it indicates that the cell can be discarded during traffic congestion.

centralized configuration database. A database prepared with the Nways Switch Configuration Tool Version 2 (NCT2) on a configuration station. It stores the parameters of a 2220 network.

CES. Circuit emulation services.

change control server (CCS or CC server). A station that runs the IBM NetView Distribution Manager for AIX to store the Nways Switch Control Program and to manage code changes.

CIR. Committed information rate.

circuit emulation services (CES). An access service that emulates a leased line. It transports information with a constant bit rate at the source and destination. The traffic can be PCM voice, video, fax, multimedia, or real-time synchronous data (such as BSC).

CLIP. Calling line identification presentation.

CLIR. Calling line identification restriction.

CLK. Clock (module).

CLKRD. Clock redrive (module).

clock module (CLK). A module of the 2220 Model 300 or 500 that transmits clock signals to the line interface couplers (LICs). It is optional and can have a backup.

clock redrive (CLKRD). A module of the 2220 Model 501 that drives the signals from the Model 500 clock module to the adapters of the Model 501. The clock redrive is optional and can have a backup.

clock references. In an Nways Switch, the software function that controls the transmission of clock signals to the LICs where they are used for bit synchronization.

CLP. Cell loss priority.

CMIP. Common management information protocol.

CMIS. Common management information services.

CMOT. CMIP over TCP/IP.

CNM. Communication network management.

code file. A named set of records stored as a unit in a change control server. An Nways Switch code file can include data or internal code.

COLP. Connected line identification presentation.

COLR. Connected line identification restriction.

configuration station. See Nways Switch configuration station.

control point (CP). In an Nways Switch, a logical resource that provides network control functions. It can have a backup.

CP. Control point.

CPA. Control point adapter (module).

CPE. Customer premises equipment.

CP spanning tree. In a 2220 network, a distribution tree that connects the Nways Switch control points through trunk lines. The CP spanning tree supplies a very fast and efficient way to multicast control messages such as network topology data.

CRC. Cyclic redundancy check.

CSU. Channel access unit.

CTD. Cell transfer delay.

data circuit-terminating equipment (DCE). An equipment installed on a user premises that provides all the functions required to establish, maintain, and terminate a connection, and to do the signal conversion

and coding between a data terminal equipment (DTE) and a line. A DCE can be separate piece of equipment or part of other equipment.

data terminal equipment (DTE). That part of a data station that serves as data source, data sink, or both, and provides the data communication control function depending on the type of protocol used.

dB. Decibel.

dBm. Decibel based on 1 milliwatt.

DC48. Dc power input type -48V

dc. Direct current.

DCD. Dc distribution (module).

DCE. Data circuit-terminating equipment.

DDI. Direct dialing-in.

DE. Discard eligibility.

decibel (dB). (1) One tenth of a bel. (2) A unit that expresses the ratio of two power levels on a logarithmic scale. (3) A unit for measuring relative power. The number of decibels is 10 times the logarithm (base 10) of the ratio of the measured power levels; if the measured levels are voltages (across the same or equal resistance), the number of decibels is 20 times the log of the ratio.

decibel based on 1 milliwatt (dBm). A unit of absolute power measurement that is scaled such that 0 dBm equals 1 milliwatt.

dialog box. On the screen of a station, an area with entry fields and push buttons. (Also called dialog.)

DLCI. Data link connection identifier.

DNPT. Destination numbering plan table.

DSP. Digital service processor.

DSU. Data service unit.

DTE. Data terminal equipment.

DTMF. Dual-tone modulation frequency.

DTR. Data terminal ready.

dummy module. In an Nways Switch, a cover inserted in the place of a module to ensure correct air cooling inside a logic subrack. During normal operation, the dummy modules must not be removed.

E1 standard. A European standard for TDM digital transmission service at 2.048 Mbps.

E3 standard. A European standard for TDM digital transmission service at 34.368 Mbps. An E3 line can transport up to 16 E1 circuits.

