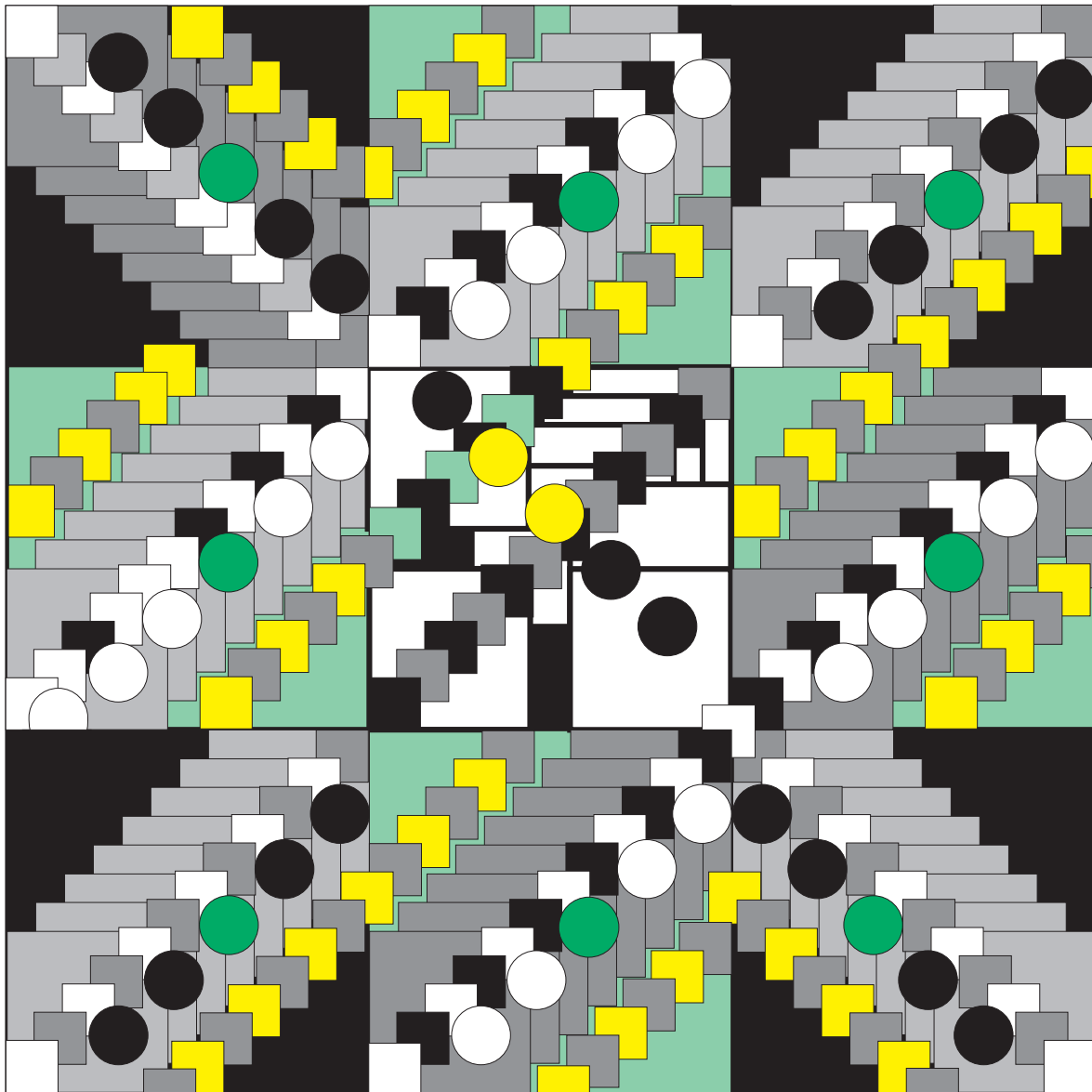


# Configuration Guide





2220 Nways BroadBand Switch  
Models 300, 500, and 501



# Configuration Guide

**Note!**

Before using this information and the product it supports, be sure to read the general information under "Appendix D. Notices" on page 175.

**First Edition (June 1998)**

This edition applies to the following IBM licensed programs:

- Nways Switch Control Program Version 2 Release 2 (V2R2)
- Nways 2220 Switch Manager (2220 Switch Manager) for AIX Version 1.

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## About This Guide

### Note

It is assumed that you are familiar with the 2220 hardware described in the *2220 Nways BroadBand Switch Planning Guide*, GA33-0293.

### *Displaying the OS/2 Online Version*

An online version of the *2220 Configuration Guide* is distributed in with the NCT2 for OS/2. From the Nways Switch Configuration folder:

- Open the *Configuration Guide* by double-clicking on its icon.
- Close the guide by pressing F3.

When the table of contents is displayed:

- Expand a topic by clicking on the + sign on the left of the topic.
- Display a topic by double-clicking on it.

When a topic is displayed:

- Click on Forward to view the next topic.
- Click on Back to view the previous topic.

---

## Who Should Use This Guide

Use this guide if you are teleprocessing specialist, system programmer, network administrator, or network specialist configuring a 2220 network.

If you are going to use a network management station (NMS), a change control server (CCS), or an Nways Switch configuration station under AIX, you must know how to use an IBM RISC System/6000\*, POWERstation\*, or POWERserver\*. In addition, you should be trained on using the IBM AIX/6000 operating system, IBM NetView for AIX, IBM NetView Distribution Manager for AIX, and IBM NetView Distribution Management Agent/6000 (NetView DMA/6000).

If you are going to use an Nways Switch configuration station under OS/2, you should be an experienced user of the IBM OS/2\* system running on an IBM PS/2\* workstation or equivalent.

---

## Purpose of This Guide

This guide is intended to help you:

- To prepare configurations for 2220 Nways Switches before they are installed.
- To change configurations when the network is operational.

---

## How This Guide Is Organized

The guide is organized as follows:

- "Chapter 1. IBM 2220 Networking" on page 1 describes the main components of a 2220 network.

- “Chapter 2. Configuration Tools and Functions” on page 11 describes the tools and functions that you use under AIX or OS/2 to configure Nways Switches.
- “Chapter 3. Handling Nways Switch Configurations” on page 29 describes how to prepare, copy, import, export, and change the Nways Switch configurations.
- “Chapter 4. Getting Started with NCT2” on page 41 helps you to start configuring a 2220 network with NCT2.
- “Chapter 5. Creating Nways Switch Configurations” on page 47 explains how to create Nways Switch configurations using NCT2.
- “Chapter 6. Configuring Physical Resources” on page 59 explains how to configure the Nways Switch physical resources using NCT2.
- “Chapter 7. Configuring ATM Resources” on page 77 explains how to configure the Nways Switch ATM resources using NCT2.
- “Chapter 8. Configuring FR, HDLC, and CES Resources” on page 101 explains how to configure the Nways Switch frame relay (FR), FR over ISDN, high-level data link control (HDLC), and circuit emulation services (CES) resources using NCT2.
- “Chapter 9. Configuring ISDN Resources” on page 129 explains how to configure the Nways Switch ISDN resources using NCT2.
- “Chapter 10. Configuring X.25 Resources” on page 145 explains how to configure the Nways Switch X.25 resources using NCT2.
- “Chapter 11. Configuring Trunks” on page 155 explains how to configure the Nways Switch X.25 resources using NCT2.
- “Appendix A. NCT2 Command Line Interface” on page 163 explains how to use the NCT2 command-line interface.
- “Appendix B. ASCII Configuration Files” on page 167 describes the ASCII configuration files exported from NCT2.
- “Appendix C. NVDM and Nways Switch” on page 171 describes how the NetView Distribution Manager for AIX (NVDM) is used on a change control server with the Nways Switch Control Program.

Also see the “Glossary” on page 177.

---

## To Find More Information

For a complete list of customer manuals, refer to the “Bibliography” on page 187.



---

## Chapter 1. IBM 2220 Networking

This chapter describes the main components of a 2220 network. It includes the following sections:

“Components of a 2220 Network”

“2220 Network and Virtual Circuits” on page 4.

---

### Components of a 2220 Network

The following figure shows communication devices located on user premises and connected through a 2220 network.

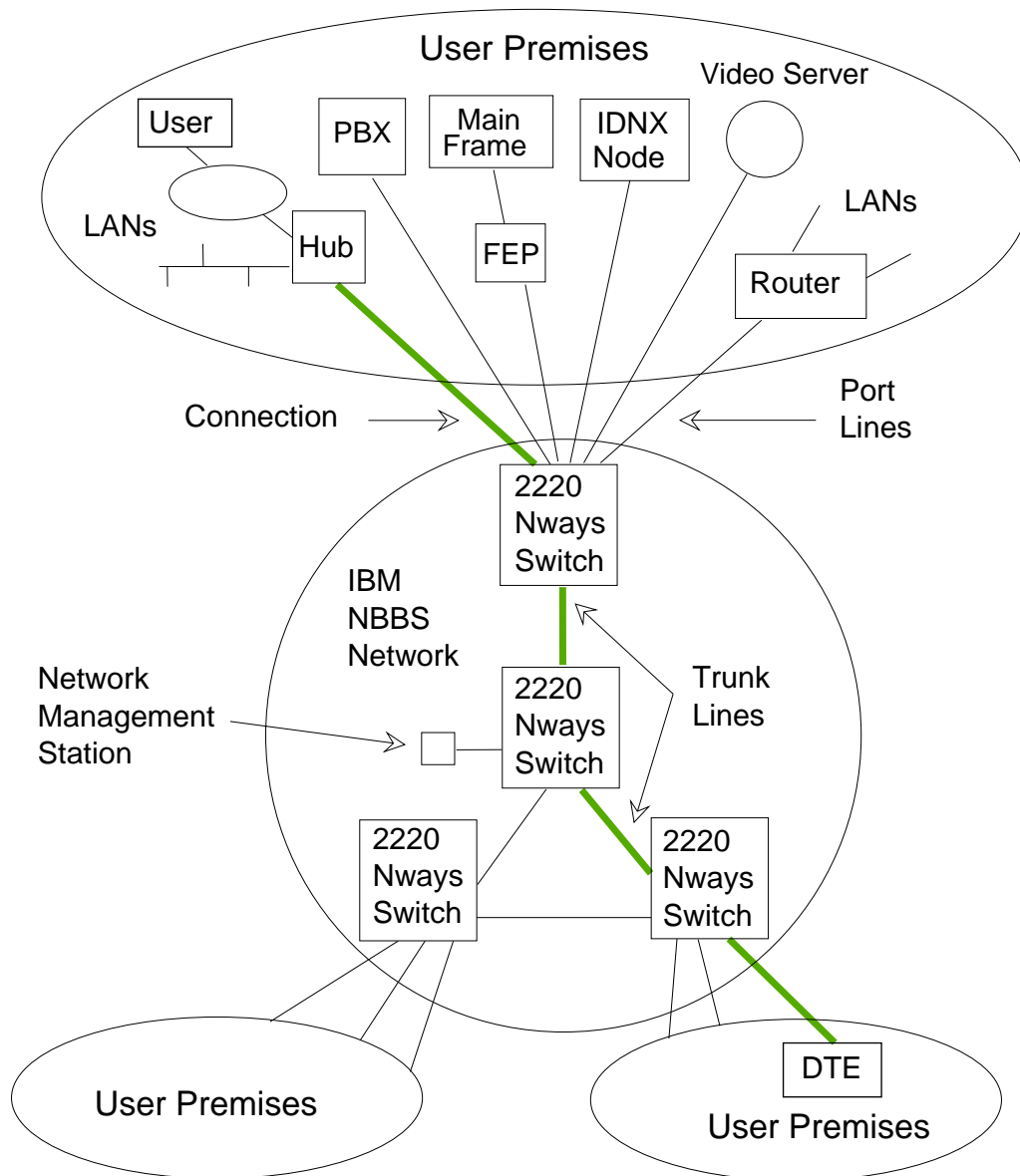


Figure 1. Components of a 2220 Network

## 2220 Network

The 2220 network shown on Figure 1 is an example of private wide area network (WAN) built to interconnect various devices located on user premises. The nodes in the network are IBM 2220 Nways Broadband Switches (*2220 Nways Switches*) that conform to the IBM Networking BroadBand Services (NBBS) architecture. Nways Switches can also be used to build public networks.

Data transported over a 2220 broadband network is routed over permanent virtual circuits (PVCs) or switched virtual circuits (SVCs) depending on protocols. Also, several logical connections (also called circuits or channels) can be multiplexed over a single physical line.

Another characteristic of a 2220 network is that error detection and correction is provided by end-point external devices rather than the Nways Switches.

## Port Line

In a 2220 network, a *port line* connects an external user device to an Nways Switch. Thus it is a port to the 2220 network. Port lines can have different protocols and interfaces. They connect to devices such as routers, hubs, or private branch exchanges (PBXs) that concentrate the traffic from a large number of end-users.

On a port line, the traffic complies to the protocol of the attached devices. For example, if a router attaches HDLC devices, traffic is HDLC up to the Nways Switch. Then it is transformed into packets or cells before being transported over trunk lines.

## Trunk Line

In a 2220 network, a *trunk line* is a high-speed communication line that connects two Nways Switches. It can be a copper cable, optical cable, or radio waves, and can be leased from telecommunication companies. The amount of bandwidth provided by the trunks is taken into account when the connections are activated.

## Connection

Figure 1 on page 2 shows a *connection* between the hub on the top-left part of the figure and a DTE on the bottom-right. The devices are installed on user premises. The hub is connected through a port line to the source Nways Switch. The DTE is connected through a port line to the destination Nways Switch. Both devices can communicate if they use **same protocol**. The 2220 network is transparent to the users.

A 2220 network is *connection oriented*. Each physical medium (for example, a communication line) supports multiple logical connections (or virtual circuits) and the bandwidth is shared between the connections. If a connection has no traffic, the physical medium is used for the traffic of the other connections.

This is different from a *circuit oriented* network where each connection is assigned a physical medium which remains unused when there is no traffic.

## Line Adapters

The Nways Switch adapters come in various hardware types and provide multiple functions. They contain all the processing logic and are loaded with internal code of the Nways Switch Control Program.

Port adapters connect port lines to the Nways Switch. Trunk adapters connect trunk lines. Port and trunk adapters always have an associated line interface coupler (LIC) on which the physical lines are connected.

---

## 2220 Network and Virtual Circuits

The purpose of any network is to connect devices and let them communicate. This section describes:

“Nways Switch and Permanent Virtual Circuits”

“Nways Switch and Switched Virtual Circuits” on page 8.

### Nways Switch and Permanent Virtual Circuits

This section describes how a 2220 network handles permanent virtual circuits (PVCs).

#### Permanent Virtual Circuit

A *permanent virtual circuit (PVC)* is a logical connection (also called circuit or channel) that is permanently established between two end-point devices.

A permanent virtual circuit can be established, for example, between an ATM hub and an ATM router through a network. The virtual circuit is said to be permanent, because it remains activated even when there is no traffic.

The Nways Switch supports the following protocols in the PVC mode:

- High-level data link control (HDLC)

- Frame relay (FR)

- Circuit emulation service (CES)

- Asynchronous transfer mode (ATM).

The following figure shows examples of ATM and CES communication devices located on user's premises and connected through a network. The Nways Switch supports the ATM and CES connections in the PVC mode.

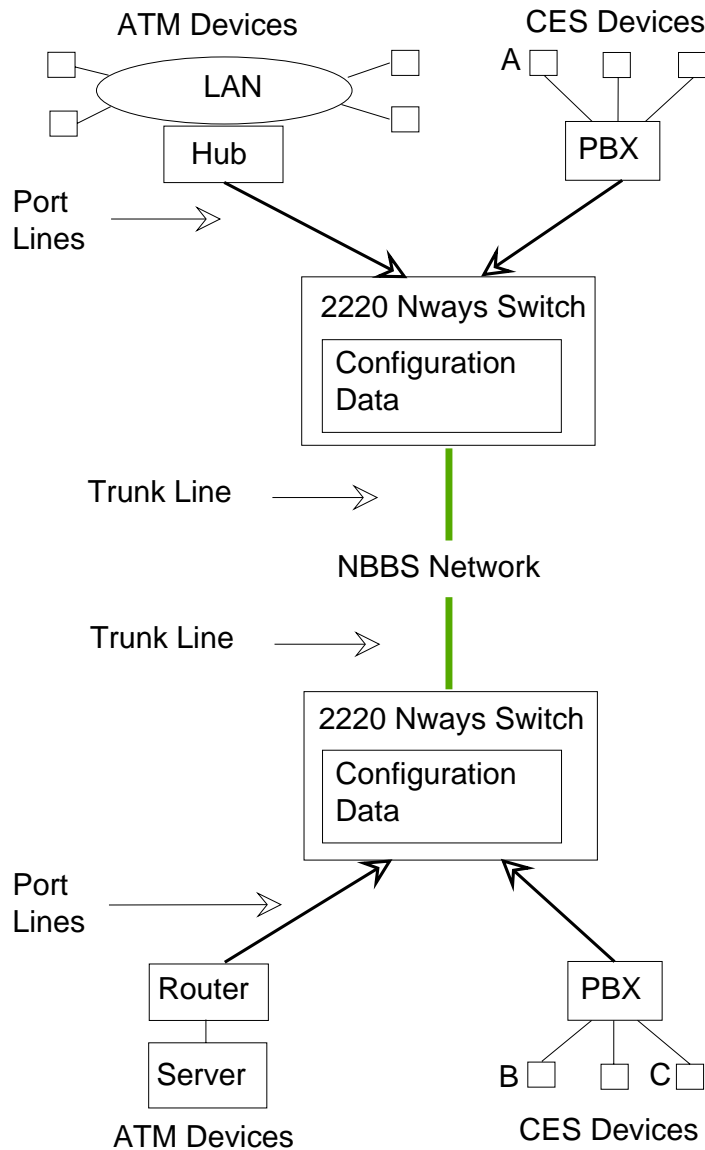


Figure 2. Permanent Virtual Circuit in a 2220 Network

## Potential Connections

In order to allow two devices to communicate, you must establish a connection between them. Before establishing a connection, you must define it. At this stage, the connection is called a potential connection. When defining a *potential connection*, you are required to specify traffic characteristics and parameters. For example:

- Connection name
- Source device identification
- Target device identification
- Traffic characteristics and quality of service.

A potential connection is defined for one source and one target device. Therefore a same potential connection cannot be used for two different source-target pairs. For example, device A can potentially communicate with device B and device C. This means that two different potential connections must to be defined: one potential connection for communication between devices A and B, one for communication between devices A and C.

In order that the two devices actually communicate, the potential connection must be activated. Only one potential connection can be activated at a time between two devices.

From the user viewpoint, the kind of connection that actually exists at the time they communicate, does not really matter. More important is that there is an *apparent* direct path between them.

## Activating Connections

Each Nways Switch stores the configuration data of its resources including the parameters of each connection. Connections are initiated:

- Permanently: the connection is established during the initial program loading (IPL) of the Nways Switch
- At an operator request
- For voice calls, after reception of a signal in channel associated signaling (CAS) dynamic mode.

The connection parameters are examined by the Nways Switch and the connection is only allowed if the network has sufficient capacity to support this new request. The best route that meets the traffic characteristics is computed and established through the trunk lines from one Nways Switch to another until the destination Nways Switch is reached. The connection does not rely on any predefined paths or routes, but rather takes advantage of all the available network resources.

When a connection is established, its traffic is bidirectional. Once a connection is established, it is maintained permanently by the source Nways Switch. If it becomes unavailable, a new path is automatically set up with the remaining available resources.

## Resources Required by Connections

As NBBS is a “dynamic connection-oriented” architecture, the resources needed to establish the connection are chosen across the network, defining the path used at that time. The connection activation process does not rely on any predefined path or routing, thus taking advantage of *all* the available resources.

The connection requirements and characteristics can be for example (but are not limited to):

- Required bandwidth and possible bandwidth adaptation. Traffic is monitored at the source level, and the bandwidth is dynamically allocated to the actual connection traffic within the requested Quality of Service (QoS).
- Metrics for this connection (for example, bursty or not bursty, burst size and duration)
- Transmission priority
- Type of traffic (real-time or not).

The only fixed parts of a connection are the hardware that connects both ends to their Nways Switch.

Depending on your network design and Nways Switches configuration, various levels of redundancy can be offered to the connections.

## Multiple Connections for the Same Pair of Devices

In order to anticipate and quickly answer to the network need variations, you can define several potential connections for the same pair of devices, each tailored to specific network requirements. For example, from one connection to another, you can vary the bandwidth according to when during the day the connection is activated. Therefore, you can:

- *Increase* the bandwidth for a priority connection during day time peak periods to guarantee delivery of data traffic.
- *Decrease* the bandwidth of a non-priority connection when the devices have low traffic exchange, for example at night.

## PVC Traffic Over Trunk Lines

The source Nways Switch multiplexes the ATM and CES traffic onto the trunk line to the next Nways Switch on the computed route. The traffic on a trunk line is made of ATM cells and PTM packets.

The maximum line bandwidth possible is used taking into account the configured traffic rates, priorities, and qualities of service of each connection.

Along the path, ATM data is routed by *logical ID swapping*. When a connection is activated, only the first cell carries the full network address of the destination in its data (payload) field. Routing tables based on the virtual path and virtual channel identifiers (VPI and VCI) are set up in the Nways Switches along the route. Node throughput is thus very high because subsequent cells of the same connection are switched by hardware at very high speed using only the VPI and VCI instead of the full address.

## PVC Traffic Delivery

On the destination Nways Switch, the traffic is delivered to the end-point devices (router and PBX) with the same protocol and in the same sequence as they were presented to the source Nways Switch. The end-point devices are in charge of distributing data to the end-users (host applications or PBX extensions).

Real time traffic is delivered ahead of non-real time and non-reserved traffic. No data integrity and lost data recovery is provided by the network. This is the responsibility of the user's equipment at the connection end points.

## Transparency in Operation

In a 2220 network, the data passing between the two devices could have been switched in and out of various intervening networks, perhaps over a common carrier ATM network, with protocols unknown to either device.

The two devices communicate with their native protocols without needing to handle network protocols, and the people using the two devices are virtually unaware of the intervening network between them.

You could change the physical location, the native protocols, the applications, the physical devices themselves at each end of the potential connection without having to reconfigure the network. Similarly, characteristics of the network could be changed without any impact on end users' operations. As long as the potential connection remains the same between the two devices, you could make changes to either the network or the pairs of connected devices, without having to reconfigure the other. The 2220 network becomes a transparent network to its users.

## **Nways Switch and Switched Virtual Circuits**

This section describes how a 2220 network handles switched virtual circuits (SVCs).

### **Switched Virtual Circuit**

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

The Nways Switch supports the following protocols in SVC mode:

- X.25 DCE

- Euro ISDN (Integrated Service Digital Network).

- Japan ISDN

- QSIG



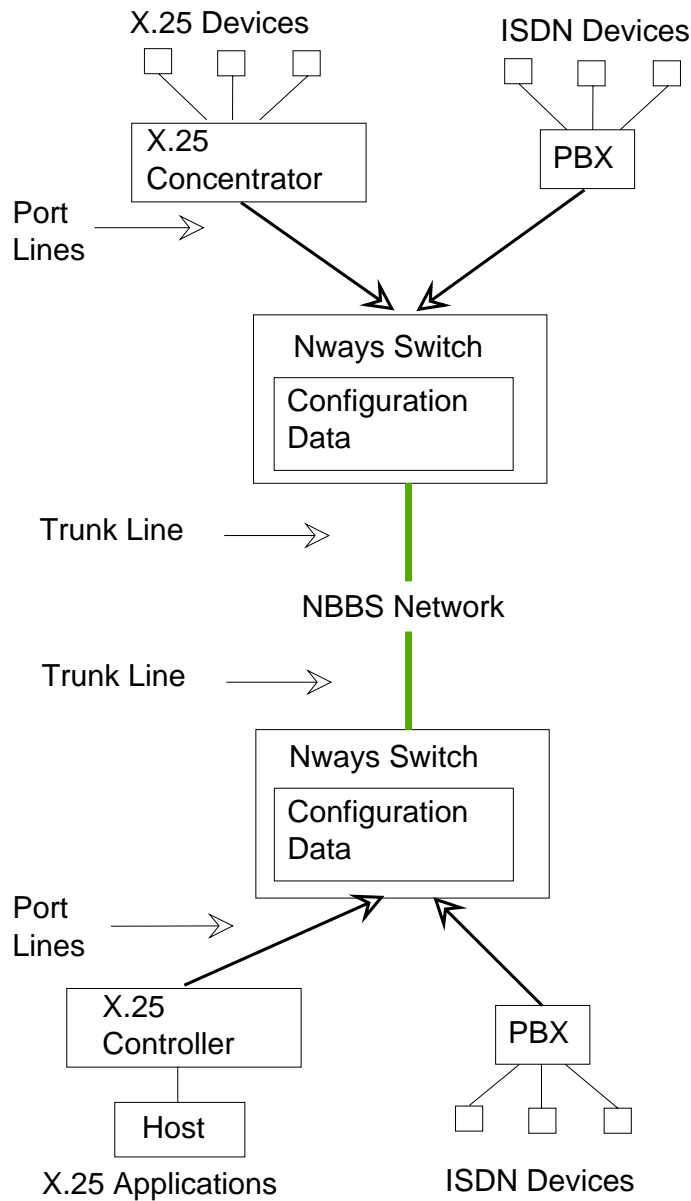


Figure 3. Switched Virtual Circuit in a 2220 Network

### Connections in SVC Mode

In the SVC mode, no connections with traffic parameters are predefined. The traffic characteristics are defined at the network level at the same time as the addressing scheme.

When a switched virtual circuit is established, its traffic is bidirectional. A switched virtual circuit is not maintained permanently as a permanent virtual circuit is.

### Activating Connections

In SVC mode, the connections are activated when a call procedure is started from a calling address (the X.25 device in the figure). When a connection is established, its

traffic is bidirectional. An X.25 or ISDN connection (switched virtual circuit) is not maintained permanently as a PVC. It is released when a clear request is received from one of the connected devices.

The Nways Switch establishes the switched connection using the available resources of the network. The best route that meets the traffic characteristics is computed and established through trunk lines from one Nways Switch to another until the destination Nways Switch is reached.

### **SVC Traffic Delivery**

On the destination Nways Switch, packets are delivered to the X.25 controller and ISDN PBX in the same sequence as they were presented to the source Nways Switch. The controller distributes the data to the host applications. The PBX delivers the calls to the ISDN terminal equipments.

No end-to-end data integrity and lost data recovery is provided by the network. This is the responsibility of the equipment at the connection end points.

### **Customer Benefits**

Using a switched voice protocol instead of a leased line protocol, such as channel associated signaling (CAS), saves bandwidth when accessing a 2220 network, because it reduces the number of required port lines. ISDN tariffs also result in cost saving, compared to leased line costs which can be very expensive depending on the connection duration and the public network offering.

The capability to connect to ISDN equipment and build private voice networks with integrated facilities by using the Q signaling (QSIG), enhances your network options. QSIG provides the same switched connection benefits as ISDN.

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## Chapter 2. Configuration Tools and Functions

This chapter describes the tools and functions that you use under AIX or OS/2 to configure the Nways Switches of your network. It also summarizes the choices that you have to make when deciding a configuration strategy.

The chapter is organized as follows:

- “Nways Switch Configuration Tool Version 2”
- “Nways Switch Configuration Station” on page 14
- “Nways Switch Resource Control” on page 17
- “NAS Configuration Database” on page 17
- “Restarting the NAS” on page 20
- “Nways Switch Configuration List” on page 21
- “Nways Switch Installation Program” on page 21
- “2220 Switch Manager and Configuration” on page 23
- “NVDM and Nways Switch Configuration” on page 24
- “Summary of Configuration Tools” on page 26
- “Defining a Configuration Strategy” on page 27.

---

### Nways Switch Configuration Tool Version 2

The Nways Switch Configuration Tool Version 2 (NCT2) is a component of the Nways Switch Control Program and provides the following functions:

- Configures the Nways Switches in the 2220 network from manually entered parameters.
- Generates IP addresses for all IP hosts: NASs, Nways Switch adapters, management stations, and remote user consoles.
- Creates a configuration database. The IBM DATABASE 2 (DB2) program is the interface between NCT2 and the configuration database.
- Ensures consistency of each Nways Switch configuration by verifying parameters. Error messages enable you to modify incorrect configuration parameters.
- Imports and exports configuration files. A configuration file contains all the configuration parameters for a given Nways Switch.
- Supports configuration files in ASCII format to more easily manage configuration parameters
- Provides a command line interface to create configurations by program without using the graphical interface.

NCT2 can be used in the following ways:

- If you have a small 2220 network (three Nways Switches or less), use NCT2 from one of the NAS PS/2 to locally update the Nways Switch configuration and perform service functions.
- If you have a large 2220 network (more than three Nways Switches), use NCT2 in stand-alone version under OS/2 or AIX on a dedicated configuration station to configure the physical and logical resources of Nways Switches in your network.

NCT2 for OS/2 and NCT2 for AIX use the same interface and functions for building, modifying, importing, and exporting Nways Switch configurations. Using NCT2 from a stand-alone configuration station, you can perform all configuration tasks and export and import configuration files. For example, you can distribute configuration files in binary format (xxx.ZIP) using FTP from the configuration station to the NASs of Nways Switches.

The stand-alone version (AIX or OS/2) of NCT2 can be ordered from your IBM representative and can be used to configure your 2220 network before the 2220 hardware is delivered.

## Defining Your IP Host Addresses

Remember that your 2220 network is organized as an IP network for transmitting network control information. IP addresses are assigned to the main elements of the network (Nways Switch adapters, NASs, management stations, and remote user consoles), which are all considered as IP hosts.

From the IP network address that you provide for your 2220 network, NCT2 generates the IP addresses for all the IP hosts. It is **mandatory** to use a single configuration database to generate the IP addresses of your network.

Later, when adding new Nways Switches or stations to an existing network, you must generate the new IP addresses from the database that was used for the original network configuration.

## Creating a Configuration Database

Install NCT2 on an OS/2 or AIX station (your Nways Switch configuration station), input the parameter values, and a configuration database is created (see Figure 4 on page 13).

## Creating an Nways Switch Configuration

The NCT2 functions help you create configurations by saving default parameters for similar entries, by incrementing identification counters automatically, and by creating return connections in protocols such as frame relay and ATM.

## Setting Default Parameters

NCT2 handles a large number of configuration parameters mainly related to lines and protocol types. To make parameter entry easier, the tool sets default values for most of them.

## Verifying an Nways Switch Configuration

NCT2 can verify parameter consistency for each Nways Switch configuration in your database. Error messages enable you to modify any incorrect configuration parameters. The verification process applies to individual Nways Switches. There is no cross-checking between Nways Switches.

## NCT2 Input and Output

Figure 4 shows the input to and output from NCT2.

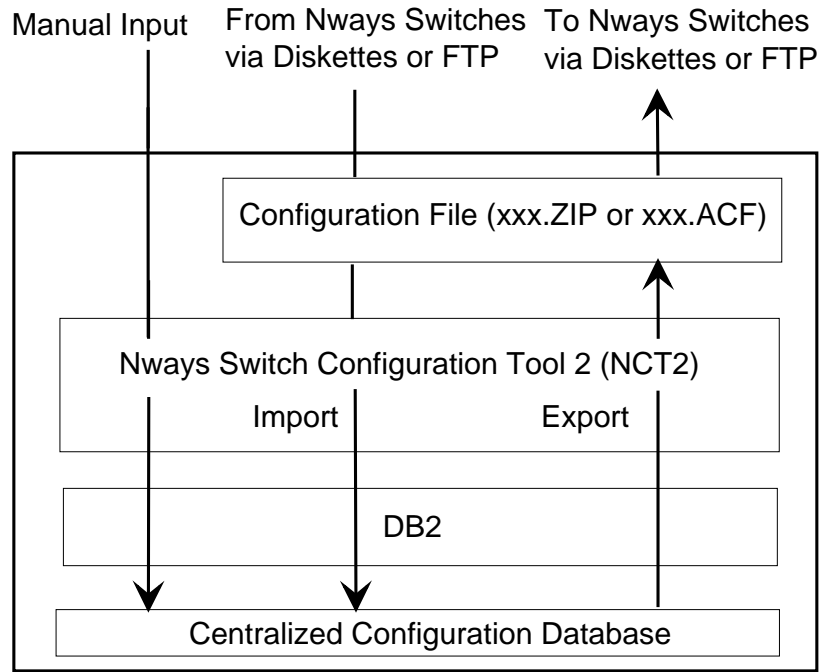


Figure 4. NCT2 Input and Output on an Nways Switch Configuration Station

### Legend:

**DB2** DATABASE 2

**FTP** File transfer protocol

The *input to NCT2* is one of the following:

- Values entered manually for user-defined configuration parameters.
- Nways Switch configuration files in compressed binary format previously prepared and exported from a NAS.
- Nways Switch configuration files in ASCII format prepared using another user tool, such as a text editor.

The *output of NCT2* is one of the following:

- Configuration file in compressed binary format (xxx.ZIP)
- Configuration file in ASCII editable format (xxx.ACF).

Any configuration produced on NCT2 for OS/2 can be exported and then imported on NCT2 for AIX. Conversely, any configuration created on NCT2 for AIX can be exported and then imported on NCT2 for OS/2.

## NCT2 Import Function

The NCT2 Import function loads configuration data from a file in binary or ASCII text formats. The imported data is loaded through DB2 into the configuration database.

## NCT2 Export Function

The Export function of NCT2 extracts the configuration data of a Nways Switch from the database, and then builds either a compressed binary (xxx.ZIP) file or an ASCII editable (xxx.ACF) file. The files are stored on the configuration station hard disk. At network installation, or Nways Switch configuration update, files are to be transferred in binary (ZIP) format to the target NAS, then imported into the NAS database.

---

## Nways Switch Configuration Station

The *Nways Switch configuration station* is an OS/2 or AIX station that runs NCT2. Using an Nways Switch configuration station and NCT2, you can configure a very large network. As your network grows, simply add disk storage as needed.

For small networks, one of the NAS PS/2s can be used as an Nways Switch configuration station.

## Centralized Configuration Database

The configuration parameters of all your Nways Switches are stored through DB2 in a configuration database on the hard disk of the configuration station. This *centralized configuration database* reflects the configuration of your 2220 network and is used for:

- Defining the IP addresses of your 2220 network in a single database (as described above)
- Adding new Nways Switches or IP hosts to your network easily
- Storing a backup configuration for every Nways Switch.

## Hardware and Software Requirements for AIX Stations

To run a Nways Switch configuration station on AIX, a RISC System/6000 Model 250/410 with the following configuration is required:

- 80 MHz clock rate
- 64 MB of random access memory (RAM)
- 15 MB of hard disk space to install NCT2
- 60 MB of hard disk space to install DB2/6000 and an additional 5 MB for each instance..
- 1 to 3 MB of hard disk space to store each Nways Switch configuration file
- Standard Ethernet adapter

An Nways Switch configuration station under AIX has the following software requirements:

- AIX V4.1.5 or higher. To install and run NCT2, a knowledge of AIX, X-windows, and basic AIX commands is required.
- IBM DATABASE 2 for AIX (DB2/6000) V2.1 or higher for the NCT2 database (see "Installing the AIX Configuration Station" on page 17)

- NCT2 available from your IBM representative (for installation information, see *2220 Network Installation and Migration*).

An Nways Switch Manager station can host NCT2 for AIX.

## Hardware and Software Requirements for OS/2 Stations

An Nways Switch configuration station running on OS/2 has the following hardware requirements:

- Pentium or equivalent microprocessor running at 166 MHz or faster.
- 48 MB of random access memory (RAM)
- 15 MB of hard disk space to install NCT2
- 1 to 3 MB of hard disk space to store each Nways Switch configuration file
- 60 to 70 MB of hard disk space to install DB2 for OS/2.
- A monitor with one of the following screen resolutions:
  - 640 x 480
  - 800 x 600
  - 1024 x 768 or higher
- (Optional) LAN connection to the 2220 network through an Nways Switch (see “Connecting the Configuration Station” for details).

An Nways Switch configuration station running on OS/2 has the following software requirements:

- OS/2 V3.0 or higher. To install and run NCT2, a knowledge of OS/2, how to handle OS/2 windows, and basic OS/2 commands is required.
- IBM DATABASE 2 OS/2 (DB2/2) V2.1 or higher for the NCT2 database (see “Installing the OS/2 Configuration Station” on page 16)
- NCT2 available from your IBM representative (for installation information, see *2220 Network Installation and Migration*)

The following software is optional for an Nways Switch configuration station running on OS/2:

- Nways Switch Resource Control program to operate the NAS from a remote user console.
- OS/2 TCP/IP (FTP is recommended to transfer configuration files between NASs in the 2220 network.)

## Connecting the Configuration Station

It is recommended that you link the Nways Switch configuration station to the Nways Switch that connects the network management station and change control server to the 2220 network (the management access Nways Switch). The attachment is through the NAS service bus, which is an Ethernet LAN. This groups the tools for network configuration and management at the same location. Also from the configuration station you can address any NAS in the network.

The following figure shows an example of configuration station connected through a LAN to the Ethernet LAN of an Nways Switch via a router. Connecting the configuration station directly to the Ethernet LAN is also possible.

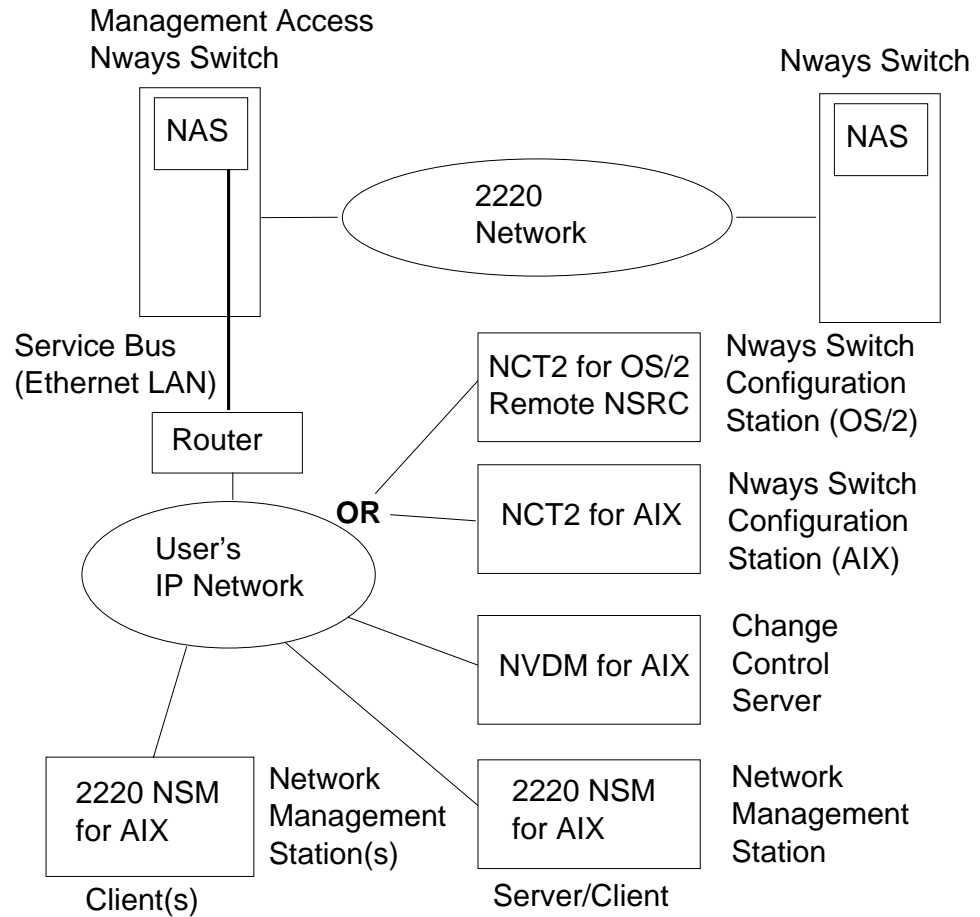


Figure 5. Nways Switch Management Stations

**Legend:**

- NAS** Nways Switch administration station
- NCT2** Nways Switch Configuration Tool 2
- NSM** Nways Switch Manager
- NSRC** Nways Switch Resource Control

If you install Nways Switch Resource Control on an OS/2 configuration station, you are able to operate the functions of a NAS remotely.

Also, with this type of connection you are able to transfer configuration files between the configuration station and the NASs using FTP. Without these connections and programs, you would, for example, have to load the configuration files on diskettes and mail them to the Nways Switch sites.

## Installing the OS/2 Configuration Station

You install the OS/2 configuration station hardware and software using the documentation provided with each product. When installing DB2/2, select the **Single-User** option.



If you want to use the Nways Switch configuration station as remote user console to operate the NASs remotely, install Nways Switch Resource Control.

## Installing the AIX Configuration Station

You install the AIX configuration station hardware and software using the documentation provided with each product. When installing DB2/6000, select the **Single-User** option.

The Nways Switch Resource Control application cannot be installed on an AIX station.

---

## Nways Switch Resource Control

*Nways Switch Resource Control* is a component of the Nways Switch Control Program. It runs on the NAS or on a remote user console. Its main functions are:

- Displaying the status of the Nways Switch resources.
- Locking or unlocking the traffic on the communication lines or voice servers.
- Deactivating a resource for configuration change or service. When a resource is deactivated, its hardware is reset and its traffic is stopped.
- Activating a resource to restart the traffic on it. When a resource is activated, its code is changed if its level is lower than the code level on the NAS hard disk.
- Restarting the Nways Switch or NAS, possibly with a new configuration.
- Forcing a switchover to a backup resource (control point adapter, switch module, or clock module).
- Managing the dual Control Program levels stored on the NAS.
- Running tests on the machine or on a specific resource.
- Getting local time from the NAS.
- Disconnecting the NAS from the Nways Switch.
- Importing configuration files in ZIP format into the new configuration.
- Exporting configuration data from the current configuration.
- Managing the NAS passwords.

## Remote Nways Switch Resource Control

Nways Switch Resource Control can be distributed from the change control server and installed on a remote user console under OS/2. Using this version of the application, you can log on to a remote NAS via TCP/IP and operate its functions remotely.

---

## NAS Configuration Database

The following figure shows how configuration databases (CDB) are organized on the NAS hard disk and NCT2.

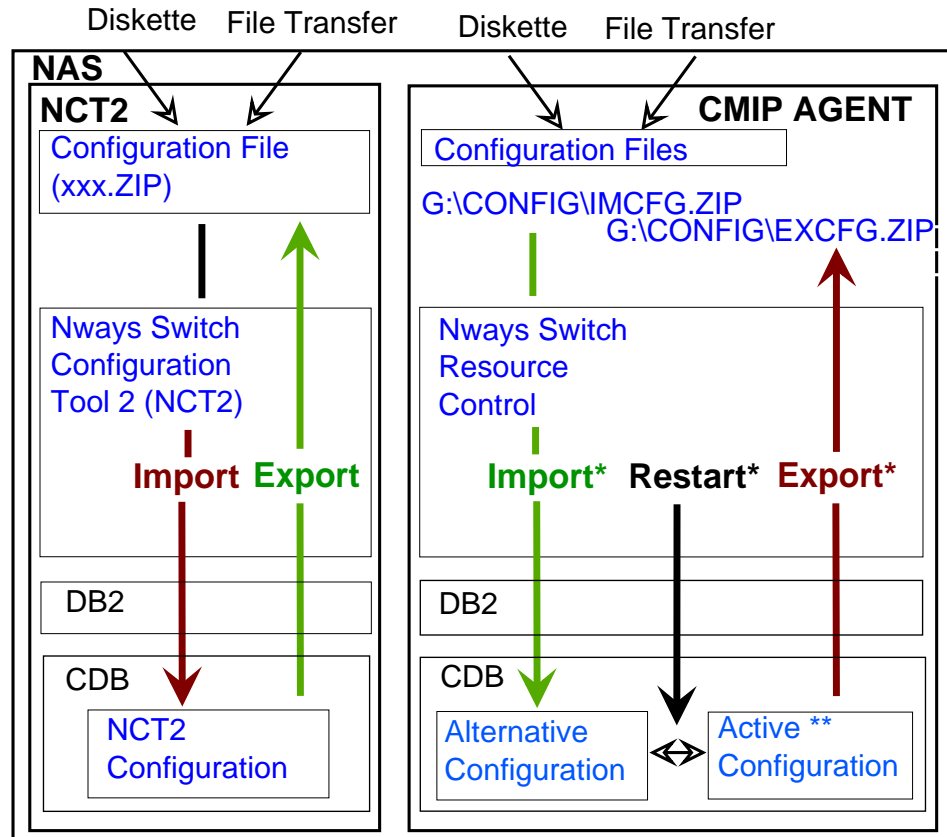


Figure 6. Nways Switch Configurations in the NAS

**Legend:**

- \* Command also available from 2220 Nways Switch Manager
- \*\* Can be changed from 2220 Nways Switch Manager through online configuration functions

- CDB** Configuration database
- CMIP** Common management information protocol
- DB2** DATABASE 2
- NAS** Nways Switch administration station

## Configuration File

A *configuration file* contains the parameters for configuring an Nways Switch in compressed binary format (xxx.ZIP).

