



## Configuring the TN3270 Server

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The implementation of TN3270 Server on a channel-attached router using the CIP or CPA provides an effective method of removing the processing of TN3270 sessions from valuable mainframe cycles to a faster and more efficient router. This chapter provides information about configuring TN3270 Server support on the CIP and CPA types of CMCC adapters on a Cisco router.

This information is described in the following sections:

- [Overview, page 1](#)
- [Benefits, page 2](#)
- [Preparing to Configure the TN3270 Server, page 16](#)
- [Configuring the TN3270 Server, page 27](#)
- [Configuring the TN3270 Server for Response-Time Monitoring, page 58](#)
- [Monitoring and Maintaining the TN3270 Server, page 60](#)
- [TN3270 Server Configuration Examples, page 63](#)

For general information about configuring CMCC adapters, refer to the “Configuring Cisco Mainframe Channel Connection Adapters” chapter in this publication.

For a complete description of the TN3270 server commands in this chapter, refer to the “TN3270 Server Commands” chapter of the *Cisco IOS Bridging and IBM Networking Command Reference* (Volume 2 of 2). To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the [“Identifying Platform Support for Cisco IOS Software Features”](#) section on page li in the “Using Cisco IOS Software” chapter.

## Overview

This section provides a brief introduction to the environments where the TN3270 server feature is used and describes some of the primary benefits and functions of the TN3270 server.

The following sections in this topic provide background information about the TN3270 Server:



- [Benefits, page 2](#)
- [TN3270 Server Environments, page 2](#)
- [TN3270 Server Architecture, page 4](#)
- [Supported PU Types, page 4](#)
- [Supported LU Types, page 5](#)
- [LU Allocation, page 6](#)
- [Session Termination, page 13](#)
- [Response-Time Collection, page 14](#)
- [SSL Encryption Support, page 15](#)

Additional details about the TN3270 Server implementation can be found in the *TN3270 Design and Implementation Guide* available on Cisco.com.

## Benefits

The latest release of the TN3270 Server feature on the CMCC implements RFC 2355, *TN3270 Enhancements* and RFC 2562, *Definitions of Protocol and Managed Objects for TN3270E Response Time Collection Using SMIv2 (TN3270E-RT-MIB)*.

The TN3270 server provides the following benefits:

- Supports clients using the ASSOCIATE request.
- Maintains knowledge of printer and terminal relationships when an association is defined between LU resources.
- Enables clients to acquire a terminal LU and its associated printer without desktop configuration to specific LUs by grouping LUs in clusters.
- Enables you to capture response-time statistics for individual sessions and clients or for groups of sessions and clients.
- Supports specification of LU names for dynamic definition of dependent LUs (DDDLUs).
- Controls how keepalives are generated and keepalive responses are handled by the CMCC adapter.
- Prevents VTAM security problems when the UNBIND request is used with CICS.
- Supports deletion of LUs automatically on session termination.
- Supports Dynamic LU Naming.
- Supports Inverse DNS Nailing.
- Provides security through SSL Encryption.

## TN3270 Server Environments

TN3270 communications in a TCP/IP network consist of the following basic elements:

- TN3270 client—Emulates a 3270 display device for communication with a mainframe application through a TN3270 server over an IP network. The client can support the standard TN3270 functions (as defined by RFC 1576) or the enhanced functionality provided by TN3270E (defined in RFC 2355). TN3270 clients are available on a variety of operating system platforms.

- TN3270 server—Converts the client TN3270 data stream to SNA 3270 and transfers the data to and from the mainframe.
- Mainframe—Provides the application for the TN3270 client and communicates with the TN3270 server using Virtual Telecommunications Access Method (VTAM).

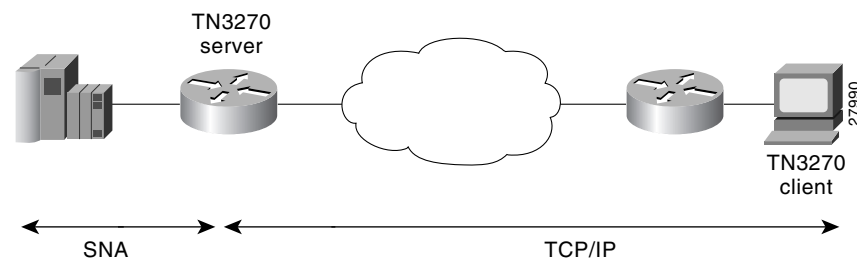
The TN3270 server feature offers an attractive solution when the following conditions need to be supported in an SNA environment:

- Maintaining an IP backbone while providing support for SNA 3270-type clients.
- Offloading mainframe CPU cycles when using a TN3270 host TCP/IP stack with a TN3270 server.
- Providing support for high session density or high transactions per second.