E&M. Earth & mark.

ECMA. European Computers Manufacturers Association.

EIA. Electronics Industries Association.

equivalent capacity. The minimum amount of bandwidth needed by a connection to ensure that the packet loss ratio is below a specified threshold.

ESF. Extended status flags.

ETS. European telecommunication standard.

FANB. Fan box.

FAT. File allocation table.

fax. Document received from a facsimile machine. Synonym for telecopy.

FCS. Frame check sequence.

FDDI. Fiber Distributed Data Interface.

FE1. Fractional E1.

FECN. Forward explicit congestion notification.

FEP. Front-end processor.

fiber. Synonym for optical fiber.

fiber budget. The optical power loss as result of the number of connections in the optical fiber link subtracted from the working budget. The loss as a result of connections includes connector loss and splice loss. The fiber budget is expressed in decibels.

Fiber Distributed Data Interface (FDDI). A U.S. standard for 100 Mbps token-ring LANs using optical fiber cables over distances of several kilometers.

fiber optic cable. Synonym for optical fiber.

FR. Frame relay.

FRAD. Frame-relay access device.

frame relay (FR). A connection-oriented protocol to transport data frames over a fast packet-network with guaranteed end-to-end quality of service.

FRFH. Frame-relay frame handler.

front-end processor (FEP). A processor, such as the IBM 3745, 3746 Model 900 or 950, or 3174, that relieves a main frame from communication control tasks.

FRTE. Frame-relay terminal equipment.

FRU. Field replaceable unit.

FT1. Fractional T1.

FTP. File transfer protocol.

Gbps. Gigabit per second (10 to the power of 9 bits per second).

GCRA. Generic cell rate algorithm.

GFP. Generic function protocol.

GFT. Generic function transport.

GSM. Group special mobile.

GUI. Graphical user interface.

HDB3. High-density bipolar 3.

HDLC. High-level data link control.

high-level data link control (HDLC). A data network protocol.

hot pluggable. Refers to a hardware component that can be installed or removed without disturbing the operation of any other resource that is not connected to, or dependent, on this component.

HPFS. High-performance file system.

HPRI. High priority.

HSAn. High-speed adapter type n (module).

HSDS. High-speed digital services.

HSSI. High-speed serial interface.

hub (intelligent). A wiring concentrator, such as the IBM 8260, that supplies bridging and routing functions for LANs with different cables and protocols.

hunt group. See X.25 hunt group.

IDNX. Integrated Digital Network Exchange.

IE. Information element.

ILMI. Interim local management interface.

IMU. Inverse multiplexing unit

Integrated Digital Network Exchange (IDNX). A processor integrating voice, data, and image applications. It also manages transmission resources and connects to multiplexers and network management support systems. It permits integration of equipment from different vendors.

integrated services digital network (ISDN). A digital end-to-end public or private network that supports multiple services including, but not limited to, voice and data.

IP. Internet Protocol.

IP gateway adapter. In an Nways Switch, a port adapter that routes the IP control between the NAS and the network management station.

ISDN. Integrated services digital network.

ISDN network interface. A logical resource generated by the Nways Switch Control Program to provide access services to a physical ISDN or QSIG port line. An ISDN network interface sets up and maintains connections between calling ISDN terminal equipments and called terminal equipments attached through other Nways Switches.

ISO. International Organization for Standardization.

isochronous. Refers to transmission at a constant bit rate where there is a clock relationship between source and destination. The bit rates are the same on the destination and source.

ITU-T. International Telecommunication Union - Telecommunication (replaces CCITT).

jitter. Undesirable variations in the transmission delay of a digital signal. Also called cell delay variation (CDV).

KB. Kilobyte (storage capacity, 1024 bytes).

kbps. Kilobit per second (1000 bits per second).

LAN. Local area network.

LAPB. Link access procedure for B-channel.

LAPD. Link access procedure for D-channel.

LCB. Line connection box.