To store a configuration file on the NAS hard disk, do one of the following:

- Load the configuration file from diskette.
- FTP the configuration file from a configuration station that runs NCT2.
- Export the configuration file in ZIP from the local NCT2 using the NCT2 export function.

- Export the active configuration from the NAS using the export function of the Nways Switch Resource Control program or 2220 Switch Manager.

Using the NCT2 import function, you can import the active configuration from the NAS hard disk as the NCT2 configuration file.

Using the import function of the Nways Switch Resource Control program or 2220 Switch Manager, you can import the ZIP file as the alternative configuration from the NAS hard disk. The path and name of the configuration file to import must be G:\CONFIG\IMCFG.ZIP

## NCT2 Configuration

The *NCT2 configuration* contains the parameters configuring Nways Switches. Using NCT2, you can perform the following operations:

- Export the NCT2 configuration file for a given Nways Switch as a compressed (xxx.ZIP) or ASCII (xxx.ACF) file to the NAS hard disk.
- Import an Nways Switch configuration file into the NCT2 configuration.

## Active Configuration

The *active configuration* is stored in the configuration database on the NAS hard disk. Using the export function of the Resource Control program, you can load the active configuration as a compressed configuration file (xxx.ZIP) on the NAS hard disk.

Using 2220 Switch Manager from the network management station, you can modify the active configuration by sending CMIP commands over the NBBS network. The configuration changes take effect immediately.

Using 2220 Switch Manager from the network management station or the Resource Control program on the NAS, you can restart the Nways Switch and the NAS with either the active configuration or an alternative configuration as shown in “Restarting the NAS” on page 20.

## Alternative Configuration

The *alternative configuration* is also stored in the configuration database on the NAS hard disk. You can update its contents from the configuration file (G:\CONFIG\IMCFG.ZIP on the NAS hard disk) file by using the import function of the Resource Control application or the import function of the 220 Nways Switch Manager.

When the Nways Switch or NAS is restarted with the **new configuration** option, the alternative configuration is activated and the active configuration becomes the alternative in the database. In this way, you can manage two different configurations in the NAS. For example, using the **new configuration** option, you can switch between the active and alternative configurations in order to test a new configuration. If there is a problem, you can easily restart the current configuration.

Using 2220 Switch Manager from the network management station or the Resource Control program on the NAS, you can activate the alternative configuration by restarting either the Nways Switch and the NAS or only the NAS. For more information, see “Restarting the NAS” on page 20.

---

## Restarting the NAS

You can restart an Nways Switch with either the active or the alternative configuration as follows:

- From the NAS, use the Resource Control program to restart the Nways Switch and the NAS or only the NAS.
- From a network management station, enter the Restart command from the 2220 Switch Manager Nways Switch menu.
- From a remote user console, remotely log on to the NAS from a Resource Control program and select the Restart function.

## Restarting an Nways Switch and the NAS

Use the **Restart Nways Switch and NAS** option to:

- Deactivate, reset, and test all hardware resources (for example, the adapters and switch modules) in an Nways Switch.
- Reload the NAS.
- Compare the level of code running in the adapters to the one stored on the NAS hard disk. If the adapter code is lower, it is upgraded. If the level is the same or higher, the code is not changed.
- Configure Nways Switch resources with data from the alternative configuration (restart the Nways Switch and the NAS with the new configuration).
- Restart the Nways Switch.

Because the **Restart Nways Switch and NAS** option disrupts traffic in the Nways Switch, use this option only at installation and for large configuration changes.

## Restart NAS Only

Use the **Restart NAS only** option to:

- Reload the NAS.
- Compare the level of code running in the adapters to the one stored on the NAS hard disk. If the adapter code is different, an alarm is logged.
- Restart the deactivated resources.
- Configure the deactivated resources with data from a new configuration.

The **Restart NAS only with new configuration** option does not disrupt network traffic on active adapters and line interface couplers, and only affects resources that are deactivated. Use this option to load the alternative configuration to:

- Add new hardware resources (for example, adapters and line interface couplers): first update the configuration, then restart the NAS with the new configuration.
- Change the configuration of a line attachment: update the configuration, deactivate the adapter, then restart the NAS with the new configuration.
- Create, change, or delete a logical resource (for example, a network interface or a connection): update the configuration, deactivate the adapter, then restart the NAS with the new configuration.
- Change the IP gateway adapter positions in a subrack (see the online help for Resource Control for details).

**Important:** Do not use the **Restart NAS only with new configuration** option when you remove or replace hardware in control point positions. These hardware

changes can result in a failure in Nways Switch operation. After you remove or replace this hardware, restart the Nways Switch using the **Restart Nways Switch and NAS with new configuration** option.

The **Restart NAS only with current configuration** option performs the same tasks as the **Restart NAS only with new configuration** option except that the current configuration is reloaded instead of the new (alternative) configuration.

---

## Nways Switch Configuration List

The *Nways Switch Configuration List* is an NCT2 function that allows you to display in readable format how the database of an Nways Switch is organized.

You cannot edit the file generated the Configuration List function as input to NCT2, as you can do with an xxx.ACF file. You can print the Configuration List file using a printer attached to your station. More than 100 pages may be printed for a small configuration file. The NAS is shipped without a printer and printer driver.

---

## Nways Switch Installation Program

The *Nways Switch Installation Program* is provided on the NAS with the Control Program and is used by your IBM service representative at installation to:

- Import the Nways Switch configuration file prepared with NCT2 and update the configuration in the NAS database.
- Set up the NAS TCP/IP configuration according to the imported configuration file.
- Configure NAS installation parameters.

The Installation Program imports the configuration file from the NAS hard disk or a diskette drive. To later update the NAS configuration and installation parameters, you must rerun the Installation program.

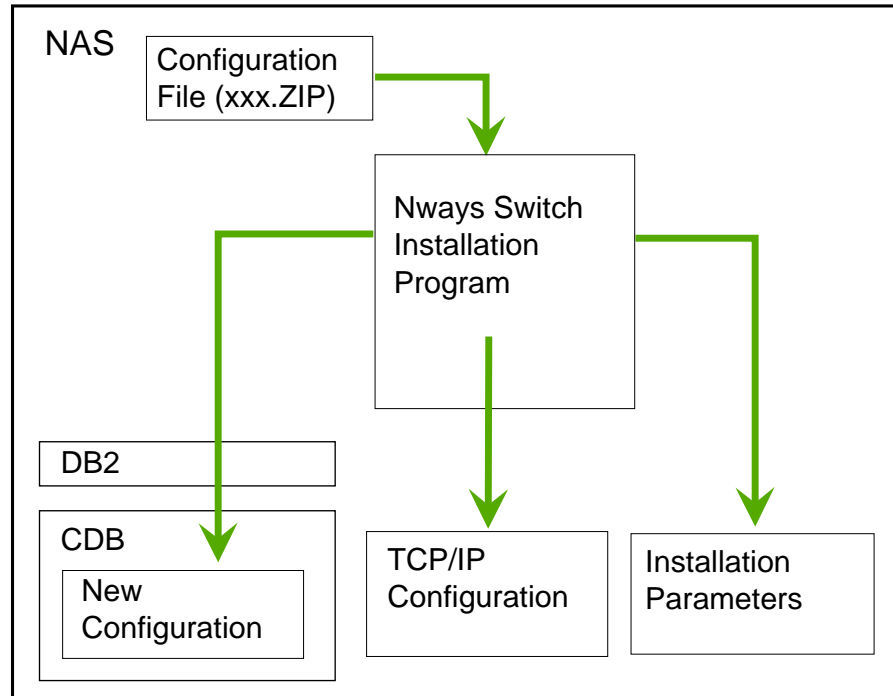


Figure 7. Nways Switch Installation Program

**Legend:**

- CDB** Configuration database
- DB2** DATABASE 2
- NAS** Nways Switch administration station

## NAS TCP/IP Configuration

The Installation Program updates the TCP/IP configuration of the NAS with the IP addresses extracted from the configuration file prepared with NCT2 of the following resources:

- NAS
- Nways Switch adapters
- Attached IP hosts, such as network management station, change control server, and remote user consoles.

Additional IP host addresses can be set in the TCP/IP configuration using the Installation program. The IP host list is used by the ping program of the NAS.

## NAS Installation Parameters

When you run the Installation program for the first time, your IBM service representative must manually enter the following parameters:

1. Name of the server that runs NetView Distribution Manager for AIX (change control server), including the domain name as defined on the change control server.
2. NAS hard disk backup time (when you want the first NAS disk to be backed up on the second disk).
3. List of IP hosts that can be tested using the PM Ping program.
4. Local time, date, and time zone.
5. Configuration parameters of the NAS modem.
6. Status of the IBM Remote Support Facility (RSF): enable or disable.

Give the settings of these parameters to your IBM service representative when the Nways Switch is installed.

The Installation program creates an installation parameter file on the NAS hard disk that you can view.

---

## 2220 Switch Manager and Configuration

2220 network management is performed using Nways 2220 Switch Manager (2220 Switch Manager) running on network management stations as shown in Figure 5 on page 16 . 2220 Switch Manager allows you to modify the configuration of Nways Switch resources from the network management station. All commands are transferred in CMIP format. Changes to the active configuration are immediately taken into account as shown in Figure 6 on page 18.

Using 2220 Switch Manager, you make configuration changes to the following Nways Switch resources:

- Adapters
- Line interface couplers
- Logical ports
- Network interfaces
- Connections
- X.25 subscribers and hunt groups
- ISDN bearer service profiles and numbering plan tables
- Logical trunks

Use the following functions from the command line interface on the network management station :

- Export the current configuration of an Nways Switch to the NAS hard disk as G:\CONFIG\IMCFG.ZIP
- Import the G:\CONFIG\IMCFG.ZIP file from the NAS hard disk as the alternative configuration on an Nways Switch
- Restarting an Nways Switch and NAS with new or current configuration
- Restart only the NAS with the active or alternative configuration.

Refer to the online *Nways 2220 Switch Manager User's Guide* for more detailed information on 2220 Switch Manager functions.

## Netscape Web Browser

Additional 2220 Switch Manager functions are available through the Netscape web browser. To access these functions, the Internet Connection Server must be installed on the network management station.

Using the web—based functions, you can display the following Nways Switch configuration data:

- Connection bandwidth information for a trunk
- Global trunks bandwidth information for a node
- Bandwidth adjustment parameters for connections with adjustable bandwidth.

For more information about the Web Browser interface, refer to the *Nways 2220 Switch Manager User's Guide*.

---

## NVDM and Nways Switch Configuration

The Nways Switch Control Program is updated using NetView Distribution Manager/6000 (NVDM) from a change control server as shown in Figure 5 on page 16 . You use NVDM scripts to operate the dual code-level function on the NAS of each Nways Switch from the change control server.

*Dual code-level management* is available in the Nways Switch Control Program starting from level V2R1 and is applicable to any later code upgrade. This function requires enhanced NAS hardware.

Using the dual code-level management function, you can store two levels of Nways Switch Control Program code and manage them from:

- 2220 Switch Manager in the network management station
- NVDM in the change control server
- Nways Switch Resource Control in the NAS.

The level of the Nways Switch Control Program that is currently running is called the *active level*. The other level that is installed is called the *inactive level*.

Any code update from NVDM/6000 is installed as the inactive level without altering the active level. Figure 8 on page 25 shows how two levels of the Nways Switch Control Program are managed using 2220 Switch Manager, NVDN, and 2220 Switch Manager.



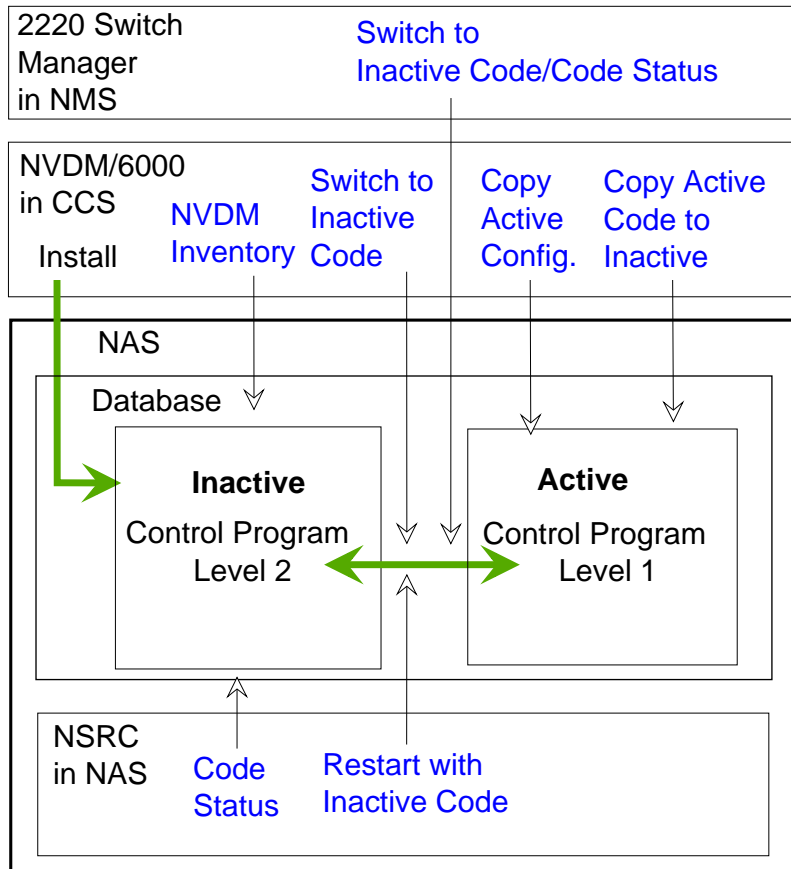


Figure 8. NVDM and Dual Code-Level Management

**Legend:**

- CCS** Code change server
- NAS** Nways Switch administration station
- NMS** Network management station
- NSRC** Nways Switch resource control
- NVDM** NetView Distribution Manager

## NVDM Inventory

Use the NVDM inventory function from the change control server to get the code inventory of each NAS. Before running this function, you must delete the target NAS history on the change control server.

A similar function called *Code Status* is available from the Nways Switch Resource Control program on the NAS and from Node configuration on the Nways Switch menu of the 2220 Switch Manager.

## Install

Code update installation from NVDM/6000 is done on the inactive level. Inactive configurations are prepared from active level configurations.

## Switch to Inactive Code

An NVDM script called *Switch to Inactive Code* is available from NVDM/6000 to activate the inactive level of code in the NAS. When the command is run:

1. The inactive code becomes active.
2. The NAS is restarted.
3. Inactive configurations are loaded and become active.

A similar command is available from the Nways Switch Resource Control program on the NAS and from 2220 Switch Manager on the network management station.

## Copy Active Configurations

An NVDM script called *Copy Active Configurations* is available from NVDM/6000 to copy the active and alternative configurations to the inactive configurations. This function is executed only when the level of inactive code is higher than the active code level.

Use this function to report configuration changes made after new code is installed as the inactive level and before you activate the code.

If the inactive code level is lower than the active level, the function is not executed and the return code is 0. Depending on the Nways Switch configuration, the time required to copy configurations is from 20 to 40 minutes.

## Copy Active Code to Inactive

An NVDM script called *Copy Active Code to Inactive* is available from NVDM/6000 to copy active code to the inactive level. Use this function before you install a partial update to the inactive code. It is not necessary to use this function before you install a new version of Nways Switch Resource Control program because the inactive code is erased first.

---

## Summary of Configuration Tools

Table 1 shows the tools used for configuring a 2220 network and on what station each tool is installed.

Table 1. Tools Used to Configure a 2220 Network

Tool	AIX Station	OS/2 Station	NAS
Nways Switch Configuration Tool 2 (NCT2)	Yes (Nways Switch configuration station)	Yes (Nways Switch configuration station)	Yes
Nways Switch Configuration List	No	Yes	Yes
Nways Switch Resource Control	No	Yes (remote user console)	Yes

Table 1. Tools Used to Configure a 2220 Network (continued)

Tool	AIX Station	OS/2 Station	NAS
Nways Switch Installation Program	No	No	Yes
Nways 2220 Switch Manager (2220 NSM)	Yes (network management station)	No	No
NetView Distribution Manager (NVDM)	Yes (change control server)	No	No

---

## Defining a Configuration Strategy

This section describes a strategy for selecting configuration tools and functions during network installation and operation.

### Configuration Strategy at Network Installation

**Note:** A configuration station running NCT2 is **mandatory** to create the IP addresses of Nways Switches and attached stations.

#### Should I install an AIX or OS/2 Configuration Station?

**AIX Configuration Station:** For station requirements, see “Hardware and Software Requirements for AIX Stations” on page 14. To transfer configuration files to Nways Switches after network installation, you use TCP/IP from an AIX configuration station attached through the service bus of an Nways Switch (for example the Nways Switch that connects the network management station to the network). To remotely import and export configuration files on the NASs, you use 2220 Switch Manager functions from the network management station.

**Should I install NCT2 for AIX on the Network Management Station?:** This depends on the size of the AIX station (computing power, RAM, and disk storage) and where you need to install the AIX configuration station; that is, who will use the configuration station during normal network operation: network planner or network operator?

**OS/2 Configuration Station:** For station requirements, see “Hardware and Software Requirements for OS/2 Stations” on page 15. To transfer configuration files to Nways Switches after network installation, you must install TCP/IP for OS/2 and attach the configuration station through the service bus of an Nways Switch (preferably the Nways Switch that connects the network management station to the network). To remotely import and export configuration files on the NASs, you must install the remote Nways Switch Resource Control program on the OS/2 configuration station.

### Configuration Strategy for Network Operation

Table 2 on page 28 displays the tools and stations used to change the configuration of 2220 resources during normal network operation.

Table 2. Tools Used to Configure 2220 Resources

<b>Configuration Changes</b>	<b>Tool</b>	<b>Environment</b>	<b>Station</b>
Nways Switch IP address	Nways Switch Configuration Tool 2	AIX or OS/2	Configuration station
Attached IP hosts (stations)	Nways Switch Configuration Tool 2	AIX or OS/2	Configuration station
Nways Switch resources when managing network	2220 Nways Switch Manager	AIX	Network management station
Nways Switch resources when upgrading code	Nways Switch Distribution Manager	AIX	Change control server
Nways Switch resources when servicing node	Nways Switch Configuration Tool 2	NAS	Nways Switch administration station
NAS IP address or installation parameters	Nways Switch Installation Program	NAS	Nways Switch administration station

---

## Chapter 3. Handling Nways Switch Configurations

This chapter describes how to prepare, copy, import, export, and change the Nways Switch configurations. It includes the following sections:

- “Preparing Configurations with NCT2”
- “Copying Configurations to Local NCT2” on page 30
- “Remote Import and Export on NAS” on page 31
- “Changing Configurations in Operations” on page 33.

---

### Preparing Configurations with NCT2

In the following sections, *local NCT2* refers to NCT2 available on the NAS of each Nways Switch. The local NCT2 is the same as NCT2 for OS/2.

The main steps for preparing configurations at network installation are the following:

1. “Configuring on the Configuration Station”
2. “Initializing Nways Switch Manager”
3. “Transferring Configuration Files”
4. “Activating Configurations” on page 30.

### Configuring on the Configuration Station

Using NCT2 on your Nways Switch configuration station, you configure the 2220 network parameters, create a configuration for each Nways Switch, and configure the physical and logical resources of each Nways Switch. For details, refer to “Starting NCT2 for OS/2” on page 42.

### Initializing Nways Switch Manager

In parallel with the configuration tasks that you perform with NCT2, you will initialize Nways 2220 Switch Manager on the network management station by defining network parameters and creating nodes. This work is required to manage the network and change configurations later on after network installation. However, using Nways 2220 Switch Manager you cannot create configuration files that can be transferred and imported on the NAS.

### Transferring Configuration Files

When the Nways Switch configurations prepared with NCT2 are ready, you transfer them to each Nways Switch as follows (see Figure 9 on page 30):

1. From your configuration station, export each configuration into a compressed configuration file called `NWAYS-SWITCH-NAME.ZIP` (for example, `N1.ZIP` or `N2.ZIP`).
2. At first installation, IP addresses are not set in your network. Thus, transfer to the NAS using FTP is not possible. You will transfer each configuration file to its destination NAS using, for example, diskettes mailed to the Nways Switch site. The configuration file must be renamed `IMCFG.ZIP` to be imported correctly by Nways Switch Resource Control on the NAS.

A transfer through the public switched network using the service modem of each NAS is also possible with the help of the IBM service personnel.

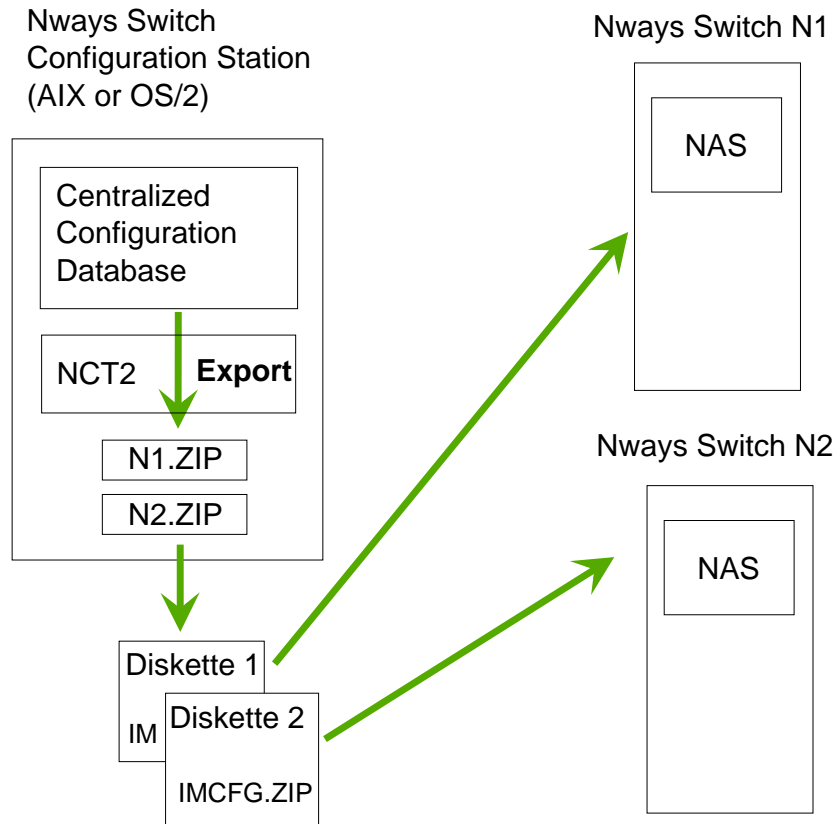


Figure 9. Preparing Nways Switch Configurations

## Activating Configurations

On the destination Nways Switch, the IBM service person:

1. Runs the Nways Switch Installation Program to import the configuration file and set up the NAS TCP/IP configuration.
2. Activates the new configuration (for details, refer to “Restarting the NAS” on page 20 ).

---

## Copying Configurations to Local NCT2

After installation, in order to update the local NCT2 database on the NAS of an Nways Switch, you can copy the current configuration as follows (see Figure 10 on page 31 ):

1. From the NAS, export the current configuration using Nways Switch Resource Control.
2. Import the current configuration into the working database of the local NCT2.

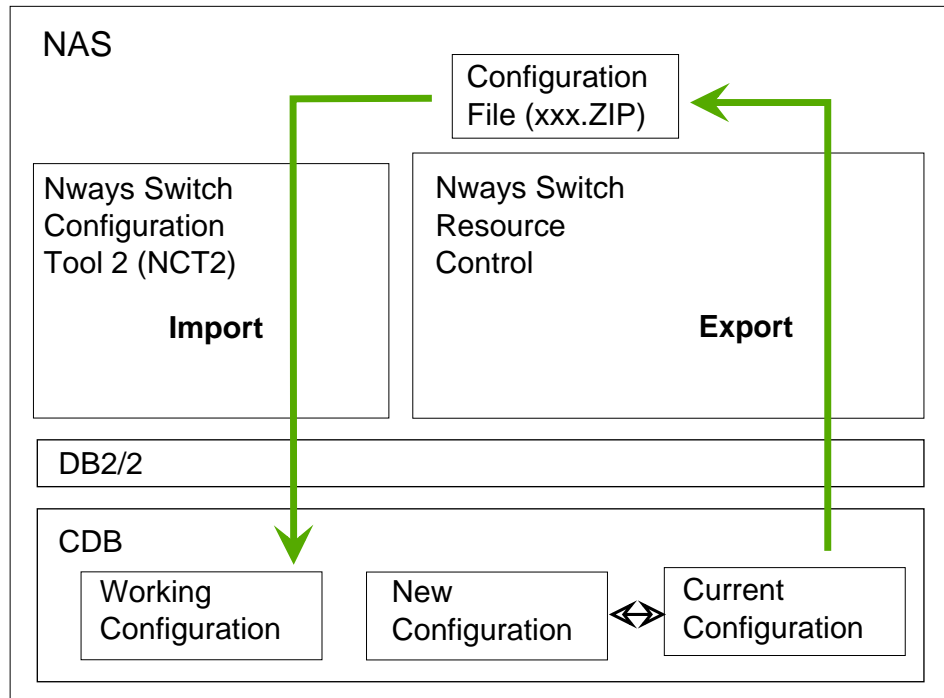


Figure 10. Updating NCT2 Working Configuration

**Legend:**

- CDB** Configuration database
- DB2** DATABASE 2
- NAS** Nways Switch administration station

---

## Remote Import and Export on NAS

This section describes the methods that you will use to import and export remotely configurations on the NAS. You can proceed as follows:

- “Importing and Exporting through 2220 NSM”
- “Importing and Exporting through Remote Resource Control” on page 33.

## Importing and Exporting through 2220 NSM

Your network management station runs 2220 NSM. If the station has enough capacity, you can also install NCT2 for AIX on it (see Figure 11 on page 32).

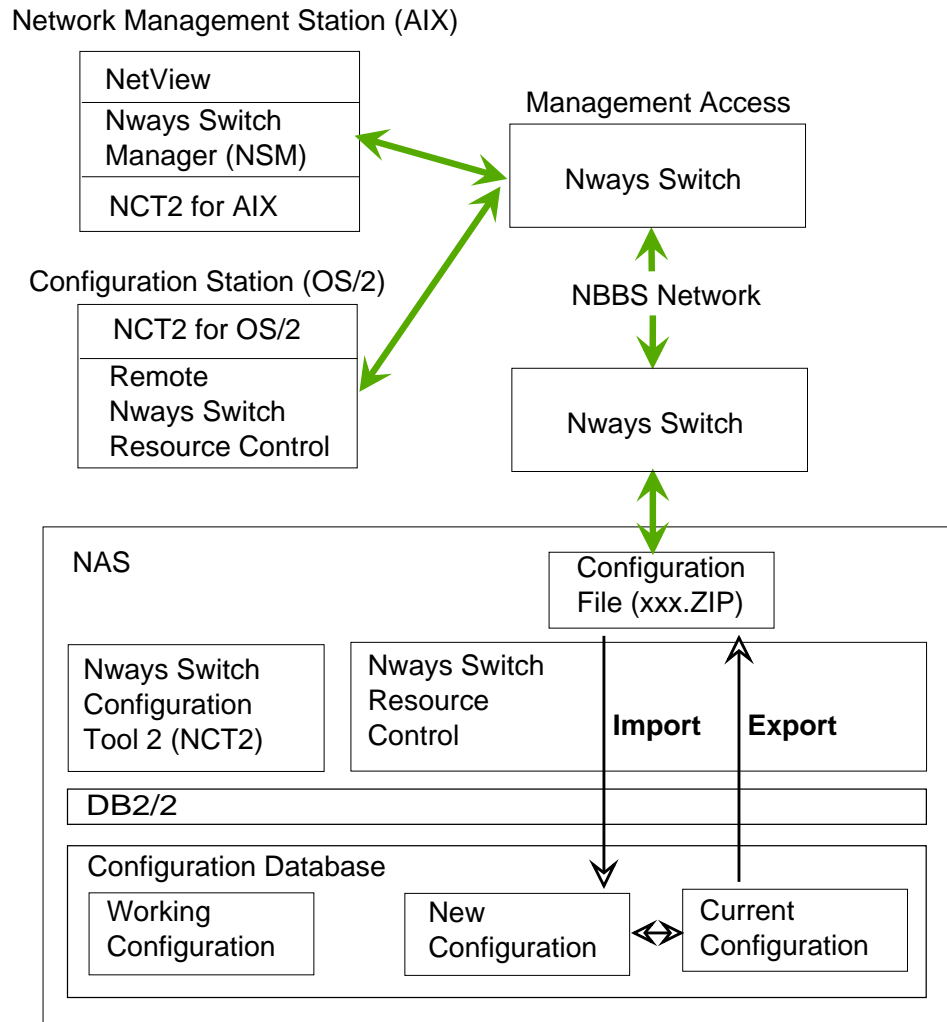


Figure 11. Importing and Exporting Configurations Remotely

1. Transfer the configuration files between the NAS and the network management station using FTP under AIX. When establishing the connection, you are asked to provide the NAS host name, which is the Nways Switch name defined with NCT2, a user name, and a password. The default values for the user name and password are:  
User name: clipper (or operator)  
Password: soleil
2. From the network management station, use the Import function of 2220 Switch Manager to import the transferred configuration file (xxxx.ZIP) into the new configuration of the NAS. For details of the 2220 Switch Manager functions, refer to the *IBM Nways 2220 Switch Manager for AIX User's Guide*.
3. Also, use the Export function of 2220 Switch Manager to export the current configuration of the Nways Switch as xxx.ZIP on the NAS hard disk and FTP to transfer it to the network management station.



## Importing and Exporting through Remote Resource Control

If you decided to install a configuration station under OS/2, to handle configuration files comfortably, you need TCP/IP and the remote Nways Switch Resource Control on the same station (see Figure 11 on page 32).

1. Transfer the configuration files between the NAS and the configuration station using FTP under OS/2. When establishing the connection, you are asked to provide the NAS host name, which is the Nways Switch name defined with NCT2, a user name, and a password. The default values for the user name and password are:  
User name: clipper (or operator)  
Password: soleil
2. From the configuration station, log on remotely to the NAS through remote Nways Switch Resource Control. Use the host name, user name, and password as described in the previous step.
3. Run the Import function of Nways Switch Resource Control to import a transferred configuration file (xxxx.ZIP) into the new configuration of the NAS. For details, refer to online help of Nways Switch Resource Control.
4. Also, use the Export function of Nways Switch Resource Control to export the current configuration of the Nways Switch (as xxxx.ZIP) on the NAS hard disk.

---

## Changing Configurations in Operations

Following are several types of configuration changes that concern:

- IP addresses of new Nways Switches or attached stations (for details, see “From Nways Switch Configuration Station”).
- Nways Switch resources (for details, see “From Network Management Station” on page 35 ).
- NAS installation parameters or temporary changes on Nways Switch configuration (for details, see “From NAS” on page 36).
- Also, if an Nways Switch configuration has been changed from the network management station or locally from the NAS, copy the current configuration to the database in the configuration station (for details, see “Copying Configurations to Configuration Station” on page 38).

The following sections describe the recommended methods for these types of changes listed above.

### From Nways Switch Configuration Station

When adding a new Nways Switch or attaching a new IP host to an Nways Switch (for example, a change control server or a user remote console), in order to define correct IP addresses, it is **mandatory** to run NCT2 again from the Nways Switch configuration station.

### Transferring Configuration Files

Once you have updated configurations using NCT2, transfer them to the NAS as follows.

1. From NCT2 for OS/2 or AIX on the configuration station, export the configuration data for each updated Nways Switch into a compressed file called Nways-Switch-name.ZIP (see Figure 12).
2. Transfer the configuration files to their destination NAS using one of the following methods:
  - Use the TCP/IP file transfer protocol (FTP) over the 2220 network. The host name, user name, and password are the same as under "Importing and Exporting through Remote Resource Control" on page 33.  
The file name on the destination NAS must be G:\CONFIG\IMCFG.ZIP
  - Mail a diskette to the Nways Switch site. The configuration file must be A:\IMCFG.ZIP

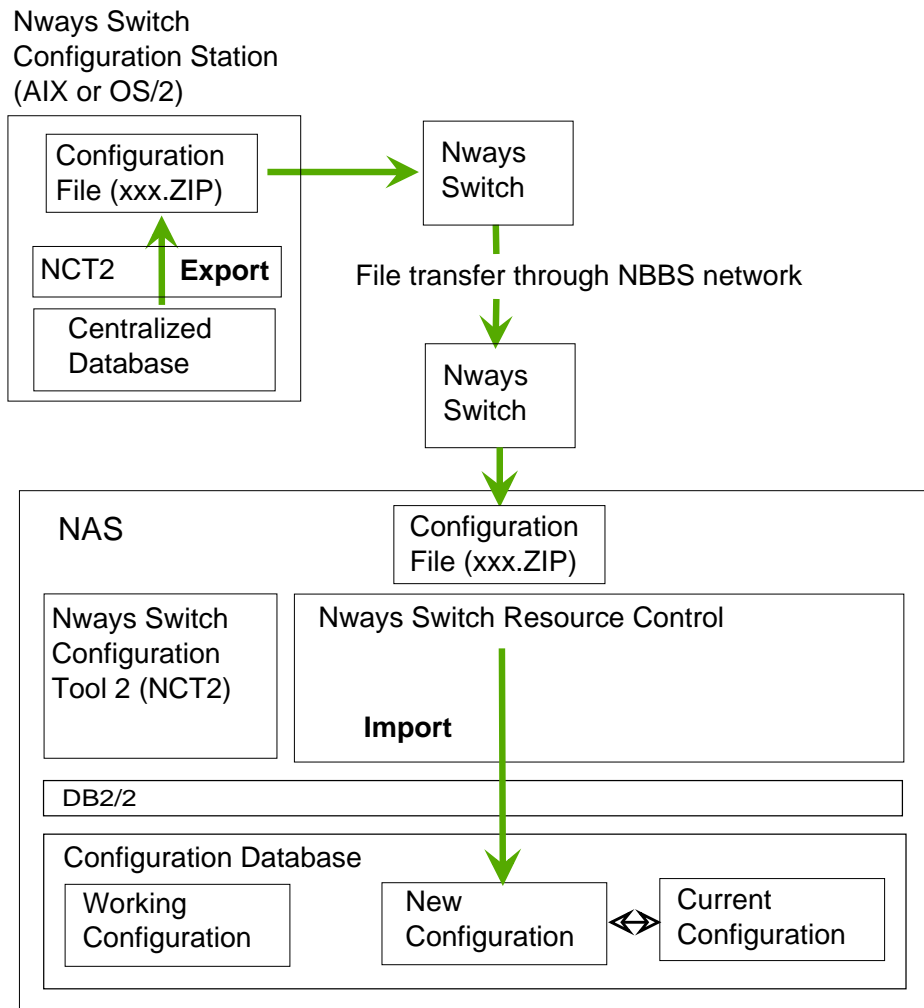


Figure 12. Changing Configurations from a Configuration Station

The configuration file names given above are required by Nways Switch Resource Control to import the configuration file correctly.

## Activating New Configuration

On the destination NAS:

1. If IP addresses have been modified, run the Nways Switch Installation Program locally to import the configuration file and set up the NAS TCP/IP configuration.
2. Otherwise, import the configuration using the Nways Switch Resource Control application as explained in “Remote Import and Export on NAS” on page 31.
3. Activate the new configuration as explained in “Restarting the NAS” on page 20.

## From Network Management Station

You may change the Nways Switch configurations remotely from the network management station using the Nways 2220 Switch Manager (2220 NSM) as shown on Figure 13. This method allows direct access to the current configuration in the NAS database.

### Configuration Functions of the 2220 Switch Manager

Use the configuration functions of 2220 Switch Manager listed in “2220 Switch Manager and Configuration” on page 23. For details of the functions, refer to the 2220 NSM online help and user’s guide.

**Attention:** When adding a new Nways Switch, in order to keep the IP addresses in a correct sequence, it is **mandatory** that you run again NCT2 on the configuration station.

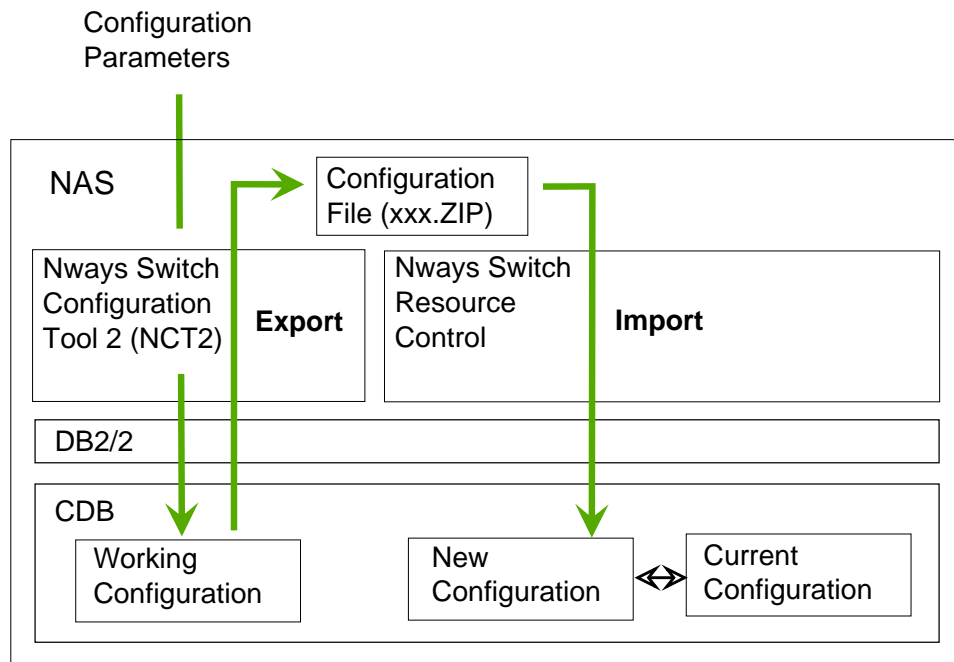


Figure 13. Changing Configurations Using 2220 NSM

## Activating Configuration Changes

The configuration changes are transferred as CMIP commands to the Nways Switch connecting the network management station to the network, then to the destination Nways Switch. They are applied to the current configuration on the NAS database and take effect immediately. This type of change is not disruptive for the node traffic.

After changing the configuration of an Nways Switch from the network management station, do not forget to update:

- The working configuration handled by the local NCT2 on the NAS as explained in “Copying Configurations to Local NCT2” on page 30.
- The centralized database located in the Nways Switch configuration station as explained in “Copying Configurations to Configuration Station” on page 38.

## From NAS

This section explains in what conditions you would configure an Nways Switch from its NAS.

### Configuring a Small Network

If your network is not too large (up to ten Nways Switches), and if the NAS of an Nways Switch is available, you can prepare a network configuration database by using NCT2 for OS/2 on the NAS. This method is possible if the Nways Switches have average configurations, that is if their configurations can be stored in the free storage of a NAS hard disk.

The configuration files are prepared, transferred, and activated as explained in “Preparing Configurations with NCT2” on page 29. However, in this case the available NAS is your configuration station.

If your network becomes larger (more than ten Nways Switches), the disk storage on the NAS that contains your network configuration database is no longer sufficient. You should consider using a stand-alone configuration station.

### Minor Changes to Physical Resources

For temporary or minor configuration changes to an Nways Switch, such as replacing or adding a line attachment, you can use the local NCT2 and proceed as shown on Figure 14 on page 37.

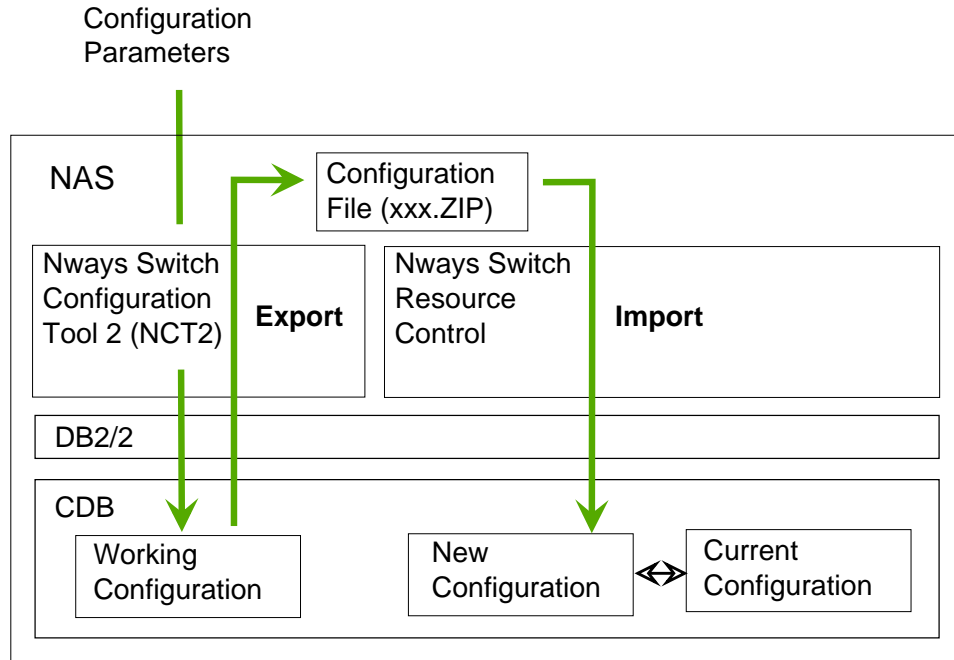


Figure 14. Configuring from the NAS

Before making changes using NCT2 on the NAS, check that the working configuration is up-to-date. It must be a copy of the configuration that the Nways Switch is currently operating with. If it is not up-to-date, proceed as explained in “Copying Configurations to Local NCT2” on page 30.

Change an Nways Switch configuration locally as follows:

1. Enter the configuration parameters using the local NCT2 on the NAS. The working configuration is updated.
2. Use the NCT2 Export function to create a compressed file on the NAS hard disk. The file name must be G:\CONFIG\IMCFG.ZIP to be correctly imported later on by Nways Switch Resource Control.
3. Import the configuration file into the new configuration using the Import function of Nways Switch Resource Control.
4. Activate the new configuration as explained in “Restarting the NAS” on page 20.

If the change is to be permanent, update the working configuration on the NAS and the configuration database on the configuration station.

