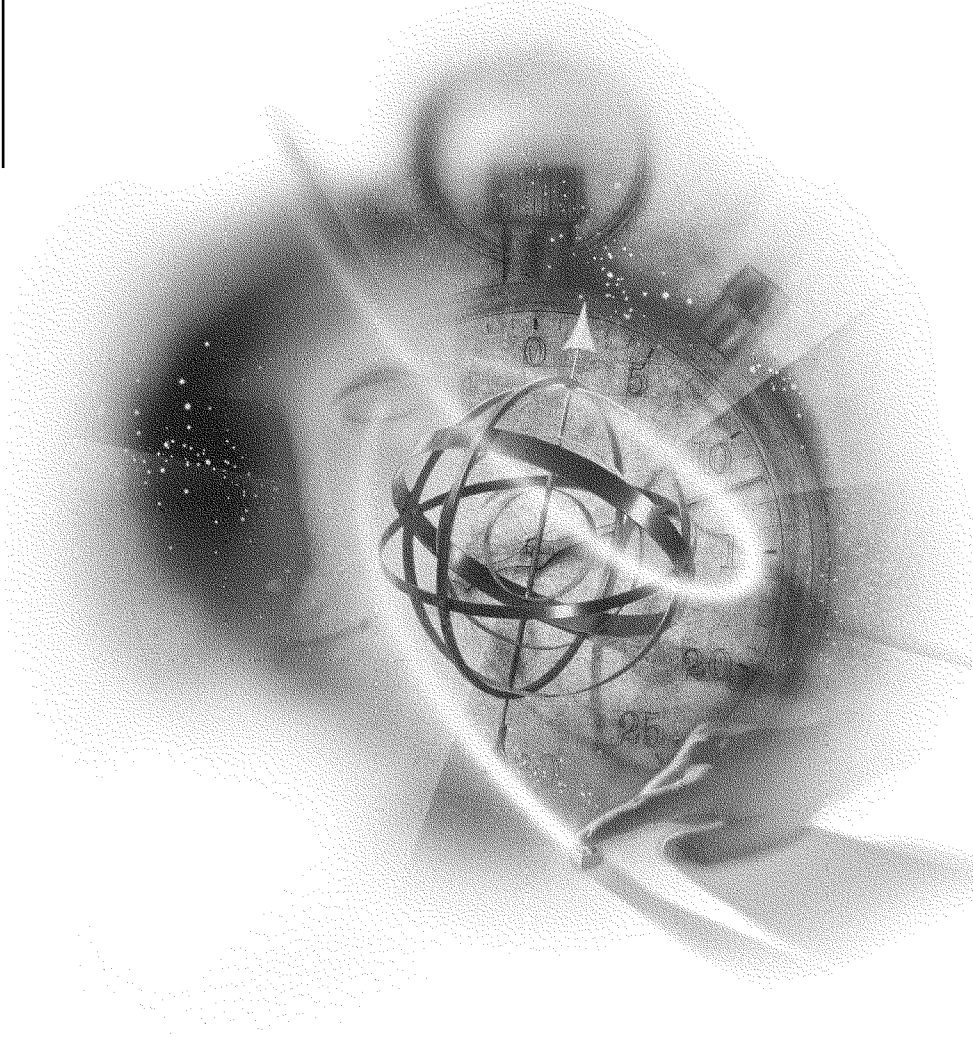


NetWare Link/ATM



Connectivity Services

Novell®

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Novell, Inc.
122 East 1700 South
Provo, UT 84606
U.S.A.

www.novell.com

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About This Guide

This guide provides the information you need to configure and manage the Novell Internet Access Server 4.1 NetWare Link/ATM software. In addition to planning information, this guide provides troubleshooting tips, techniques, and tools, as well as the symptoms of and solutions to commonly occurring problems for the NetWare Link/ATM components of Novell Internet Access Server 4.1.