LCBB. Line connection box, base (LCEB and LCPB).

LCBE. Line connection box, expansion (LCEE and LCPE).

LCEB. Line connection enclosure, base.

LCEE. Line connection enclosure, expansion.

LCPB. Line connection power, base.

LCPE. Line connection power, expansion.

LCR. Least cost routing.

LED. Light-emitting diode.

LICn. Line interface coupler type n (module).

line. In a 2220 network, any physical medium, such as a telephone wire, microwave beam, or optical fiber, that transmits information. A line can be a trunk line or a port line.

line connection box (LCB). A metallic box that:

- Multiplexes up to 15 low-speed lines. There can be up to four LCBs per LIC type 511 for a total of 60 lines (two LCBs and 30 lines per LIC connector).
- Reduces cable lengths between Nways Switch and DCE or DTE locations.

An LCB fits in a standard 19-inch rack. Each one houses up to 15 active remote connectors (ARCs).

line interface coupler (LIC). In an Nways Switch, a module that physically attaches trunk or port lines. Each line interface coupler is associated with a trunk or port adapter, and supports specific line interfaces.

LIV. Link integrity verification.

LMI. Local management interface.

local area network (LAN). A computer network located on a user premises in a limited geographical area.

logical port. (Also called NBBS port.) A logical resource generated by the Nways Switch Control Program to provide access services to a physical port line (or channel of a TDM port line) using HDLC, FR, or CES protocol. A logical port sets up and maintains its predefined connections.

logical trunk. (Also called NBBS trunk.) A logical resource generated by the Nways Switch Control Program to provide transport services to a physical trunk line (or channel of a TDM trunk line). A logical trunk is mainly responsible for optimizing bandwidth and maintaining the CP spanning tree.

LSAn. Low-speed adapter type n (module).

MA/SR. Multi-access/sub-rate.

management access. Refers to an Nways Switch that connects a network management station or a change control server to a 2220 network through its service bus, which is a dedicated Ethernet LAN.

MB. Megabyte (storage capacity, 1 048 576 bytes).

Mbps. Megabit per second (10 to the power of 6 bits per second).

MBS. Maximum burst size.

MLT. Multiple logical trunks.

module. In an Nways Switch, a hardware unit plugged in a slot of the logic subrack. It houses, for example, an

adapter, a line interface coupler, or a voice server extension. All modules are hot pluggable.

ms. Millisecond (1/1000 second).

NAS. Nways Switch administration station.

NBBS. Networking BroadBand Services (architecture).

NBBS architecture. See Networking BroadBand Services.

NBBS connection. See potential connection and virtual connection.

NBBS network. A network built with IBM 2220 Nways BroadBand Switches and conforming to the IBM Networking BroadBand Services (NBBS) architecture.

NBBS port. See logical port.

NBBS trunk. See logical trunk.

NCT2. Nways Switch Configuration Tool Version 2.

NDPS. Non-disruptive path switching.

NEM. Nways Enterprise Manager (see 2220 Nways Switch Manager).

network control. Functions that are performed by an Nways Switch control point to:

- Allocate and control the Nways Switch resources
- Provide topology and directory services
- Select routes
- Control congestion.

network management station (NMS). A station that runs IBM NetView for AIX and the 2220 Nways Switch Manager. It is used to manage network topology, accounting, performance, configuration, and error reporting.

network node interface (NNI). An interface between nodes in a communication network.

Network Support Center (NSC). A location from which IBM remotely supports 2220 networks.

Networking BroadBand Services (NBBS). An IBM architecture for high-speed networking that complements ATM standards and provides access services, transport services, and network control to user traffic.

NIC. Network Information Center.

NMS. Network management station.

NNI. Network node interface.

NPT. Numbering plan table.

NR. Non-reserved.

NRT. Non-real-time.

NRZI. Non-return-to-zero inverted recording.

NRZ-1. Non-return-to-zero change-on-ones recording.

NSAP. Network service address point.