### Changing the NAS Installation Parameters

After installation, if you want to update the NAS installation parameters (for example, its local time), run the appropriate function of the Installation Program (see “Nways Switch Installation Program” on page 21 for details).

## Copying Configurations to Configuration Station

The following figure shows how to keep the centralized configuration database up-to-date by copying updated configurations to the configuration station.

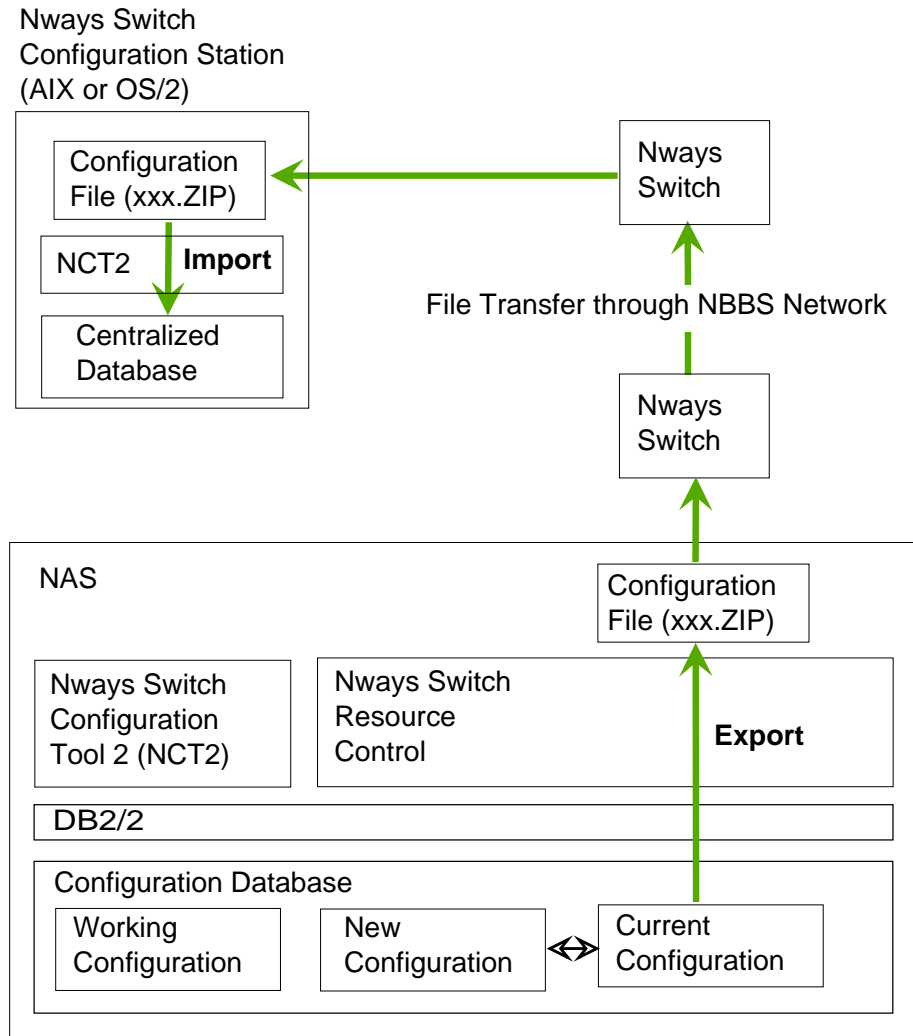


Figure 15. Copying Configurations to Configuration Station

### Exporting Configurations

Export the current Nways Switch configuration as explained in “Remote Import and Export on NAS” on page 31.

**Attention:** If you use Nways Switch Resource Control, do not select **Export configuration file -> Only hardware** because this function produces a compressed file which cannot be imported by NCT2. Use **Export configuration file -> Whole Nways Switch** instead.

The resulting file is a compressed file in binary format which is stored on the NAS hard disk as `NWAYS-SWITCH-NAME.ZIP`

## Transferring Configuration File

Transfer the configuration file to the configuration station using FTP. At the configuration station, load the configuration into the database using the Import function of NCT2 (see Figure 15 on page 38).

## Importing Configuration File

Import the configuration file into the NCT2 database using the Import function.

### ***Recommendations:***

- When you replace an existing Nways Switch configuration with a new one with the same name, a warning message is displayed. If you want to replace the old configuration, click on **Yes**.  
If you want to save the old configuration before replacing it, click on **No**, save the old configuration, and restart the import procedure.
- When an Nways Switch configuration is imported, its IP network address is imported at the same time and added to the list of IP network addresses.





---

## Chapter 4. Getting Started with NCT2

This chapter helps you to start configuring a 2220 network with NCT2. It includes the following sections:

- “Nways Switch Configuration Folder”
- “Starting NCT2 for OS/2” on page 42
- “Starting NCT2 for AIX” on page 42
- “NCT2 Workflow” on page 42
- “Network: Window and Dialog” on page 44
- “Network Parameters” on page 45
- “Network Profile” on page 46
- “X.25 General Parameters” on page 46.

---

### Nways Switch Configuration Folder

When NCT2 for OS/2 is installed, you see a folder called Nways Switch Configuration on your desktop. You open the folder by double-clicking on its icon. Its contents is shown on the following figure:

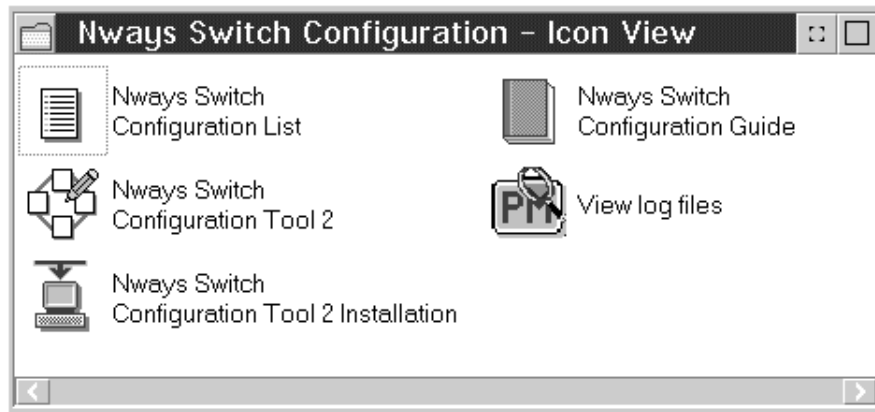


Figure 16. Nways Switch Configuration Folder

#### **Nways Switch Configuration List**

A utility that produces an ASCII file that reflects the database organization. This file is different from the ASCII file (xxx.ACF) produced by NCT2 and cannot be used as NCT2 input.

#### **Nways Switch Configuration Tool 2**

Nways Switch Configuration Tool 2 (NCT2) for OS/2

#### **Nways Switch Configuration Tool 2 Installation**

A utility that updates an already installed version of NCT2.

#### **Nways Switch Configuration Guide**

An online version of the *2220 Configuration Guide*, GA33-0xxx.

### View log files

A utility that displays the log file (NWAYS-SWITCH-NAME.VLO) produced by the Verify function of NCT2.

To start an application of the Nways Switch Configuration folder, double-click on its icon.

---

## Starting NCT2 for OS/2

To start NCT2 for OS/2, proceed as follows:

1. Open the DB2/2 folder and double-click on **Start DB2**. When prompted, enter the DB2 user ID and password. In the U.S., the DB2/2 defaults are:

User ID: userid  
Password: password

In other countries, refer to the DB2/2 documentation for default user ID and password.

2. Open the Nways Switch Configuration folder and double-click on **Nways Switch Configuration Tool 2**. If prompted, enter the desired user ID and password.

---

## Starting NCT2 for AIX

1. Open an X-window or dterm window.
2. Log on as ownerid.
3. Change to the directory /home/ownerid/nct2\_dir
4. Enter the command aharodt2
5. When prompted, enter the DB2/6000 user ID and password.

---

## NCT2 Workflow

The following figure shows the general NCT2 workflow. All the resources must be configured in **parallel**. That is, a type of resources (for example, Nways Switches) must be completely configured before starting to configure the next type of resources (for example, physical resources).

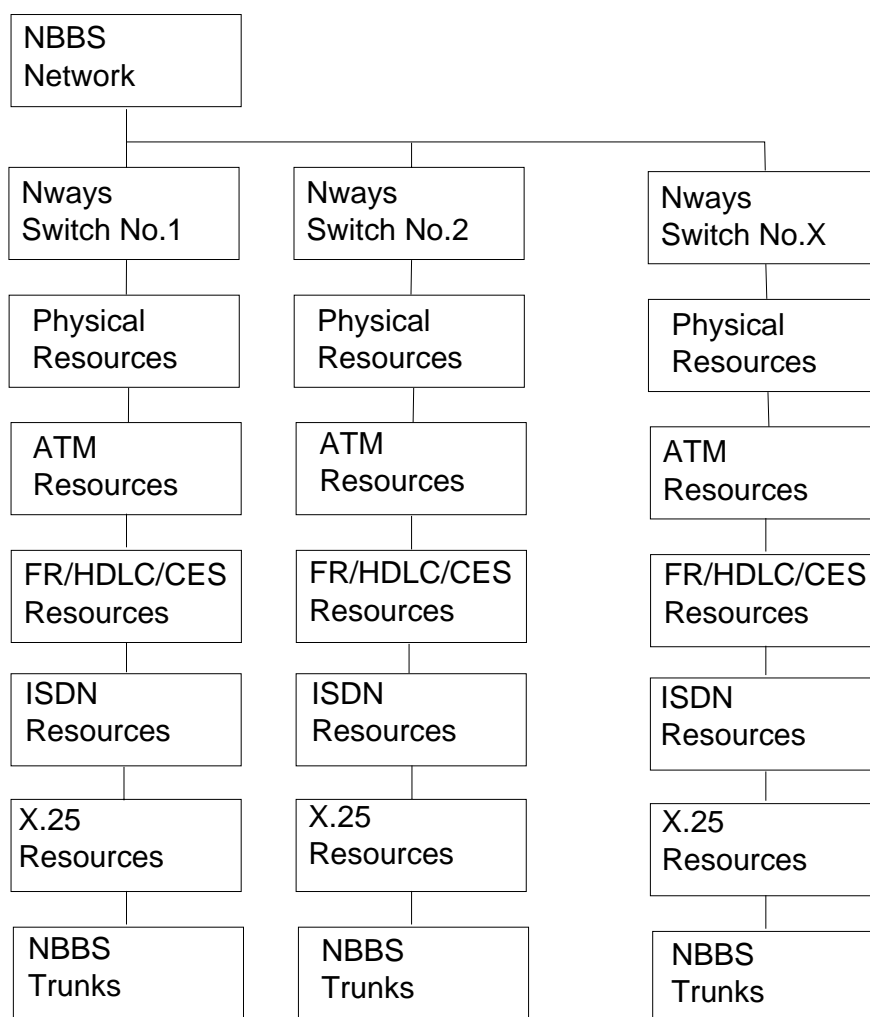


Figure 17. NCT2 Workflow

Here is a summary of your tasks when you use NCT2 to configure a network of Nways Switches:

1. First, configure the network parameters (for details, see “Network Parameters” on page 45). Create a network profile (for details, see “Network Profile” on page 46 ). Configure the X.25 general parameters, which are common to all X.25 resources in the network (for details, see “X.25 General Parameters” on page 46 ).
2. Create the Nways Switch configurations (Nways Switch no.1 to Nways Switch no.X). Also create their profiles and attached IP hosts (when applicable). For details, see “Chapter 5. Creating Nways Switch Configurations” on page 47.
3. For each Nways Switch, configure the adapters, line interface couplers, line attachments, and voice server extensions (if any). If the network is synchronized, configure the clock references. For details, see “Chapter 6. Configuring Physical Resources” on page 59.
4. For each Nways Switch, create one ATM network interface per physical ATM port line. For each ATM network interface, create ATM virtual paths and virtual

connections between ATM external devices. The backward connections are automatically created by NCT2. For details, see “Chapter 7. Configuring ATM Resources” on page 77.

5. For each Nways Switch, create one logical port per physical line operating in frame relay (FR), high-level data link control (HDLC), or circuit emulation services (CES). If the line is channelized (for example, a T1 or E1 line), create one logical port per channel.

For each logical port, create one or more potential connections. For frame relay connections, NCT2 automatically creates the backward virtual connections. For details, see “Chapter 8. Configuring FR, HDLC, and CES Resources” on page 101 .

6. For each Nways Switch, create one X.25 network interface per physical X.25 port line. Also create the X.25 subscribers and X.25 hunt groups. For details, see “Chapter 10. Configuring X.25 Resources” on page 145
7. For each Nways Switch, create the ISDN bearer service profiles, numbering plans, and network interfaces (one per physical ISDN port line). For details, see “Chapter 9. Configuring ISDN Resources” on page 129.
8. For each Nways Switch, create one logical trunk per physical trunk or channel (on E1 or T1 lines) connecting two Nways Switches. For details, see “Chapter 11. Configuring Trunks” on page 155.

## ASCII Configuration File

In addition to the compressed binary format (xxx.ZIP), NCT2 provides configuration files in ASCII editable format (xxx.ACF). For more information about ASCII configuration files, refer to “Appendix B. ASCII Configuration Files” on page 167.

---

## Network: Window and Dialog

On the screen of a station, a *window* is an area with a title bar, a menu bar, and scroll bars. A dialog box (also called *dialog*) is an area with entry fields and push buttons.

The following figure shows the NCT2 window and dialogs used to configure the network parameters. When you use NCT2 for the first time, the network parameters are not yet defined and the Network Parameters Configuration dialog displays automatically.

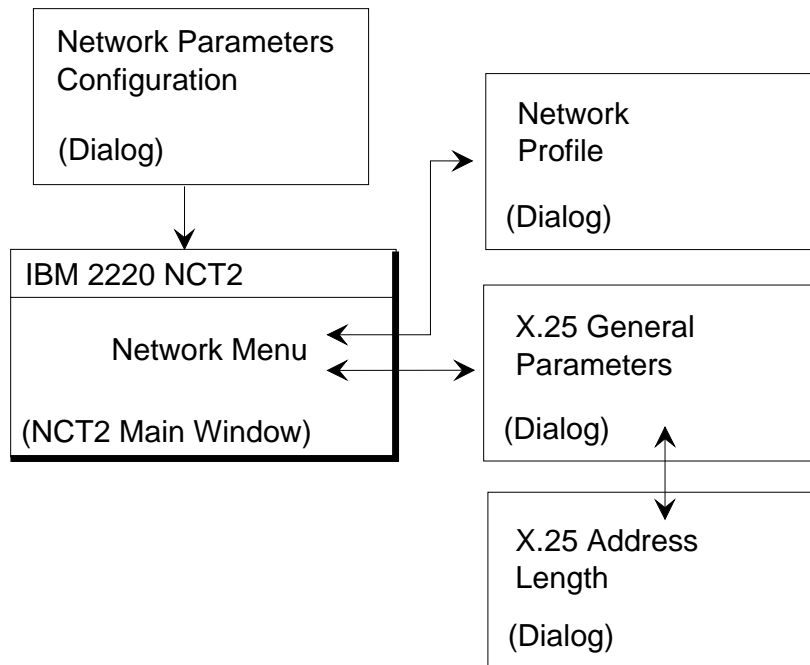


Figure 18. Network: Window and Dialogs

After the network parameters have been configured, the NCT2 Main Window is displayed. It is empty when you start configuring.

From the NCT2 Main Window:

- Open the Network Profile dialog by clicking on **Network** in the menu bar, then on **Open, Profile**.
- Open the X.25 General Parameters dialog by clicking on **Network, Open, X.25 General Parameters**.

From the X.25 General Parameters dialog, open the X.25 Address Length dialog by clicking on the **Address Length** push button.

---

## Network Parameters

Following are the 2220 network parameters:

### 2220 network name

A unique name provided by IBM through the Network Identification Registration process.

### IP address class

A, B, or C depending on the size of your network.

### Number of expected nodes

Selected for the IP address classes A and B. For class C, the maximum number of nodes is 254 by default.

**IP network mask**

Computed by NCT2.

**IP network address**

If your network is connected to Internet, this address is assigned by the Network Information Center.

For network parameter details, see the NCT2 online help.

## Example of Network Parameters

Network name: NET  
Class: A or B  
Maximum expected nodes: 190  
IP network mask: 255.255.254.000  
IP network address: 128.1.10.0

---

## Network Profile

Following is the 2220 network profile:

- Name of the person to contact if there is a problem in network operation
- Phone number of the person to contact if there is a problem.

---

## X.25 General Parameters

The X.25 general parameters are configured once for all the X.25 resources in the 2220 network. The parameters are:

- Private network identifier code (PNIC)
- DCE timeouts for restart, reset, clear, and incoming call
- In a separate dialog, default address length and up to 10 predefined address lengths.

For details of X.25 general parameters, see the NCT2 or Nways 2220 Switch Manager online help.

---

## Chapter 5. Creating Nways Switch Configurations

This chapter explains how to create Nways Switch configurations using NCT2. Similar functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

- “Nways Switches: Windows and Dialogs”
- “Configuring an Nways Switch” on page 48
- “IP Hosts and IP Addressing” on page 50
- “Example of NCT2 Main Window” on page 54.

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### Nways Switches: Windows and Dialogs

The following figure shows the NCT2 window and dialogs used to create Nways Switch configurations. Attached IP hosts are stations such as network management station, change control server, or user remote console attached to the Nways Switch that is being configured.

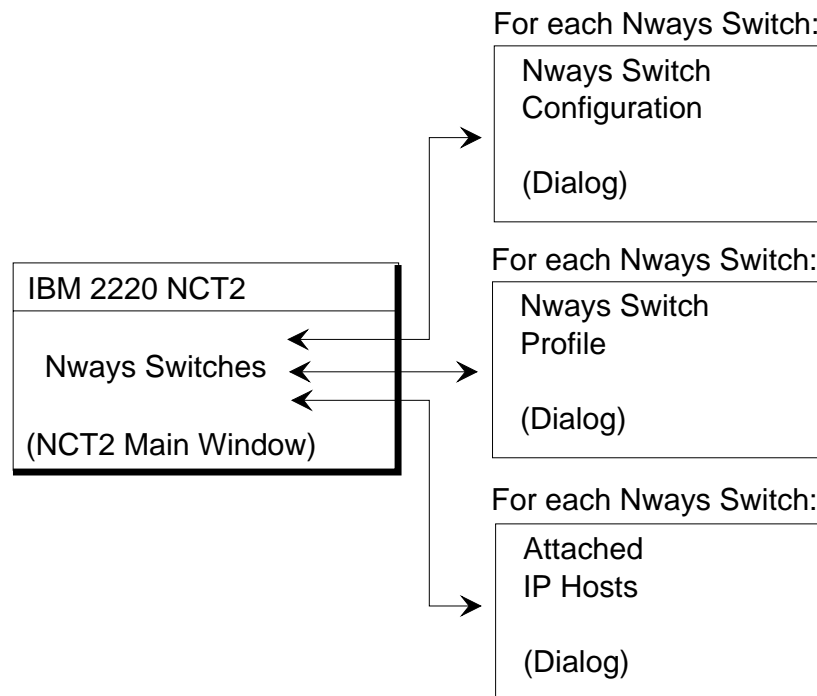


Figure 19. Nways Switch: Window and Dialogs

From the NCT2 Main Window:

- Open the Nways Switch Configuration dialog by clicking on **Network** in the menu bar, then on **Create Nways Switch**.

- Open the Nways Switch Profile dialog by clicking on the Nways Switch to select it, and clicking on **Selected** in the menu bar, and on **Open profile**.
- Open the Attached IP Hosts dialog by clicking on the Nways Switch to select it, then on **Selected, Open attached IP hosts**.

---

## Configuring an Nways Switch

This section describes the Nways Switch configuration parameters. It is organized as follows:

- “Control Point Adapter”
- “Control Point Maximum Capacities”
- “IP Gateway Adapter” on page 49
- “Nways Switch Parameters” on page 49
- “Example of Nways Switch Parameters” on page 50
- “Nways Switch Profile” on page 50.

### Control Point Adapter

In an Nways Switch, a *control point adapter* runs network control functions to:

- Allocate and control the node resources
- Provide topology and directory services
- Select routes in the network
- Control congestion.

Following are the configuration rules of a control point adapter:

- An adapter type LSA1, LSA2, LSA3, HSA1, HSA2, or HSA3 plugged in slot 10 or 12 of the 2220-300 or 2220-500 logic subrack is a dedicated control point. In these slots, the modules are called control point adapters (CPAs).
- An adapter type LSA2, LSA3, HSA2, or HSA3 plugged in slots 1 to 6 (2220-300) or 1 to 8 (2220-500) can be both a trunk adapter and control point. In these slots, the modules are called trunk and control point adapters (TCPAs).
- A port adapter or an ATM adapter cannot be control point.
- The backup trunk adapter of a trunk line type T3 attached through a Y-cable cannot be a control point.
- In a redundant control point configuration, both control points must be of the same type (either both CPAs or both TCPAs).

### Control Point Maximum Capacities

A control point has different capabilities depending on the module it is housed in. The following table shows the maximum number of Nways Switches and trunks that a control point can handle.

*Table 3. Control Point Maximum Capacities*

Adapter Type	LSA1* or HSA1*	LSA2, HSA2*, or HSA3	LSA3
Control point (CPA)	128 nodes and 128 trunks	300 nodes and 700 trunks	500 nodes and 1000 trunks



Table 3. Control Point Maximum Capacities (continued)

Adapter Type	LSA1* or HSA1*	LSA2, HSA2*, or HSA3	LSA3
Trunk and control point (TCPA)	Not applicable	250 nodes and 500 trunks	300 nodes and 700 trunks

**Legend:**

- \* No longer orderable
- CPA** Control point adapter
- HSA<sub>n</sub>** High speed adapter type n
- LSA<sub>n</sub>** Low speed adapter type n
- TCPA** Trunk and control point adapter

## IP Gateway Adapter

In an Nways Switch, an IP gateway adapter routes the IP control between the NAS and the network management station. It can be duplicated.

Following are the IP gateway adapter configuration rules:

- A 2220 must have at least one IP gateway adapter installed. It can be in slots 1 to 6 for a Model 300, or in slots 1 to 8 for a Model 500.
- An IP gateway adapter must be a port adapter.
- In a management access Nways Switch (the Nways Switch that connects a network management station to the network), installing a backup IP gateway adapter is recommended.

## Nways Switch Parameters

Following are the Nways Switch parameters:

**Nways Switch name**

Up to eight characters. The Nways Switch name is also the IP host name of the NAS.

**Type** 2220 Model 300, 2220 Model 500, or 2220 Model 500 with Model 501

**Redundancy options**

Applicable to control point, switch module, clock, and power

**Locations**

Applicable to control point adapters and IP gateway adapters

**IP addressing**

IP network address, IP domain name, and IP name server

**Phone number**

Phone number of the NAS in the public switched network (mandatory)

**Maximum transmission unit**

Maximum size of a transmission unit the an NAS modem will transmit over a switched line.

**Voice compression law**

A-law in Europe. Mu-law in the U.S. and Japan.

For parameter details, see the NCT2 or Nways 2220 Switch Manager online help.

## Example of Nways Switch Parameters

Nways Switch name: N1  
IBM 2220 Model 500  
Full redundancy: Yes  
Clock option: Yes  
Control point adapters: A10 and A12  
IP gateway adapters: A2 and A6  
IP network address: 128.1.10.0  
Domain name: IPNET.NET  
Domain name server: 128.1.10.10  
NAS phone number: 04 92 11 54 94  
Maximum transportation unit: 296  
Voice compression support: A-law

## Nways Switch Profile

Following is the Nways Switch profile:

### **Nways Switch description**

Up to 60 characters

### **Nways Switch location**

For example, building, floor, and room

### **NAS IP address**

Computed by NCT2. It is also the Nways Switch IP address.

### **NAS switched IP address**

Computed by NCT2. It is used over the public switched network to connect remotely to the NAS.

### **Caller service IP address**

Computed by NCT2. This is the IP address of the IBM Network Support Center.

### **Power related information**

When required, power cord type and power features.

---

## IP Hosts and IP Addressing

When a station, such as a network management station, change control server, or a user remote console, is attached to the Nways Switch, additional parameters are required to define the type of station (called *attached IP hosts*) and the way it is attached to the Nways Switch (directly attached or attached through a router).

## NCT2 and IP Addresses

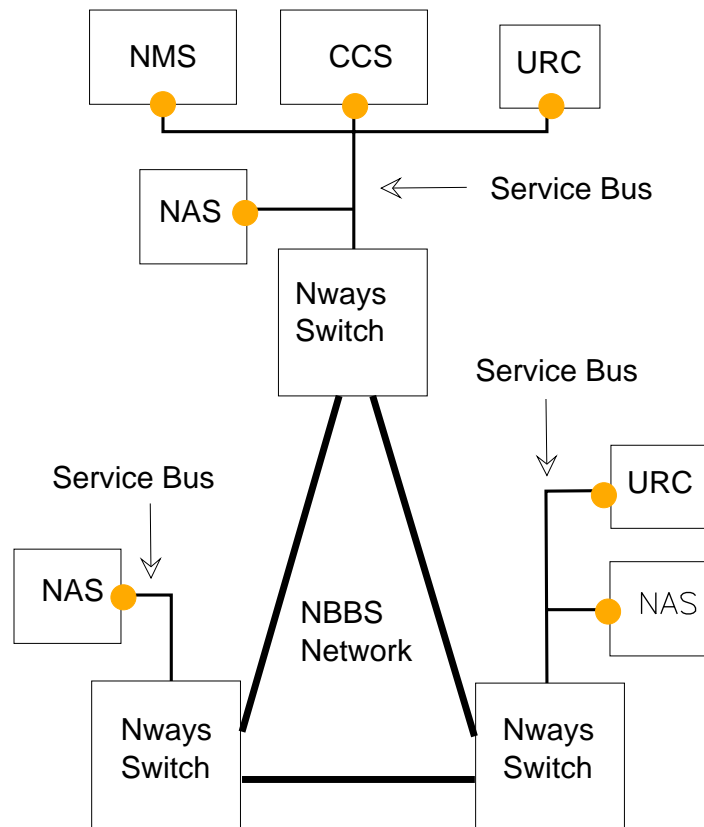
From the network IP address that you provide, NCT2 (installed in the configuration station) generates IP addresses for all the stations (Nways Switch administration stations, network management stations, change control servers, and user remote consoles) in your network. These IP addresses are stored in a centralized configuration database in your configuration station.

If a new Nways Switch, a station, or a console is added to the network, NCT2 must be run again from the configuration station to generate a new IP address in the correct sequence.

When stations are attached through a router, the router IP address computed by NCT2 must be set in the router configuration. IP addresses of IP hosts attached to an Nways Switch are set in the TCP/IP configuration of the NAS when IBM runs the Nways Switch Installation Program.

## Directly Attached Stations

The following figure shows the IP addresses of the management stations and user remote consoles when they are directly attached to an Nways Switch.



● IP address generated by NCT2

Figure 20. Directly Attached IP Hosts

### Legend:

- CCS** Change control server
- NAS** Nways Switch administration station
- NMS** Network management station
- URC** User remote console

## Stations Attached Through a Router

The following figure shows the IP addresses of the management stations and user remote console when they are attached through a router.

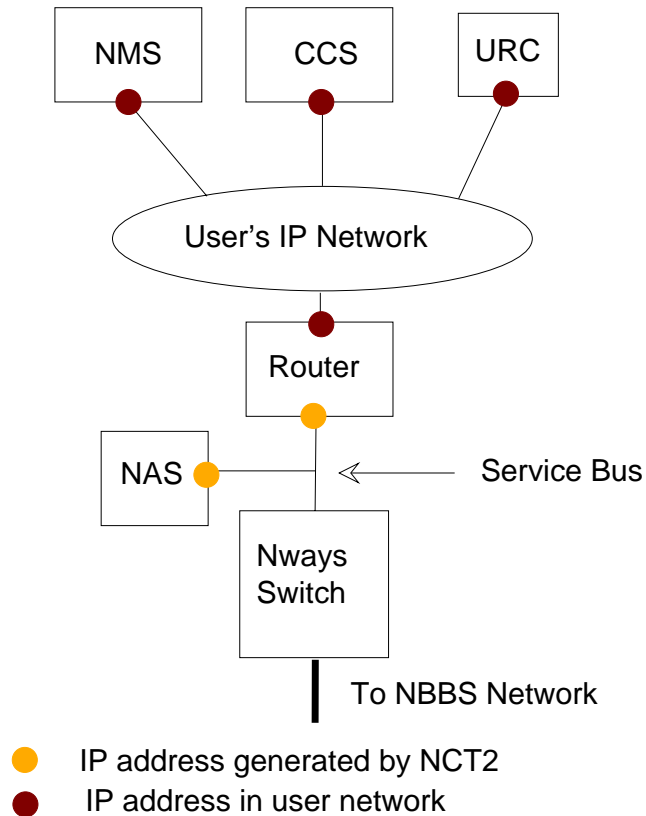


Figure 21. IP Hosts Attached through Router

### Legend:

- CCS** Change control server
- NAS** Nways Switch administration station
- NMS** Network management station
- URC** User remote console

## Router IP Address

The router must be directly attached to the service bus of the management access Nways Switch (the service bus is an Ethernet LAN). The router IP address in the 2220 network is generated by NCT2.

In this type of attachment, the router address in your IP network, as well as the management station addresses, are not known by NCT2. You must provide these addresses when configuring the management access Nways Switch.

# Server/Client Network Management Stations

The following figure shows the IP addresses of the server and client network management stations.

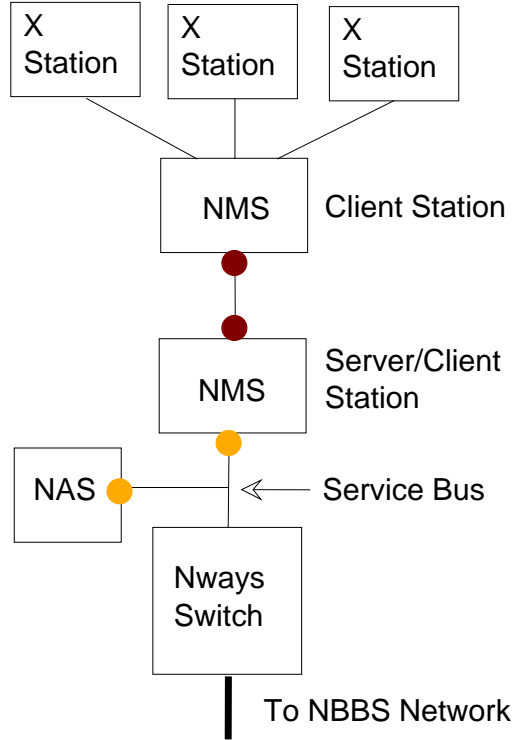


Figure 22. Server/Client Network Management Stations

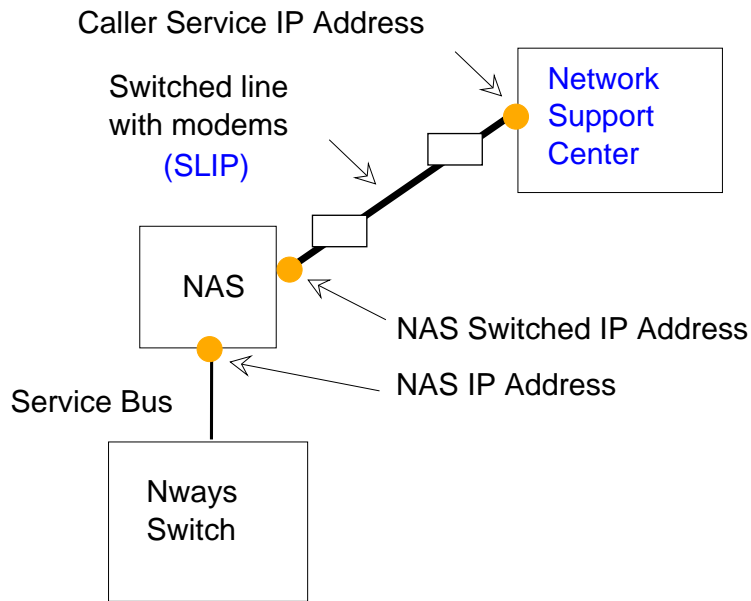
**Legend:**

**NAS** Nways Switch administration station

**NMS** Network management station

## NAS to NSC Connection

The following figure shows the IP addresses generated by NCT2 for the switched connection between NAS and IBM Network Support Center (NSC). These IP addresses are displayed (using NCT2) in the Nways Switch profile.



- Legend:
- IP address generated by NCT2

Figure 23. NAS to NSC Connection

## Example of NCT2 Main Window

This section provides other examples of Nways Switch parameters. It is organized as follows:

- “Other Nways Switch Parameters”
- “Example of 2220 Network” on page 55
- “Example of NCT2 Main Window” on page 56.

## Other Nways Switch Parameters

Nways Switch name: N1  
 IBM 2220 Model 500 with Model 501  
 Full redundancy: No  
 Power redundancy: Yes  
 Clock option: Yes  
 Control point adapter 1: A10  
 Control point adapter 2: A12  
 IP gateway adapter: A2  
 Primary IP gateway adapter: A2  
 Backup IP gateway adapter: A6  
 IP network address: 128.1.10.0  
 Domain name: IPNET.NET  
 Domain name server: 128.1.10.10  
 NAS phone numbers: 05 93 11 56 89  
 Maximum transportation unit: 296  
 Voice compression support: A-law

Nways Switch name: N2  
 IBM 2220 Model 500

Full redundancy: No  
Power redundancy: Yes  
Clock option: Yes  
Control point adapter: A10  
IP gateway adapter: A2  
No backup IP gateway adapter  
IP network address: 128.1.10.0  
Domain name: IPNET.NET  
Domain name server: 128.1.10.10  
NAS phone numbers: 05 93 11 54 94  
Maximum transportation unit: 296  
Voice compression support: A-law

Nways Switch name: N3  
IBM 2220 Model 500  
Full redundancy: No  
Power redundancy: Yes  
Clock option: Yes  
Control point adapter: A10  
IP gateway adapter: A2  
No backup IP gateway adapter  
IP network address: 128.1.10.0  
Domain name: IPNET.NET  
Domain name server: 128.1.10.10  
NAS phone numbers: 01 94 11 54 94  
Maximum transportation unit: 296  
Voice compression support: A-law

## Example of 2220 Network

The following figure shows the network used as example in this chapter.

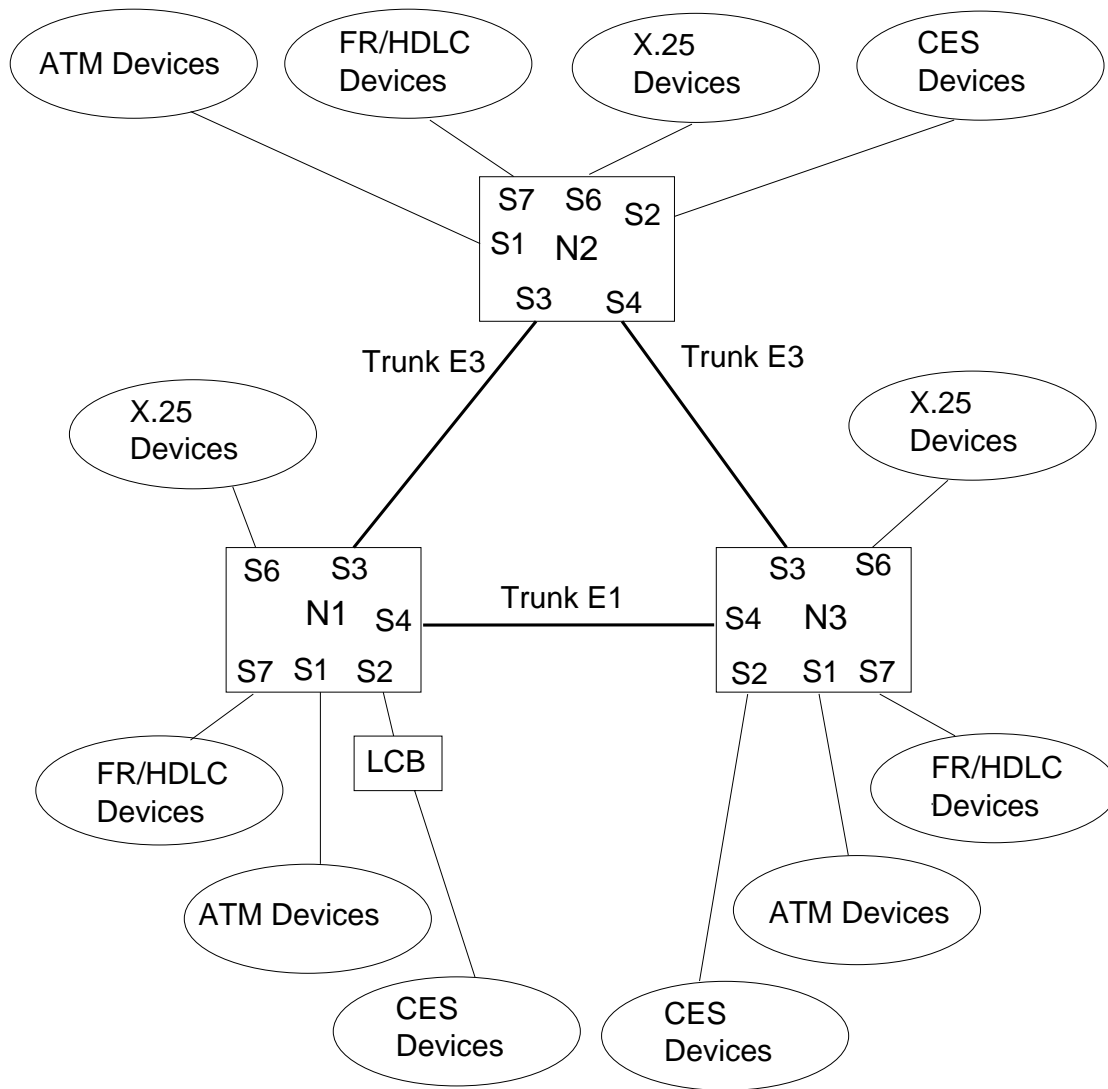


Figure 24. Example of 2220 Network

## Example of NCT2 Main Window

When three Nways Switches called N1, N2, and N3 have been created, the NCT2 Main Window is as follows.

Here is an example of an NCT2 Main Window when you select **View -> Icon**.



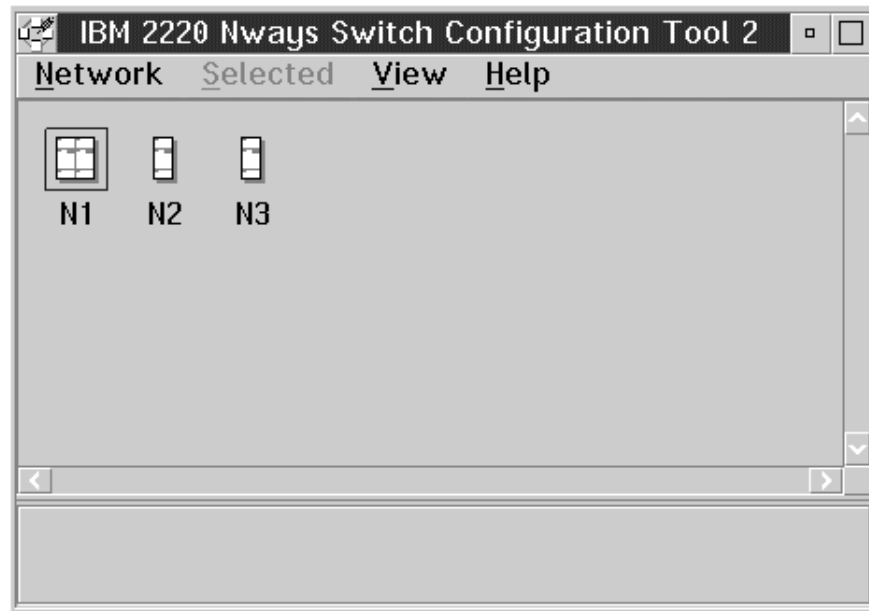


Figure 25. NCT2 Main Window (Icon View)

Here is an example of an NCT2 Main Window when you select **View -> Details**.

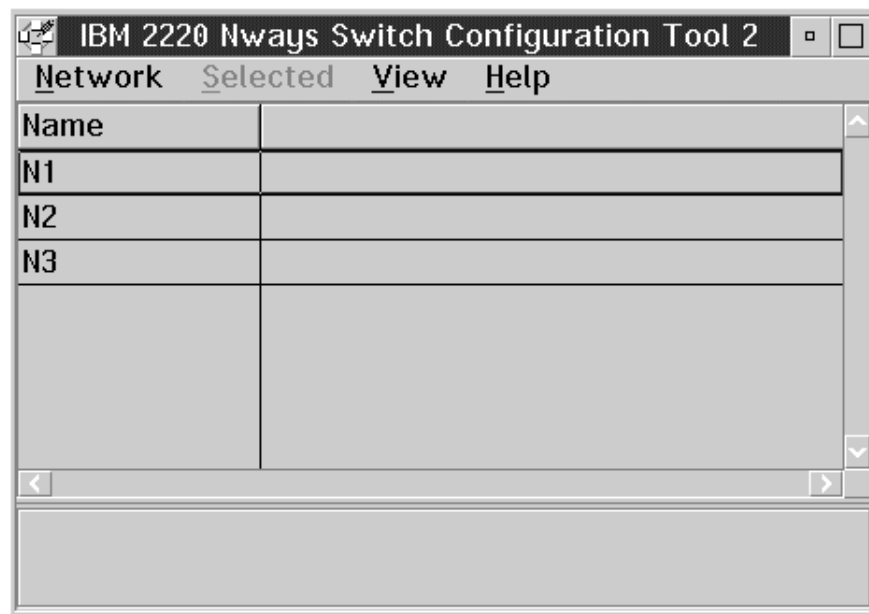


Figure 26. NCT2 Main Window (Details View)



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## Chapter 6. Configuring Physical Resources

This chapter explains how to configure the Nways Switch physical resources using NCT2. Similar configuration functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

“Configuring Adapters, LICs, and VSEs”

“Configuring Line Attachments” on page 69

“Configuring Control Points and Clock References” on page 74.

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### Configuring Adapters, LICs, and VSEs

This section explains how to configure adapters, line interface couplers (LICs), and voice server extensions (VSEs) from a rack window. For 2220 hardware description and locations, see the *2220 Nways BroadBand Switch Planning Guide*, GA33-0293.

#### Adapters, LICs, and VSEs: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the physical resources of an Nways Switch: adapters, line interface couplers (LICs), line attachments, voice server extensions (VSEs), and clock references.