1

Understanding

This section describes the concept of asynchronous transfer mode (ATM) LAN emulation and the benefits of ATM network technology for information transmission in both LAN and WAN environments.

Introduction to ATM

ATM networks provide a unified communication infrastructure capable of carrying telecommunication, video communication, and data communication between users around the globe.

ATM network technology is characterized by cell switching. ATM is a standard form of cell switching based on 53-byte cells. Cell-switching networks provide the quality of both the current telephone networks, which use circuit switching, and the current data networks, which use packet switching.

ATM networks feature:

- ♦ Controlled communications delay (latency)

Controlled communications delay, or latency, is inherent to ATM networks. This feature is due to the small cell size of 53 bytes, controller cell buffering, and high line speeds.

- ♦ Scalable over physical size, speed, and node count

ATM networks can be scaled geographically. Because ATM networks can be scaled indefinitely, they tend to eliminate the distinction between LANs and WANs.

- ♦ Bandwidth on demand

Data can be delivered at various rates, as desired. All LANs provide this capability now.

- ◆ Virtual circuit multiplexing

Virtual circuit multiplexing allows many dialogs to occur simultaneously over a single physical interface. This provides greater flexibility and simplicity than traditional telephone networks because more than a single call can be placed on a single physical interface.

ATM Cell Switching

High-speed cell switching is at the core of ATM technology. This method is used by ATM to transmit information through a series of switch hops.

The ATM cell is 53 bytes long. The path a cell takes through a series of switch hops is determined by a virtual circuit. Call signaling procedures establish the ATM virtual circuits used to route information through the network.

Each switch in the path taken by a call creates a routing table during call setup that defines the source to destination ports and virtual circuit identifiers through each switch. After a call is established, all cell switching is based on the 5-byte header of the 53-byte ATM cell.

When a cell enters a switch, the switch extracts the 24-bit virtual circuit number contained in the cell header. The switch uses the routing table created during call setup to switch the cell to a destination port. The cell header is replaced with one containing the number of the virtual circuit for the next hop.

ATM virtual circuits deliver each cell in sequence at the destination. When a cell arrives at the destination, the adapter hardware creates a packet or byte stream. A network layer called the ATM Adapter Layer (AAL) performs the segmentation and reassembly of cells to create packet and byte streams.

There are five AAL types: AAL1 through AAL5. For example, AAL5 is a connection-oriented packet service, and AAL1 is a constant bit rate circuit emulation stream.

Software that interfaces with an ATM network is never actually aware of ATM cells. Instead, the adapters that interface with the ATM network perform the AAL functions to provide a packet or byte stream at the software interface. When using AAL5, ATM carries frames up to 64 KB and includes a CRC check. The ATM frame has no header and carries the CRC and control fields in a frame trailer. With AAL1, data has no frame structure and contains no CRC check (AAL1 cells have 8 bits of header information).

The type of AAL, along with the traffic type and bandwidth, is determined at call setup. The ATM end point determines specific data qualities for the switching network. The end station must create cells by slicing packets or byte streams and must pace the cells on to the media. Traffic contract negotiation during circuit creation determines data pacing. There are three basic data pacing contract types:

- ◆ Constant bit rate (CBR)—Sets peak rate.
- ◆ Variable bit rate (VBR)—Sets peak and sustained rates.
- ◆ Available bit rate (ABR)—Sets peak and minimum rates.

ATM Network Features

An ATM network is composed of one or more interconnected ATM switches, each having point-to-point attachments to ATM users. The following features are found in an ATM network:

- ◆ Interface types

The interface between ATM switches is called a *Network to Network Interface* (NNI). The interface between an ATM switch and an end user is called a *User to Network Interface* (UNI), which is the interface between a public ATM carrier and a customer's switch.

- ◆ Switch types

ATM switches come in a variety of types and sizes. A small switch (a few gigabits) is called *customer premise equipment* (CPE). A large switch (100 GB or larger) is called a *central office* (CO) switch. A CPE and CO cannot be defined in terms of speed. They also have different MTBF rates.