NSC. Network Support Center.

NSM. (See 2220 Nways Switch Manager)

NVDM. NetView Distribution Manager for AIX.

NTT. Nippon Telegraph & Telephone (Corporation).

numbering plan table (NPT). A set of parameters, organized in origin NPT and destination NPT, that defines a type of called ISDN numbers. A numbering plan table is associated with each ISDN network interface.

Nways 2220 Switch Manager (2220 Switch Manager). An IBM licensed program that runs under NetView for AIX to manage the 2220 Nways Switch operation and configuration from a network management station. It replaces the Nways Enterprise Manager (NEM) which is no longer available.

Nways BroadBand Switch. Synonym for 2220 Nways BroadBand Switch.

Nways Enterprise Manager (NEM). An IBM licensed program that was used under NetView for AIX in a network management station to manage Nways Switches, routers, and bridges in a 2220 network (see 2220 Nways Switch Manager).

Nways Switch. Synonym for 2220 Nways BroadBand Switch.

Nways Switch administration station (NAS). A station attached to each 2220 to run the Control Program, and control and service the Nways Switch locally.

Nways Switch configuration station. A mandatory OS/2 or AIX station that runs a stand-alone version of the Nways Switch Configuration Tool Version 2 (NCT2) and stores the centralized configuration database of the NBBS network. An OS/2 station can be used as a remote user console.

Nways Switch Configuration Tool Version 2 (NCT2). A component of the Nways Switch Control Program that is used to configure physical and logical resources. It is also used in stand-alone version under OS/2 or AIX .

Nways Switch Control Program. The IBM licensed program that runs in the NAS and adapters of the 2220 Nways Switch. It includes a CMIP agent to work with the 2220 Switch Manager.

Nways 2220 Switch Manager for AIX. (See Nways 2220 Switch Manager)

Nways Switch Resource Control. A component of the Nways Switch Control Program. It is used from the NAS of an Nways Switch or from a remote user console to control resources and configuration files.

OAM. Operation, administration, and maintenance.

OC3. Optical carrier level 3.

ONPT. Origin numbering plan table.

operation, administration, and maintenance (OAM). A group of functions coded in specific ATM cells to handle alarms and loopback tests on ATM connections.

optical fiber. In fiber optics technology, a wave guide that propagates optical signals from light-generating transmitters to light-detecting receivers.

OSI. Open systems interconnection.

packet loss ratio. The probability that a packet will not reach its destination or not reach it in a specified time. It is obtained by dividing the number of packets lost in transmission by the total number transmitted.

packet transfer mode (PTM). The native transfer mode of the NBBS architecture. PTM divides the traffic into packets of variable length.

PBX. Private branch exchange.

PCM. Pulse code modulation.

PCR. Peak cell rate.

PDH. Plesiochronous digital hierarchy.

permanent virtual circuit (PVC). A virtual circuit that has a logical channel permanently assigned to it at each item of data terminal equipment. It is activated by a program or by a network operator request.

plesiochronous. Refers to transmission at a nominal bit rate where the source and destination are controlled by different clocks. The bit rates are nearly the same.

PLP. Packet layer protocol.

PNP. Private numbering plan.

port. See logical port.

port adapter. In an Nways Switch, a module that provides access services to one or more port lines. Each port adapter is associated with a line interface coupler (LIC).

port line. A communication line that connects a device on user premises to an Nways Switch and serves as a port to the 2220 network. Port lines have different protocols and interfaces.

position. When configuring an Nways Switch, the position parameter indicates the line attachment number on the LIC module (1 to 8, depending on the LIC type).

potential connection. A predefined connection through a 2220 network between two HDLC, CES, or frame-relay devices.

PPP. Point-to-point protocol.

PRA. Primary Rate Access.

private branch exchange (PBX). A switching system located on a user premises that relays inside lines (extensions) and provides access to the public telephone network.

PRS. Primary reference source.

PSDN. Packet switched data network.