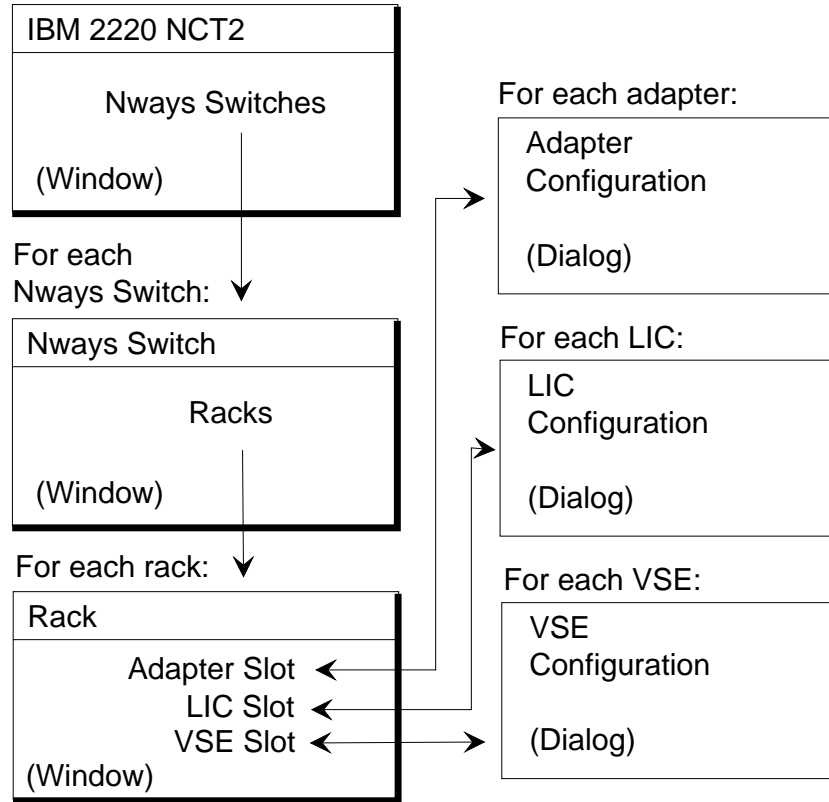


Figure 27. Adapters, LICs, and VSEs: Window and Dialogs

Open a Rack window as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window”).
2. From the Nways Switch window, double-click on a Rack icon. The Rack (A or B) window opens.

From a Rack window:

- Open the Adapter Configuration dialog by double-clicking on the desired empty adapter slot located in the front of the rack.
- Open the Line Interface Coupler (LIC) Configuration dialog by double-clicking on the desired empty LIC slot located in the rear of the rack. Create the related adapter first.
- Open the Voice Server Extension (VSE) Configuration dialog by double-clicking on the desired VSE slot located in the rear of the rack. Create the related voice server adapter first.

## Example of Nways Switch Window

Here is an example of an Nways Switch window.

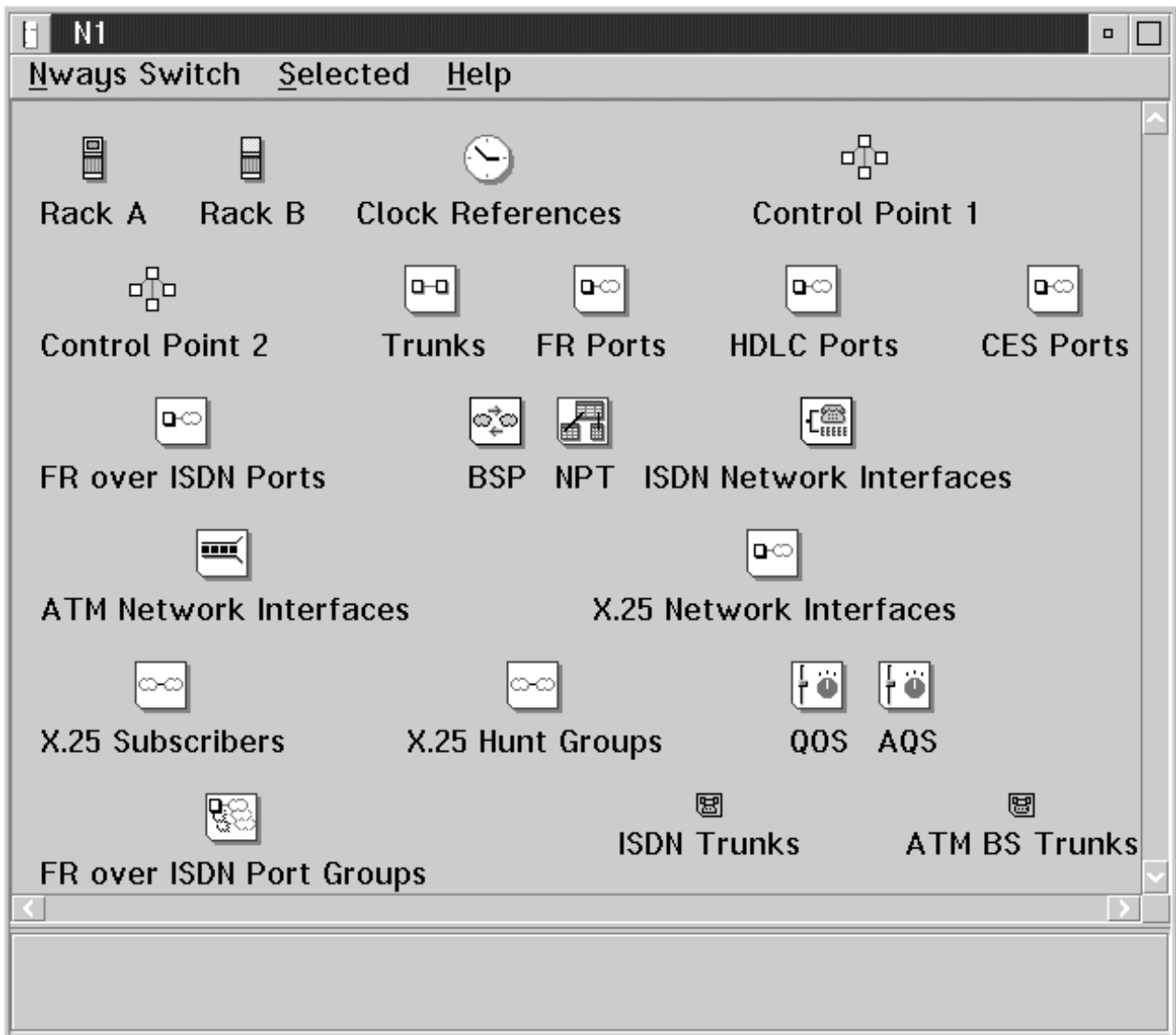


Figure 28. Nways Switch Window

## Configuring Adapters

This section describes the adapter configuration. For adapter hardware description, refer to the *2220 Nways BroadBand Switch Planning Guide, GA33-0293*.

### Adapter Functions

Depending on its hardware type and the code that it runs, an adapter can be a:

- Port adapter (provides access services to port lines)
- Trunk adapter (provides transport services to trunk lines)
- Control point adapter (provides the network control functions to the Nways Switch)
- Trunk and control point adapter (provides both transport services and network control).

The following table lists the 2220 modules that can be used as adapter and their functions.

Table 4. Summary of Adapter Functions

Adapter Module	Port Adapter (1)	Trunk Adapter	Control Point Adapter (2)	Trunk/ Control Point Adapter (3)
ATMA1 (4)	Yes	Yes	No	No
ATMA2	Yes	Yes	No	No
HSA1 (4)	Yes	Yes	Yes	No
HSA2 (4)	Yes	yes	Yes	Yes
HSA3	Yes	Yes	Yes	Yes
LSA1 (4)	Yes	Yes	Yes	No
LSA2	Yes	Yes	Yes	Yes
LSA3	Yes	Yes	Yes	Yes

**Notes:**

1. A port adapter can be configured as IP gateway adapter (for details, see “IP Gateway Adapter” on page 49).
2. A control point adapter (CPA) is located in slots 10 or 12 of a 2220 Model 300 or Model 500.
3. A trunk and control point adapter (TCPA) is located in slots 1 to 6 of a 2220 Model 300, or slots 1 to 8 of a 2220 Model 500.
4. Module no longer orderable.

**Maximum Number of Adapters Per 2220 Model**

Table 5 summarizes the number of adapters allowed in each Nways Switch model:

Table 5. Maximum Number of Adapters Per Nways Switch Model

2220 Model	Low-Speed Adapters and LICs	High-Speed Adapters and LICs	ATM adapters and LICs	VSA (and VSEs)	Control Points (CPAs and TCPAs)	Total (See Note)
300	4	4	4	2	2	8
500	8	8	8	4	2	10
501	6	6	6	6	0	6
500 and 501	14	14	14	10	2	16

**Note:** The totals can include a mixture of LSA, HSA, VSA, and ATMA for the front of the subracks, and a corresponding mixture of LIC and VSE for the back of the subracks. For the Model 300 and Model 500, the figures include the control point adapters in slots 10 and 12.

**Example of Nways Switch Window:** Screen capture: Nways Switch window (Icons)

## Port Adapter Configuration

The configuration rules for a port adapter are as follows:

- A port adapter cannot be a control point.
- A port adapter can be an IP gateway adapter (for details, see “IP Gateway Adapter” on page 49).
- A port adapter can be plugged in slots 1 to 6 of a 2220 Model 300, and in slots 1 to 8 of a 2220 Model 500 or 501.

## Trunk Adapter Configuration

The configuration rules for a trunk adapter are as follows:

- A trunk adapter can be a control point.
- A trunk adapter cannot be an IP gateway adapter.
- A trunk adapter can be plugged in slots 1 to 6 of a 2220 Model 300, and in slots 1 to 8 of a 2220 Model 500 or 501.

## Adapter Parameters

Following are the adapter parameters:

**Type** Selected among the following choices:

- High speed type 1, 2, or 3
- Low speed type 1, 2, or 3
- Voice server
- ATM type 1 or 2.

**Mode** Selected among the following choices:

- Port adapter, if the connected line is a port line.
- Trunk adapter, if the connected line is a trunk line.
- Voice compression in group special mobile (GSM) or adaptive differential pulse code modulation (ADPCM).

### Control point function

Displayed for information. You selected the control point number and locations when configuring the Nways Switch.

## Examples of Adapter Configurations

Nways Switch: N1  
Slot 1: ATM adapter type 2, port  
Slot 2: Low-speed adapter type 2,  
port (also IP gateway adapter)  
Slot 3: ATM adapter type 2, trunk  
Slot 4: Low-speed adapter type 3,  
trunk  
Slot 5: Voice server adapter with GSM  
Slot 6: High-speed adapter type 3,  
port  
Slot 7: Low-speed adapter type 3,  
port  
Slot 10: Control point adapter 1  
Slot 12: Control point adapter 2  
Nways Switch: N2  
Slot 1: ATM adapter type 2, port  
Slot 2: Low-speed adapter type 2,  
port (also IP gateway adapter)  
Slot 3: ATM adapter type 2, trunk

Slot 4: High-speed adapter type 3, trunk  
Slot 5: Voice server adapter with GSM  
Slot 6: High-speed adapter type 3, port  
Slot 7: Low-speed adapter type 3, port  
Slot 10: Control point adapter  
Nways Switch: N3  
Slot 1: ATM adapter type 2, port  
Slot 2: Low-speed adapter type 2, port (also IP gateway adapter)  
Slot 3: ATM adapter type 2, trunk  
Slot 4: Low-speed adapter type 3, trunk  
Slot 5: Voice server adapter with GSM  
Slot 6: High-speed adapter type 3, port  
Slot 7: Low-speed adapter type 3, port  
Slot 10: Control point adapter

## Configuring Line Interface Couplers

This section describes the line interface coupler (LIC) configuration. For LIC hardware description, refer to the *2220 Nways BroadBand Switch Planning Guide*, GA33-0293.

### ATM LICs and Adapters Compatibility

The following table shows the adapters compatible with the ATM LICs.

*Table 6. ATM LICs and Adapters Compatibility*

LIC Type	ATMA1 (Note)	ATMA2
551 (Two DS3)	Port or trunk	Port or trunk
552 (Two E3)	Port or trunk	Port or trunk
553 (One SDH/SONET electrical)	Port or trunk	Port or trunk
554 (One SDH/SONET optical long range)	Port or trunk	Port or trunk
555 (One SDH/SONET optical short range)	Port or trunk	Port or trunk
556 (One SDH/SONET optical multi-mode)	Port or trunk	Port or trunk

**Note:** ATMA1 is no longer orderable.

### High-Speed LICs and Adapters Compatibility

The following table shows the adapters compatible with the high-speed LICs.

*Table 7. High-Speed LICs and Adapters Compatibility*

LIC Type	HSA1 (Note)	HSA2 (Note)	HSA3
513 (One T3)	Port or trunk	Port or trunk	Port or trunk
523 (Four E2/J2/E3)	Port or trunk	Port or trunk	Port or trunk



Table 7. High-Speed LICs and Adapters Compatibility (continued)

LIC Type	HSA1 (Note)	HSA2 (Note)	HSA3
530 (One HSSI)	Port or trunk	Port or trunk	Port or trunk

**Note:** HSA1 and HSA2 are no longer orderable.

## Low-Speed LICs and Adapters Compatibility

The following table shows the adapters compatible with the low-speed LICs.

Table 8. Low-Speed LICs and Adapters Compatibility

LIC Type	LSA1 (Note)	LSA2	LSA3
511 (60 V.24, V.35, or X.21)	No	Port	Port
514 (Four T1 or J1)	Port or trunk	Port or trunk	Port or trunk
515 or 516 (Four E1)	Port or trunk	Port or trunk	Port or trunk
517 (Four JJ-20)	No	Port	No
522 (Four V.35, V.36, or X.21)	No	Port or trunk	Port or trunk
544 (Eight T1 or J1)	No	No	Port or trunk
545 (Eight E1, 75 ohms)	No	No	Port or trunk
546 (Eight E1, 120 ohms)	No	No	Port or trunk
562 (One J2, 75 ohms)	No	No	Trunk
563 (Two Euro-ISDN, two E1 120 ohms)	No	No	Trunk
567 (Four E1, 120 ohms)	No	No	Port

**Note:** LSA1 is no longer orderable

## LICs and Protocols

Table 9 shows the physical interfaces and protocols that are available for each LIC.

Table 9. LIC Physical Interfaces and Protocols

LIC Type	CES	PCM Voice	HDLC and FR	ISDN/QSIG (1)	ATM	X.25 (1)	Protocol Merge (1)
511 (Sixty V.24, V.35, or X.21)	Yes	No	Yes	No	No	Yes	Yes (2)
513 (One T3)	No	No	Yes	No	No	No	No
514 (Four T1 or J1)	Yes	T1 only	Yes	Yes(6)	No	No	Yes (3)
515 (Four E1 75 ohms)	Yes	Yes	Yes	Yes (5)	No	No	Yes (3) (4)
516 (Four E1 120 ohms)	Yes	Yes	Yes	Yes (5)	No	No	Yes (3) (4)
517 (Four JJ-20 TTC)	Yes	Yes	No	No	No	No	No

Table 9. LIC Physical Interfaces and Protocols (continued)

LIC Type	CES	PCM Voice	HDLC and FR	ISDN/QSIG (1)	ATM	X.25 (1)	Protocol Merge (1)
522 (Four V.35, V.36, or X.21)	Yes	No	Yes	No	No	Yes	Yes (2)
523 (Four E2, J2, or E3)	No	No	Yes	No	No	No	No
530 (One HSSI)	No	No	Yes	No	No	No	No
544 (Eight T1 or J1)	Yes	T1 only	Yes	Yes (6)	No	No	Yes (3)
545 (Eight E1 75 ohms)	Yes	Yes	Yes	Yes (5)	No	No	Yes (3) (4)
546 (Eight E1 120 ohms)	Yes	Yes	Yes	Yes (5)	No	No	Yes (3) (4)
551 (Two DS3)	No	No	No	No	Yes	No	No
552 (Two E3)	No	No	No	No	Yes	No	No
553 (One SDH Sonet electrical)	No	No	No	No	Yes	No	No
554 (One SDH Sonet optical LR)	No	No	No	No	Yes	No	No
555 (One SDH Sonet optical SR)	No	No	No	No	Yes	No	No
556 (One SDH Sonet optical multi mode)	No	No	No	No	Yes	No	No
567 (Four E1 ISDN 120 ohms)	Yes	Yes (no CAS)	Yes	Yes (5)	No	No	Yes (3) (4)

**Notes:**

1. Requires an LSA3.
2. Each line can have a different protocol (frame relay, HDLC, or CES).
3. Each clear-channel line or channel can have a different protocol (frame relay, HDLC, or CES).
4. In ISDN, each B-channel can be dynamically assigned to data or voice in frame relay, HDLC, or CES.
5. LIC567 may be required depending on country certification.
6. INS-Net Support (ISDN in Japan) on J1-type line only. QSIG in USA on T1-type line only.

**Merged Line Protocols**

The low-speed adapter type 3 (LSA3) allows merging multiple protocols (frame relay, HDLC, CES, and ISDN) on its attached LIC. With CES, channel associated signaling (CAS) and channel common signaling (CCS) are available. With ISDN, Q signaling (QSIG) can be used. Except for LIC type 517 (four JJ-20 line attachments), all the low-speed LICs support merged line protocols.

The following configuration rules apply to merged line protocols:

1. Merging line protocols requires an LSA3.

2. On LIC types 511 and 522, protocols are selected at line level. Each line attachment of a LIC can be configured with a different protocol (frame relay, HDLC, or CES).
3. On the other LIC types (T1, J1, or E1), each line attachment can be configured without channels (clear-channel mode) or with channels (channel mode).
  - In **clear-channel mode**, protocols are selected at line level, as for LIC511 or LIC522. Each line attachment can be configured with a different protocol (frame relay, HDLC, or CES). ISDN is not available in clear-channel mode.
  - In **channel mode**:
    - a. Frame relay, HDLC, and CES protocols are selected at channel level. Each channel can be configured with a different protocol.
    - b. CAS and CCS signaling modes are selected at line level. Each line attachment can be configured with a different signaling mode.
    - c. ISDN and QSIG are available on E1 lines.
    - d. In ISDN, each B-channel can be dynamically assigned to data or voice in HDLC, frame relay, or CES. Data traffic is transparently transported end-to-end over the 2220 network. Voice traffic can use voice server functions as required.

The following table shows how protocols and signaling modes can be merged on low-speed LICs.

*Table 10. Low-Speed LICs and Merged Line Protocols*

LIC Type	HDLC or FR	CES	CAS	CCS	ISDN QSIG
511	Yes	Yes	No	No	No
522	Yes	Yes	No	No	No
514 or 544 in clear channel mode	Yes	Yes	No	No	No
514 or 544 in channel mode	Yes	Yes	Yes	Yes	No
515, 516, 545, or 546 in clear channel mode	Yes	Yes	No	No	No
515, 516, 545, or 546 in channel mode	Yes	Yes	Yes	Yes	Yes
567 in clear channel mode	Yes	Yes	No	No	No
567 in channel mode	Yes	Yes	No	Yes	Yes

## LIC Parameters

In the LIC configuration dialog several LIC types are proposed. They depend on the type of adapter that is located in front of the LIC. You select a LIC type by clicking on the desired type.

## Examples of LIC Configurations

Nways Switch: N1  
 Slot 1: LIC554, ATM OC3 155 Mbps, port  
 Slot 2: LIC511, V.35, port  
 Slot 3: LIC523, E3, trunk

Slot 4: LIC515, E1, trunk  
 Slot 5: No voice server extension  
 Slot 6: LIC522, X.21, port  
 Slot 7: LIC515, E1, port

Nways Switch: N2  
 Slot 1: LIC554, ATM OC3 155 Mbps, port  
 Slot 2: LIC522, V.35, port  
 Slot 3: LIC523, E3, trunk  
 Slot 4: LIC523, E3, trunk  
 Slot 5: No voice server extension  
 Slot 6: LIC522, X.21, port  
 Slot 7: LIC515, E1, port

Nways Switch: N3  
 Slot 1: LIC554, ATM OC3 155 Mbps, port  
 Slot 2: LIC522, V.35, port  
 Slot 3: LIC523, E3, trunk  
 Slot 4: LIC515, E1, trunk  
 Slot 5: No voice server extension  
 Slot 6: LIC522, X.21, port  
 Slot 7: LIC515, E1, port

## Configuring Voice Server Extensions

This section describes the voice server extension (VSE) configuration. For VSE hardware description, refer to the *2220 Nways BroadBand Switch Planning Guide*, GA33-0293.

### VSAs/VSEs and Voice Connections

If you use voice server functions (voice compression, echo cancellation, or silence removal) on a CES potential connection, conform to the following restrictions:

- CES connections using voice server functions must operate on mono-slot (64 kbps) channels (one connection per time slot).
- Depending on the number of VSAs and VSEs installed in your Nways Switch, you can assign voice server functions to only a limited number of voice connections. If all voice slots are busy, voice signals are transmitted without being processed (for example, without voice compression or without echo cancellation).

To know if the number of available voice slots in your Nways Switch is sufficient for the CES voice connections that you are going to configure, proceed as follows:

1. Compute the number of available voice slots as explained in “Available Voice slots”.
2. Determine the number of voice slots required for each voice connection as explained in “Required Voice slots” on page 69.
3. Make the sum of all the voice slots required by your voice connections.
4. Compare the number of available voice slots to the number of required voice slots.

If there are not enough voice slots, you may decide to order additional VSAs or VSEs.

**Available Voice slots:** Voice modules (VSA, VSE, and VSE2) are built with digital service processors (DSPs) that have the following numbers of voice slots:

- Five voice slots when configured with GSM compression
- Four voice slots when configured with ADPCM compression.

The following table gives the maximum number of voice slots available for a VSA alone, a VSA with a VSE1, or a VSE2.

Table 11. Voice Server Adapter Channel Capacities

Voice Modules	DSP	GSM Slots	ADPCM Slots
VSA only	4	20 (4x5)	16 (4x4)
VSA and VSE1	16	80 (16x5)	64 (16x4)
VSA and VSE2	28	140 (28x5)	112 (28x4)

**Note:** If echo cancellation is required, all the figures of this table must be divided by 2.

**Required Voice slots:** The following table gives the number of voice slots required by a voice function or a mix of voice functions. The figures apply to GSM and ADPCM compressions.

Table 12. Required Voice Slots per Voice Function

Voice Server Functions	Required Voice Slots
Compression law conversion	0 (Note)
Idle signal removal	0 (Note)
Echo cancellation	1
Voice compression	1
Silence removal	1
Echo cancellation and silence removal	1
Voice compression and silence removal	1
Voice compression and echo cancellation	2
Voice compression, echo cancellation, and silence removal	2

**Note:** No voice slot required, but an additional voice function (voice compression, echo cancellation, or silence removal) must be selected for the voice connection.

---

## Configuring Line Attachments

This section describes the line attachment configuration. For line interface descriptions, see *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References, GA33-0379*.

### Line Attachments: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the line attachments of an Nways Switch.

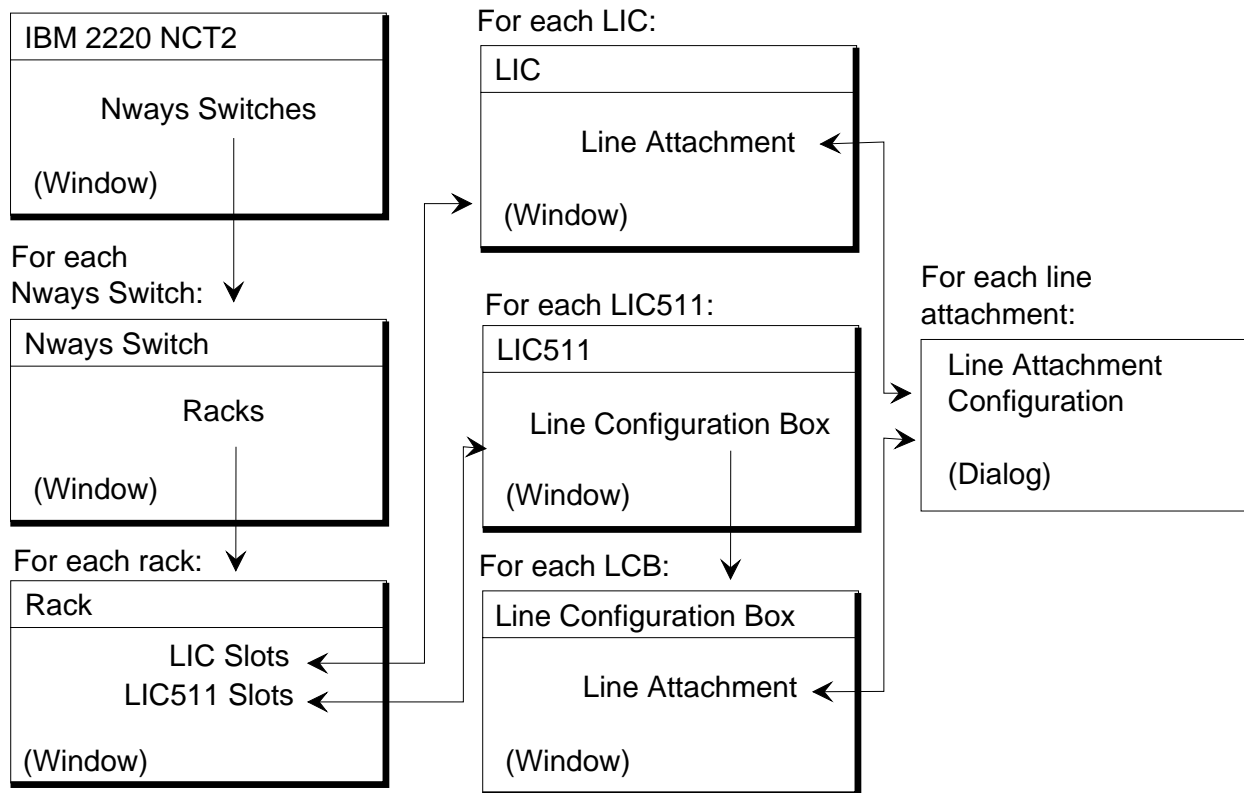


Figure 29. Line Attachments: Window and Dialogs

Open a Line Attachment Configuration dialog as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens.
2. From the Nways Switch window, double-click on a Rack icon. The Rack (A or B) window opens.
3. From the Rack window, double-click on a configured LIC icon. The LIC window opens.
4. From the LIC511 window, double-click on a not configured line connection box (LCB) to create an LCB configuration. Double-click on the LCB icon to open the LCB window.
5. From the LIC or LCB window, double-click on a not configured line icon. The Line Attachment Configuration dialog opens.

## Line Attachment Parameters

Every line attachment of the Nways Switch must be configured. A line attachment is identified by its location: rack A (2220 Model 300 or 500), rack B (2220 Model 501), slot in the logical subrack, and position on the LIC. Parameters depend on the line type. Some parameters are obtained from the carrier who provides the lines, while others are defined by the user.

For every trunk line, whatever its type, you have to identify the destination Nways Switch by giving:

- Its name (as given when defining the Nways Switches for IP purposes)

- The rack, slot, and line position that the trunk will be connected to on this Nways Switch.

For details of line attachment parameters, refer to the following information:

- *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References*, GA33-0379, which lists the standard supported for each type of line
- NCT2 or Nways 2220 Switch Manager online help.

Examples of line attachment parameters are given in the following sections.

### **E1/FE1/JJ20 Port Line Parameters**

Line type  
 Frame format  
 Clock role (internal or external)  
 Idle character  
 Signalling type  
 External echo canceller  
 Channel configuration for TDM lines.

### **E1/FE1/JJ20 Trunk Line Parameters**

Destination Nways Switch  
 Destination rack, slot, and position  
 Line type  
 Frame format  
 Clock role (internal or external)  
 Idle character  
 Signalling type  
 External echo canceller  
 Channel configuration for TDM lines.

### **T1/FT1 or J1/FJ1 Port Line Parameters**

Line type  
 Frame format  
 Cable length and attenuation  
 Line code  
 Clock role: internal or external  
 Channels configuration  
 Bit 8 stuffing selection.

### **T1/FT1 or J1/FJ1 Trunk Line Parameters**

Destination Nways Switch  
 Destination rack, slot, and position  
 Line type  
 Frame format  
 Cable length and attenuation  
 Line code  
 Clock role: internal or external  
 Channels configuration

Bit 8 stuffing.

### **T3 Port Line Parameters**

Line type

Frame format

Cable length and attenuation

Clock role: internal or external

For ATM DS3:

Transmission convergence layer

Cell payload scrambling

Cell discard policy.

### **T3 Trunk Line Parameters**

Destination Nways Switch

Destination rack, slot, and position

Line type

Frame format

Cable length and attenuation

Clock role: internal or external

For ATM DS3:

Transmission convergence layer

Cell payload scrambling

Cell discard policy.

### **E2/J2/E3 Port Line Parameters**

Line type

Frame format

Cable length and attenuation

Clock role: internal or external

For ATM E3:

Transmission convergence layer

Cell payload scrambling

Cell discard policy.

### **E2/J2/E3 Trunk Line Parameters**

Destination Nways Switch

Destination rack and slot

Line type

Frame format

Cable length and attenuation

Clock role: internal or external

For ATM E3:

Transmission convergence layer

Cell payload scrambling

Cell discard policy.



### **HSSI Port Line Parameters**

Clock role: internal or external  
Interface role: DTE or DCE  
Clock speed  
Access rate.

### **HSSI Trunk Line Parameters**

Destination Nways Switch  
Destination rack and slot  
Clock role: internal or external  
Interface role: DTE or DCE  
Clock speed  
Access rate.

### **V.24, V.35, V.36, X.21 Port Line Parameters**

Interface type  
Clock role: internal or external  
Interface role: DTE or DCE  
Clock speed  
Access rate  
Non-returned to zero inverted (NRZI)  
Device-ready timeout  
Ready-for-sending timeout.

### **V.35, V.36, X.21 Trunk Line Parameters**

Destination Nways Switch  
Destination rack and slot  
Interface type  
Clock role: internal or external  
Interface role: DTE or DCE  
Clock speed  
Access rate  
Non-returned to zero inverted (NRZI)  
Device-ready timeout  
Ready-for-sending timeout.

### **ATM SONET/SDH Port Line Parameters**

Line framing  
Clock role: internal or external  
Cell discard policy.

### **ATM SONET/SDH Trunk Line**

Destination Nways Switch  
Destination rack and slot  
Line framing  
Clock role: internal or external  
Cell discard policy.

## Alarm Parameters

- Time to set alarm
- Time to clear alarm
- Alarm indication signal
- Loss of frame
- Loss of signal
- Remote alarm indication
- Receive idle signal
- Loss of check.

## Examples of Line Attachment Configurations

Nways Switch: N1

- Slot 1: LINE 1: SDH STM-1, External clock, ITU-T Unassigned and Idle
- Slot 2: LCB 1 Base, LINES 0-14: V.35, External clock, 56 kbps
- Slot 3: LINE 1: E3, Destination: N2 A 3 1, Internal clock
- Slot 4: LINE 1: E1 G.703, Destination: N3 A 4 1, No channels, Internal clock
- Slot 5: (No voice server extension)
- Slot 6: LINES 1-4: X.21, External clock, 2048 kbps
- Slot 7: LINES 1-4, E1 port, External clock, Two channels: 1-20 and 21-31

Nways Switch: N2

- Slot 1: LINE 1: SDH STM-1, External clock, ITU-T Unassigned and Idle
- Slot 2: LINES 1-4: V.35, External clock, 56 kbps
- Slot 3: LINE 1: E3, Destination: N1 A 3 1, Internal clock
- Slot 4: LINE 1: E3, Destination: N3 A 3 1, Internal clock
- Slot 5: (No voice server extension)
- Slot 6: LINES 1-4: X.21, External clock, 2048 kbps
- Slot 7: LINES 1-4, E1 port, External clock, Two channels: 1-20 and 21-31

Nways Switch: N3

- Slot 1: LINE 1: SDH STM-1, External clock, ITU-T Unassigned and Idle
- Slot 2: LINES 1-4: V.35, External clock, 56 kbps
- Slot 3: LINE 1: E3, Destination: N2 A 4 1, Internal clock
- Slot 4: LINE 1: E1, Destination: N1 A 4 1, Internal clock
- Slot 5: (No voice server extension)
- Slot 6: LINES 1-4: X.21, External clock, 2048 kbps
- Slot 7: LINES 1-4, E1 port, External clock, Two channels: 1-20 and 21-31

---

## Configuring Control Points and Clock References

This section describes the configuration of control points and clock references.

## Control Points and Clocks: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the control points and clock references of an Nways Switch.

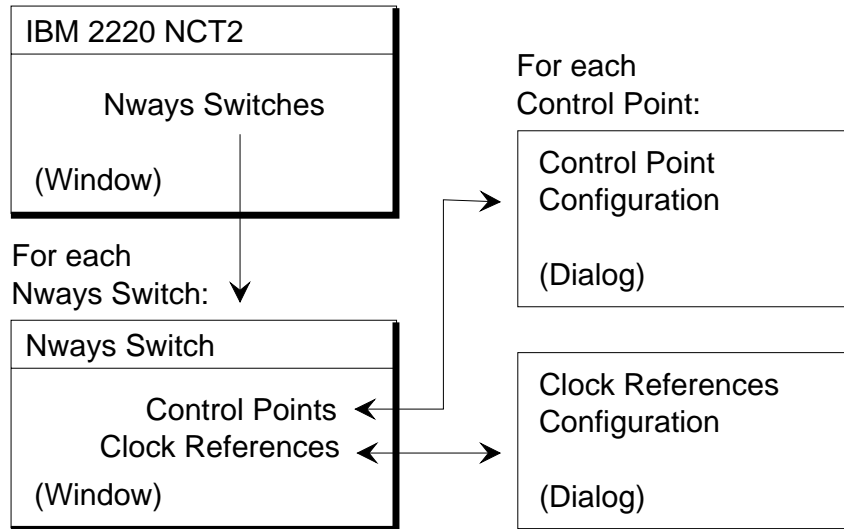


Figure 30. Control Points and Clocks: Window and Dialogs

Open a Control Point or Clock References Configuration dialog as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens.
2. From the Nways Switch window, double-click on a Control Point icon. The Control Point Configuration dialog opens.
3. From the Nways Switch window, double-click on a Clock References icon. The Clock References Configuration dialog opens.

## Control Point Parameters

Following are the control point parameters:

- Location of the control point adapter and duplicated control point adapter if any (displayed by NCT2)
- Initialization retry interval (default value: 100 ms)
- Initialization timeout length (default value: 3000 ms).

The locations of the control point adapters are selected when configuring the Nways Switches.

## Clock Reference Parameters

When the 2220 network is synchronized, you configure clock reference parameters. Information to prepare a Network Clocking Synchronization Plan and Topology is given in *2220 Nways BroadBand Switch Planning Guide*, GA33-0293. The clock reference parameters are specified as follows:

- You select Local Oscillator if clock references are provided from clock modules installed in the Nways Switch.
- You define up to four clock references and their priorities.
- You specify the locations of the external line attachments that receive the clock references.
- You define an alarm wait time to be used in case of clock failure.

---

## Chapter 7. Configuring ATM Resources

This chapter explains how to configure asynchronous transfer mode (ATM) resources using NCT2. Similar configuration functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

“ATM Network Interface Virtual Connections for Ports” on page 79

“Configuring ATM Network Interfaces for Ports”

“Configuring ATM VPCs (VP Services)” on page 82

“Configuring ATM VCCs (VC Services)” on page 87

“ATM Qualities of Service” on page 92

“Configuring ATM Bearer Service Network Interfaces for Trunks” on page 93

“Configuring ATM Bearer Service VPCs” on page 97.

---

### Configuring ATM Network Interfaces for Ports

This section describes the ATM port interface configuration and is organized as follows:

“ATM Network Interfaces for Ports : Windows and Dialogs” on page 80

“ATM Network Interface for Ports Parameters” on page 81

“Examples of ATM Network Interfaces for Ports” on page 82.

ATM logical ports (layer 2 of the OSI reference model) are called ATM network interfaces. On a port line interface, an ATM network interface is called *ATM network interface for a port* and provides ATM access services to the physical ATM port line. An ATM port interface sets up and maintains predefined ATM connections.

### ATM Network Interface Protocol Support for Ports

The following figure shows how ATM devices are connected through a 2220 network.

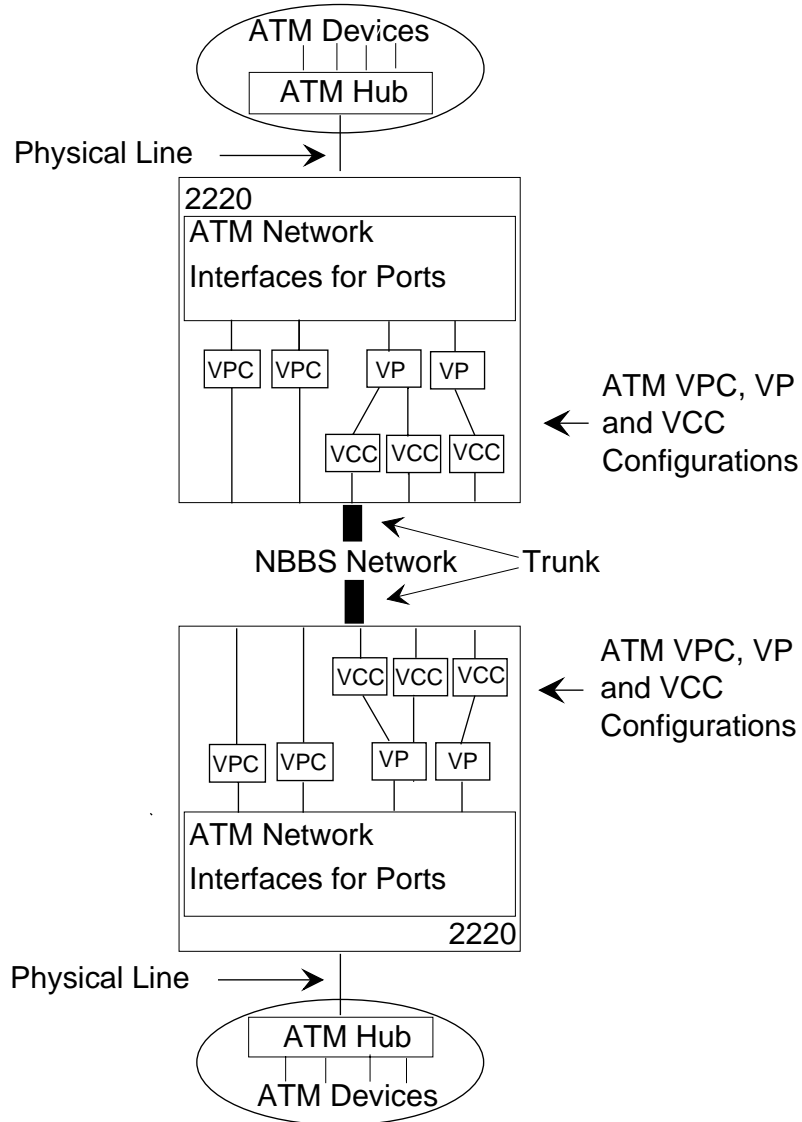


Figure 31. ATM Network Interface Protocol Support for Ports

**Legend:**

- ATM** Asynchronous transfer mode
- VCC** Virtual channel connection
- VPC** Virtual path connection

The Nways Switch supports non-real-time, real-time, and non-reserved ATM traffic over permanent virtual circuits (PVCs). The circuits are established and maintained permanently between two ATM devices. The Nways Switch also supports the ATM user network interface (UNI), and the virtual path (VP) and virtual channel (VC) services.

For interface specifications, see *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378.

## ATM Network Interface Virtual Connections for Ports

An ATM connection can be defined at:

- Virtual path (VP) level
- Virtual channel (VC) level.

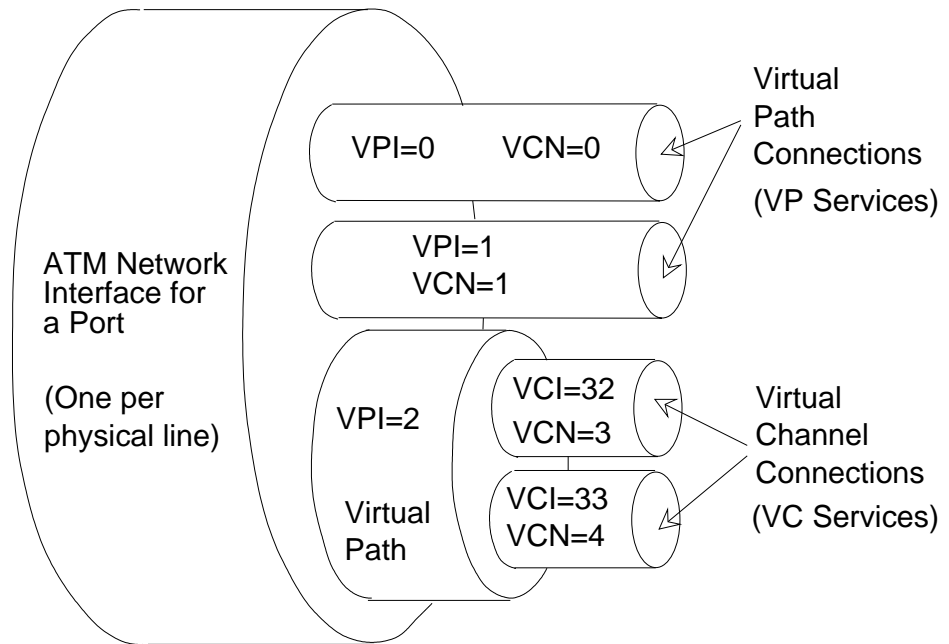


Figure 32. ATM Network Interface Virtual Connections for Ports

### Virtual Path and Virtual Channel Identifiers

In the ATM cell header, each virtual path is identified by an 8-bit field called *virtual path identifier* (VPI) and each virtual channel is identified by a 16-bit field called *virtual channel identifier* (VCI). Along the ATM virtual paths and channels, the Nways Switches routes the cells using VPI and VCI swapping.

In Figure 32, three VPIs have been allocated: 0, 1, and 2. Also two VCIs have been allocated: 32 and 33.

### ATM Cell Format

The following figure shows the ATM cell format at the user network interface.

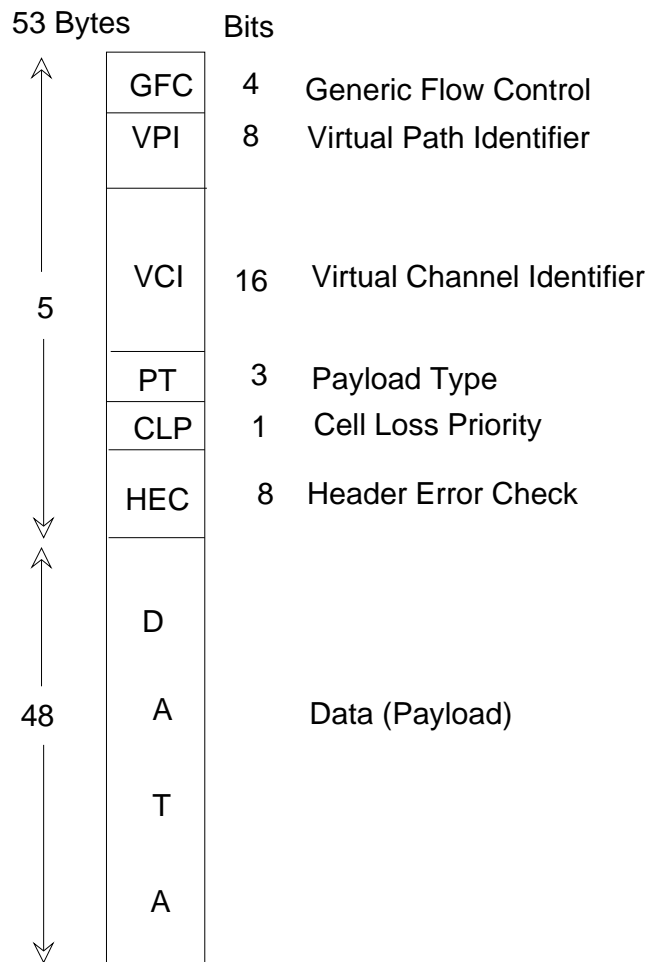


Figure 33. ATM Cell Format

### ATM Empty Cells

A cell with both VPI and VCI set to zero is an *empty cell*. At the 2220 network entry, an Nways Switch discards empty cells. At the destination port, another Nways Switch reinserts the empty cells.

## ATM Network Interfaces for Ports : Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ATM Network Interfaces for Ports .