- ◆ Attached devices

Attached devices can range from residential television sets to large computers.

- ◆ Link speeds

ATM networks support a variety of link speeds, from 1.544 Mbps to 622 Mbps and higher.

- ◆ Attach media

Users can attach by means of category 3 and category 5 for copper interfaces and multimode or single mode for fiber-optic interfaces.

ATM LAN Emulation

LAN emulation software is a layer of protocol software that operates between the data networking protocol and the ATM protocol. The software emulates existing LAN services, making the ATM network appear connectionless and allowing existing network protocols to run over ATM without modification.

An emulated LAN (ELAN) is logically analogous to an Ethernet/IEEE 802.3 or 802.5 segment. Multiple ELANs can be configured within an ATM network. LAN emulation also supports today's bridging and routing methods to allow interoperability between software applications residing on ATM-attached end systems and traditional LAN end systems.

LAN Emulation Components

Each ELAN consists of one or more LAN Emulation Clients (LECs) and a single LAN Emulation Service that resides in the ATM network or on the ATM switch. The LAN Emulation Service includes LAN Emulation Servers (LESs), Broadcast Unknown Servers (BUSs), and one optional LAN Emulation Configuration Server (LECS). These components are defined as follows:

- ◆ LEC—Emulates a LAN station over an ATM end station. This device enables communication among ATM end stations, or between ATM end stations and end stations on connected legacy LANs.
- ◆ LES—Resolves MAC addresses for 802.3 LANs and source route descriptors for 802.5 LANs into ATM addresses. All LECs are required to connect to the LES.
- ◆ BUS—Forwards initial unicast data with unknown ATM addresses, broadcast data, and multicast data. All LECs are required to connect to the BUS.
- ◆ LECS—Provides configuration information for the LECs.

An ELAN interfaces with a network protocol in the same way that a traditional LAN does. When a network protocol sends a packet, it sends the packet to the LEC and provides the MAC address of the LAN destination. The LEC, operating with the LES and BUS, determines the ATM-attached end station representing the LAN destination. The packet is then sent to this destination over the ATM network. Together, the LEC, LES, and BUS perform the following functions:

- ◆ Manage ATM virtual connections

- ◆ Determine the MAC address of the LAN destination and translate it to the ATM address of the LAN destination
- ◆ Deliver broadcast and multicast traffic as if the network were connectionless

ATM LAN Emulation Client

The LAN Emulation Client (LEC) is a component of an emulated LAN (ELAN). The ATM LEC on a client workstation runs over the Novell Client™ for DOS and Windows 3.1x or Novell Client for Windows 95 NIOS (network input/output system). It is loaded as a LAN driver in the server and client environments. The LEC interfaces with LAN applications and the ATM network to enable client access to other NetWare® servers or routers using ATM LAN emulation.

The ATM LEC features provide support for connectionless services, such as Ethernet (ATMELEC) and token ring (ATMTRLEC), by emulating Ethernet/IEEE 802.3 or 802.5 LAN port characteristics.

ATM LEC configurations support LAN-specific services such as the following:

- ◆ Connectionless service—Sends data without a previously established connection.
- ◆ Interconnectivity—Supports source route bridging to provide ATM-to-LAN, as well as LAN-to-ATM, connectivity.
- ◆ LAN emulation—Provides a logical analogy between ATM devices and LAN stations.
- ◆ MAC driver interfaces—Provides MAC driver support.
- ◆ Multicast services—Provides multicast and broadcast support.

ELANs can be created for administrative reasons (for example, creating a LAN for each work group) or for grouping users who run a specific application. Each workstation and server that belongs to the emulated network runs the LEC. The LEC emulates a LAN station (an Ethernet port or token ring port). An ELAN is created by associating one or more LECs, a LES, and BUS components. All LECs in an ELAN communicate with the same instance of LES and BUS components. A LEC instance is created each time the LEC is loaded with a unique set of values for the ATMBOARD, NODE, and ELAN parameters. Because ELANs are created by logical association between the

LEC, LES, and BUS, any workstation or server can be easily moved or configured to operate on another emulated LAN.