PSN. Public switched network.

PSTN. Public switched telephone network.

PTF. Program temporary fix.

PTM. Packet transfer mode.

PTNX. Private telecommunications network exchange.

pulse code modulation (PCM). A standard adopted for the digitalization of analog voice signals. In PCM, voice is sampled at a rate of 8 kHz and each sample is coded in an 8-bit frame.

PVC. Permanent virtual circuit.

Q signaling (QSIG). An international standard for signaling procedures in private telecommunication networks. It applies to the PBX-to-Nways Switch interface, which is called the Q reference point.

QoS. Quality of service.

QSIG. Q signaling.

quality of service (QoS). In a 2220 network, a set of parameters that guarantees the characteristics of a connection, mainly its end-to-end delay, delay variation, and packet loss tolerance.

RABM. Router and Bridge Manager.

rack. A metallic structure, with a standard 19-inch width, that houses the hardware elements of an Nways Switch, that is, logic subrack with modules, fan boxes, and power units. When configuring an Nways Switch, the rack parameter indicates the 2220 Model (rack A is the Model 300 or 500, and rack B is the Model 501).

RDI. Remote defect indication.

real-time processing. Refers to the manipulations of data that are required, or generated, by certain process while the process is in operation. Usually, the results influence the process and, perhaps, related processes.

remote user console. A station running OS/2, TCP/IP, and Nways Switch Resource Control. It can be connected to the NAS of an Nways Switch to remotely control and service it.

resource. In an Nways Switch, a hardware element or a logical entity created by the Control Program. Adapters, modules, and line attachments are examples of physical resources. Control points, logical trunks, logical ports, and network interfaces are examples of logical resources.

resource profile. A record of the characteristics of an Nways Switch resource. It includes (for example) the part number or module name, the change level, and the name and phone number of the person to contact when a problem occurs.

RETAIN. Remote Technical Assistance Information Network

RIP. Route Information Protocol.

router. An attaching device that connects two LAN segments of the same or different architectures. It can also be connected to a wide area network. A router works at the network level (layer 3) of the OSI reference model by determining the best paths for network traffic flows.

Router And Bridge Manager. An application that provides distributed management for routers such as the IBM 2210 or 2216, bridges such as the IBM 8229, and communication controllers such as the IBM 3746 in IP mode.

RS. Recommended specification.

RSF. Remote support facility.

RSN. Receive sequence number.

RT. Real-time.

RVX. RS/EIA-232, V.24/V.35, X.21.

s. Second.

SCR. Sustainable cell rate.

SDH. Synchronous digital hierarchy.

SDLC. Synchronous data link control.

SDT. Structured data transfer.

serial line internet protocol (SLIP). A TCP/IP protocol used on a point-to-point connection between two IP hosts over a serial line (for example, an RS/EIA-232 connection to a modem over a telephone line).

SLA. Serial link architecture.

SLIP. Serial line internet protocol.

slot. When configuring an Nways Switch, the slot parameter indicates the module location (1 to 12) in the logic subrack.

SNA. Systems Network Architecture.

SNMP. Simple Network Management Protocol.

SONET. Synchronous optical network.

spanning tree. See CP spanning tree.

SRC. System reference code.

SSN. Send sequence number.

station. A microcomputer that is connected to a host or a network and at which a user can run applications.

STM-1. Synchronous transport module type 1.

STS-3c. Synchronous transport signal type 3 concatenated.

SUB. Subaddress.

subrack. A metallic structure installed in an Nways Switch rack. A logic subrack holds modules. A power subrack holds power supply components.

SVC. Switched virtual circuit.

SW. Switch (module).

switch module (SW). A module of the 2220 Model 300 or 500 that interconnects the adapters through an ATM cell switch. It can have a backup.

switch redrive (SWRD). A module of the 2220 Model 501 that drives the signals from the switch module in the Model 500 to the adapters of the Model 501. It can have a backup.