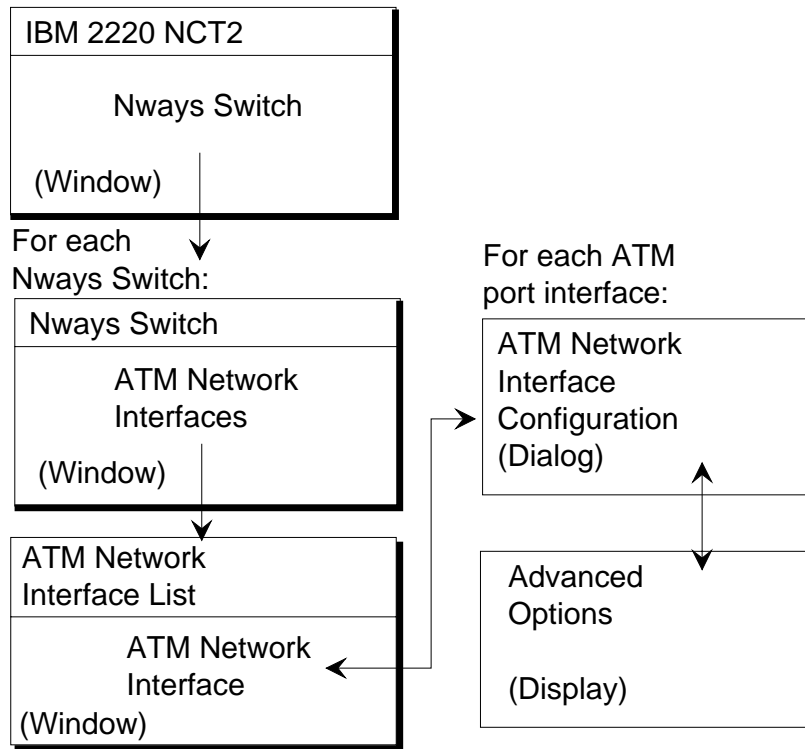


Figure 34. ATM Network Interfaces for Ports : Windows and Dialogs

Open an ATM Network Interface Configuration List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on ATM Network Interfaces. The ATM Network Interface Configuration List opens.

From the ATM Network Interface Configuration List, create an ATM network interface for a port by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface -> accessed through Leased Line (Port)**. The ATM Network Interface Configuration dialog for a port opens.

## ATM Network Interface for Ports Parameters

Before creating ATM connections, you configure ATM network interfaces on both Nways Switches at the end-points of the connection. You configure one ATM network interface for each ATM physical port line. On one end, the network interface serves as *connection initiator*. On the other end, the network interface serves as *connection completer*. A connection is always activated from the initiator network interface.

Following are the network interface parameters:

### Network Interface Name

Up to 32 characters

**Line Attachment Location**

Rack, slot, and position

**Resource Identification**

Identification of the resource attached through the ATM port line

**Network Interface Type**

Public user network interface (UNI), private UNI, or carrier to carrier.

**Protocol Role**

User side, network side, or both

**Numbering Plans**

E.164, private numbering plan (PNP), and network service address point (NSAP). The three plans are supported by default.

**Connection type**

Connection initiator and completor

**Maximum bandwidth available**

Bandwidth that is less than or equal to the line speed

Clicking on **Advanced Options** displays the following:

- Maximum number of virtual paths and virtual channels on each ATM interface
- Maximum number of virtual channels on each network interface
- Number of active bits used in ATM cell headers for virtual path identifiers (VPIs) and virtual channel identifiers (VCIs).

For parameter details, see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of ATM Network Interfaces for Ports

Nways Switch: N1  
ATM network interface: N1ATM1  
Location: Rack A, slot 1, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N1ATM1R1  
Maximum bandwidth: 149 760 kbps (default)

Nways Switch: N2  
ATM network interface: N2ATM1  
Location: Rack A, slot 1, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N2ATM1R1  
Maximum bandwidth: 149 760 kbps (default)

Nways Switch: N3  
ATM network interface: N3ATM1  
Location: Rack A, slot 1, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N3ATM1R1  
Maximum bandwidth: 149 760 kbps (default)

---

## Configuring ATM VPCs (VP Services)

This section describes the ATM virtual path connection (VPC) configuration and is organized as follows:

“ATM VPC: Windows and Dialogs” on page 83

“ATM VPC Parameters” on page 84

“Examples of ATM VPCs” on page 85

“VPC Parameter Relationship” on page 85.

## ATM VPC: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the VPCs of an Nways Switch

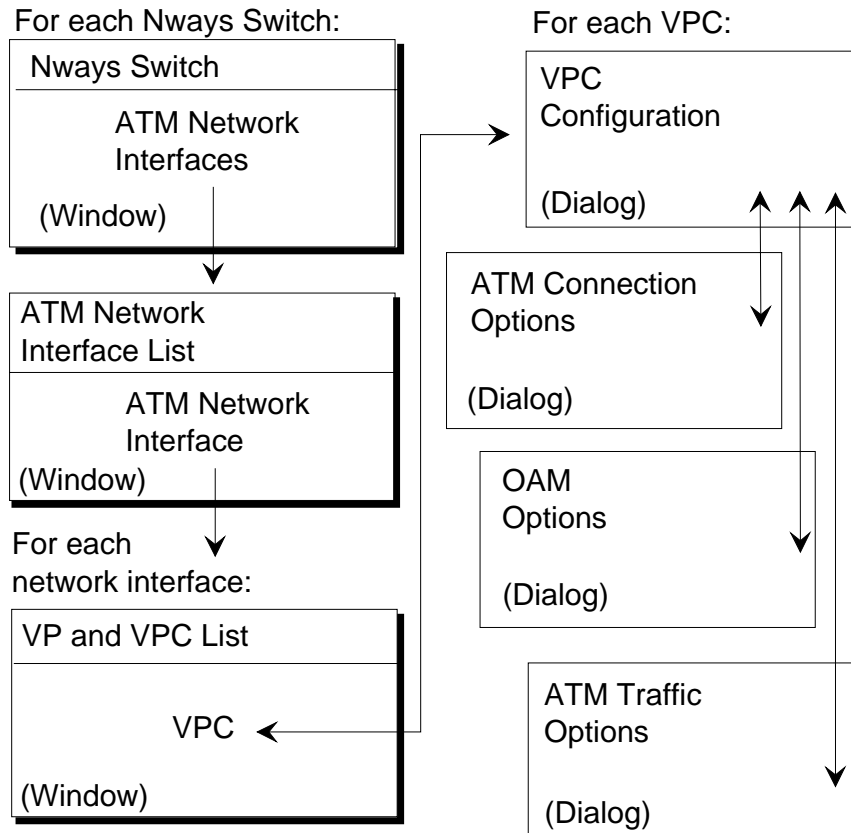


Figure 35. VPCs: Windows and Dialogs

Open the VP and VPC List as follows:

1. From an Nways Switch window, double-click on ATM Network Interfaces (for a figure, see “Example of Nways Switch Window” on page 60). The ATM Network Interface List opens.
2. From the ATM Network Interface List, double-click on a network interface. The VP and VPC List for this interface opens.

From the VP and VPC List, create a VPC by clicking on **VP and VPC List** in the menu bar, then on **Create VPC (VP services)**. The VPC Configuration dialog opens.

From the VPC Configuration dialog:

- Open the ATM Connection Options dialog by clicking on **Connection Options**

- Open the OAM Options dialog by clicking on **OAM Options**
- Open the ATM Traffic Options dialog by clicking on **Traffic Options**.

## ATM VPC Parameters

In VP services, you create VPCs from the initiator Nways Switches. NCT2 creates automatically the return VPCs on the completer Nways Switches. Following are the ATM VPC parameters:

### **VPC Name**

Up to 32 characters. A VPC name is proposed by NCT2.

### **Virtual Circuit Number (VCN)**

Proposed by NCT2. Each VPC has a unique VCN.

### **VPC Initiator Side**

Nways Switch and ATM network interface on initiator side (displayed by NCT2). A VPI is automatically proposed.

### **VPC Completer Side**

Nways Switch and ATM network interface on completer side (you select them from a list). A VPI is automatically proposed.

### **Resource on Initiator Side**

Selected from a list

### **Resource on Completer Side**

Selected from a list

Following are additional **ATM connection options**:

- ATM quality of service (QoS) for the forward and backward paths
- Policing (always enabled)
- If required, shaping and shaping speed
- Connection activation (permanently activated or not)
- Accounting (if required).

Following are the **OAM options**:

- Fault support: enabled or disabled
- Loopback: enabled or disabled
- Performance monitoring and continuity check are always disabled.

Following are additional **ATM traffic options**:

- ATM traffic standard selected among the following:
  - No CLP/No SCR
  - CLP without Tagging/No SCR
  - CLP with Tagging/No SCR
  - No CLP/SCR
  - CLP without Tagging/SCR
  - CLP with Tagging/SCR
- Peak cell rate in cells per second
- Sustainable cell rate
- Maximum burst size in cells
- Cell delay variation tolerance in seconds.

For details of ATM configuration options and QoSs, refer to the following information:

- *2220 Nways BroadBand Switch ATM Interface Specifications, GA33-0378*
- NCT2 or Nways 2220 Switch Manager online help.

## Examples of ATM VPCs

```
From Nways Switch N1:
VCN: 0
Initiator: N1, N1ATM1, VPI 0
  VPC name:VPC10
  Resource: N1ATMIR1
Completor: N2, N2ATM1, VPI 0
  VPC name:VPC10
  Resource: N2ATMIR1

From Nways Switch N1:
VCN: 1
Initiator: N1, N1ATM1, VPI 1
  VPC name:VPC11
  Resource: N1ATMIR1
Completor: N3, N3ATM1, VPI 1
  VPC name:VPC11
  Resource: N3ATMIR1

From Nways Switch N2:
VCN: 2
Initiator: N2, N2ATM1, VPI 1
  VPC name:VPC22
  Resource: N2ATMIR1
Completor: N3, N3ATM1, VPI 0
  VPC name:VPC22
  Resource: N3ATMIR1
```

## VPC Parameter Relationship

The following figures and tables illustrate the relationship between the VPC parameters for Nways Switches N1, N2, and N3.

## VCN=0 and VCN=1

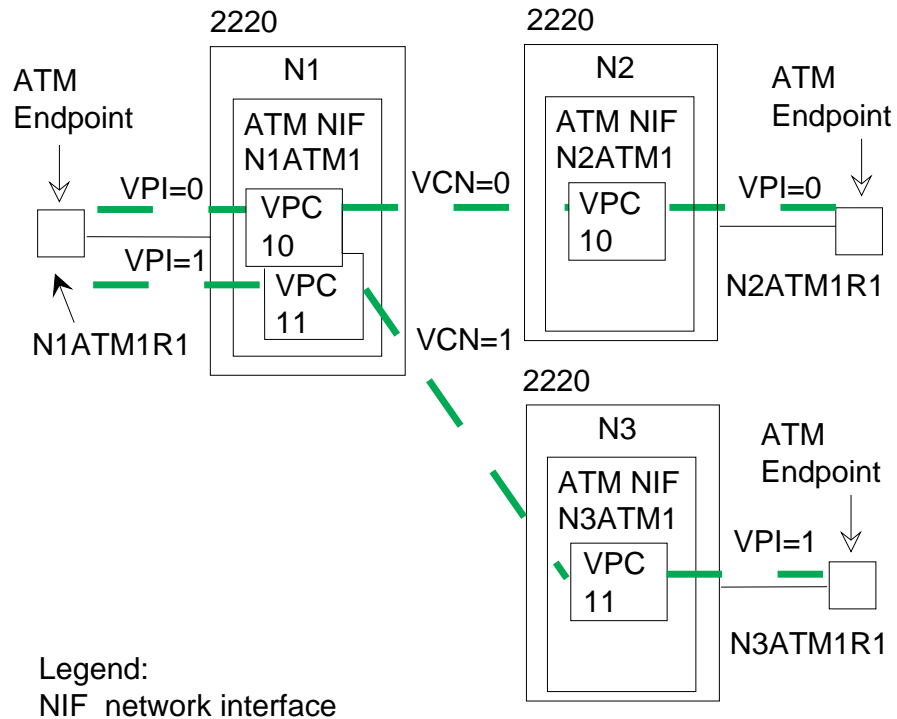
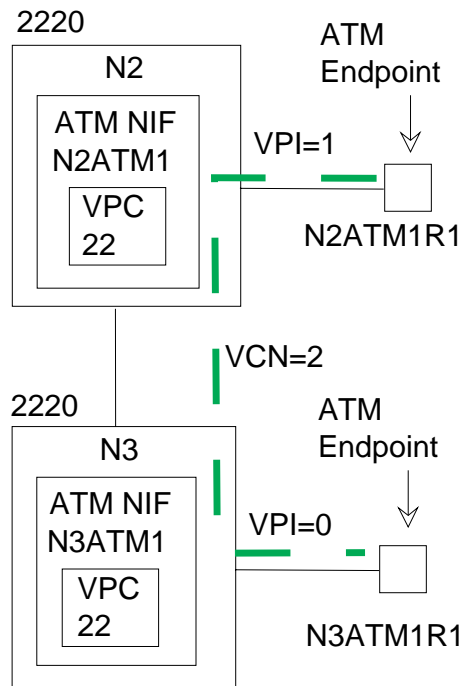


Figure 36. VPC Parameter Relationship (N1 to N2/N3)

VCN	0			
VPC Name	10		10	
Nways Switch	N1	N2	N2	N1
Side	Initiator	Completor	Initiator	Completor
Network Interface	N1ATM1	N2ATM1	N2ATM1	N1ATM1
Resource ID	N1ATM1R1	N2ATM1R1	N2ATM1R1	N1ATM1R1
VPI	0	0	0	0
VCN	1			
VPC Name	11		11	
Nways Switch	N1	N3	N3	N1
Side	Initiator	Completor	Initiator	Completor
Network Interface	N1ATM1	N3ATM1	N3ATM1	N1ATM1
Resource ID	N1ATM1R1	N3ATM1R1	N3ATM1R1	N1ATM1R1
VPI	1	1	1	1

## VCN=2



Legend:  
NIF network interface

Figure 37. VPC Parameter Relationship (N2 to N3)

VCN	2			
VPC Name	22	N3	22	
Nways Switch	N2	N3	N3	N2
Side	Initiator	Completor	Initiator	Completor
Network Interface	N2ATM1	N3ATM1	N3ATM1	N2ATM1
Resource ID	N2ATM1R1	N3ATM1R1	N3ATM1R1	N2ATM1R1
VPI	1	0	0	1

## Configuring ATM VCCs (VC Services)

This section describes the virtual channel connection (VCC) configuration and is organized as follows:

“Configuring ATM VPs”

“Configuring ATM VCCs” on page 89.

## Configuring ATM VPs

Before configuring VCCs, you create ATM virtual paths (VPs) as explained in this section.

## ATM VP: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the VPs of an Nways Switch

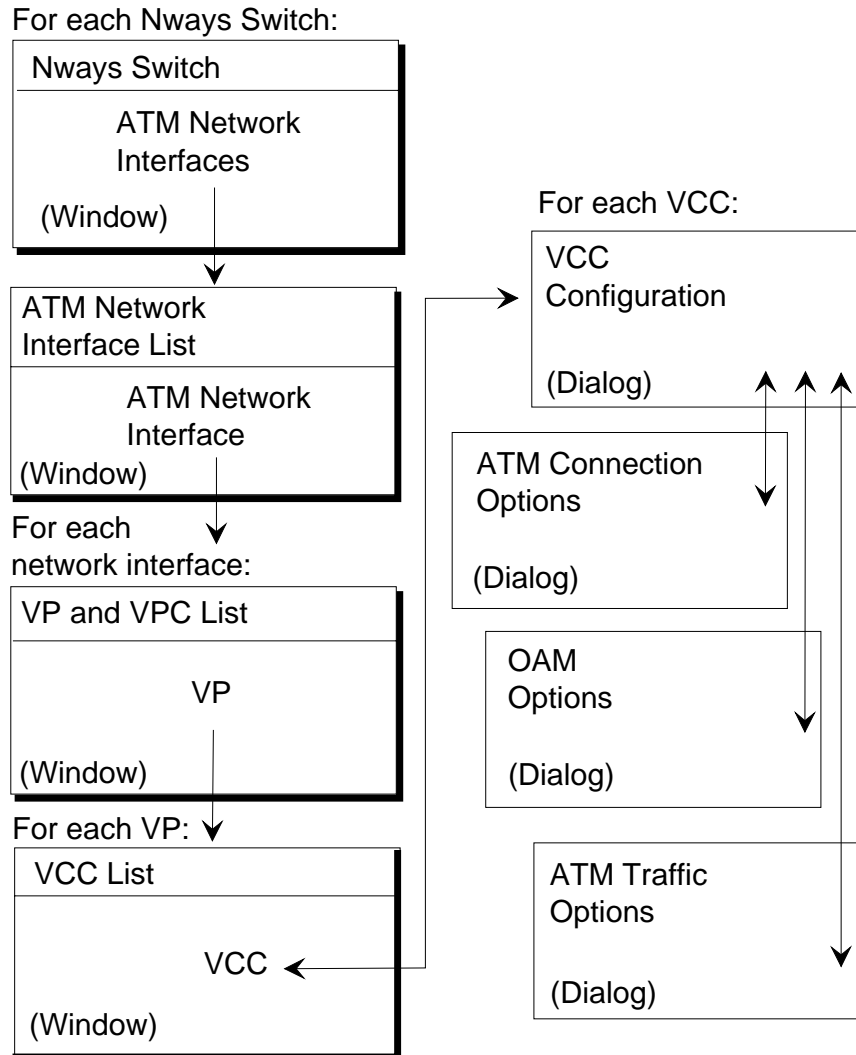


Figure 38. VPs: Windows and Dialogs

Open the VP and VPC List as follows:

1. From an Nways Switch window, double-click on ATM Network Interfaces (for a figure, see “Example of Nways Switch Window” on page 60). The ATM Network Interface List opens.
2. From the ATM Network Interface List, double-click on a network interface. The VP and VPC List for this interface opens.

From the VP and VPC List, create a VP by clicking on **VP and VPC List** in the menu bar, then on **Create VP (VC services)**. The VP Configuration dialog opens.

From the VP Configuration dialog, open the OAM Options dialog by clicking on **OAM Options**.



## ATM VP Parameters

In VC services, you create VPs before creating virtual channel connections (VCCs). VPs must be created individually on each Nways Switch. VPs on completor sides must be created first.

### VP Name

Up to 32 characters. A VP name is proposed by NCT2.

### Virtual Path Identifier

Proposed by NCT2. Each VP has a unique VPI.

### Shaping

You can select shaping and shaping speed at VP level. All the virtual channels on the path are shaped together.

For descriptions of OAM options, see “ATM VPC Parameters” on page 84.

## Examples of VP Configurations

From N2 (completor):

VP name (defaulted by NCT2)

VPI: 2

From N3 (completor):

VP name (defaulted by NCT2)

VPI: 2

From N1 (initiator):

VP name (defaulted by NCT2)

VPI: 2

## Configuring ATM VCCs

This section describes the ATM virtual channel connection (VCC) configuration.

### ATM VCC: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the VCCs of an Nways Switch

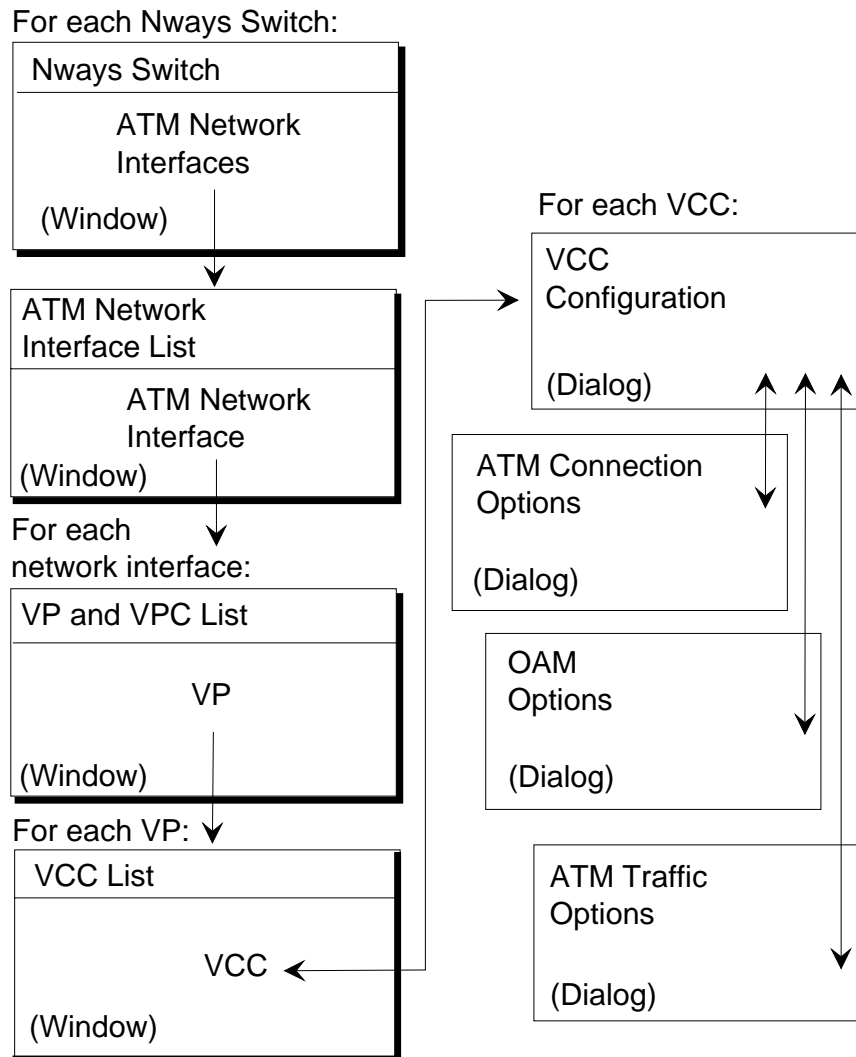


Figure 39. VCCs: Windows and Dialogs

Open the VCC List as follows:

1. From an Nways Switch window, double-click on ATM Network Interfaces (for a figure, see “Example of Nways Switch Window” on page 60). The ATM Network Interface List opens.
2. From the ATM Network Interface List, double-click on a network interface. The VP and VPC List for this interface opens.
3. From the VP and VPC List, double-click on a VP. The VCC List opens.

From the VCC List, create a VCC by clicking on **VCC List** in the menu bar, then on **Create VCC**. The VCC Configuration dialog opens.

From the VCC Configuration dialog:

- Open the ATM Connection Options dialog by clicking on **Connection Options**
- Open the OAM Options dialog by clicking on **OAM Options**
- Open the ATM Traffic Options dialog by clicking on **Traffic Options**.

## ATM VCC Parameters

In VC services, you create VCCs from the initiator Nways Switches. NCT2 creates automatically the return VCCs on the completor Nways Switches. Following are the ATM VCC parameters:

### VCC Name

Up to 32 characters. A VCC name is proposed by NCT2.

### Virtual Circuit Number (VCN)

Proposed by NCT2. Each VCC has a unique VCN.

### VCC Initiator Side

Nways Switch and ATM network interface on initiator side (displayed by NCT2). A VCI is automatically proposed.

### VCC Completor Side

Nways Switch and ATM network interface on completor side (you select them from a list). A VCI is automatically proposed.

### Resource on Initiator Side

Selected from a list

### Resource on Completor Side

Selected from a list

For descriptions of ATM connection options, OAM options, and ATM traffic options, see "ATM VPC Parameters" on page 84.

## Examples of ATM VCCs

From Nways Switch N1:

VCN: 3

Initiator: N1, N1ATM1, VPI 2

VCI 32, VCC name: VCC13

Resource: N1ATM1R1

Completor: N2, N2ATM1, VPI 2

VCI 32, VCC name: VCC13

Resource: N2ATM1R1

From Nways Switch N1:

VCN: 4

Initiator: N1, N1ATM1, VPI 2

VCI 33, VCC name: VCC14

Resource: N1ATM1R1

Completor: N3, N3ATM1, VPI 2

VCI 32, VCC name: VCC14

Resource: N3ATM1R1

## VCC Parameter Relationship

The following figures illustrate the relationship between the VCC parameters for Nways Switches N1, N2, and N3.

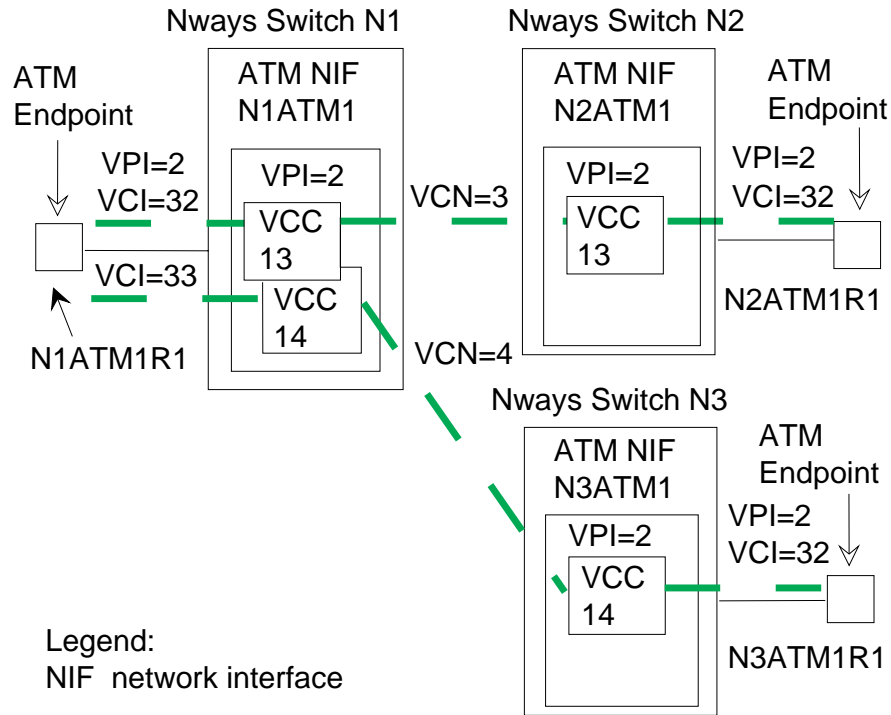


Figure 40. VCC Parameter Relationship (N1 to N2/N3)

VCN	3			
VCC Name	13		13	
Nways Switch	N1	N2	N2	N1
Side	Initiator	Completor	Initiator	Completor
Network Interface	N1ATM1	N2ATM1	N2ATM1	N1ATM1
Resource ID	N1ATM1R1	N2ATM1R1	N2ATM1R1	N1ATM1R1
VPI	2	2	2	2
VCI	32	32	32	32
VCN	4			
VCC Name	14		14	
Nways Switch	N1	N3	N3	N1
Side	Initiator	Completor	Initiator	Completor
Network Interface	N1ATM1	N3ATM1	N3ATM1	N1ATM1
Resource ID	N1ATM1R1	N3ATM1R1	N3ATM1R1	N1ATM1R1
VPI	2	2	2	2
VCI	33	32	32	33

## ATM Qualities of Service

NCT2 and Nways 2220 Switch Manager provide predefined ATM qualities of service (QoS) which you can assign to ATM connections in relation with their types of traffic. You select a predefined QoS by clicking in a list. The QoSs are organized by ATM traffic types as follows:

### Real-Time Class 1 (RT1)

RT1 is a logical queue in each transit Nways Switch. It is used for real-time applications requiring very low delay and very low jitter, such as constant bit rate voice. RT1 provides the lowest delay and jitter.

**Real-Time Class 2 (RT2)**

RT2 is a logical queue which is used for real-time applications that can support slightly more delay and jitter than RT1. RT2 provides better bandwidth optimization than RT1 but increases the end-to-end delay.

**Non-Real Time (NRT)**

NRT is a logical queue which is used for applications requiring guaranteed bandwidth but not sensitive to delay or jitter.

**Non-Reserved (NR)**

NR is a logical queue which is used for applications that do not require delay and bandwidth guarantees, only best effort delivery. NR is also used for internal 2220 network control flows.

For details of ATM QoSs, refer to the *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378. Also see the NCT2 or Nways 2220 Switch Manager online help.

---

## Configuring ATM Bearer Service Network Interfaces for Trunks

This section describes the configuration of an ATM network interface for a trunk and is organized as follows:

“ATM Bearer Service Network Interfaces for Trunks : Windows and Dialogs” on page 95

“ATM Bearer Service Network Interface for Trunks Parameters” on page 96.

On a trunk line interface, an ATM network interface is called *ATM bearer service network interface for a trunk* and provides transport services to one physical ATM trunk line used for ATM bearer service. The ATM network interface for a trunk sets up and maintains predefined ATM VP connections.

## ATM Bearer Service Network Interface Protocol Support for Trunks

The following figure shows how ATM devices are connected through a 2220 network.

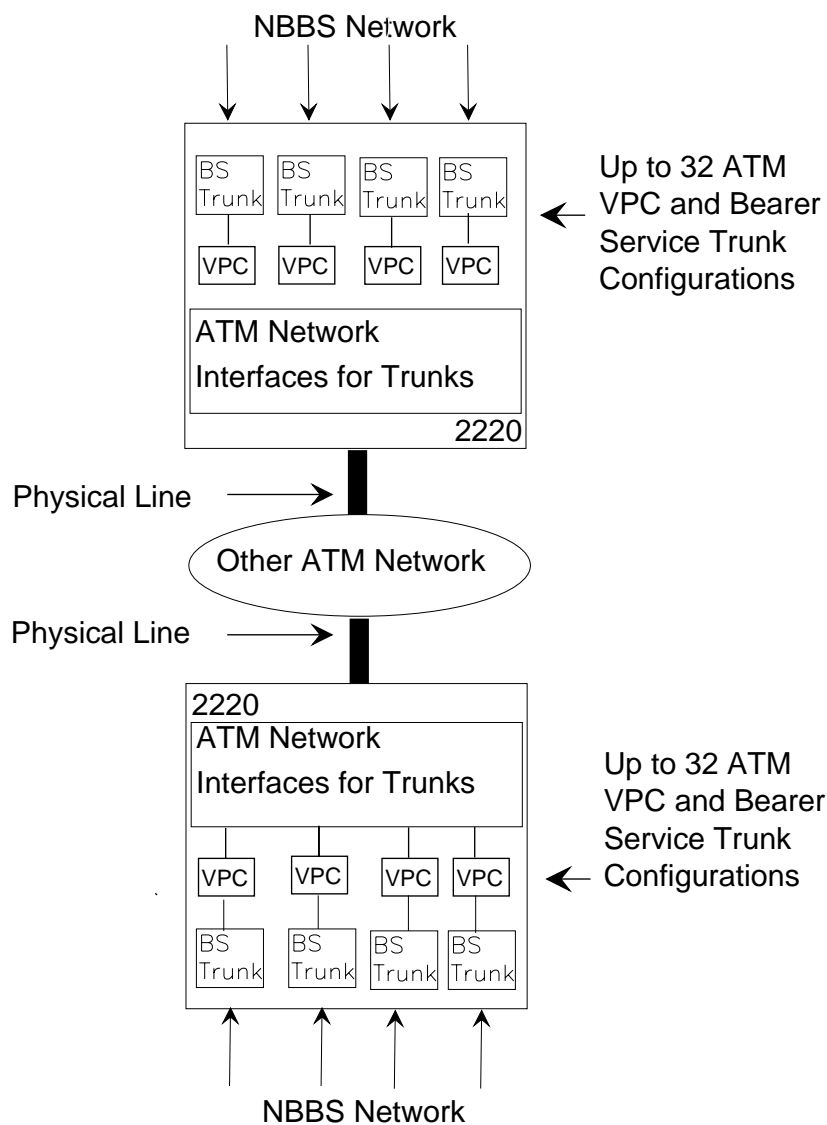


Figure 41. ATM Bearer Service Network Interface Protocol Support for Trunks

**Legend:**

**ATM** Asynchronous transfer mode

**VPC** Virtual path connection

## ATM Bearer Service Network Interface for Trunks Virtual Connections

ATM connections can be defined at VP level.

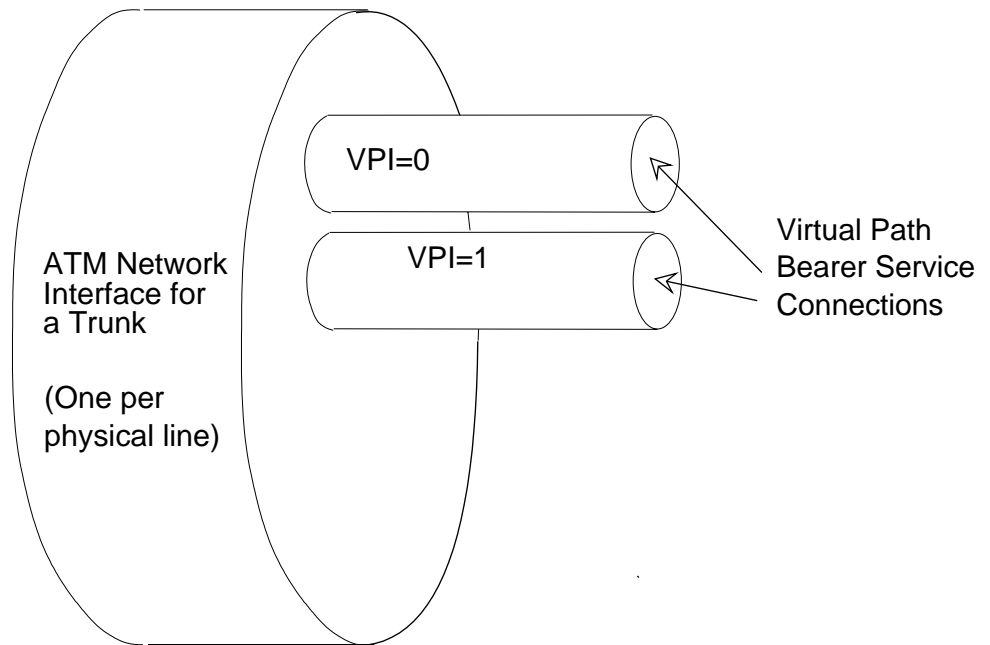


Figure 42. ATM Bearer Service Network Interface Virtual Connections for Trunks

## ATM Bearer Service Network Interfaces for Trunks : Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ATM network interfaces for trunks .

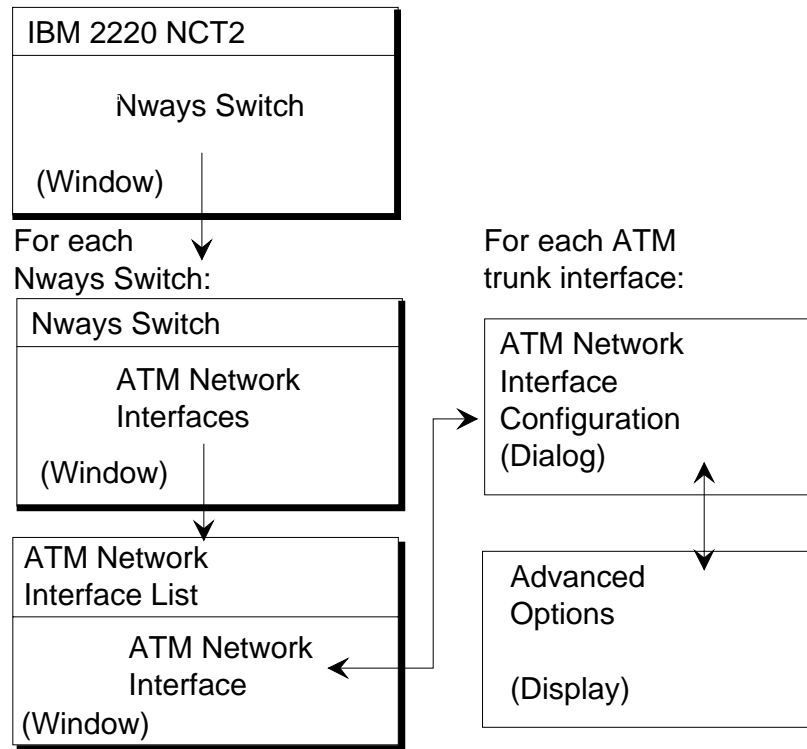


Figure 43. ATM Bearer Service Network Interfaces for Trunks : Windows and Dialogs

Open an ATM Network Interface Configuration List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on ATM Network Interfaces. The ATM Network Interface Configuration List opens.

From the ATM Network Interface Configuration List, create an ATM network interface for a trunk by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface -> accessed through Bearer Service (Trunk)**. The ATM Network Interface Configuration dialog opens.

## ATM Bearer Service Network Interface for Trunks Parameters

Before creating ATM connections, you configure ATM network interface (trunks) on both Nways Switches at the end-points of the connection. You configure one ATM network interface (trunk) for each ATM physical trunk line. On one end, the network interface serves as *connection initiator*. On the other end, the network interface serves as *connection completer*. A connection is always activated from the initiator network interface.

Following are the network interface parameters:

### Network Interface Name

Up to 32 characters



**Line Attachment Location**

Rack, slot, and position

**Resource Identification**

Identification of the resource attached through the ATM trunk line

**Network Interface Type**

Public user network interface (UNI), private UNI, or carrier to carrier.

**Protocol Role**

User side, network side, or both

**Numbering Plans**

E.164, private numbering plan (PNP), and network service address point (NSAP). The three plans are supported by default.

**Connection type**

Connection initiator and completor

**Maximum bandwidth available**

Bandwidth that is less than or equal to the line speed

Clicking on **Advanced Options** displays the following:

- Maximum number of virtual paths and virtual channels on each ATM interface
- Maximum number of virtual channels on each network interface
- Number of active bits used in ATM cell headers for virtual path identifiers (VPIs) and virtual channel identifiers (VCIs).

For parameter details, see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of ATM Bearer Service Network Interfaces for Trunks

Nways Switch: N1  
ATM network interface: N1ATM2  
Location: Rack A, slot 3, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N1ATM2  
Maximum bandwidth: 149 760 kbps (default)

Nways Switch: N2  
ATM network interface: N2ATM2  
Location: Rack A, slot 3, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N2ATM2  
Maximum bandwidth: 149 760 kbps (default)

Nways Switch: N3  
ATM network interface: N3ATM2  
Location: Rack A, slot 3, position 1  
Network interface: private UNI  
Protocol role: network side  
Resource identifier: N3ATM2  
Maximum bandwidth: 149 760 kbps (default)

---

## Configuring ATM Bearer Service VPCs

A set of ATM VP trunks can be defined on an ATM interface using the ATM Bearer Service, which enables you to split one physical ATM line interface (ATM UNI or NN) into several trunks mapped over ATM Virtual Paths (VP). Up to 32 logical trunks can be defined for each ATM adapter.

Configuring ATM Bearer Service trunks is explained in “Configuring ATM Bearer Service Trunks” on page 159.

To configure ATM Bearer Service VPCs:

1. From the ATM Network Interface List, select the network interface for trunk icon, click the right mouse button on the icon and select **VPCs**.
2. On the VP and VPC List, click on **VPC List** in the menu bar, then on **Create VPC (Bearer Service)**

The VPC (bearer Service) Configuration dialog is displayed.

From the VP and VPC List select

## ATM Bearer Service VPC Parameters

Following are the ATM Bearer Service parameters:

### Examples of ATM Bearer Service VPCs

From Nways Switch N1

Name VPC1  
VP local side:  
Nways Switch: N1  
Network interface: N1BS1  
VPI: 0  
Connection Shaper Speed: 300 cells/s  
VP remote side:  
Nways Switch: N2  
Network interface: N2BS1  
VPI: 0  
Connection shaper speed: 300 cells/s

From Nways Switch N1

Name VPC2  
VP local side:  
Nways Switch: N1  
Network interface: N1BS1  
VPI: 1  
Connection Shaper Speed: 300 cells/s  
VP remote side:  
Nways Switch: N3  
Network interface: N3BS1  
VPI: 1  
Connection shaper speed: 300 cells/s

From Nways Switch N1

Name VPC4  
VP local side:  
Nways Switch: N1  
Network interface: N1BS1  
VPI: 2  
Connection Shaper Speed: 300 cells/s  
VP remote side:  
Nways Switch: N3  
Network interface: N3BS1  
VPI: 2  
Connection shaper speed: 300 cells/s

From Nways Switch N2  
Name VPC1  
VP local side:  
  Nways Switch: N2  
  Network interface: N2BS1  
  VPI: 0  
  Connection Shaper Speed: 300 cells/s  
VP remote side:  
  Nways Switch: N1  
  Network interface: N1BS1  
  VPI: 0  
  Connection shaper speed: 300 cells/s  
From Nways Switch N2

Name VPC3  
VP local side:  
  Nways Switch: N2  
  Network interface: N2BS1  
  VPI: 1  
  Connection Shaper Speed: 300 cells/s  
VP remote side:  
  Nways Switch: N3  
  Network interface: N3BS1  
  VPI: 1  
  Connection shaper speed: 300 cells/s  
From Nways Switch N3

Name VPC2  
VP local side:  
  Nways Switch: N3  
  Network interface: N3BS1  
  VPI: 1  
  Connection Shaper Speed: 300 cells/s  
VP remote side:  
  Nways Switch: N1  
  Network interface: N1BS1  
  VPI: 1  
  Connection shaper speed: 300 cells/s  
From Nways Switch N3

Name VPC3  
VP local side:  
  Nways Switch: N3  
  Network interface: N3BS1  
  VPI: 0  
  Connection Shaper Speed: 300 cells/s  
VP remote side:  
  Nways Switch: N2  
  Network interface: N2BS1  
  VPI: 0  
  Connection shaper speed: 300 cells/s  
From Nways Switch N3

Name VPC4  
VP local side:  
  Nways Switch: N3  
  Network interface: N3BS1  
  VPI: 2  
  Connection Shaper Speed: 300 cells/s  
VP remote side:  
  Nways Switch: N1  
  Network interface: N1BS1  
  VPI: 2  
  Connection shaper speed: 300 cells/s

---

## ATM VP (Bearer Service) Trunks

For information on configuring ATM Bearer Service trunks, see “Configuring ATM Bearer Service Trunks” on page 159.

---

## Chapter 8. Configuring FR, HDLC, and CES Resources

This chapter explains how to configure frame relay (FR), FR over ISDN, high-level data link control (HDLC), and circuit emulation services (CES) resources using NCT2. Similar configuration functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

- “Configuring Frame-Relay Resources”
- “Configuring Frame Relay over ISDN Resources” on page 110
- “Configuring HDLC Resources” on page 118
- “Configuring CES Resources” on page 123
- “Qualities of Service” on page 127.

---

### Configuring Frame-Relay Resources

This section explains how to configure frame-relay resources and is organized as follows:

- “Frame-Relay Protocol Support”
- “Configuring FR Ports” on page 103
- “Configuring FR Connections” on page 106.

### Frame-Relay Protocol Support

The following figure shows how frame-relay (FR) devices are connected through an 2220 network.