For more information about the ATM LEC, refer to:

- ♦ [ATM LEC Configuration](#)
- ♦ [ATM LEC Component Communication](#)

ATM LEC Configuration

Before the ATM LEC can be configured, the LECS must first be configured. The LECS is a software component that provides configuration information to the LEC, LES and BUS. The user configures the LECS to define LEC, LES, and BUS configuration parameters and to initialize the LES and BUS components of the ELAN. Upon loading, individual LEC components communicate with the LECS to obtain configuration parameters. Each LEC member of an ELAN is configured with the same set of operational parameters. The parameters define the ATM address of the LES component, timeout values, and number of retry attempts for establishing virtual circuit connections (VCCs). For detailed information about ATM LEC configuration parameters, refer to [“Setting Up.”](#)

ATM LEC Component Communication

Communication between a LEC and a LES is defined by the LAN Emulation User to Network Interface (LUNI) protocol. To facilitate this communication, VCCs are set up between the various LAN emulation service components. The VCCs used between the LEC and other LAN emulation service components are referred to as control VCCs. Control VCCs obtain configuration information, send or receive broadcast and unicast frames, and resolve the ATM address of a LAN destination. Control VCCs include Configuration-Direct, Control-Direct, Control-Distribute, Multicast-Send, and Multicast-Forward. VCCs used to transfer encapsulated IEEE 802.3 or 802.5 frames between LECs are known as Data-Direct VCCs.

The BUS and LES must be configured before the LEC can join the ELAN. To join the ELAN, the LEC establishes a connection to the LECS and obtains client configuration parameters, including the LES ATM address. The LEC then establishes a connection to the LES. As the LEC joins the ELAN, it registers a MAC address or route descriptor and an ATM address with the LES. The LEC can also register additional MAC addresses that are associated

with the same ATM address. The LEC then uses the LAN emulation Address Resolution Protocol, LE-ARP, with the LES to obtain the BUS ATM address. A VCC connection is then established with the BUS. The BUS, in turn, establishes a multipoint circuit connection for forwarding broadcast and unicast frames to the LEC. At this point, the LEC is operational and can send data to and receive data from other LECs on the same ELAN.

A LEC also maintains a cache of ATM address information for LAN destinations to which it has been connected recently. When the LEC receives a frame for transmission, and the address is available in the cache, the frame is sent directly to the LAN destination. For LAN destinations that are not registered or are unknown, the LEC sends an LE-ARP request to the LES to obtain the ATM address. When the LEC receives a successful ARP_RESPONSE, it establishes a direct VCC to the LAN destination. This Data-Direct VCC is then used by the LEC for sending data.

The LEC forwards all broadcast frames, multicast frames, and initial unicast frames to the BUS. The BUS, in turn, sends the frames to all other LECs in the ELAN.

NetWare Link/ATM

The NetWare Link/ATM™ software is contained in the Novell® Internet Access Server 4.1 routing software. NetWare Link/ATM allows network protocols, such as IP, to communicate over ATM networks.

NetWare Link/ATM supports source route bridging software and AppleTalk, IP, and Internetwork Packet Exchange™ (IPX™) protocols.

RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, describes two encapsulation methods for carrying bridged or routed data over ATM: *VC-based multiplexing* and *LLC encapsulation*. The method used is signaled during call setup.