SWRD. switch redrive (module)

switched virtual circuit (SVC). A connection set up from a calling address to a called address following a call establishment protocol. It is released when a clear request signal is received.

synchronous digital hierarchy (SDH). A international recommendation for the internal operation of carrier optical networks.

synchronous optical network (SONET). A U.S. standard for transmitting digital information over optical interfaces. It is closely related to the international recommendation for synchronous digital hierarchy (SDH).

T1 standard. A TDM digital transmission service with a basic rate of 1.544 Mbps. Also called DS-1.

T3 standard. A TDM digital transmission service with a basic rate of 44.736 Mbps. A T3 line can transport up to 28 T1 circuits. Also called DS-3.

TCPA. Trunk and control point adapter.

TCP/IP. Transmission Control Protocol/ Internet Protocol.

TDM. Time division multiplexing.

TE. Terminal equipment.

Telnet. In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the display station were locally attached. Telnet uses the Transmission Control Protocol (TCP) as the underlying protocol.

time division multiplexing (TDM). The process of breaking the bandwidth on a communication line into a number of channels, possibly of different size.

TME. Tivoli Management Environment.

TMN. Telecommunication Management Network.

TPA. Trunk or port adapter.

Transmission Control Protocol/ Internet Protocol (TCP/IP). A set of communication protocols that support peer-to-peer connections over both local and wide area networks.

transport services. Functions that are performed by a trunk adapter of an Nways Switch to:

- Support the attachment of trunk lines
- Maximize bandwidth utilization
- Guarantee the quality of service of a connection
- Transfer packets between Nways Switches
- Manage logical queues and schedule transmission.

trunk. See logical trunk.

trunk adapter. In an Nways Switch, a module that provides transport services to one or more trunk lines. Each trunk adapter is associated with a line interface coupler (LIC).

trunk line. In a 2220 network, a high-speed line connecting two Nways Switches. It can be, for example, a copper cable, optical fiber, or radio wave guide and can be leased from telecommunication companies.

UBR. Unspecified bit rate. A best effort service with no quality commitment.

UNI. User network interface.

UPC. Usage parameter control.

URL. Uniform resource locator.

user network interface (UNI). A standardized interface between a user and a communication network.

UTC. Universal time, coordinated.

UUS. User-user signaling.

VBR. Variable bit rate.

VC. Virtual channel.

VCC. Virtual channel connection.

VCI. Virtual channel identifier.

VCN. Virtual circuit number.

virtual channel (VC). In ATM, a unidirectional route between two ATM devices. Virtual channels always come in pairs, one in each direction. They follow virtual paths.

virtual channel connection (VCC). In ATM, a unidirectional connection established over a virtual channel. Virtual channel connections always come in pairs, one VCC in each direction.

virtual channel identifier (VCI). In ATM, the unique numeric tag that identifies every channel. It is defined by a 16-bit field in the ATM cell header.

virtual connection. In frame relay, the return path of an FR potential connection.

virtual path (VP). In ATM, a group of virtual channels that are switched together as one unit. (Also called VC service.)

virtual path connection (VPC). In ATM, a connection established over a virtual path. Virtual path connections always come in pairs, one VPC in each direction. (Also called VP service.)

virtual path identifier (VPI). In ATM, an 8-bit field in the ATM cell header that indicates the virtual path over which the cell is to be routed.

voice server adapter (VSA). In an Nways Switch, a module that supplies additional voice functions to voice connections operating in pulse code modulation at 64 kbps. It can attach a voice server extension (VSE).

voice server extension (VSE). In an Nways Switch, a module associated with a voice server adapter (VSA) to supply voice functions to an extended number of PCM voice connections.

VP. Virtual path.

VPC. Virtual path connection.

VPD. Vital product data.

VPI. Virtual path identifier.

VPN. Virtual private network.

VSA. Voice server adapter (module).

VSEn. Voice server extension type n (module).