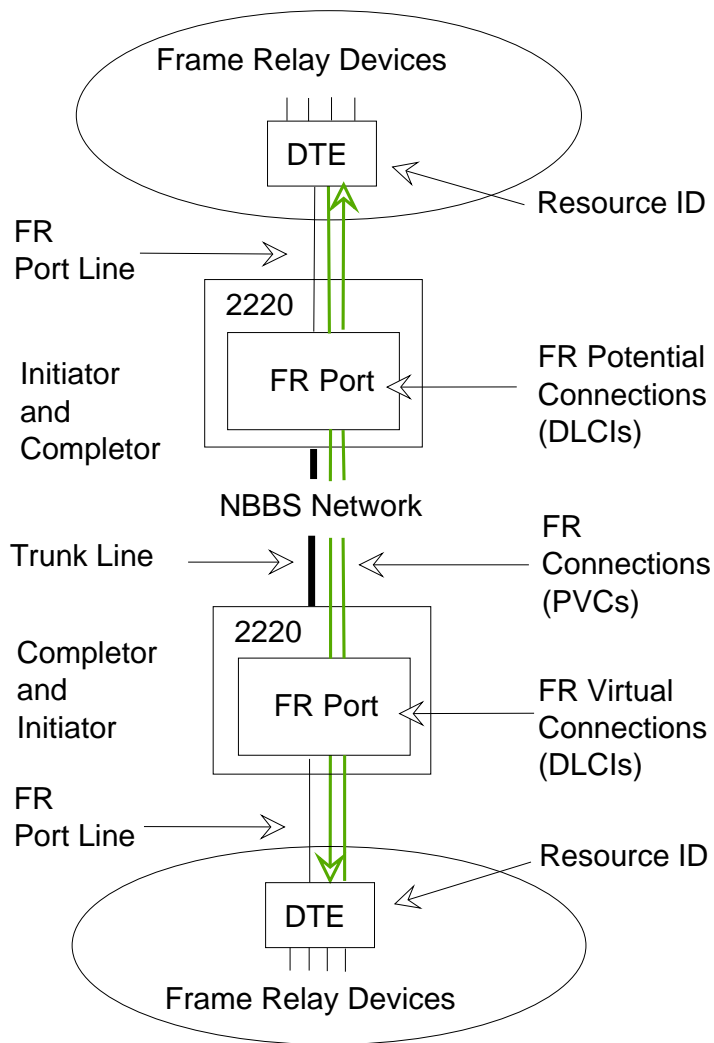


Figure 44. Frame-Relay Protocol Support

**Legend:**

- DTE** Data terminal equipment
- DLCI** Data link control identifier
- VCN** Virtual circuit number
- FR** Frame relay

The Nways Switch supports non-real-time, real-time, and non-reserved FR traffic over permanent virtual circuits (PVCs). The circuits are established and maintained permanently between two frame-relay DTEs. The Nways Switch also supports the frame-relay user network interface (UNI) and network node interface (NNI).

## FR Logical Ports

Frame-relay logical ports (layer 2 of the OSI reference model) are called *FR ports*. They are generated by the Nways Switch Control Program to provide frame-relay access services to physical frame-relay port lines. An FR port sets up and maintains predefined FR connections.

## Data Link Control Identifier (DLCI)

In frame relay, a data link control identifier (DLCI) is assigned to each permanent virtual circuit between two FR devices. The DLCI is included in each frame. DLCIs can be the same or different on both ends of a connection. If they are different, the Nways Switch changes the DLCI before passing the frame to the destination DTE.

## FR Connections

In an 2220 network, frame-relay connections are predefined between FR devices attached to the network. FR connections are point-to-point and unidirectional. They operate in real-time and non-real-time over PVCs and are always created in pairs:

- One *FR potential connection* configured as the initiator.
- One *FR virtual connection* configured as the completer. The purpose of a virtual connection is to match the DLCI used at one end of the connection with the DLCI used at the remote end depending on the virtual circuit number (unique for a given connection).

## Configuring FR Ports

This section describes the frame-relay port configuration.

### FR Port: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the FR, HDLC, or CES ports of an Nways Switch.

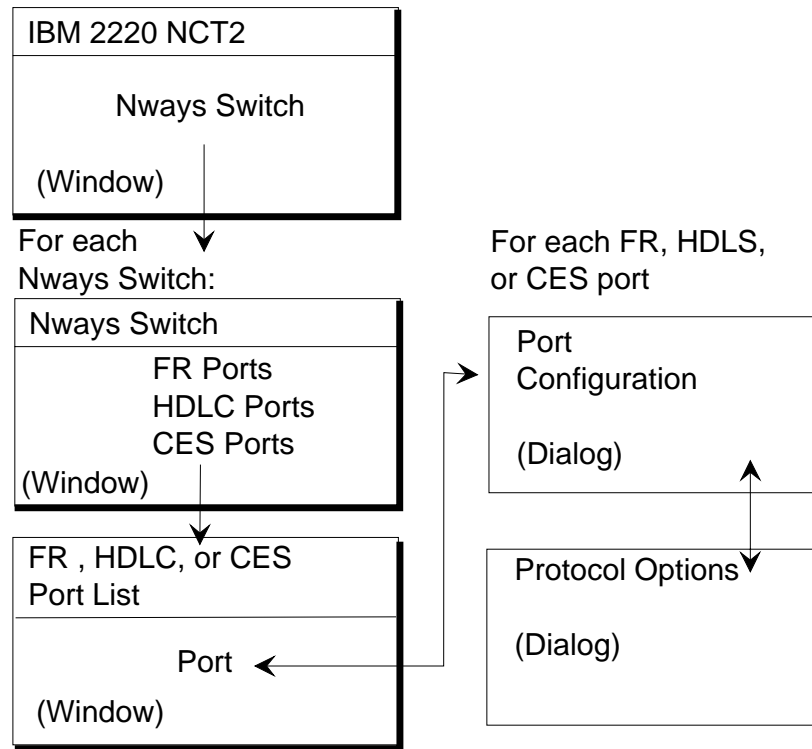


Figure 45. Ports: Windows and Dialogs

Open a Port List window as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on FR Ports, HDLC Ports, or CES Ports. The Port List opens.

From the Port List, create an FR port by clicking on **Port List** in the menu bar, then on **Create Port**. The Port Configuration dialog opens.

From the Port Configuration dialog, open the Frame Relay Protocol Options dialog by clicking on **Protocol Options**.

## FR Port Parameters

In a 2220 network, you configure an FR port for each frame-relay physical link. Using the 64 kbps time slots, you can create channels on port lines working in time division multiplexing (E1, T1, or J1). You can create a channel for each time slot or group of time slots, and you configure one FR port on each channel.

The following physical interfaces support multiple FR ports:

- E1 line with LICs 515, 516, 545, 546, and 567
- T1 and J1 lines with LICs 514 and 544.

Following are the FR port parameters:



**Port name**

Up to 20 characters

**Resource Identification**

Identification of the resource attached through the port line

**Line attachment location**

Rack, slot, position, and channel (if any)

**Connection type**

Connection initiator, completer, or both

**Administrative state**

Status of the port when the Control Program is loaded (unlocked or locked)

**Maximum bandwidth available**

Bandwidth that is less than or equal to the line speed

You configure the following frame-relay options:

- Interval of authorized data link connection identifier (DLCI) values. Default values are from 16 to 991.
- Number of configured DLCIs (updated by the configuration program)
- Maximum number of permanent virtual circuits (PVCs). Default value: 400.
- Local management interface (LMI) type: none, ANSI standard T1.617-D, or ITU-T Q.933-A.
- LMI mode: user, network, user and network.

You also configure LMI parameters, such as:

N391 full status polling counter

N392 error threshold

N393 monitored events count

T391 link integrity verification polling timer

T392 polling verification timer.

For parameters details, see the NCT2 or Nways 2220 Switch Manager online help.

**Examples of FR Ports**

Nways Switch: N1

Port name: N1PORT1

Resource definitions: Type PNP, identifier NETN1PORT1

Location: Rack A, slot 1, LCB Base 1, position 0

Connection initiator: Yes

Connection completer: Yes

Time slot allocation: 2 channels, 1-20 and 21-31

Channel number: 1

Administrative state: Unlocked

Maximum bandwidth: 56 kbps (default)

Nways Switch: N2

Port name: N2PORT1

Resource definitions: Type PNP, identifier NETN2PORT1

Location: Rack A, slot 2, LCB None, position 1

Connection initiator: Yes

Connection completer: Yes

Time slot allocation: 2 channels, 1-20 and 21-31

Channel number: 1

Administrative state: Unlocked

Maximum bandwidth: 56 kbps (default)

Nways Switch: N3  
Port name: N3PORT1  
Resource definitions: Type PNP, identifier NETN3PORT1  
Location: Rack A, slot 2, LCB None, position 1  
Connection initiator: Yes  
Connection completer: Yes  
Time slot allocation: 2 channels, 1-20 and 21-31  
Channel number: 1  
Administrative state: Unlocked  
Maximum bandwidth: 56 kbps (default)

## Creating a Backup FR Port

You can create a backup for an FR port, which can be used over ISDN if a leased line between an Nways Switch and a frame relay DTE fails. From the Nways Switch window, click mouse button 2 on the FR port for which a backup is to be configured, and select **Backup Configuration** → **Create** from the pop-up menu. The FR over ISDN Port Configuration dialog is displayed. For further information, see “Configuring Frame Relay over ISDN Resources” on page 110.

## Configuring FR Connections

This section describes the frame-relay connection configuration.

### FR Connections: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the FR connections of an Nways Switch

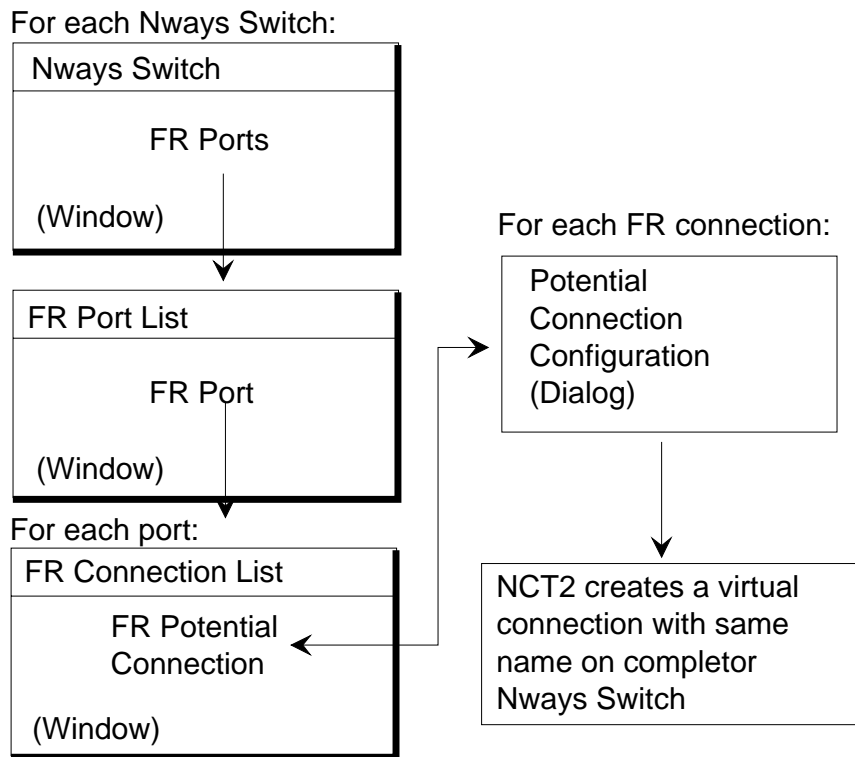


Figure 46. FR Connections: Windows and Dialogs

Open the FR Connection List as follows:

1. From an Nways Switch window, double-click on FR Ports (for a figure, see “Example of Nways Switch Window” on page 60). The FR Port List opens.
2. From the FR Port List, double-click on an FR port. The FR Connection List for this port opens.

From the FR Connection List, create an FR potential connection by clicking on **Connection List** in the menu bar, then on **Create Connection → Create Potential Connection**.

The Potential Connection Configuration dialog opens.

When you create an FR potential connection, NCT2 proposes to create the associated virtual connection.

From the FR Potential Connection dialog, open the Frame Relay Traffic Options by clicking on **Traffic Options**.

## FR Connection Parameters

Each frame-relay connection consists of a potential connection and a virtual connection. You configure FR potential connections for each FR port defined as connection initiator. On the remote FR port, you configure virtual connections which are the return paths of the potential connections. FR ports on each end of the connection are defined as both connection initiator and completer.

It is possible to define several FR connections with different data link connection identifiers (DLCIs) on the same FR port. The connections can be activated at the same time.

Associated potential and virtual connections have the **same virtual circuit number**. To be displayed together using the Nways 2220 Switch Manager, they must have the **same name**.

**Potential Connection:** Following are the parameters of a frame relay potential connection:

**Connection name**

Up to 32 characters

**Virtual Circuit Number**

Assigned by NCT2. It is unique for the pair of connections (potential and virtual connections).

**Initiator Identification**

Initiator Nways Switch, port, DLCI, and resource (displayed by NCT2)

**Completor Identifications**

Completor Nways Switch, port, DLCI, and resource

**Quality of Service**

QoS assigned to the FR potential and virtual connections

**Traffic Definition Mode**

Traffic definition in either NBBS mode (peak bit rate, mean bit rate, and mean burst length) or in frame relay mode (AR, CIR, Bc, and Be)

**Connection Activation Mode**

Permanent or on reception of a start command from the network operator

**Administrative state**

Status of the connection when the Control Program is loaded (unlocked or locked)

**Accounting**

Connection accountable (if required) and bandwidth sensitivity over which accounting information is recorded.

NCT2 has an "Apply then another" function that creates another potential connection and automatically increments the VCN and DLCI numbers.

For details of frame-relay configuration options and QoSs, refer to *2220 Nways BroadBand Switch Frame Relay Interface Specifications*, GA33-0374. Also see the NCT2 and Nways 2220 Switch Manager online help.

**Virtual Connection:** Following are the parameters for a frame relay virtual connection:

**Connection name**

Up to 32 characters. **Same name** as the associated potential connection.

**Virtual Circuit Number**

Selected by the NCT2 if the virtual connection has been created automatically

**Initiator Identification**

Initiator Nways Switch, port, DLCI, and resource

## Completor Identifications

Completor Nways Switch, port, DLCI, and resource (displayed by NCT2)

As for the potential connection, NCT2 has an "Apply then another" function that creates another virtual connection and automatically increments the VCN and DLCI numbers.

## Potential Connection Path

The following figure shows the physical and logical resources that are used along the path of a potential connection.

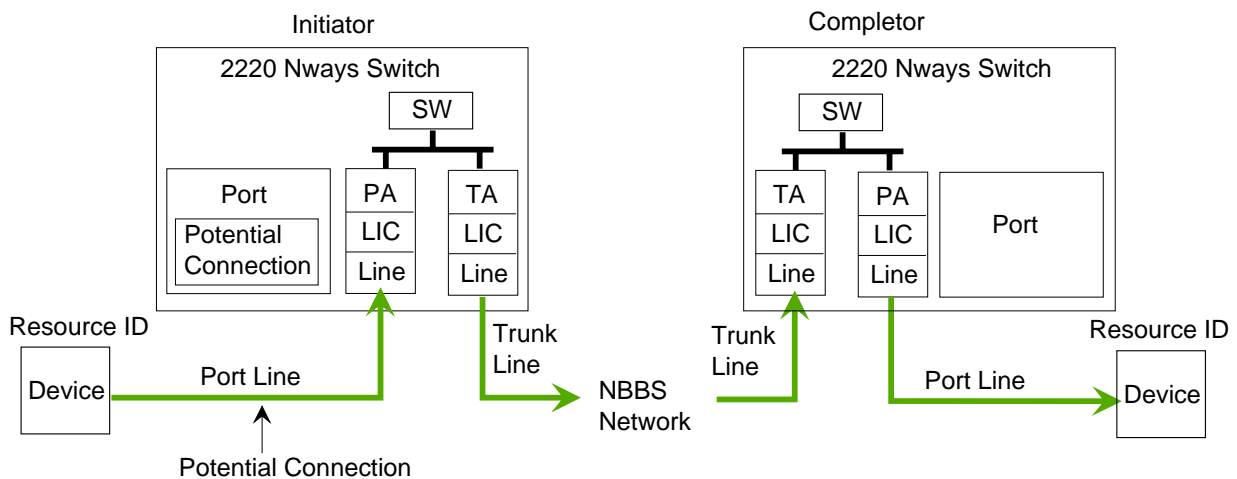


Figure 47. Potential Connection: Parameter Relationship

### Legend:

- LIC** Line attachment coupler
- PA** Port adapter
- SW** Switch module
- TA** Trunk adapter

The logical port is associated with the physical resources by the line attachment location: rack, slot, line connection box (if any), line position, and channel (if any). The logical port is associated with the potential connection by the initiator resource identification.

## Examples of FR Connections

Nways Switch: N1

Port name: NETPORT10

VCN 0

Initiator side: Nways Switch N1, port name N1PORT1, DLCI 16, resource type PNP, identifier NETPORT1

Completor side: Nways Switch N1, port name N1PORT2, DLCI 16, resource type PNP, identifier NETPORT2

Quality of Service: Forward QOSFRHDLIC, return QOSFRHDLIC

Traffic mode: NBBS

```
Connection activation: Permanent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)

Nways Switch: N2
Port name: NETPORT20
Initiator side: Nways Switch N2, port name N2PORT1, DLCI 16,
                resource type PNP, identifier NETPORT1
Completer side: Nways Switch N2, port name N2PORT2, DLCI 16,
                resource type PNP, identifier NETPORT2
Quality of Service: Forward QOSFRHDLIC, return QOSFRHDLIC
Traffic mode: NBBS
Connection activity: Permanaent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)

Nways Switch: N3
Port name: NETPORT30
Initiator side: Nways Switch N2, port name N3PORT1, DLCI 16,
                resource type PNP, identifier NETPORT1
Completer side: Nways Switch N2, port name N3PORT2, DLCI 16,
                resource type PNP, identifier NETPORT2
Quality of Service: Forward QOSFRHDLIC, return QOSFRHDLIC
Traffic mode: NBBS
Connection activity: Permanaent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)
```

---

## Configuring Frame Relay over ISDN Resources

This section explains how to configure FR relay over ISDN resources. FR over ISDN allows an Nways Switch frame-relay port to be accessed through a dial-up ISDN connection for limited traffic for several hours a day. An FR over ISDN port can also be used as a backup for an FR port if a leased line between an Nways Switch and a frame relay DTE fails.

The section is organized as follows:

- “Frame Relay over ISDN Protocol Support”
- “Configuring FR over ISDN Port Groups” on page 111
- “Configuring Frame Relay over ISDN Ports” on page 112
- “Configuring FR over ISDN Connections” on page 115

In addition you must configure ISDN network interfaces. This is described in “Chapter 9. Configuring ISDN Resources” on page 129.

## Frame Relay over ISDN Protocol Support

The following figure shows how FR over ISDN devices are connected through a 2220 network.

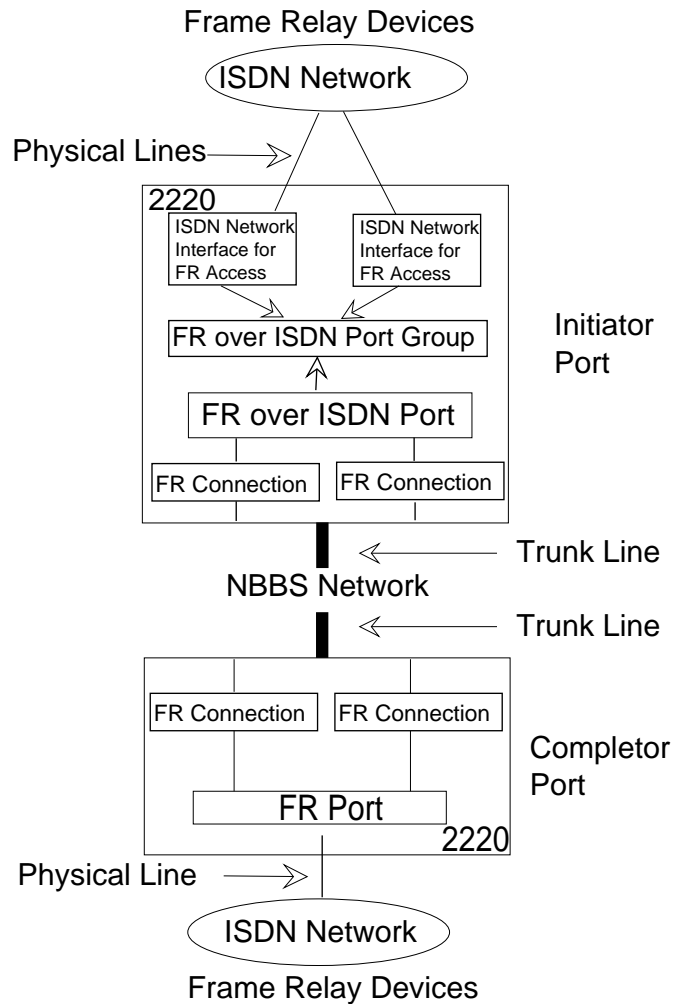


Figure 48. FR over ISDN Protocol Support

## Configuring FR over ISDN Port Groups

This section describes the FR over ISDN port group configuration.

### FR over ISDN Port Groups: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the FR over ISDN port groups of an Nways Switch.

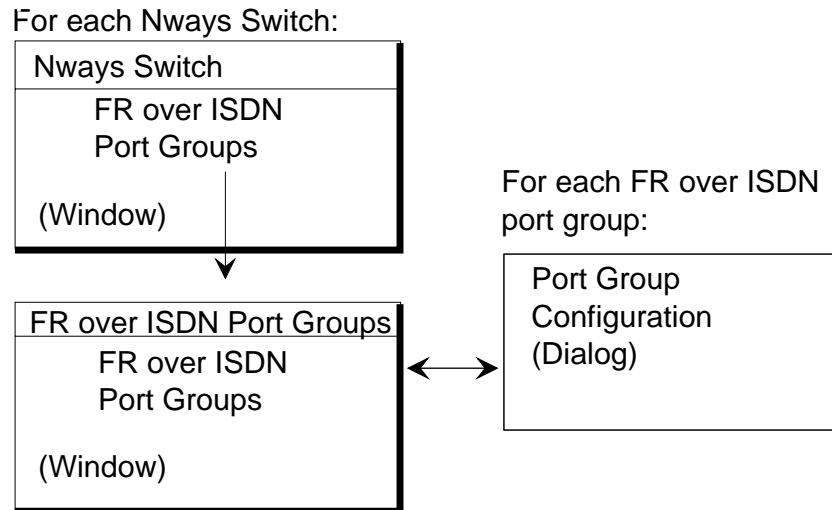


Figure 49. FR over ISDN Port Groups: Windows and Dialogs

Open a Port Group List window as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on FR over ISDN Port Groups. The FR over ISDN Port Groups List opens.

From the FR over ISDN Port Group List, create an FR over ISDN port group by clicking on **Port Group List** in the menu bar, then on **Create Port Group**. The FR over ISDN Port Group Configuration dialog opens.

### FR over ISDN Port Group Parameter

Up to 20 characters.

## Configuring Frame Relay over ISDN Ports

This section describes the FR over ISDN port configuration. Before you can configure FR over ISDN ports, you must create at least one FR over ISDN port group. See “Configuring FR over ISDN Port Groups” on page 111.



## FR over ISDN Port: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the FR over ISDN ports of an Nways Switch, or to configure an FR port as a backup port (“Creating a Backup FR Port” on page 106).

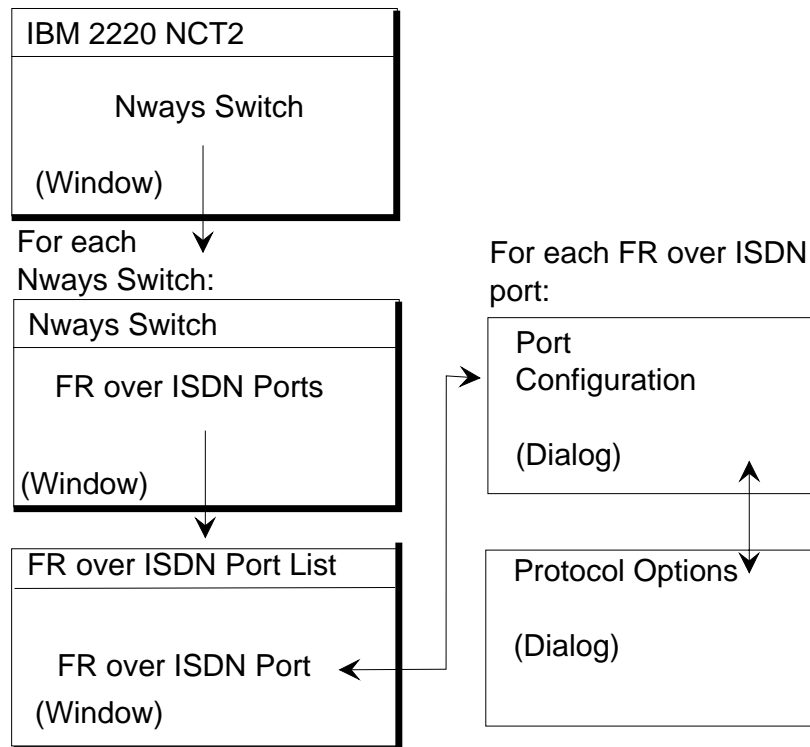


Figure 50. FR over ISDN Port: Windows and Dialogs

Open a Port List window as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on FR over ISDN Ports. The FR over ISDN Ports List opens.

From the FR over ISDN Port List, create an FR over ISDN port by clicking on **Port List** in the menu bar, then on **Create Port**. The FR over ISDN Port Configuration dialog opens.

From the FR over ISDN Port Configuration List dialog, open the Protocol Options dialog by clicking on **Protocol Options**.

## FR over ISDN Port Parameters

You create an FR over ISDN port on the initiator Nways Switch and a regular FR port on the completer Nways Switch. You can also derive the configuration for an existing FR port to backup.

Following are the FR over ISDN port parameters:

**Port type**

Port type, dial-in or backup.

**Name definitions**

Node and port names.

**Primary name definitions**

Primary node and port names.

**Resource definitions**

Type of port and its identifier.

**FR over ISDN parameters**

Name of the port group to which this port belongs, and the DTE calling number.

**Administrative state**

Status of the port when the Control Program is loaded (unlocked or locked)

**Maximum bandwidth available**

Bandwidth that is less than or equal to the line speed

You configure the following frame-relay options:

- Interval of authorized data link connection identifier (DLCI) values. Default values are from 16 to 991.
- Number of configured DLCIs (updated by the configuration program)
- Maximum number of permanent virtual circuits (PVCs). Default value: 400.
- Local management interface (LMI) type: none, ANSI standard T1.617-D, or ITU-T Q.933-A.
- LMI mode: user, network, user and network.

You also configure LMI parameters, such as:

N391 full status polling counter

N392 error threshold

N393 monitored events count

T391 link integrity verification polling timer

T392 polling verification timer.

For parameters details, see the NCT2 or Nways 2220 Switch Manager online help.

**Examples of FR over ISDN Ports**

```
Nways Switch: N1
Port type: Backup
Name definitions: Node N1, port N1PORT
Primary name definitions: Node N2, port N2PORT2
Resource definitions: Type PNP, identifier N1PORT1
Port group name: PORT GROUP 1
Calling number:04 92 11 36 5421
Connection initiator: Yes
Connection completer: Yes
Administrative state: Unlocked
Maximum allowable bandwidth: 128 kbps (default)

Nways Switch: N2
Port type: Dial-in
Name definitions: Node N2, port N2PORT
Primary name definitions: None
Resource definitions: Type PNP, identifier N2PORT3
Port group name: PORT GROUP 1
Calling number:04 92 11 36 6444
```

```

Connection initiator: Yes
Connection completer: Yes
Administrative state: Unlocked
Maximum available bandwidth: None

Nways Switch: N3
Port type: Dial-in
Name definitions: Node N3, port N3PORT
Primary name definitions: None
Resource definitions: Type PNP, identifier N3PORT3
Port group name: PORT GROUP 1
Calling number:04 92 11 36 5555
Connection initiator: Yes
Connection completer: Yes
Administrative state: Unlocked
Maximum available bandwidth: None

```

## Configuring FR over ISDN Connections

This section describes the frame-relay over ISDN connection configuration.

### FR over ISDN Connections: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure FR over ISDN connections of an Nways Switch.

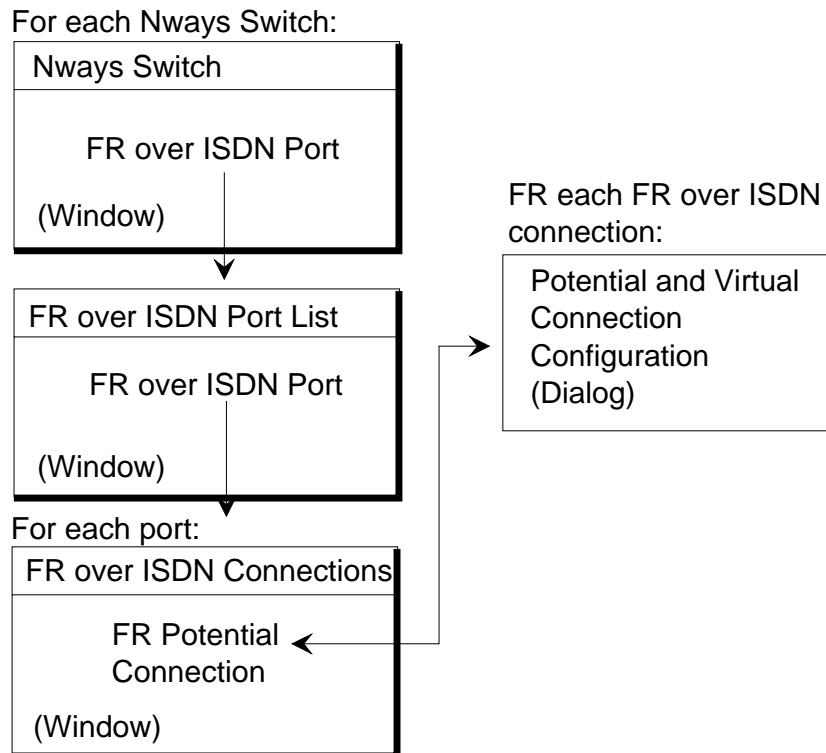


Figure 51. FR over ISDN Connections: Windows and Dialogs

Open the FR over ISDN Connection List as follows:

1. From an Nways Switch window, double-click on FR over ISDN Ports (for a figure, see “Example of Nways Switch Window” on page 60). The FR over ISDN Port List opens.

2. From the FR over ISDN Port List, double-click on an FR over ISDN port. The FR over ISDN Connection List for this port opens.

From the FR over ISDN Connection List, create an FR potential connection by clicking on **Connection List** in the menu bar, then on **Create Connection → Create Potential Connection**.

The Potential Connection Configuration dialog opens.

From the FR Potential Connection dialog, open the Frame Relay Traffic Options by clicking on **Traffic Options**.

From the FR over ISDN Connection List, create an FR virtual connection by clicking on **Connection List** in the menu bar, then on **Create Connection → Create Virtual Connection**.

The Virtual Connection Configuration dialog opens.

## FR over ISDN Connection Parameters

Each FR over ISDN connection consists of a potential connection and a virtual connection. You configure FR over ISDN potential connections for each FR over ISDN port defined as connection initiator. On the remote FR port, you configure virtual connections which are the return paths of the potential connections. FR over ISDN ports are defined as both connection initiator and completer.

It is possible to define several FR over ISDN connections with different data link connection identifiers (DLCIs) on the same FR over ISDN port. The connections are activated when the FR DTE call is established.

Associated potential and virtual connections have the **same virtual circuit number**. To be displayed together using the Nways 2220 Switch Manager, they must have the **same name**.

**Potential Connection:** Following are the parameters of a frame relay potential connection:

**Connection name**

Up to 32 characters

**Virtual Circuit Number**

Assigned by NCT2. It is unique for the pair of connections (potential and virtual connections).

**Initiator Identification**

Initiator Nways Switch, port, DLCI, and resource (displayed by NCT2)

**Completer Identifications**

Completer Nways Switch, port, DLCI, and resource

**Quality of Service**

QoS assigned to the FR potential and virtual connections

**Traffic Definition Mode**

Traffic definition in either NBBS mode (peak bit rate, mean bit rate, and mean burst length) or in frame relay mode (AR, CIR, Bc, and Be)

**Connection Activation Mode**

Permanent or on reception of a start command from the network operator

**Administrative state**

Status of the connection when the Control Program is loaded (unlocked or locked)

**Accounting**

Connection accountable (if required) and bandwidth sensitivity over which accounting information is recorded.

NCT2 has an "Apply then another" function that creates another potential connection and automatically increments the VCN and DLCI numbers.

For details of frame-relay configuration options and QoSs, refer to *2220 Nways BroadBand Switch Frame Relay Interface Specifications*, GA33-0374. Also see the NCT2 and Nways 2220 Switch Manager online help.

**Virtual Connection:** Following are the parameters for a frame relay virtual connection:

**Connection name**

Up to 32 characters. **Same name** as the associated potential connection.

**Virtual Circuit Number**

Selected by the NCT2 if the virtual connection has been created automatically

**Initiator Identification**

Initiator Nways Switch, port, DLCI, and resource

**Completor Identifications**

Completor Nways Switch, port, DLCI, and resource (displayed by NCT2)

As for the potential connection, NCT2 has an "Apply then another" function that creates another virtual connection and automatically increments the VCN and DLCI numbers.

**Examples of FR over ISDN Connections**

```
Nways Switch: N1
Port name: NETPORT11
VCN 0
Initiator side: Nways Switch N1, port name N1PORT, DLCI 16,
                resource type PNP, identifier N1PORT1
Completor side: Nways Switch N2, port name N2PORT1, DLCI 17,
                resource type PNP, identifier NETPORT1
Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC
Traffic mode: Frame relay
Connection activation: No
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)

Nways Switch: N2
Port name: NETPORT12
Initiator side: Nways Switch N2, port name N2PORT, DLCI 16,
                resource type PNP, identifier N2PORT1
Completor side: Nways Switch N2, port name N2PORT2, DLCI 17,
                resource type PNP, identifier NETPORT2
Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC
Traffic mode: Frame relay
Connection activity: No
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)
```

Nways Switch: N3  
Port name: NETPORT13  
Initiator side: Nways Switch N2, port name N3PORT, DLCI 16,  
resource type PNP, identifier NETPORT1  
Completer side: Nways Switch N2, port name N3PORT2, DLCI 17,  
resource type PNP, identifier NETPORT3  
Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC  
Traffic mode: Frame relay  
Connection activity: No  
Administrative state: Unlocked  
Accounting: No  
Bandwidth sensitivity: 50 % (default)

---

## Configuring HDLC Resources

This section explains how to configure HDLC resources and is organized as follows:

“HDLC Protocol Support”

“Configuring HDLC Ports” on page 120

“Configuring HDLC Connections” on page 121.

## HDLC Protocol Support

The following figure shows how high-level data link control (HDLC) devices are connected through a 2220 network.

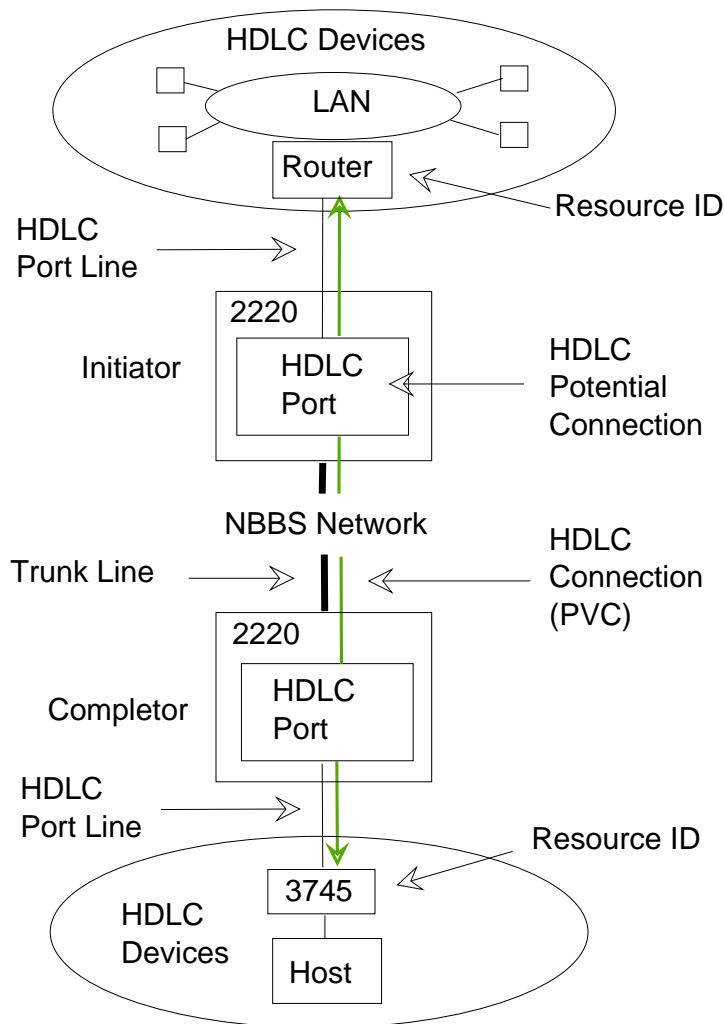


Figure 52. HDLC Protocol Support

The Nways Switch supports non-real-time, real-time, and non-reserved HDLC traffic over permanent virtual circuits (PVCs). The circuits are established and maintained permanently between two HDLC devices. The Nways Switch provides the same data link controls as:

- Synchronous data link control (SDLC) used with SNA
- Link access procedure for D-channel (LAP-D) used with ISDN.

## HDLC Logical Ports

HDLC logical ports (layer 2 of the OSI reference model) are called *HDLC ports*. They are generated by the Nways Switch Control Program to provide HDLC access services to physical HDLC port lines. An HDLC port sets up and maintains predefined HDLC connections.

## HDLC Connections

In a 2220 network, *HDLC potential connections* are predefined between two HDLC devices attached to the network. HDLC connections are point-to-point and

bidirectional. They operate in real-time and non-real-time over permanent virtual circuits (PVCs). In HDLC, only one connection is supported per logical port.

## Configuring HDLC Ports

The windows and dialogs used to configure the HDLC ports are the same as for configuring FR ports (see “FR Port: Windows and Dialogs” on page 103).

### HDLC Port Parameters

Before creating HDLC connections, you create HDLC ports on both Nways Switches at the end-points of the connection. On one end, the port serves as *connection initiator*. On the other end, the port serves as *connection completer*. A connection is always activated from the initiator logical port.

In a 2220 network, you configure an HDLC port for each frame-relay physical link. Using the 64 kbps time slots, you can create channels on port lines working in time division multiplexing (E1, T1, or J1). You can create a channel for each time slot or group of time slots, and you configure one HDLC port on each channel.

The following physical interfaces support multiple HDLC ports:

- E1 line with LICs 515, 516, 545, 546, and 567
- T1 and J1 lines with LICs 514 and 544.

Following are the HDLC port parameters:

**Port name**

Up to 20 characters

**Resource Identification**

Identification of the resource attached through the port line

**Line attachment location**

Rack, slot, position, and channel (if any)

**Connection type**

Connection initiator, completer, or both

**Administrative state**

Status of the port when the Control Program is loaded (unlocked or locked)

**Maximum bandwidth available**

Bandwidth that is less than or equal to the line speed

For parameters details, see the NCT2 and Nways 2220 Switch Manager online help.

### Examples of HDLC Ports

Nways Switch: N1  
Port name: N1PORT1  
Resource definitions: Type PNP, identifier NETN1PORT1  
Location: Rack A, slot 2, LCB Base 1, position 3  
Time slot allocation: None  
Channel number: None  
Connection initiator: Yes  
Connection completer: Yes  
Administrative state: Unlocked  
Maximum available bandwidth: 56 kbps (default)



```

Nways Switch: N2
Port name: N2PORT1
Resource definitions: Type PNP, identifier NETN2PORT1
Location: Rack A, slot 2, LCB None, position 2
Connection initiator: Yes
Connection completer: Yes
Time slot allocation: None
Channel number: None
Administrative state: Unlocked
Maximum available bandwidth: 56 kbps (default)

Nways Switch: N3
Port name: N3PORT1
Resource definitions: Type PNP, identifier NETN3PORT1
Location: Rack A, slot 2, LCB None, position 4
Connection initiator: Yes
Connection completer: Yes
Time slot allocation: None
Channel number: None
Administrative state: Unlocked
Maximum available bandwidth: 56 kbps (default)

```

## Configuring HDLC Connections

This section describes the HDLC connection configuration.

### HDLC Connections: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the HDLC and CES connections of an Nways Switch.

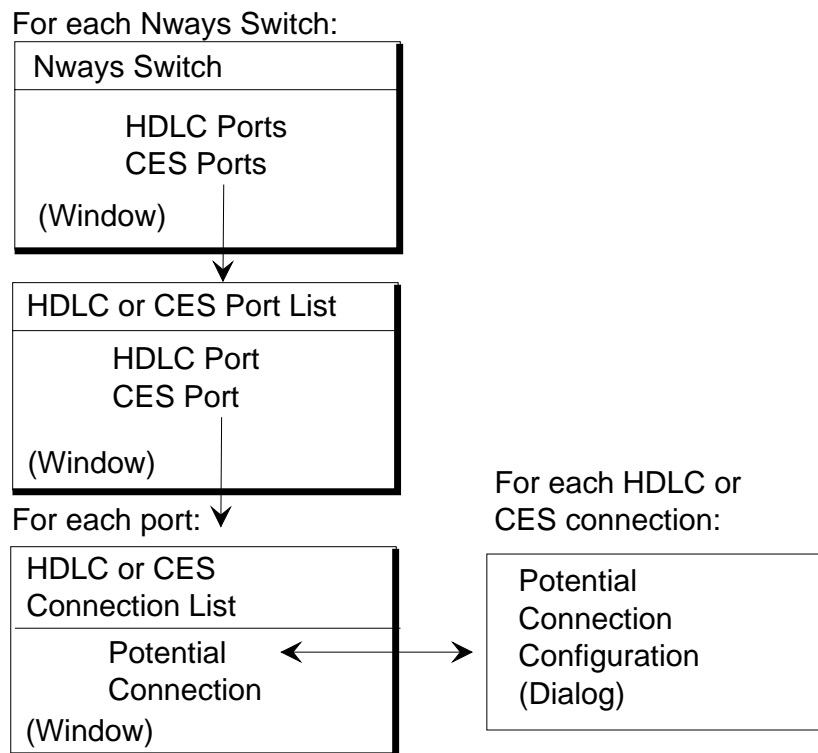


Figure 53. HDLC/CES Connections: Windows and Dialogs

Open the HDLC or CES Connection List as follows:

1. From an Nways Switch window, double-click on HDLC or CES Ports (for a figure, see “Example of Nways Switch Window” on page 60). The HDLC or CES Port List opens.
2. From the Port List, double-click on a port. The Connection List for this port opens.

From the Connection List, create an HDLC potential connection by clicking on **Connection List** in the menu bar, then on

**Create Connection**. The Connection Configuration dialog opens.

From the Connection Configuration dialog, open the Traffic Options dialog by clicking on **Traffic Options**.

## HDLC Potential Connection Parameters

You configure one permanent HDLC potential connection for each HDLC port configured as a connection initiator. It is possible to define several non-permanent connections on the same HDLC port, but only one connection is active at a time. On port lines with channels, you configure one permanent connection per channel.

Following are the HDLC potential configuration parameters:

### Connection name

Up to 32 characters

### Initiator Identification

Initiator Nways Switch, port, and resource (displayed by NCT2)

### Completer Identifications

Completer Nways Switch, port, and resource

### Quality of Service

QoS assigned to the HDLC connection for both directions

### Connection Activation Mode

Permanent or on reception of a start command from the network operator

### Administrative state

Status of the connection when the Control Program is loaded (unlocked or locked)

### Accounting

Connection accountable (if required) and bandwidth sensitivity over which accounting information is recorded.