NetWare Link/ATM supports both of these encapsulation methods. For more information about these encapsulation methods, refer to:

- ◆ [VC-Based Multiplexing](#)
- ◆ [LLC Encapsulation](#)
- ◆ [Limitations of LLC Encapsulation](#)
- ◆ [On-Demand and Permanent Link Support](#)
- ◆ [Inbound Call Authentication](#)

- ◆ **Maximum Number of VCs Supported**
- ◆ **Quality of Service Classes Supported**

VC-Based Multiplexing

VC (virtual connection)-based multiplexing supports one protocol over each ATM connection. No encapsulation is required when data is transmitted. ATM connection setup and takedown occur directly by way of protocol stack requests.

Although NetWare Link/ATM does not place any restrictions on multiple calls using the same protocol, some protocols do not support multiple calls.

The advantage of VC-based multiplexed connections over LLC is traffic separation because it allows connection configuration for individual protocols.

LLC Encapsulation

LLC encapsulation allows multiple protocols to share a single ATM connection. The ATM connection request is initiated only when the first protocol requests a connection to a remote end station. After a connection is set up, any other protocols requesting a connection to the same remote end station will not cause additional connection setup messages to be sent. Instead, a call confirmation is generated by the local system. At the remote end station, an incoming call signal is generated when it receives the first data packet, then the call is established.

The ATM connection is taken down only when the last referencing protocol of an established ATM connection requests takedown of its connection. If the protocol requesting the disconnect is not the last one referencing the ATM connection, the call is disconnected only at the local system. If the user does not manually reestablish the call within 15 minutes, the remote system will disconnect the call for the protocol. Therefore, the user might see one end station showing a call as disconnected, although the other end station shows the connection as still up until the 15-minute timeout has expired.

The advantage of LLC encapsulation over VC-based multiplexing is reduced VC count.

Limitations of LLC Encapsulation

The following limitations apply when LLC encapsulation is used:

- ◆ Only one ATM connection is established, and only one call per protocol is allowed over a shared virtual channel. If a second call from the same protocol is attempted, the call will be rejected. Protocol features that require multiple connections to the same end station, such as IPX load sharing, should not be enabled.
- ◆ When two end stations communicate with each other, only one of the two encapsulation methods can be used.
- ◆ Bridging is supported only by using the LLC encapsulation method.
- ◆ The permanent virtual connection (PVC) call type is supported only by using the LLC encapsulation method.

On-Demand and Permanent Link Support

An on-demand connection is released when a period of time, during which no data is received, reaches the specified idle-timeout value. If multiple protocols over a single connection are used, the idle-timeout value applies to the ATM connection, not to each protocol connection.

Inbound Call Authentication

Inbound call authentication is supported by NetWare Link/ATM. This feature allows the user to specify a list of remote ATM addresses from which incoming calls are accepted. However, because an ATM end station can have more than one address, the user must ensure that all addresses for that ATM end station are entered in the list.

Maximum Number of VCs Supported

NetWare Link/ATM does not place any limitation on the number of connections that can be established for a system. However, users should consult with the adapter board vendors for information specific to a particular adapter board.

Quality of Service Classes Supported

NetWare Link/ATM supports all services supported by ATM adapters, including the following Quality of Service (QoS) class implementations: Variable Bit Rate (VBR), Unspecified Bit Rate (UBR), and Available Bit Rate (ABR) traffic.

The VBR QoS class requests Broadband Bearer Class C and has the following traffic elements: PCR (CLP=0+1), SCR (CLP=0+1), MBS (CLP=0+1), and Tagging=No. The UBR QoS class requests Broadband Bearer Class X and has the following traffic elements: PCR (CLP=0+1), Best Effort, and Tagging=No. The ABR QoS class is mapped to Broadband Bearer Class X.

The types of service classes supported by specific adapter boards and switches vary. Contact your ATM service provider for detailed information about service classes.

2

Setting Up

Asynchronous Transfer Mode (ATM) networks use a standard form of cell switching based on a 53-byte cell to provide low-latency, scalable virtual-circuit-multiplexed connectivity. Novell[®] Internet Access Server 4.1 includes the NetWare[®] Link/ATM[™] software feature and the ATM LAN Emulation Client (LEC). To configure the LEC, refer to **Setting Up** in the *Boards* documentation.