WAN. Wide area network.

wide area network (WAN). A network that provides communication services to a large geographic area. It can use or provide public communication facilities.

window. On the screen of a station, an area with a title bar, a menu bar, and scroll bars.

X.25 hunt group. A group of X.25 network interfaces associated with one common subscriber address. If an interface is busy, the connection searches (hunts) for the other interfaces of the group until a free one is found.

X.25 network interface. A logical resource generated by the Nways Switch Control Program to provide access services to a physical X.25 port line. An X.25 network interface sets up and maintains connections between calling X.25 subscribers and called subscribers attached to other Nways Switches.

X.25 Recommendation. An international standard for the interface between data terminal equipments and packet-switched networks.

X.25 subscriber. An X.25 end-user connected to an X.25 network interface through a DTE. A subscriber is defined by an address and a logical name.

Bibliography

This section lists prerequisite and related publications.

Nways Switch Publications

- *2220 Nways BroadBand Switch At a Glance, an Overview*, GA33-0292
- *2220 Nways BroadBand Switch Planning Guide*, GA33-0293
- *2220 Nways BroadBand Switch Configuration Guide*, GA33-0474
- *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References*, GA33-0379
- *2220 Nways BroadBand Switch Frame Relay Interface Specifications*, GA33-0374
- *2220 Nways BroadBand Switch HDLC Interface Specifications*, GA33-0375
- *2220 Nways BroadBand Switch CES Interface Specifications*, GA33-0376
- *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378
- *2220 Nways BroadBand Switch X.25 Interface Specifications*, GA33-0413
- *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447
- *How to use the NAS*, online tutorial[1]

Nways 2220 Switch Manager Publications

- *IBM Nways 2220 Switch Manager for AIX Installation Guide*, SH11-3088
- *IBM Nways 2220 Switch Manager for AIX: Performance Monitoring and Accounting*, GA33-0366
- *IBM Nways 2220 Switch Manager User's Guide*, online manual[2]

TME 10 NetView for AIX Version 5 Publications

- *NetView for AIX Installation and Configuration* , SC31-8163

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1. Online documentation delivered with the 2220 Nways Switch Control Program.

2. Online documentation delivered with the Nways 2220 Switch Manager product.

- *NetView for AIX V4R1 User's Guide* , SC31-8158

TMN 2.2 Publications

- *TMN 2.2 General Information* , GT01-0458
- *TMN 2.2 Agent User's Guide* SC31-8157

TME 10 Software Distribution Publications

- *Software Distribution for AIX Concepts* , GH19-4161
- *Software Distribution for AIX Getting Started* , GH19-4162
- *Software Distribution for AIX User's Guide* , GH19-4163
- *Software Distribution for AIX Installation and Customization* , GH19-4164
- *NetView Distribution Management Agent/2 User's Guide* , SH19-4084

OSI System Management Standards for CMIP

OSI stands for Open Systems Interconnection

OSI Management Framework and Overview

- *OSI Basic Reference Model Part 4: Management Framework* ISO 7498-4
- *Systems Management Overview* ISO 10040

CMIP/CMIS

- *Common Management Information Service Definition* ISO 9595

Systems-Management Functions

- *Part 1: Object Management Function* , ISO 10164-1
- *Part 2: State Management Function* , ISO 10164-2
- *Part 3: Attributes for Representing Relationships* ISO 10164-3
- *Part 4: Alarm Reporting Function* , ISO 10164-4
- *Part 5: Event Report Management Function* , ISO 10164-5

- *Part 9: Objects and Attributes for Access Control* ISO 10164-9
- *Accounting Management* , SC 21 N 4971
- *OSI Software Management* , SC 21 N 6040
- *General Relationship Model* , SC 21 N 6041
- *Performance Management* , SC 21 N 6306

Management Information Model

- *Part 1: Management Information Model* , ISO 10165-1
- *Part 2: Definition of Management Information* , ISO 10165-2
- *Part 5: Generic Managed Information* , ISO 10165-5

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