For details of HDLC configuration options and QoSs, refer to *2220 Nways BroadBand Switch HDLC Interface Specifications*, GA33-0375. Also see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of HDLC Connections

Nways Switch: N1

Port name: NETPORT10

Initiator side: Nways Switch N1, port name N1PORT1,  
resource type PNP, identifier NETPORT10

Completer side: Nways Switch N2, port name N2PORT1,  
resource type PNP, identifier NETN2PORT1

Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC

```
Connection activation: Permanent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)

Nways Switch: N2
Port name: NETN2PORT1
Initiator side: Nways Switch N2, port name N2PORT1,
                 resource type PNP, identifier NETN2PORT1
Completer side: Nways Switch N1, port name N1PORT1,
                 resource type PNP, identifier NETPORT10
Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC
Connection activity: Permanent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)

Nways Switch: N3
Port name: NETN3PORT1
Initiator side: Nways Switch N3, port name N3PORT1,
                 resource type PNP, identifier NETN3PORT1
Completer side: Nways Switch N1, port name N1PORT1,
                 resource type PNP, identifier NETPORT10
Quality of Service: Forward QOSFRHDLC, return QOSFRHDLC
Connection activity: Permanent mode
Administrative state: Unlocked
Accounting: No
Bandwidth sensitivity: 50 % (default)
```

---

## Configuring CES Resources

This section explains how to configure CES resources and is organized as follows:

- “CES Protocol Support”
- “Configuring CES Ports” on page 125
- “Configuring CES Connections” on page 126.

### CES Protocol Support

The following figure shows how circuit emulation services (CES) devices are connected through a 2220 network.

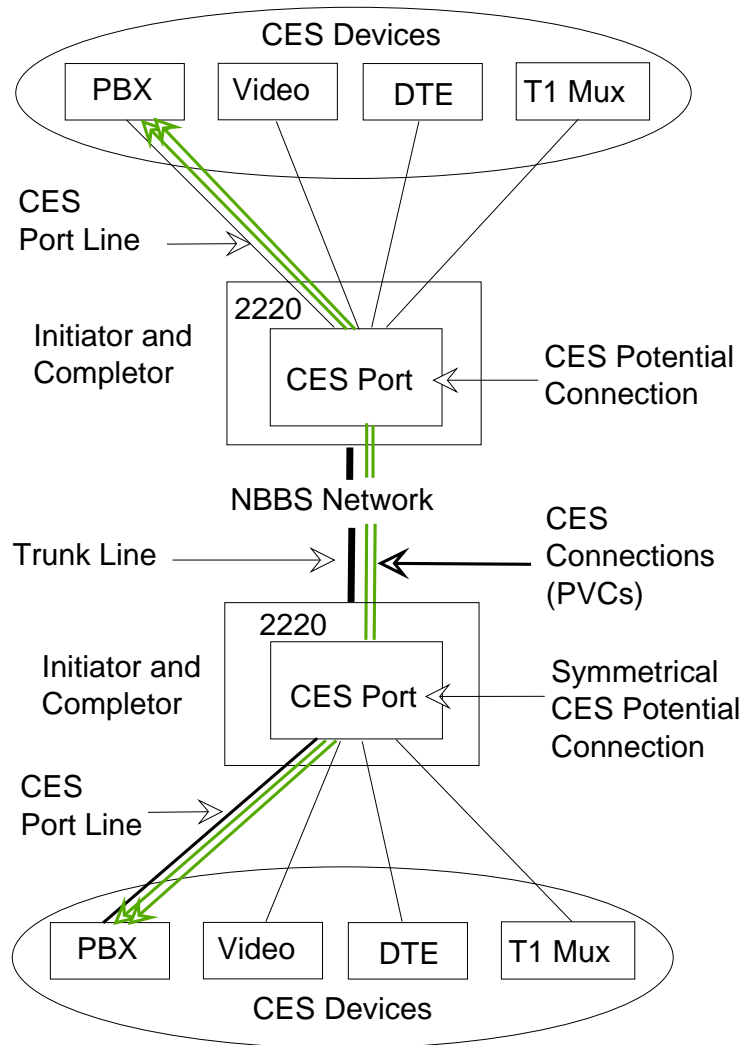


Figure 54. CES Protocol Support

The Nways Switch supports CES in real-time over permanent virtual circuits (PVCs). The circuits are established and maintained permanently between two CES devices.

### CES Logical Ports

CES logical ports (layer 2 of the OSI reference model) are called *CES ports*. They are generated by the Nways Switch Control Program to provide CES access services to physical CES port lines. A CES port sets up and maintains predefined CES connections.

### CES Connections

In a 2220 network, *CES potential connections*) are predefined between two CES devices attached to the network. CES connections are point-to-point and bidirectional. They operate in real-time over permanent virtual circuits (PVCs). In CES, only one connection is supported per logical port.

## Symmetrical CES Voice Connections

CES voice connections can be activated from either end. This is the case when the connection is defined as *dynamic*. An event occurring on the line connecting a PBX to the Nways Switch is detected and activates the connection. When the event can occur on either side, two connections must be defined accordingly.

Such connections must be configured symmetrically on the two Nways Switches at both ends, and further updates must also be performed at both ends to ensure the consistency of the configuration.

## Configuring CES Ports

The windows and dialogs used to configure the CES ports are the same as for configuring FR ports (see “FR Port: Windows and Dialogs” on page 103).

Before creating CES connections, you create CES ports on both Nways Switches at the end-points of the connection. On one end, the port serves as *connection initiator*. On the other end, the port serves as *connection completer*. A connection is always activated from the initiator logical port.

In a 2220 network, you configure one CES port for each CES physical link. Using the 64 kbps time slots, you can create channels on port lines that work in time division multiplexing (E1, T1, or J1). You can create a channel for each time slot or group of time slots, and you configure one CES port on each channel.

The following physical interfaces support multiple CES ports:

- E1 line with LIC types 515, 516, 545, 546, and 567
- T1 and J1 with LIC types 514 and 544.

CES port parameters are the same as HDLC port parameters (see “HDLC Port Parameters” on page 120).

### Examples of CES Ports

Nways Switch: N1  
Port name: N1PORT  
Resource definitions: Type PNP, identifier NETN1PORT  
Location: Rack A, slot 2, LCB Base 1, position 4  
Time slot allocation: None  
Channel number: None  
Connection initiator: Yes  
Connection completer: Yes  
Administrative state: Unlocked  
Maximum available bandwidth: 56 kbps (default)

Nways Switch: N2  
Port name: N2PORT  
Resource definitions: Type PNP, identifier NETN2PORT  
Location: Rack A, slot 7, LCB None, position 2  
Connection initiator: Yes  
Connection completer: Yes  
Time slot allocation: None  
Channel number: None  
Administrative state: Unlocked  
Maximum available bandwidth: 128 kbps

Nways Switch: N3  
Port name: N3PORT  
Resource definitions: Type PNP, identifier NETN3PORT  
Location: Rack A, slot 7, LCB None, position 1

Connection initiator: Yes  
Connection completer: Yes  
Time slot allocation: None  
Channel number: None  
Administrative state: Unlocked  
Maximum available bandwidth: 56 kbps (default)

## Configuring CES Connections

This section describes the CES connection configuration. The windows and dialogs used to configure CES connections are the same as for HDLC (see “HDLC Connections: Windows and Dialogs” on page 121).

### CES Potential Connection Parameters

You configure one permanent CES potential connection for each CES port configured as connection initiator. It is possible to define several non-permanent connections on the same CES port, but only one connection is active at a time. On port lines with channels, you configure one permanent connection per channel.

Following are the configuration parameters of a CES potential connection:

**Connection name**

Up to 32 characters

**Initiator Identification**

Initiator Nways Switch, port, and resource (displayed by NCT2)

**Completer Identifications**

Completer Nways Switch, port, and resource

**Quality of Service**

QoS assigned to the CES connection for both directions

**Traffic Type**

Data or voice

**Echo Cancellation**

Required (for voice traffic) when voice compression is used or with a VSA or VSE.

**Voice Treatment**

For voice traffic, use of echo canceller and voice server function (GSM or ADPCM compression, silence removal, and both)

**Connection Activation Mode**

Permanent or on reception of a start command from the network operator. For PBX CAS dynamic, select “On external event”.

**Administrative state**

Status of the connection when the Control Program is loaded (unlocked or locked)

**Accounting**

Connection accountable (if required) and bandwidth sensitivity over which accounting information is recorded.

For details of CES configuration options and QoSs, refer to *2220 Nways BroadBand Switch CES Interface Specifications*, GA33-0376. Also see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of CES Connections

Nways Switch: N1  
Port name: NETPORT20  
Initiator side: Nways Switch N1, port name N1PORT,  
resource type PNP, identifier NETPORT20  
Completer side: Nways Switch N2, port name N2PORT1,  
resource type PNP, identifier NETN2PORT  
Quality of Service: Forward QOSFRHDL, return QOSFRHDL  
Connection activation: No  
On external event: No  
Administrative state: Unlocked  
Accounting: No  
Bandwidth sensitivity: 50 % (default)

Nways Switch: N2  
Port name: NETN2PORT  
Initiator side: Nways Switch N2, port name N2PORT,  
resource type PNP, identifier NETN2PORT  
Completer side: Nways Switch N1, port name N1PORT,  
resource type PNP, identifier NETPORT20  
Quality of Service: Forward QOSFRHDL, return QOSFRHDL  
Connection activity: No  
On external event: No  
Administrative state: Unlocked  
Accounting: No  
Bandwidth sensitivity: 50 % (default)

Nways Switch: N3  
Port name: NETN3PORT  
Initiator side: Nways Switch N3, port name N3PORT,  
resource type PNP, identifier NETN3PORT  
Completer side: Nways Switch N2, port name N2PORT,  
resource type PNP, identifier NETN2PORT  
Quality of Service: Forward QOSFRHDL, return QOSFRHDL  
Connection activity: No  
On external event: No  
Administrative state: Unlocked  
Accounting: No  
Bandwidth sensitivity: 50 % (default)

---

## Qualities of Service

NCT2 and Nways 2220 Switch Manager provide predefined QoSs which you can assign to FR, HDLC, or CES connections in relation with the types of traffic described as follows:

### **Circuit Emulation Class 1 (CE1)**

CE1 is a logical queue in each transit Nways Switch. It is used for real-time applications requiring very low delay and very low jitter, such as constant bit rate voice. CE1 provides the lowest delay and jitter.

### **Circuit Emulation Class 2 (CE2) or Real-Time Class 2 (RT2)**

CE2 (or RT2) is a logical queue which is used for real-time applications that can support slightly more delay and jitter than CE1. CE2 provides better bandwidth optimization than CE1 but increases the end-to-end delay.

### **Non-Real Time (NRT)**

NRT is a logical queue which is used for applications requiring guaranteed bandwidth but not sensitive to delay or jitter.

### **Non-Reserved (NR)**

NR is a logical queue which is used for applications that do not require delay and bandwidth guarantees, only best effort delivery. NR is also used for internal 2220 network control flows.

You select a predefined QoS by clicking in a list. The following table summarizes the traffic types per protocol.

Traffic Type	Frame Relay	HDLC	CES
Circuit emulation class 1 (CE1)	No	No	Yes (voice)
Circuit emulation class 2 (CE2) or real-time class 2 (RT2)	Yes	Yes	Yes (voice and data)
Non-real-time	Yes	Yes	No
Non-reserved	Yes	Yes	No

For details of QoS options, see the NCT2 online help or refer to:

- *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.*



---

## Chapter 9. Configuring ISDN Resources

This chapter explains how to configure integrated services data network (ISDN) resources using NCT2. Similar configuration functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

- “ISDN Protocol and Q Signaling Support”

- “Configuring Bearer Service Profiles” on page 131

- “Configuring Numbering Plan Tables” on page 133

- “Configuring ISDN Network Interfaces for Voice/Data/Video Switching” on page 136

- “Configuring ISDN Network Interfaces for Frame Relay Remote Access” on page 138

- “Configuring ISDN Network Interfaces for Trunk Backup/Overflow” on page 140.

---

### ISDN Protocol and Q Signaling Support

The following figure shows how ISDN terminal equipment is connected through an 2220 network.

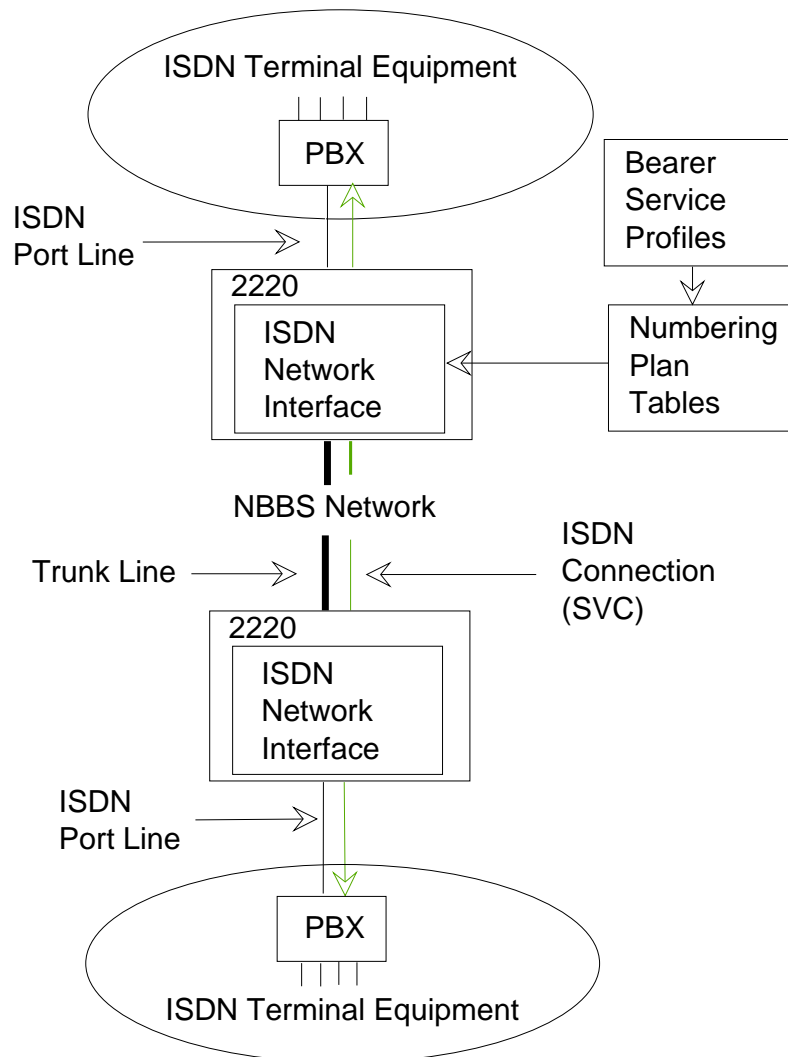


Figure 55. ISDN Protocol Support

**Legend:**

- PBX** Private branch exchange
- SVC** Switched virtual circuit

The Nways Switch supports ISDN and Q signaling (QSIG) as follows:

- Connected ISDN equipment comply with the Euro-ISDN standard in Europe and INS-Net standard in Japan. The Nways Switch can act as a DCE or a DTE. It can be used to build private network and to access public IDN networks.
- Private branch exchanges (PBXs) using Q signaling are connected through E1 or T1 port lines.
- Connections are switched virtual circuits (SVCs).
- Supplementary ISDN services such as direct dialing-in (DDI) or subaddressing are provided.

For details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447.

## Bearer Service Profile

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

The Nways Switch selects one BSP dynamically according to the destination number and transports the ISDN traffic as PTM packets over the 2220 network.

## Numbering Plan Table

A *numbering plan table* (NPT) is 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.

Call configuration is made simple through the following facilities:

- Local declaration of ISDN numbers
- Wildcards to speed-up declarations
- Open and closed private numbering plans.

## ISDN Network Interface

An *ISDN network interface* is 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 links between calling ISDN terminal equipment and called terminal equipment attached through other Nways Switches.

---

## Configuring Bearer Service Profiles

ISDN resources must be configured in the following order:

1. ISDN bearer service profiles
2. ISDN numbering plan tables
3. ISDN network interfaces.

## BSPs: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ISDN bearer service profiles.

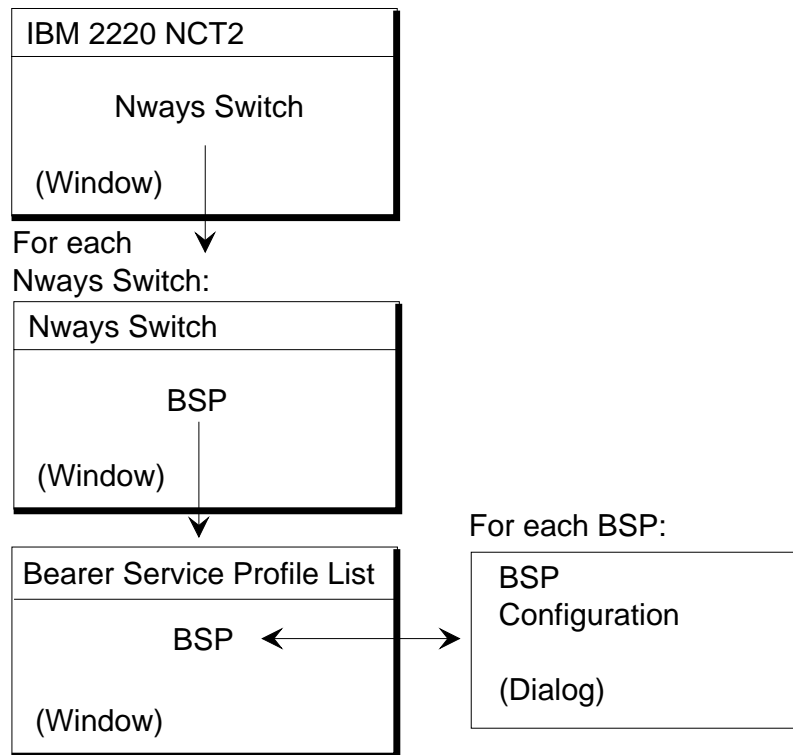


Figure 56. ISDN Bearer Service Profiles: Windows and Dialogs

Open a Bearer Service Profile List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on BSP. The Bearer Service Profile List opens.

From the Bearer Service Profile List, create a BSP by clicking on **Bearer Service Profile List** in the menu bar, then on **Create Bearer Service Profile**. The BSP Configuration dialog opens.

## BSP Parameters

You can create several BSPs per Nways Switch. One BSP corresponds to a type of ISDN traffic. Following are the BSP parameters:

### **BSP Name**

Up to 32 characters

### **Data Bearer Service**

For data traffic, select Clear Channel or HDLC/IR (HDLC with idle removal)

### **QoS Name, HDLC/IR Data**

Quality of service for HDLC/IR data traffic

### **QoS Name, Clear Channel Data**

Quality of service for Clear Channel data traffic

**Voice Treatment**

Voice server function selected from a list: GSM or ADPCM voice compression with or without silence removal

**Echo Cancellation**

Required if echo cancellation is provided by a VSA or VSE and if voice compression is used.

**Negotiable Services**

If set to yes, the connection is established even if the voice server function are not available.

For option details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications, GA33-0447*. Also see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of BSPs

```
Nways Switch: N1
BSP name: N1BSP1
Data parameters:
  Data bearer service: Clear channel
  HDLC/IR: QOSFRHDL
  Clear channel: QOSCESDATA
Voice parameters:
  Voice treatment: No compression
  Echo cancellation: Required
  Negotiable services: Yes
  Compressed voice: QOSCESVOICE2
  Uncompressed voice: QOSCESVOICE1NDPS

Nways Switch: N2
BSP name: N2BSP1
Data parameters:
  Data bearer service: Clear channel
  HDLC/IR: QOSFRHDL
  Clear channel: QOSCESDATA
Voice parameters:
  Voice treatment: No compression
  Echo cancellation: Required
  Negotiable services: Yes
  Compressed voice: QOSCESVOICE2
  Uncompressed voice: QOSCESVOICE1NDPS

Nways Switch: N3
BSP name: N3BSP1
Data parameters:
  Data bearer service: Clear channel
  HDLC/IR: QOSFRHDL
  Clear channel: QOSCESDATA
Voice parameters:
  Voice treatment: No compression
  Echo cancellation: Required
  Negotiable services: Yes
  Compressed voice: QOSCESVOICE2
  Uncompressed voice: QOSCESVOICE1NDPS
```

---

## Configuring Numbering Plan Tables

ISDN resources must be configured in the following order:

1. ISDN bearer service profiles
2. ISDN numbering plan tables
3. ISDN network interfaces.

## NPTs: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ISDN numbering plan tables.

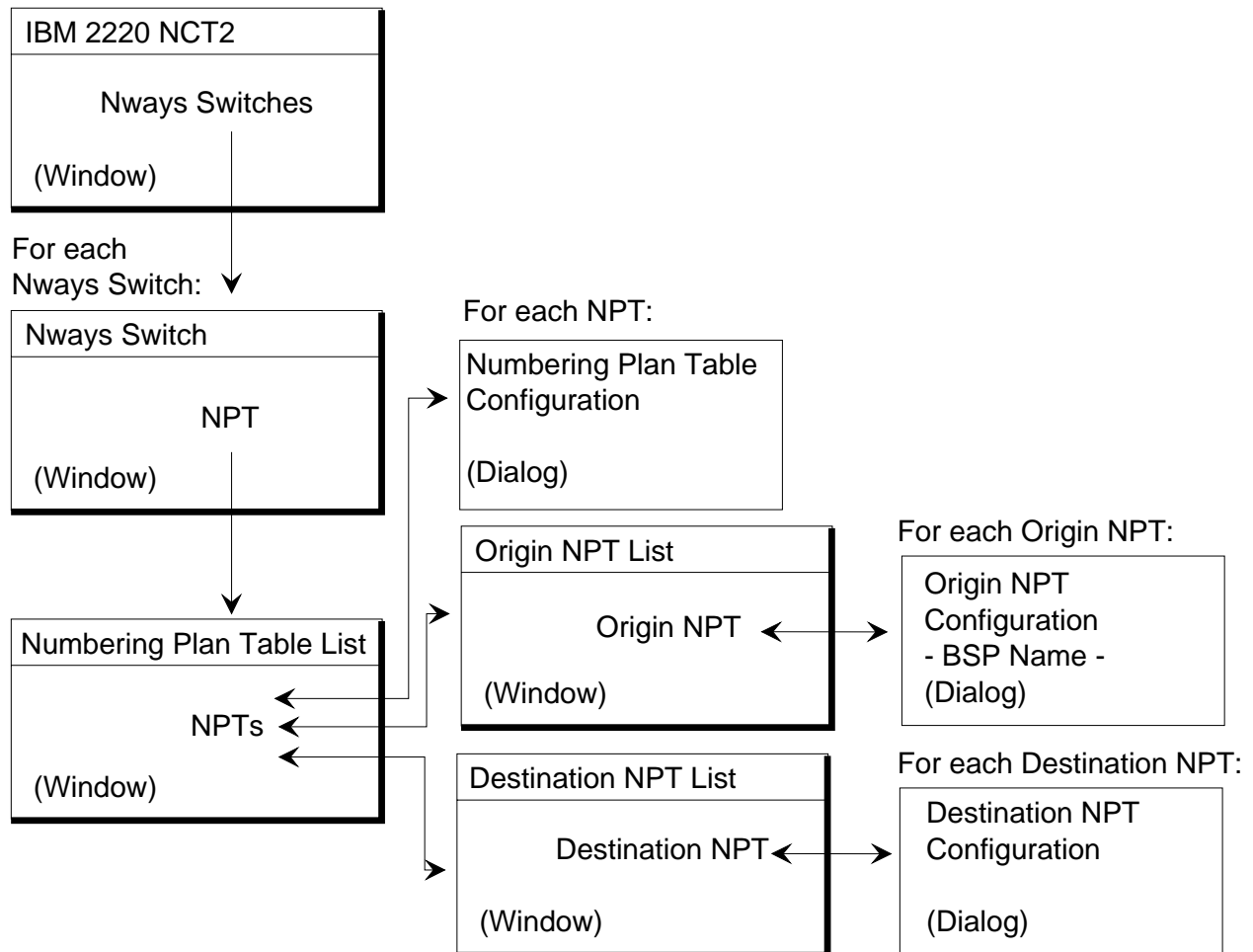


Figure 57. ISDN Numbering Plan Tables: Windows and Dialogs

Open a Numbering Plan Table List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on NPT. The Numbering Plan Table List opens.

From the Numbering Plan Table List:

- Create an NPT by clicking on **Numbering Plan Table List** in the menu bar, then on **Create NPT Entry**. The NPT Configuration dialog opens.
- Display the Origin NPT List by clicking with the right mouse button on an NPT, then on **ONPT Entries** in the displayed menu.

- Display the Destination NPT List by clicking with the right mouse button on an NPT, then on **DNPT Entries** in the displayed menu.

From the Origin NPT List, create an Origin NPT by clicking on **Origin NPT List** in the menu bar, then on **Create ONPT Entry**. The Origin NPT Configuration dialog opens.

From the Destination NPT List, create a Destination NPT by clicking on **Destination NPT List** in the menu bar, then on **Create DNPT Entry**. The Destination NPT Configuration dialog opens.

## NPT Configuration

For each Nways Switch, ISDN numbering plan tables (NPTs) must be configured after ISDN bearer service profiles. An NPT has a unique parameter: its **name**, which can have up to 32 characters. To each numbering plan table you can associate multiple origin and destination NPTs.

## ONPT Parameters

Following are the origin NPT parameters:

### **BSP Name**

Name of the BSP associated with the ONPT (selected from a list)

### **Called Number Prefix**

Up to 10 digits

### **Called Number, Numbering Plan Identifier**

E.164, private numbering plan (PNP), unknown, or any

### **Called Number, Type of number**

International, national, local, unknown, or any

### **Called Number, Number of Digits to Accumulate**

Value in the range 0 to 20

### **Number Alteration Rules**

Number of digits to strip-off (0 to 20), additional prefix (up to 10 digits), numbering plan identifier (E.164, PNP, or unchanged), and type of number (international, national, local, unknown, or unchanged)

For parameter details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447. Also see the NCT2 or Nways 2220 Switch Manager online help.

## DNPT Parameters

Destination numbering plan table:

- Called number: prefix, numbering plan identifier, and type of number (displayed by NCT2)
- Number alteration rules: number of digits to strip-off, additional prefix, numbering plan identifier, and type of number

Following are the destination NPT parameters:

### **Called Number Prefix**

Up to 10 digits

**Called Number, Numbering Plan Identifier**

E.164, private numbering plan (PNP), unknown, or any

**Called Number, Type of number**

International, national, local, unknown, or any

**Called Number, Number of Digits to Accumulate**

Value in the range 0 to 20

**Number Alteration Rules**

Number of digits to strip-off (0 to 20), additional prefix (up to 10 digits), numbering plan identifier (E.164, PNP, or unchanged), and type of number (international, national, local, unknown, or unchanged)

For parameter details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447. Also see the NCT2 or Nways 2220 Switch Manager online help.

---

## Configuring ISDN Network Interfaces for Voice/Data/Video Switching

This section describes the ISDN network interface for voice/data/video switching configuration.

### ISDN Network Interfaces for Voice/Data/Video Switching: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ISDN network interfaces for voice/data/video switching.



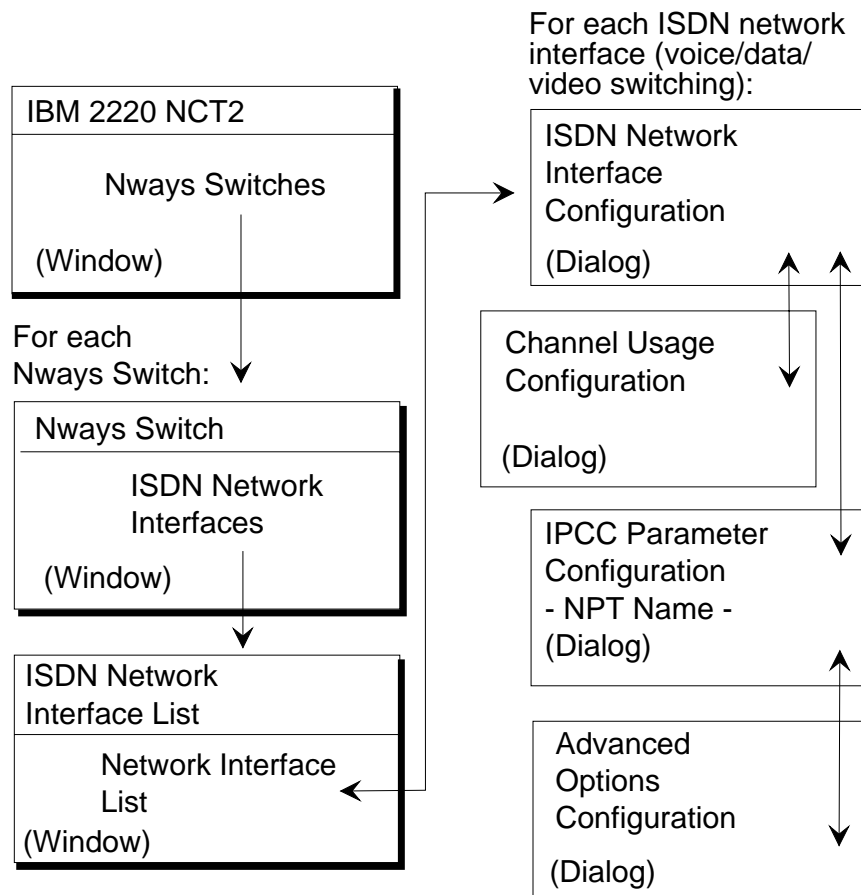


Figure 58. ISDN Network Interfaces (Voice/Data/Video Switching): Windows and Dialogs

Open an ISDN Network Interface List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on ISDN Network Interfaces. The ISDN Network Interface List opens.

From the ISDN Network Interface List, create a network interface by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface** and then choose **Voice/Data/Video Switching**.

The corresponding ISDN Network Configuration dialog opens.

From the Network Interface Configuration dialog:

- Open the Channel Usage Configuration dialog by clicking on **Channel Usage**.
- Open the IPCC Parameter Configuration dialog by clicking on **More Parameters**.

From the IPCC Parameter Configuration dialog, open the Advanced Options configuration dialog by clicking on **Advanced Options**.

## ISDN Network Interface for Voice/Data/Video/Switching Parameters

You configure one ISDN network interface per physical ISDN or QSIG port line. Following are the network interface parameters:

**Network Interface Name**

Up to 32 characters

**Line Attachment Location**

Rack, slot, and position of the ISDN port line

**Channel Usage**

Push button that opens the Channel Usage Configuration dialog.

**Protocol**

Euro-ISDN, QSIG, or Japan ISDN (displayed by NCT2)

**Access to**

For an end-user equipment: public or private subscriber. For a network: public network or private network.

**Layer 2 Protocol Role**

Network or user

**Layer 3 Protocol Role**

Network side or user side

**Administrative State**

Status of the network interface after the Nways Switch Control Program has been loaded (Unlocked or Locked)

**Line Automatic Restart**

Selected to restart the call when the line attachment is activated

For parameter details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447. Also see the NCT2 or Nways 2220 Switch Manager online help.

If required, click on **Channel Usage** to display a channel usage table. It is used to select a usage for each channel: incoming, outgoing, bidirectional (default choice), and not available. Channel 0 is reserved for synchronization. Channel 16 is reserved for signaling.

---

## Configuring ISDN Network Interfaces for Frame Relay Remote Access

ISDN network interfaces for frame-relay remote access can be configured when limited traffic is required for a few hours per day.

### ISDN Network Interfaces (Frame Relay Remote Access): Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ISDN network interfaces for voice/data/video switching.

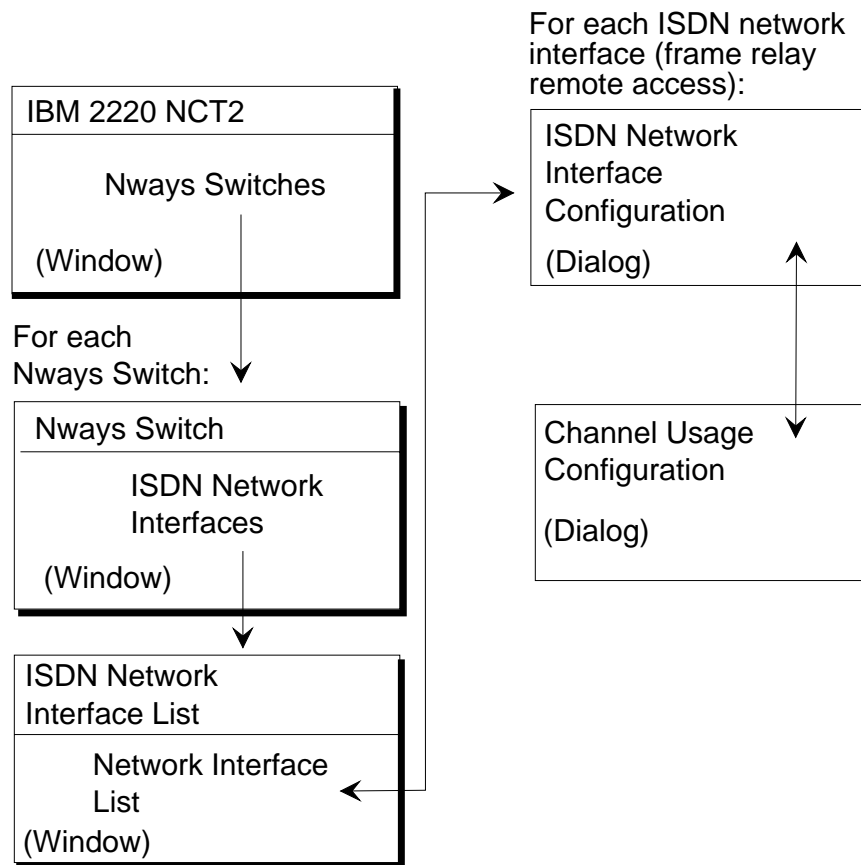


Figure 59. ISDN Network Interfaces (Voice/Data/Video Switching): Windows and Dialogs

Open an ISDN Network Interface List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on ISDN Network Interfaces. The ISDN Network Interface List opens.

From the ISDN Network Interface List, create a network interface by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface** and then choose **Frame Relay Remote Access**.

The corresponding ISDN Network Configuration dialog opens.

Open the Channel Usage Configuration dialog by clicking on **Channel Usage**.

## ISDN Network Interface for Frame Relay Remote Access Parameters

You configure one ISDN network interface per physical ISDN or QSIG port line. Following are the network interface parameters:

### Network Interface Name

Up to 32 characters

**Line Attachment Location**

Rack, slot, and position of the ISDN port line

**Channel Usage**

Push button that opens the Channel Usage Configuration dialog.

**Protocol**

Euro-ISDN or Japan ISDN

**Layer 2 Protocol Role**

Network or user

**Layer 3 Protocol Role**

Network side or user side

**Port Group Name**

The name of the port group that will use this remote access.

**Line Number**

The line ISDN number called and used by the DTE.

**Inactivity Timer**

The inactivity timer value

**Access Control**

Whether access control is enabled or disabled

**Administrative State**

Status of the network interface after the Nways Switch Control Program has been loaded (Unlocked or Locked)

**Line Automatic Restart**

Selected to restart the call when the line attachment is activated

For parameter details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447. Also see the NCT2 or Nways 2220 Switch Manager online help.

If required, click on **Channel Usage** to display a channel usage table. It is used to select a usage for each channel: incoming, outgoing, birectional (default choice), and not available. Channel 0 is reserved for synchronization. Channel 16 is reserved for signaling.

---

## Configuring ISDN Network Interfaces for Trunk Backup/Overflow

**Note:** A low speed adapter type 3 (LIC563 E1 ISDN Trunk Backup) must be used for trunk backup. See "Chapter 6. Configuring Physical Resources" on page 59 for information on configuring line adapters.

ISDN network interfaces can be configured and used when an overflow condition is detected

on a leased line.

## Network Interfaces for Trunk Backup/Overflow: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the ISDN network interfaces for trunks.

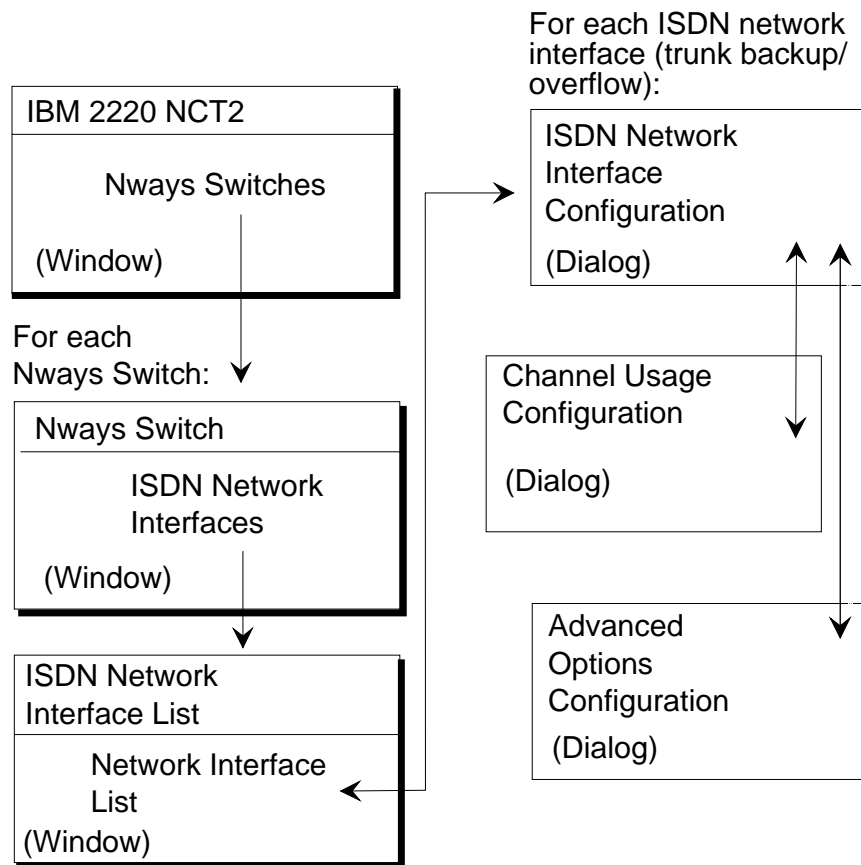


Figure 60. ISDN Network Interfaces for Trunk Backup/Overflow: Windows and Dialogs

Open an ISDN Network Interface List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on ISDN Network Interfaces. The ISDN Network Interface List opens.

From the ISDN Network Interface List, create a network interface by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface** and then choose **Trunk Backup/Overflow**,

The corresponding ISDN Network Configuration dialog opens.

From the Network Interface Configuration dialog:

Open the Channel Usage Configuration dialog by clicking on **Channel Usage**.

Open the Advanced Options dialog by clicking on **Advanced Options**.

## ISDN Network Interface for Trunk Backup/Overflow Parameters

You configure one ISDN network interface per physical ISDN or QSIG port line. Following are the network interface parameters:

**Network Interface Name**

Up to 32 characters

**Line Attachment Location**

Rack, slot, and position of the ISDN port line

**Channel Usage**

Push button that opens the Channel Usage Configuration dialog.

**Protocol**

Euro-ISDN

**Layer 2 Protocol Role**

Network or user (displayed only)

**Layer 3 Protocol Role**

Network side or user side (displayed only)

**Local Call Number**

Local ISDN call number

**Maximum Number of Calls**

Maximum number of calls that can be made

**Administrative State**

Status of the network interface after the Nways Switch Control Program has been loaded (Unlocked or Locked)

**Line Automatic Restart**

Selected to restart the call when the line attachment is activated

For parameter details, see the *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447. Also see the NCT2 or Nways 2220 Switch Manager online help.

If required, click on **Channel Usage** to display a channel usage table. It is used to select a usage for each channel: incoming, outgoing, bidirectional (default choice), and not available. Channel 0 is reserved for synchronization. Channel 16 is reserved for signaling.

If required, click on **Advanced Options** to display the Advanced Options dialog where you can specify the interval and timeout values for link liveness and the retry interval and timeout values for initialization applying to the trunks established over this interface.

## Configuring a Trunk Call Control List

This section describes the Trunk Call Control List configuration. A call control list is required so that the incoming and outgoing trunks can communicate.

Open the Call Control List Configuration dialog as follows:

1. Open the ISDN Network Interface List as described in "Network Interfaces for Trunk Backup/Overflow: Windows and Dialogs" on page 140
2. Select the trunk backup/overflow network interface

3. Click mouse button 2 on the network interface, and choose **Call Control List**.

The Call Control Configuration dialog opens where you can specify the Nways Switch and add the ISDN calling numbers of the trunk interface authorized to call.





---

## Chapter 10. Configuring X.25 Resources

This chapter explains how to configure X.25 resources. Similar configuration functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

- “X.25 Protocol Support”

- “Configuring X.25 Network Interfaces” on page 147

- “Configuring X.25 Subscribers” on page 150

- “Configuring X.25 Hunt Groups” on page 152.

---

### X.25 Protocol Support

The following figure shows how X.25 subscribers are connected through an 2220 network.

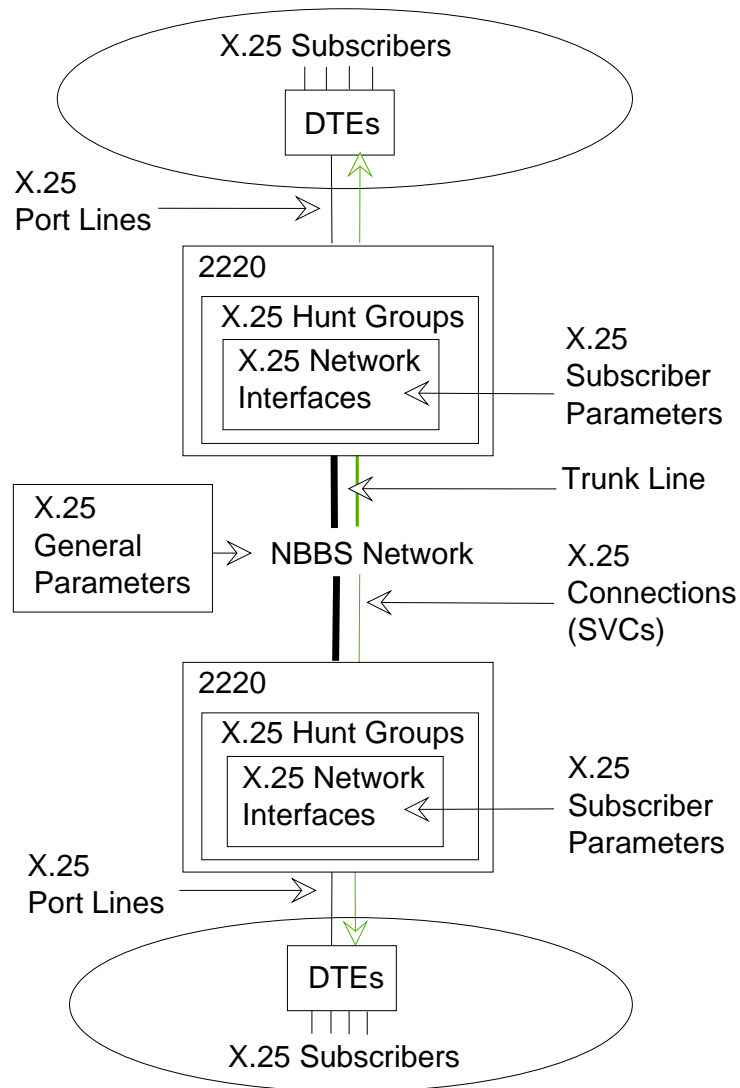


Figure 61. X.25 Protocol Support

**Legend:**

**DTE** Data terminal equipment

**SVC** Switched virtual circuit

The Nways Switch supports the X.25 protocol as follows:

- Private network service is provided as data circuit-terminating equipment (DCE)
- X.25 DTEs are connected through non-switched (port) lines at speeds of 2400 bps to 2048 kbps
- X.25 connections are set over the network in switched virtual circuit (SVC) mode
- Modulo 8 is supported.