How to Configure NetWare Link/ATM Network Interface Parameters

Before you begin, you must complete the following tasks:

- ◆ Familiarize yourself with exactly what your ATM service provider has done to provision the connection medium.

You should have values for the following service classes:

ABR (Available Bit Rate)

VBR (Variable Bit Rate)

UBR (Unspecified Bit Rate)

- ◆ Be aware of the physical limitations of the adapter board used for your ATM interface.
- ◆ Verify that both physical and logical boards are configured for NetWare Link/ATM.

The logical interface for NetWare Link/ATM is called ATMWAA. Separate logical boards (ATMWAA1, ATMWAA2, and so forth) are configured for each ATMWAA module.

To configure NetWare Link/ATM network interface parameters, complete the following steps:

- 1** Load NIASCFG, then select the following parameter path:
Select Configure NIAS > Protocols and Routing > Network Interfaces > a logical board
- 2** In the Interface Status field, press Enter.
- 3** Select Enabled.
- 4** In the Physical Board Name field, press Enter.
A list of all configured physical ATM boards appears. If the list is empty, make sure that you have configured an ATM adapter board.
- 5** In the User Data Size field, accept the default value or enter a new value.
This field specifies the largest user packet data size that applications can send and receive. The size is also limited by the maximum packet size configured for the system.
Range: 1-18,200
Default: 4188
- 6** In the Send Queue Limit field, accept the default value or enter a new value.
This field specifies the maximum number of outbound packets that can be queued for the interface. When the queue limit is reached, randomly selected packets are removed from the queue and discarded.
Range: 1-512
Default: 100
- 7** In the Authentication Options field, press Enter.
The Link/ATM Inbound Authentication Options menu appears. This feature allows you to configure a list of remote ATM addresses from which incoming calls can be accepted.
The Interface Name field shows the interface for which authentication is configured.
- 8** In the Inbound Authentication field, press Enter.
- 9** Select Enabled.

- 10** In the Authentication Database Name field, accept the name shown or enter a new name.

This field specifies the symbolic name of the inbound authentication database for the interface. Multiple interfaces can share a single database.
- 11** In the Authentication Database field, press Enter.

The Link/ATM Inbound Authentication Database screen appears.
- 12** To create a new entry in the database, press Ins.
- 13** Select the desired remote system ID from the list of configured remote IDs.
- 14** To exit this configuration procedure and save your changes, press Esc and select Yes when prompted.

How to Configure NetWare Link/ATM WAN Call Destination Parameters

To configure NetWare Link/ATM WAN call destination parameters, complete the following steps:

- 1** Load NIASCFG, then select the following parameter path:
Select Configure NIAS > Protocols and Routing > WAN Call Directory > Press Ins
- 2** Type the new WAN call destination name.
- 3** Select ATMWAA from the supported wide area media list.
- 4** In the Call Type field, accept Permanent or press Enter to select On Demand.
- 5** In the Interface Name field, select the logical board name used for this ATMWAA interface.
- 6** In the Connection Type field, accept SVC or press Enter to select PVC.

When you set the connection type to SVC, you must enter a destination ATM address in the field provided.

When you set the connection type to PVC, you must enter a virtual connection identifier in the field provided.
- 7** In the PVC VCI field, for PVC connection type, enter the PVC identifier.

The PVC identifier consists of a 1-byte virtual path identifier, followed by a 2-byte virtual channel identifier.

The valid range is 0x000020 through 0xFFFFF.

- 8** In the Destination ATM Address field, for SVC connection type, enter the destination ATM address.
- 9** In the Multiplex Protocols field, accept Yes or press Enter to select No.
- 10** In the Retry Mode field, accept Retry Self-Correcting Failures or press Enter to select another value.
- 11** In the Retry Limit Handling field, accept Continuous At Limit or press Enter to select another value.
- 12** In the Retry Interval Limit field, accept 00:10:00 or press Enter to enter another value.
- 13** In the Retry Line Timeout field, accept 00:10:00 or press Enter to enter another value.
- 14** In the Remote System ID field, enter the name of the target remote system.
- 15** In the Service Class field, accept UBR or press Enter to enter another value.

The service class specifies the service parameters to be used during connection setup:

ABR (Available Bit Rate)

VBR (Variable Bit Rate)

UBR (Unspecified Bit Rate)

- 16** In the Peak Rate field, accept the default value, or enter the value given by your ATM service provider.
- 17** In the Sustained Rate field, if service class is set to VBR, accept the default value, or enter the value given by your ATM service provider.
- 18** In the Minimum Rate field, if service class is set to ABR, accept the default value, or enter the value given by your ATM service provider.
- 19** In the Rate Adjustment field, accept Nearest or press Enter to select Nearest Lower.

This parameter specifies how the bit rate is rounded off when it is converting to cell rate.

- 20** In the Inbound Authentication Update field, accept Enabled or press Enter to select Disabled.
- 21** To exit this configuration procedure and save your changes, press Esc and select Yes when prompted.

3

Managing

This section describes the utilities used to monitor NetWare[®] Link/ATM WAN connections.

Using the ATMCON Utility

ATMCON is an NLM diagnostic console utility that provides access to configuration information and statistical data relating to the operation of NetWare Link/ATM.

To launch ATMCON, enter **LOAD ATMCON** at the system console prompt or load NIASCFG and follow this path:

Select View Status for NIAS > Protocols and Routing > ATM

Monitoring Overall Link Performance

To monitor the performance of a particular interface, load MONITOR and follow this path:

Select LAN/WAN Information > interface you want to view

Check the following fields:

- ◆ Send Line Utilization
- ◆ Receive Line Utilization
- ◆ Receive Overruns
- ◆ Data Q Backup in 1/1000 second

Consistently high values in these fields indicate that the link is busy and that performance has probably degraded. In this case, consider using a higher line

speed. Note that occasional increases in the values for these fields are normal in all networks.

4 Troubleshooting

This section contains NetWare® Link/ATM™ troubleshooting information that is divided into four categories:

- ◆ Troubleshooting tools
- ◆ Configuration tips
- ◆ Troubleshooting checkpoints
- ◆ Common problems

If a problem that is general in nature occurs, perform the procedure described in [“Troubleshooting Checkpoints” on page 28](#) to isolate and resolve the problem. If a problem with a specific symptom occurs, refer to [“Common Problems.”](#)

Troubleshooting Tools

This section describes the following utilities that can be used to troubleshoot NetWare Link/ATM:

- ◆ [ATMCON](#)
- ◆ [MONITOR](#)

ATMCON

ATMCON, a NetWare Loadable Module™ (NLM™) diagnostic console utility for NetWare Link/ATM, provides access to NetWare Link/ATM configuration information and statistical data relating to the operation of NetWare Link/ATM.

MONITOR

MONITOR, an NLM utility, allows you to determine which NetWare Link/ATM adapters are installed and exchanging traffic with the network. The LAN/WAN driver information provided by MONITOR enables viewing of generic and custom statistics for ATM and ATMWAA drivers. These statistics enable you to determine whether the drivers are sending and receiving data and whether error statistics such as No ECB and Receive Packet Too Large have been logged.

Configuration Tips

When troubleshooting NetWare Link/ATM, remember to perform the following tasks:

- ◆ Inspect the cabling and connectors associated with NetWare Link/ATM connections to the network.
- ◆ Ensure that the ATMWAA network interface is configured properly.
- ◆ Ensure that the ATM remote address is configured properly in the WAN call directory.
- ◆ Verify that the network protocol is bound properly to the ATMWAA interface, not to the ATM adapter board.
- ◆ Check the idle-timeout value if an on-demand link is used.
- ◆ Check the encapsulation method used.
- ◆ Verify that identical values for the user data size are being used at both ends of a connection.