## X.25 Network Interface

X.25 logical ports (layer 2 of the OSI reference model) are called *X.25 network interfaces*. They are generated by the Nways Switch Control Program to provide access services to physical port lines. 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 Subscriber

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

## X.25 Hunt Group

An *X.25 hunt group* includes several X.25 network interfaces associated with a 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 General Parameters

X.25 general parameters are configured at network level and apply to all the X.25 resources. For a list of general parameters, see “X.25 General Parameters” on page 46 .

---

## Configuring X.25 Network Interfaces

This section describes the X.25 network interface configuration and is organized as follows:

“X.25 Network Interfaces: Windows and Dialogs”

“X.25 Network Interface Parameters” on page 149

“Examples of X.25 Network Interface Configurations” on page 149.

## X.25 Network Interfaces: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the X.25 network interfaces.

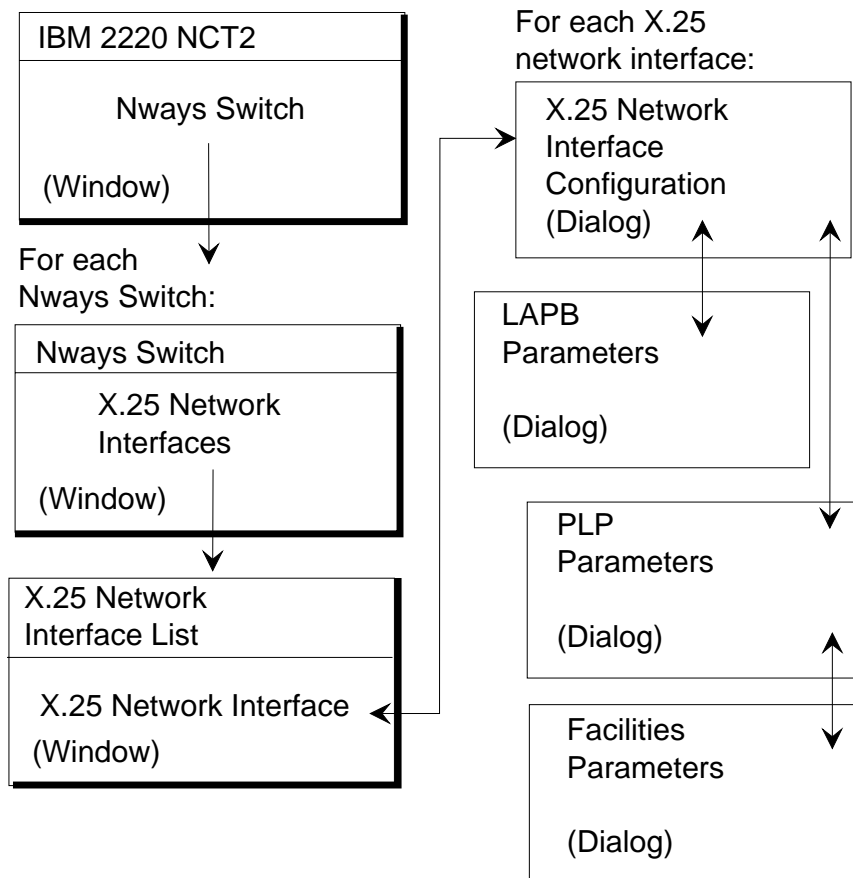


Figure 62. X.25 Network Interfaces: Windows and Dialogs

Open an X.25 Network Interface List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on X.25 Network Interfaces. The X.25 Network Interfaces List opens.

From the X.25 Network Interface List, create an X.25 network interface by clicking on **Network Interface List** in the menu bar, then on **Create Network Interface**. The Network Interface Configuration dialog opens.

From the X.25 Network Interface Configuration dialog:

- Open the LAP-B Parameters dialog by clicking on **LAP-B Parameters**
- Open the PLP Parameters dialog by clicking on **PLP Parameters**

From the PLP Parameters dialog, open the Facilities Parameters dialog by clicking on **Facilities**.

## X.25 Network Interface Parameters

You configure one X.25 network interface per physical X.25 port line. On one end, the network interface serves as *connection initiator*. On the other end, the network interface serves as *connection completor*. A connection is always activated from the initiator network interface.

Following are the network interface parameters:

### Network Interface Name

Up to 32 characters

### Line Attachment Location

Rack, slot, line connection box (if any), and position

### Default Called Address

Address that is used when there is no called address in the incoming call.  
Up to 15 digits.

### Default Calling Address

Address that is used as calling address if the call does not contain a calling address

Packet layer protocol: **PLP parameters:**

- X.25 Recommendation: ITU-T version number
- Default packet size
- Default window size
- Default transit delay
- Default throughput class assignment
- Incoming channel numbers
- Two-way channel numbers
- Outgoing channel numbers
- Selection of X.25 facilities such as transit delay indication, fast select accept, or incoming call barred.

Link access procedure for B-channel: **LAPB parameters:**

- Retransmission period (T1)
- Frame window size (K)
- Maximum transmission attempts (N2)
- Link alarm selection.

For parameter details, see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of X.25 Network Interface Configurations

```
Nways Switch: N1
X.25 network interface names:
  N1X25I01
  N1X25I02
  N1X25I03
  N1X25I04
Locations:
  Rack A, slot 7, LCB: none
  Positions: 1 to 4
```

Nways Switch: N2  
X.25 network interface names:  
N2X25I01  
N2X25I02  
N2X25I03  
N2X25I04  
Locations:  
Rack A, slot 7, LCB: none  
Positions: 1 to 4  
Nways Switch: N3  
X.25 network interface names:  
N3X25I01  
N3X25I02  
N3X25I03  
N3X25I04  
Locations:  
Rack A, slot 7, LCB: none  
Positions: 1 to 4

---

## Configuring X.25 Subscribers

This section describes the X.25 subscriber configuration and organized as follows:

“X.25 Subscribers: Windows and Dialogs”

“X.25 Subscriber Parameters” on page 151

“Examples of X.25 Subscriber Configurations” on page 152.

### X.25 Subscribers: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the X.25 subscribers.

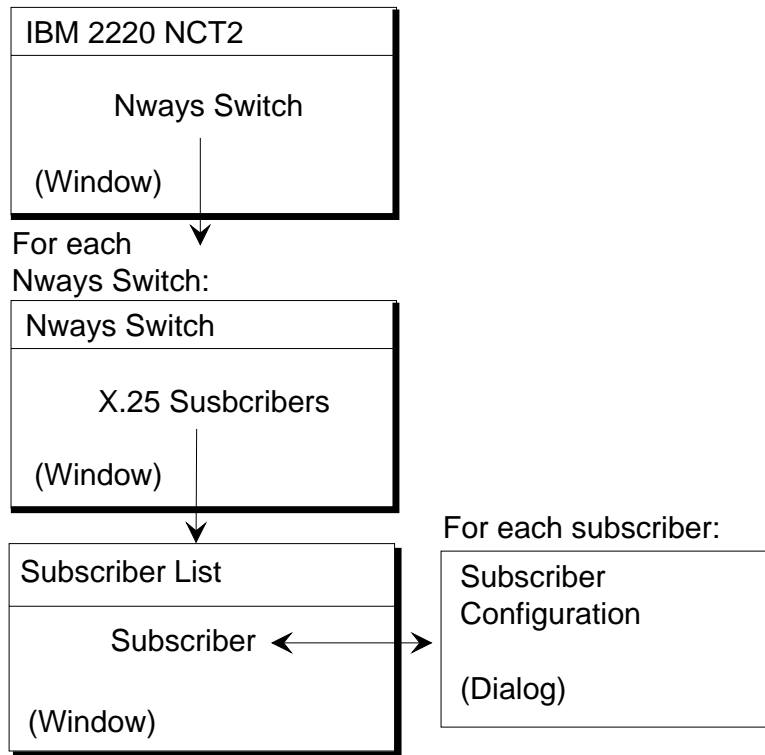


Figure 63. X.25 Subscribers: Windows and Dialogs

Open an X.25 Subscriber List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on X.25 Subscribers. The Subscriber List opens.

From the Subscriber List, create an X.25 Subscriber by clicking on **Subscriber List** in the menu bar, then on **Create subscriber**. The Subscriber Configuration dialog opens.

## X.25 Subscriber Parameters

Following are the X.25 subscriber parameters:

### Subscriber Name

Up to 32 characters

### Subscriber Address

Up to 15 digits entered in X.121 format

### Network Interface Name

Name of the X.25 network interface that attaches the subscriber to the Nways Switch (selected from a list)

### Comment

Up to 132 characters

For parameters details, see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of X.25 Subscriber Configurations

```
Nways Switch: N1
X.25 network interface name: N1X25I01
Subscribers: N1SUB1X, address (X.121) 1114000
              N1SUB2X, address (X.121) 1115000
              N1SUB3X, address (X.121) 1116000
              N1SUB4X, address (X.121) 1117000
```

```
Nways Switch: N2
X.25 network interface name: N2X25I01
Subscribers: N2SUB1X, address (X.121) 2224000
              N2SUB2X, address (X.121) 2225000
              N2SUB3X, address (X.121) 2226000
              N2SUB4X, address (X.121) 2227000
```

```
Nways Switch: N3
X.25 network interface name: N3X25I01
Subscribers: N3SUB1X, address (X.121) 3334000
              N3SUB2X, address (X.121) 3335000
              N3SUB3X, address (X.121) 3336000
              N3SUB4X, address (X.121) 3337000
```

---

## Configuring X.25 Hunt Groups

This section describes the X.25 hunt group configuration and is organized as follows:

“X.25 Hunt Groups: Windows and Dialogs”

“X.25 Hunt Group Parameters” on page 153

“Examples of X.25 Hunt Group Configurations” on page 154.

### X.25 Hunt Groups: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the X.25 hunt groups.



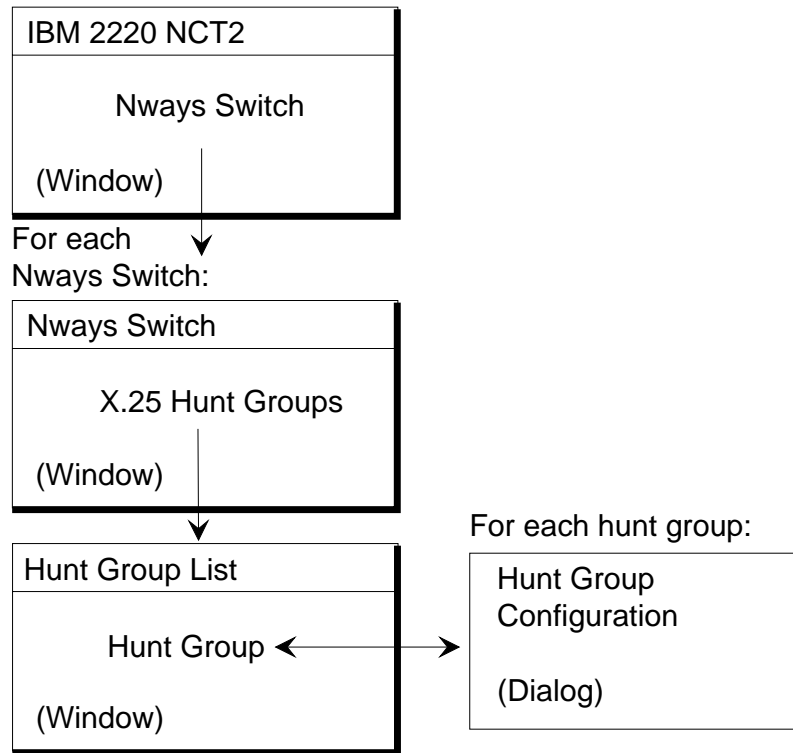


Figure 64. X.25 Hunt Groups: Windows and Dialogs

Open an X.25 Hunt Group List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on X.25 Hunt Groups. The Hunt Group List opens.

From the Hunt Group List, create an X.25 hunt group by clicking on **Hunt Group List** in the menu bar, then on **Create hunt group**. The Hunt Group Configuration dialog opens.

## X.25 Hunt Group Parameters

Following are the X.25 hunt group parameters:

### Hunt Group Name

Up to 32 characters

### Hunt Group Address

Up to 15 digits entered in X.121 format

### Network Interface Names

Names of the X.25 network interfaces that are part of the hunt group. Up to 32 interfaces can be selected from a list.

### Comment

Up to 132 characters

For parameters details, see the NCT2 or Nways 2220 Switch Manager online help.

## Examples of X.25 Hunt Group Configurations

Nways Switch: N1  
X.25 hunt group name: N1X25H1  
Address (X.121): 111111  
Network interfaces: N1X25I01  
                          N1X25I02  
                          N1X25I03  
                          N1X25I04

Nways Switch: N2  
X.25 hunt group name: N2X25H1  
Address (X.121): 222222  
Network interfaces: N2X25I01  
                          N2X25I02  
                          N2X25I03  
                          N2X25I04

Nways Switch: N3  
X.25 hunt group name: N3X25H1  
Address (X.121): 333333  
Network interfaces: N3X25I01  
                          N3X25I02  
                          N3X25I03  
                          N3X25I04

---

## Chapter 11. Configuring Trunks

This chapter explains how to configure logical trunks using NCT2. Similar functions are available in Nways 2220 Switch Manager. They are documented in the online *Nways 2220 Switch Manager User's Guide*.

The chapter includes the following sections:

“Logical Trunks”

“Configuring PTM Trunks” on page 157

“Configuring ATM Leased Trunks” on page 158

“Configuring ATM Bearer Service Trunks” on page 159

“Configuring ISDN Trunks” on page 160

---

### Logical Trunks

The following figure shows how Nways Switches are connected through physical and logical trunks.

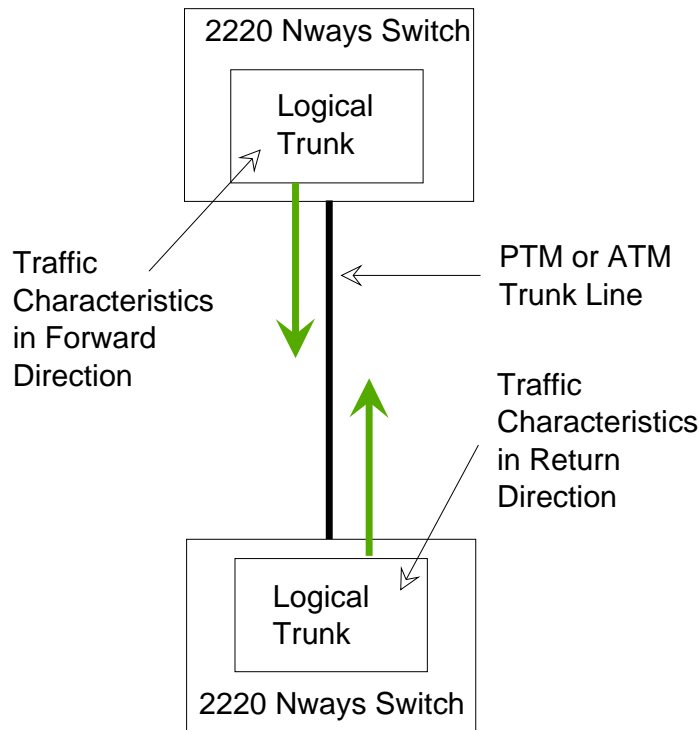


Figure 65. Logical Trunk

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

Logical trunks must be configured on the Nways Switches at both ends of a physical trunk. Each logical trunk configuration provides the traffic characteristics in one direction.

## PTM Trunks

The *packet transfer mode* (PTM) trunk lines have non-ATM interfaces and work in the native transfer mode of the NBBS architecture. PTM divides traffic into packets of variable length well adapted for the transport of voice or real-time applications requiring very short packets. PTM also allows transporting large packets, thus reducing the required bandwidth by saving the packet header overhead.

PTM trunks transport both variable length packets and ATM cells.

Examples of trunk lines supported in PTM are the following:

- V.24, V.35, V.36, and X.21
- E1 and fractional E1
- T1 and fractional T1
- E2, E3, and J2
- T3
- HSSI.

## ATM Trunks

The asynchronous transfer mode (ATM) trunk lines work in native ATM. Traffic is made of fixed-length (53 bytes) cells. ATM is asynchronous in that the cell delay is variable between nodes in the network. However, correct timing and sequence of cells are recovered at the end-point switches.

There is no fixed assignment of bandwidth and the sum of the input bandwidth can be greater than the line bandwidth. The ATM network (as well as the 2220 network) relies on statistical multiplexing of the inputs.

ATM trunks transport ATM cells and non-ATM traffic segmented into ATM cells. The non-ATM traffic can be in frame relay, HDLC, and CES protocols. It is supported in the ATM adaptation layer 5 (AAL5).

Examples of trunk lines supported in ATM are the following:

- DS-3, 45 Mbps
- E3, 34 Mbps
- SONET/SDH multi-mode fiber, 155 Mbps
- SONET/SDH single-mode fiber, 155 Mbps.

ATM trunks work in one of the following modes:

- *Point-to-point*: the trunks are leased line trunks with one virtual path per trunk. You configure one virtual path connection (VPC) per virtual path. VP0 is reserved. Up to 85% of the bandwidth is used by the traffic. If needed, less than 85% can be configured and the trunk becomes a *fractional trunk*.
- *Point-to-multipoint*: the trunks are ATM bearer service (BS) trunks with up to 32 virtual paths per trunk. You still configure one virtual path connection per virtual path. All the bandwidth (100%) can be used for the traffic.

---

## Configuring PTM Trunks

This section describes the PTM trunk configuration and is organized as follows:

“Trunks: Windows and Dialogs”

“Trunk Parameters” on page 158.

### Trunks: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure the PTM trunks.

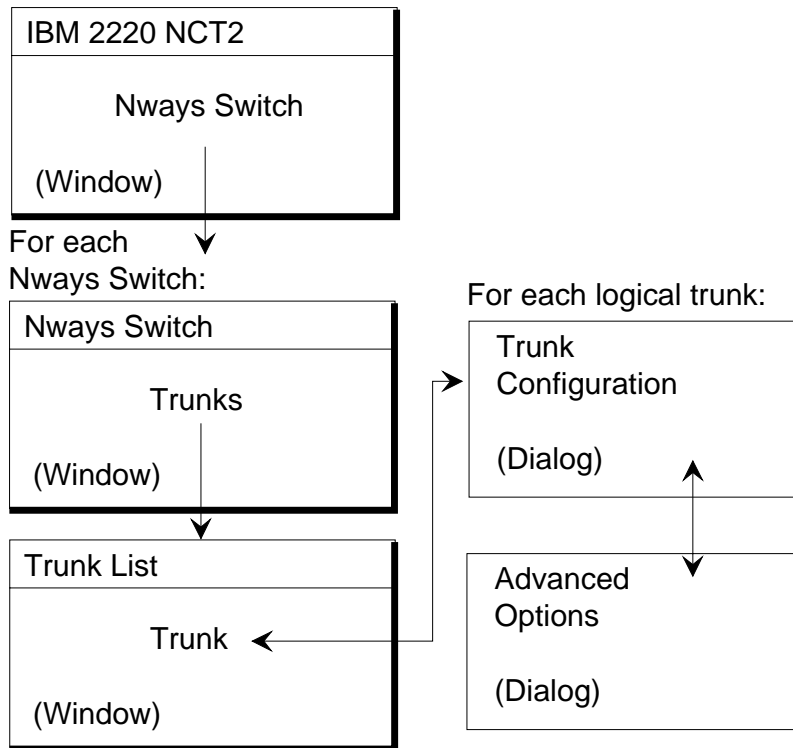


Figure 66. PTM Trunks: Windows and Dialogs

Open a Trunk List as follows:

1. From the NCT2 Main Window, double-click on an Nways Switch icon. The Nways Switch window opens (for an example, see “Example of Nways Switch Window” on page 60).
2. From the Nways Switch window, double-click on Trunks. The Trunk List window opens.

From the Trunk List, create a logical PTM trunk by clicking on **Trunks** in the menu bar, then on **Create Trunk**. The Trunk Configuration dialog opens.

## Trunk Parameters

For each Nways Switch, you configure a PTM trunk on each non-ATM physical trunk line. If you configured channels on the trunk line, create one PTM trunk per channel using the multi-logical trunk feature of the Nways Switch.

Following are the PTM trunk parameters:

**Logical Trunk Name**

Up to 32 characters

**Line Attachment Location**

Rack, slot, and position

**Remote Node Name**

Name of the remote Nways Switch (optional)

**Time Slot Allocation**

Channel allocation configured for the line attachment (displayed by NCT2). You create one PTM trunk per channel.

**Propagation Delay**

Average propagation delay over the physical line obtained from your telecommunication company

**Administrative State**

Administrative state after loading the Control Program, unlocked or locked.

For each PTM trunk, **advanced options** can be configured with the following parameters:

- Maximum bandwidth available: total amount of bandwidth that can be used on the trunk. By default, it is the line speed.
- Bandwidth reservable: defaulted to 85% for traffic and 15% for network control (displayed by NCT2)
- Smallest connection size: defaulted to 0.101 kbps
- CP spanning tree preferability: selected in the range 0-15 (0 means never used for CP spanning tree update)
- Traffic support, circuit emulation and real-time selection
- Link liveness interval: defaulted to 500 ms
- Link liveness timeout: defaulted to 1500 ms

For details of trunk parameters, see the NCT2 and Nways 2220 Switch Manager online help.

---

## Configuring ATM Leased Trunks

For each Nways Switch, you configure one logical trunk on each ATM physical trunk line. You cannot configure channels on ATM trunks.

You proceed as for PTM trunks as explained in “Trunks: Windows and Dialogs” on page 157 . The ATM leased trunk parameters include the same parameters as for PTM trunks plus an extra set which is as follows:

Usable virtual path identifier (VPI) range

Reserved virtual channel identifier (VCI) range

Negotiable VCI range

Usable VCI range.

For details of ATM parameters, see the *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378. Also see the NCT2 and 2220 Switch Manager online help.

You can configure a *fractional ATM trunk* by selecting a reservable bandwidth less than 85% in the ATM trunk advanced options. This is useful when you want to assign only a subset of the ATM bandwidth to the user of the trunk line.

---

## Configuring ATM Bearer Service Trunks

Before configuring ATM BS trunks, you must have configured the following resources:

- ATM physical resources: ATM adapter (always type 2), ATM LIC, and line attachments as explained in “Chapter 6. Configuring Physical Resources” on page 59 .
- ATM network interfaces for trunks accessed in bearer service as explained in “Configuring ATM Bearer Service Network Interfaces for Trunks” on page 93.
- ATM Bearer Service VPCs as explained in “Configuring ATM Bearer Service VPCs” on page 97.

### ATM Bearer Service Trunks: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure ATM Bearer Service (BS) trunk.

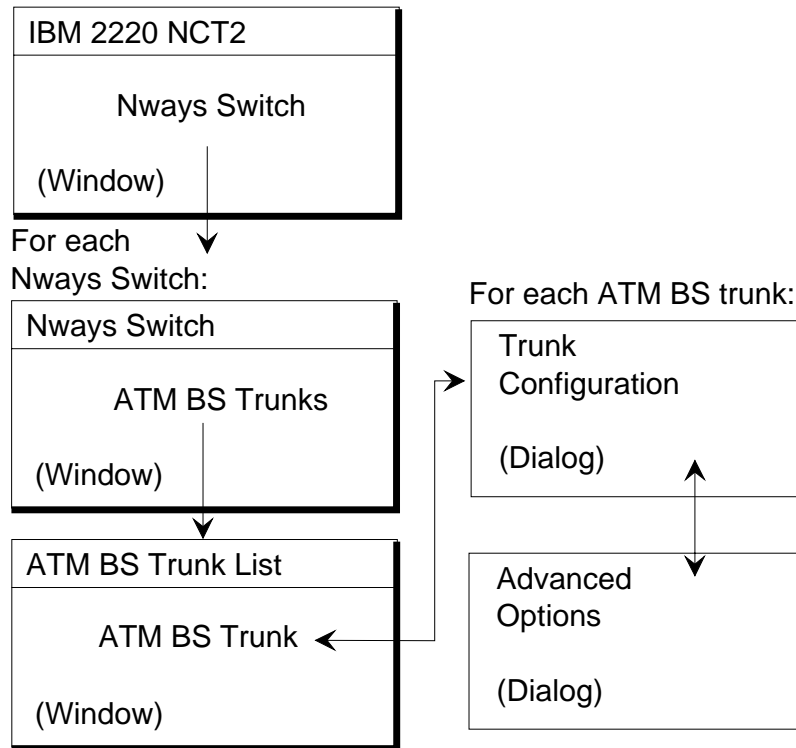


Figure 67. ATM Bearer Service Trunks: Windows and Dialogs

## ATM Bearer Service Trunk Parameters

Following are the ATM Bearer Service trunk parameters:

**Logical Trunk Name**

Up to 32 characters

**Network Interface (Bearer Service)**

Name of the network interface.

**VPC** VPC name.

**Remote Node Name**

Name of the remote Nways Switch (optional)

**Network Connection Support**

The type of network support (VPC or VCC).

**Propagation Delay**

Average propagation delay over the physical line obtained from your telecommunication company

**Administrative State**

Administrative state after loading the Control Program, unlocked or locked.

---

## Configuring ISDN Trunks

This section describes ISDN trunk configuration. An ISDN trunk can be used as a backup for another leased-line trunk to reduce costs, or as a temporary trunk when more bandwidth is required.



**Notes:**

1. ISDN trunks used for backup can be used only on a low speed adapter type 3 configured with a line interface coupler type LIC563, E1 line ISDN Trunk Backup). See “Chapter 6. Configuring Physical Resources” on page 59 for information on configuring line adapters.
2. An ISDN network interface for trunk backup/overflow must be created for the specified Nways Switch. See “Configuring ISDN Network Interfaces for Trunk Backup/Overflow” on page 140 for further information.
3. You must define a call control list. See “Configuring a Trunk Call Control List” on page 142 for further information.

## ISDN Trunks: Windows and Dialogs

The following figure shows the windows and dialogs that you use to configure ISDN trunks for backup.

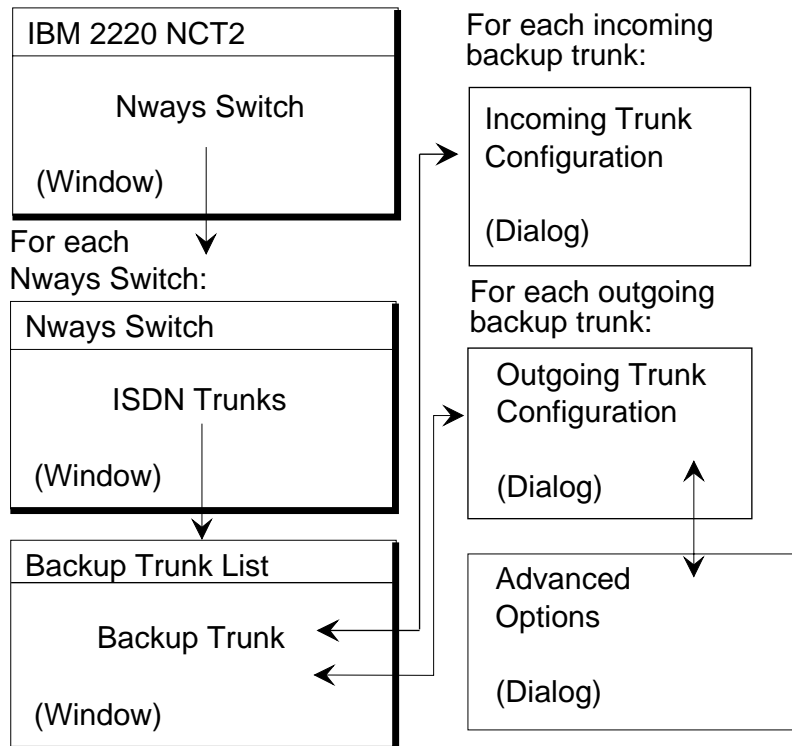


Figure 68. ISDN Trunks for Backup: Windows and Dialogs

## ISDN Backup Trunk Parameters

For each Nways Switch, you can configure incoming and outgoing backup trunks.

### Incoming Backup Trunk:

Following are the parameters for incoming backup trunks:

**Name** Up to 32 characters

**Network Interface**

Name of the network interface.

**Number of trunks**

Number of trunks to create.

Following are the parameters for outgoing backup trunks:

**Outgoing Backup Trunk:**

**Name** Up to 32 characters

**Network Interface**

Name of the network interface.

**Remote parameter definitions**

Preferred and alternative node name, and their calling numbers.

**Traffic support**

Whether circuit emulation is required or not.

**ISDN characteristics**

Whether auto- reverse backup is required, and the maximum and minimum number of channels to bond.

---

## Appendix A. NCT2 Command Line Interface

This appendix explains how to use the NCT2 command line interface and includes the following sections:

“Using the Command Line Interface”

“Processing the CCE Command”

“Commands and Options”

“Example” on page 165.

---

### Using the Command Line Interface

NCT2 for OS/2 and NCT2 for AIX provide a command line interface through the `cce` command. You will use this facility to automate the NCT2 configuration process.

Enter the `cce` command in an OS/2 window or an aixterm window, either alone or followed by a series of commands with arguments. The commands are described in the following sections.

**cce** Searches for a `cfgargs` file in the current directory. If the file exists, executes the commands in the file.

**cce <cmd1 [arguments] ... -cmdN [arguments]>**

Searches for and execute `cfgargs` as above. Then, processes all of the commands specified after `cce` (`cmd1` to `cmdN`). All commands start with a minus (-) sign and can be followed by arguments. Commands after `cce` may be specified in a command file.

---

### Processing the CCE Command

The commands in the `cfgargs` file are always processed before the commands entered after `cce`. Then, all the commands after `cce` are processed in the order they are encountered.

During command line processing, a command log and a status log are created. After each command processing, a message is logged with a timestamp, the command name, the value of significant parameters, and whether or not the result was successful. Invalid commands and processing problems are also logged. Logging messages are always appends to existing files. When all of the command line processing is complete, a final completion message is logged.

---

### Commands and Options

All of the commands begin with a minus (-) sign. Commands and arguments are separated by spaces or tabs. When commands are specified in a file, the commands and arguments may be entered on separate lines.

#### **-asciiExport**

`-asciiExport <file1 node1 [withComments] ... fileN nodeN [withComments]>`

Exports the specified nodes to the specified ASCII files. Multiple pairs of files and nodes may be entered. The `cce` command does not check the parameter values.

An unmatched parameter at the end of the list is ignored. Since comments are not included by default in ASCII configuration files, the `withComments` parameter must be specified when desired.

Multiple `-asciiExport` commands may be specified after a `cce` command or in command files.

## **-asciiImport**

```
-asciiImport <file1 [withoutLogging] ... fileN [withoutLogging]>
```

Imports the specified ASCII files. Node names are included in the imported files. Multiple file names may be entered. Since logging of validation messages is done by default, the `withoutLogging` parameter must be specified when desired.

Multiple `-asciiImport` commands may be specified after a `cce` command or in command files.

## **-binaryExport**

```
-binaryExport <file1 node1 ... fileN nodeN>
```

Exports the specified nodes to the specified binary files. Multiple pairs of files and nodes may be entered. The `cce` command does not check the parameter values. An unmatched parameter at the end of the list is ignored.

Multiple `-binaryExport` commands may be specified after a `cce` command or in the `cfgargs` file.

## **-binaryImport**

```
-binaryImport <file1 ... fileN>
```

Imports the specified binary files. Node names are included in the imported files. Multiple file names may be entered. Multiple `-asciiImport` commands may be specified after a `cce` command or in command files.

## **-binaryImportAllowUpgrade**

```
-binaryImportAllowUpgrade <file>
```

Imports the specified binary file and upgrades it to the current release level, if the file is at a lower release level.

## **-binaryExportDowngradeTo**

```
-binaryExportDowngradeTo <level file node> [allowDelete]
```

Exports the specified node into the specified file at the specified release level. The export is aborted if the configuration data of the node contains functions that do not exist at the specified release level. The `allowDelete` keyword causes the up— level configuration data to be deleted from the NCT2 Release 4.3 database, if any data exists.

## **-commandsFrom**

`-commandsFrom <commandFile>`

Causes cce to read commands from the specified file. Commands are processed after the commands in `cfgargs` and in the order they are read from `commandFile`.

## **-displayMessages**

`-displayMessages on/off`

Specifies whether messages should be displayed. The default is on. When messages are not displayed, the default answer (okay) is always returned for all message prompts. When multiple `-displayMessages` commands are processed, the value of the last one parsed is used.

## **-exit**

`-exit`

Indicates that the NCT2 graphical interface must not be started after processing. Thus, configuration operations are performed in batch mode.

## **-logMessages**

`-logMessages on [logFile] / off`

Specifies whether messages should be logged to the specified file. The default is off. When messages are logged, `cfg.log` is the default log file. If multiple `-logMessages` commands are present, the value of the last command parsed is used.

---

## **Example**

The cce command is entered as follows:

```
cce -commandsFrom command.1st -logMessages on
    -asciiImport A.acf -exit
```

`cfgargs` file contains:

```
-displayMessages off
-commandsFrom batch.1st
-logMessages on commands.log
```

`batch.1st` file contains:

```
-logMessages off
-asciiImport B.acf withoutLogging
```

`command.1st` file contains:

```
-logMessages off
-binaryExport C.zip nodeC
```

The processing would occur as follows:

1. Exhaust `cfgargs`:
  - a. Set display messages off.
  - b. `-commandsFrom` encountered, exhaust `batch.1st`:
    - 1) Set log messages off.

- 2) Add `-asciiImport B.acf withoutLogging` to operations.
- 3) Set log messages on with `commands.log` as log file.
2. Exhaust cce command line, `-commandsFrom command.1st` encountered.
  - a. Set log messages off.
  - b. Add `-binaryExport C.zip nodeC` to operations.
3. Continue processing cce command line and set log messages on.
4. Continue processing cce command line and add `-asciiImport A.acf` to operations.
5. Continue processing cce command line and note that the graphical interface must not be started after operations are executed.
6. Execute ASCII import of B.acf without logging.
7. Execute binary export of nodeC to C.zip
8. Execute ASCII import of A.acf
9. Do not start the graphical interface.

When processing completes, no messages would have been displayed, the graphical interface would not be started, and the default log file (`cfg.log`) would contain four messages:

1. ASCII import for B.acf with timestamp and status
2. Binary export for nodeC to C.zip with timestamp and status
3. ASCII import for A.acf with timestamp and status
4. Command line processing completion with timestamp.

---

## Appendix B. ASCII Configuration Files

This appendix describes the ASCII configuration files exported from NCT2 and includes the following sections:

“ASCII File Format”

“Creating (Exporting) an ASCII File”

“Interpreting an ASCII File”

“Changing an ASCII File” on page 168

“Importing and Validating an ASCII File” on page 169.

---

### ASCII File Format

You can use NCT2 to create and read configuration files in binary (ZIP) or ASCII format. You can also convert configuration files from one format to the other.

An ASCII configuration file may be useful if you need to make minor alterations to many configurations at one time without having to load configurations into the NCT2 many times. However, the ASCII file support is not intended to be used to create new configurations or to make major modifications to existing configurations.

For example, if you need to update many IP addresses throughout a network, it may be quicker for you to save the affected configuration files in ASCII format and then manually (or automatically with a program) update the addresses. A configuration file saved in ASCII format is also useful when you want to scan the configuration online or print the configuration for review.

After updating an ASCII configuration, you will have to import it into NCT2, export it in binary, forward it to its destination Nways Switch, and import it into the NAS configuration database.

---

### Creating (Exporting) an ASCII File

Create an ASCII configuration file using the Export function of NCT2. The configuration file contains the configuration parameters and their current values. Creating an ASCII file is effectively the same as converting a configuration from its binary form to ASCII.

If you select **with comments** when you start exporting a configuration, comments are added to the ASCII file. The comments are a guide to help you update the ASCII configuration file later. They include:

Brief description of each parameter

Value type, if applicable

Valid values or range of values.

---

### Interpreting an ASCII File

In an ASCII configuration file with comments, data is organized in groups beginning each with a specific symbol. The groups are described below.

### Header

Header information begins with !

### Comments

Comments begin with an asterisk (\*) in column 1. Comments contain descriptions of parameters, valid values, and value ranges. When necessary, comments indicate the *parameter types* which are as follows:

- Multiple segments: used for data composed of well-defined parts. For example, a four-segment numeric address that is used to define IP addresses and IP address masks.
- Numeric: typically used for data that may have mathematical calculations performed on it. Data value ranges are enforced on all numeric data types.
- String: each string must be within a certain length and can be composed only of a specific set of characters.
- Enumerated: used for multiple-choice values. When an ASCII file is saved with comments, the comments explain the possible values.

### Configuration groups and parameters

Configuration groups and parameters begin with # The word nil signifies that the parameter has no value currently.

### Group of items and lists

Items in a group and elements in a list are contained within { and }

All parameters appear in the file even if you did not configure the parameter. When you did not explicitly specify the value, the program uses the default value. If a default value for the parameter does not exist, the program uses nil.

Encrypted values are preceded with an E. To specify a new value to be encrypted by the configuration program, change the E to a U and overwrite the old value with the new value. When the configuration program reads in the ASCII file, it will encrypt the new value.

---

## Changing an ASCII File

You can change parameters in an ASCII configuration file and re-import it in NCT2. Proceed as follows:

1. Create the ASCII file using the Export function of NCT2.
2. Using a text editor, remove all groups that you are not changing. Make sure you do not change the version number at the top of the file. The parent groups of the modified values must be included in the ASCII file. However, peer fields and groups may be removed.
3. Make the changes to the appropriate parameters.
4. Save the file.
5. Read and validate the file into the configuration database using the Import function of NCT2 as explained in "Importing and Validating an ASCII File" on page 169 .



---

## Importing and Validating an ASCII File

Import and validate an ASCII configuration file in the database of NCT2 using the Import function. If you select **With validation logging**, NCT2 checks the configuration and logs errors. This feature is useful to check the configuration and correct any problems before transmitting the binary file to the device. Also, when reading ASCII files from multiple routers, you can determine any validation errors when the read process completes.

The validation file has the same name as the ASCII configuration file with a file extension of `.vlg`



---

## Appendix C. NVDM and Nways Switch

This appendix describes how NVDM is used on a change control server with the Nways Switch Control Program. The appendix includes the following sections:

“NVDM Change Files”

“Nways Switch Control Program Files”

“NVDM Scripts for Dual Code-Level Management” on page 173.

---

### NVDM Change Files

The Nways Switch Control Program files are received as NetView Distribution Manager for AIX *change files*. A change file is downloaded onto the change control server from tape and distributed to Nways Switch clients. The code is then activated from the change control server. A change file also includes the specifications (a README file) on how the installation or updating process must be performed.

### Program Refreshes

A *program refresh* contains the files either for a first installation of the software or for the complete replacement of a previously installed software version.

### Program Updates

A *program update* contains data to update software to a new maintenance level or to add new functions. Only files affected by the update are replaced.

### Program Temporary Fixes

*Program temporary fixes (PTF)* fix a specific problem diagnosed by IBM in a current release of the program.

### Roll Back

If a major program update is distributed to Nways Switch clients, NetView Distribution Manager for AIX is able to keep the previously installed version as a backup. If there are problems with the new version, it can be *rolled back* to the previous version. The program version can be rolled back even further than the previous version depending on how many versions you keep on your disk.

Starting from the Control Program level V2R2, the roll back function of NVDM is replaced by the Dual Code-Level Management function of the Control Program.

---

### Nways Switch Control Program Files

This section describes the file organization of the Nways Switch Control Program.

## File System

The NVDM installation creates a file system (or directory) in the /usr/lpp/netviewdm directory. The Nways Switch software distribution uses this standard file system.

## Control Program Naming Conventions

The change files provided by IBM for the Nways Switch Control Program follow a naming convention so that you can easily manage them on your hard disk. The name of each file depends on its type and content, as explained in the following sections.

### Refresh File

The name of a refresh file is:

IBM.NSCP $x$ .REF. $level$

where:

- x** Indicates a component of the Nways Switch Control Program.
- level** Specifies the level to be installed, as  $vrrlmmmm$ . The format of  $level$  is  $v$  is the version,  $rr$  the release,  $l$  the level, and  $mmmm$  the modification.

Example: IBM.NSCPA.REF.10321000

### Update File

The name of an update file is/

IBM.NSCP $x$ .UPD. $old\_level$ . $new\_level$

where:

- x** Indicates a component of the Nways Switch Control Program.
- old\_level** Specifies the level of code that is currently installed. Refer to Refresh File for the format of **old\_level** and **new\_level**.
- new\_level** Specifies the new level of code to be installed.

Example: IBM.NSCPNAS.UPD.10321000.10331000

### Fix File

The name of a fix file is:

IBM.NSCP $x$ .FIX. $level$ .PTF $_{number}$

where:

- x** Indicates a component of the Nways Switch Control Program.
- level** Specifies the level of code that is currently installed. Refer to Refresh File for the format of **old\_level** and **new\_level**.
- PTF $_{number}$**  PTF number in the IBM RETAIN system.

---

## NVDM Scripts for Dual Code-Level Management

This section describes the NVDM scripts that you will use from the change control server to operate Dual-Code Level Management on the NASs. If you use the graphical user interface of NVDM, select the script to be executed and the target NAS from the menus. You can also use the command line with the parameters given in the following sections. The name of the target NAS is preceded by -w.

### NVDM Inventory

#### Function

Get the NAS inventory.

**Important:** Before running NVDM inventory, delete the target history on the change control server.

**Name** IBM.NSCP.NVDMINV.0001

#### Parameters

NVDM\_Admin\_Id (NVDM administrator user ID)  
NVDM\_Admin\_Password (NVDM administrator password)

#### Output

On the change control server, the NAS inventory is refreshed.

### Switch to Inactive Code

#### Function

Activates the inactive code in the NAS. When the command is run:

1. The inactive code becomes active and vice-versa.
2. The NAS is restarted.
3. The inactive configuration is loaded and becomes the active configuration.

A Switch to Inactive Code command is also available from the NAS through Nways Switch Resource Control, and from the network management station through 2220 Switch Manager.

**Attention:** Before running Switch to Inactive Code, check the code level using NVDM Inventory.

**Name** IBM.NSCP.CODESWITCH.0001

#### Parameters

None

#### Output

The target NAS is restarted with the new (inactive) code level.

### Copy Active Code to Inactive

#### Function

Copies the active code to the inactive level. Use this function before installing a partial update to the inactive code. The function is not required before installing an entire Control Program refresh because the inactive code is erased first.

**Name** IBM.NSCP.CODECOPY.0001

**Parameters**  
None

**Output**  
The active code is copied to the inactive side.

## Copy Active Configurations

### Function

Copies the active (new and current) configurations to the inactive configurations. The function is executed only when the inactive code level is *higher* than the active code level.

If the inactive code level is lower than the active level, the function is not executed and the return code is 0. Depending on the Nways Switch configuration, copying configurations may last from 20 to 40 minutes.

**Important:** Use the function only when you want to report configuration changes performed after code installation on the inactive level and before switching to inactive level.

**Name** IBM.NSCP.CONFIGCOPY.0001

**Parameters**  
None

**Output**  
The inactive configurations are updated with the active configurations.

---

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**IDNX** Network Equipment Technologies, Incorporated

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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.

**ATMA<sub>n</sub>.** 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.

**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.



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## Bibliography

This section lists prerequisite and related publications.

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### 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<sup>1</sup>

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### 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<sup>2</sup>

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### 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

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### TMN 2.2 Publications

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

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### 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

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### 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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Models 300, 500, and 501  
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