Troubleshooting Checkpoints

To isolate and resolve problems with NetWare Link/ATM, complete the following steps:

- 1** Load ATMCON to verify that the interface is active and connections are present.
- 2** Load ATMCON to verify that the configuration parameters are listed in the Connection Information window.
- 3** Load ATMCON to verify that data is being sent and received over the virtual connection.

- 4 Use MONITOR to verify that the adapter board is sending and receiving data packets.

Common Problems

Various symptoms of common problems and the associated solutions are as follows:

- ◆ ATMWAA is inactive.

If ATMCON indicates that the ATMWAA interface is inactive, verify that the ATM adapter board has been loaded. To do this, enter **CONFIG** at the console, then verify that the physical adapter board name configured in the Link/ATM Network Interface Configuration window matches the adapter board name.

- ◆ The ATM adapter board is not loaded.

Cause 1 —The ATM adapter board is not initialized because there is a system resource problem. Load NIASCFG (parameter path: Select configure NIAS > Protocols and Routing > View Configuration > Console Messages) to view console messages. You should see a message indicating that the loading of the adapter was attempted but failed.

Cause 2 —The ATM adapter board is enabled but not loaded. This occurs when the physical adapter board name has been changed but the system has not been reinitialized.

Use NIASCFG to complete the following steps:

1. Delete the adapter from the Link/ATM Network Interface Configuration window.
2. Reselect the adapter, press `Esc` to return to the NIASCFG menu, and save your change when prompted.
3. Select Reinitialize System.

- ◆ The ATM adapter board is operating but is not registered with the ATM switch.

Cause 1 —The electrical characteristics of the adapter board's physical interface do not match the characteristics of the switch's interface. For example, the encoding used by a 100-Mbps adapter board does not allow it to communicate with a 155-Mbps switch, even though they use the same cable and connectors.

Cause 2 —The adapter cannot acquire the ATM address from the switch. Use the MONITOR LAN/WAN driver function to view adapter information. The Number of Signaling Link (Re)starts and the Number of Addresses Registered should be at least 1. If you do not see this status, this indicates that the ATM link between the system and the ATM switch is not operational, or this indicates that the switch is not compliant with UNI 3.0.

- ◆ Connections cannot be established.

Usually, if a connection cannot be established, a message indicating the reason is displayed on the console. In addition to the reasons listed in **“Configuration Tips” on page 28** the following causes can apply.

Cause 1 —The switch is using an incompatible call establishment protocol. NetWare Link/ATM uses ATM Forum 3.0 signaling with the Address Registration ILMI procedures. For private virtual circuits (PVCs), Forum 3.0 signaling is not required, but Forum 3.0 ILMI Address Registration must be used. For switched virtual circuits (SVCs), both Forum 3.0 signaling and ILMI Address Registration are required.

Cause 2 —The user data size is configured differently at each end of the ATM connection.

Cause 3 —The remote end station address is not specified in the authentication database when inbound authentication is enabled.

Cause 4 —The encapsulation method is incompatible for both end stations.

Cause 5 —For PVCs, a call has not been established at both end stations.

Cause 6 —For PVCs, the virtual connection identifier is improperly configured. Check with your Internet Service Provider (ISP) or the network manager who configured the ATM switch to obtain the correct Virtual Path Identifier/Virtual Channel Identifier (VPI/VCI) pair.

Cause 7 —The adapter board or ATM switch does not support the service class specified in the WAN call destination. Some adapter boards might convert unsupported service classes to a type that they support.

- ◆ Packets are dropped during data transfer.
- ◆ Protocol connection is taken down.

If multiple protocols share a single ATM connection, the protocol connection will be automatically taken down if no data is received for 15

minutes. If necessary, you can reestablish the protocol connection from CALLMGR.



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