The TN3270 server feature on a CMCC adapter card provides mapping between an SNA 3270 host and a TN3270 client connected to a TCP/IP network as shown in [Figure 1](#). Functionally, it is useful to view the TN3270 server from two different perspectives:

- [SNA Functions, page 3](#)
- [Telnet Server Functions, page 4](#)

**Figure 1** TN3270 Implementation



## SNA Functions

From the perspective of an SNA 3270 host connected to the CMCC adapter, the TN3270 server is an SNA device that supports multiple PUs, with each PU supporting up to 255 logical units (LUs). The LU can be Type 1, 2, or 3. The SNA host is unaware of the existence of the TCP/IP extension on the implementation of these LUs.

The LUs implemented by the TN3270 server are dependent LUs. To route these dependent LU sessions to multiple VTAM hosts connected to the TN3270 server in the CMCC adapter card, rather than routing in the VTAM hosts, the TN3270 server implements a SNA session switch with end node (EN) dependent LU requester (DLUR) function. SNA session switching allows you to eliminate SNA subarea routing between hosts of TN3270 traffic by establishing Advanced Peer-to-Peer Networking (APPN) links with the primary LU hosts directly.

Using the DLUR function is optional so that the TN3270 server can be used with VTAM versions prior to version 4.2, which provide no APPN support. In these non-APPN environments, access to multiple hosts is accomplished using direct PU configuration in the TN3270 server.

## Telnet Server Functions

From the perspective of a TN3270 client, the TN3270 server is a high-performance Telnet server that supports Telnet connections, negotiation and data format. The server on the CMCC adapter card supports Telnet connection negotiation and data format as specified in RFC 1576 (referred to as *Traditional TN3270*) and RFC 2355 (referred to as *TN3270 Enhancements*).

Unless the TN3270 server uses a Token Ring connection to a front-end processor (FEP), or other LLC connectivity to the mainframe host, it will require CSNA or CMPC support. For more information about configuring CSNA or CMPC support, see the “Configuring CSNA and CMPC” chapter in this publication.

## TN3270 Server Architecture

The Cisco TN3270 server can be placed on a channel-attached router or a remote router. If the router is directly connected to the host, the TN3270 server resides on a CIP or CPA that is connected to the mainframe using Enterprise Systems Connection (ESCON) or bus-and-tag channel attachment.

Alternatively, you can use the TN3270 server on a remote router as an intermediate step toward using the CIP or CPA as a direct host connection. In this case, the TN3270 server resides on a router that is connected to the mainframe using a channel connection device, such as the FEP or a CIP or CPA.

The TN3270 server feature is implemented on the following CMCC adapters:

- CIP—Installed in a Cisco 7000 with RSP7000 or 7500 series router. Each CIP has up to two ESCON or two bus-and-tag (parallel) interfaces and a single virtual interface. The TN3270 server is installed on the virtual interface. Therefore, each CIP can have a single TN3270 server.
- CPA—ECPA or PCPA installed in a Cisco 7200 series router. Each CPA combines the function of an ESCON interface and a virtual interface on a single interface. As with the CIP, a single TN3270 server can be installed on each CPA.

Because a router can accommodate more than one CIP or CPA, each router can support multiple TN3270 servers.

## Supported PU Types

The TN3270 server supports two types of PUs:

- Direct PUs—Used in subarea SNA
- DLUR PUs—Used with APPN

Direct PUs and DLUR PUs can coexist on the same CIP or CPA. Both types of PUs support either static or dynamic LUs. However, the LU type is defined only in VTAM and is not explicitly defined in the TN3270 server.

### Direct PUs

The TN3270 server supports direct PUs when you want to configure a PU entity that has a direct link to a host. Direct PUs are used in non-APPN environments.

The definition of each direct PU within the router requires that you define a local service access point (SAP). Each PU on the TN3270 server must have a unique local/remote media access control (MAC)/SAP quadruple. If you want to connect PUs on the same adapter to the same remote MAC (RMAC) and remote SAP (RSAP), then you must configure each PU with a different link SAP (LSAP).

With direct PUs, the LU names in the TN3270 server do not necessarily match the LU names defined in VTAM. However, there are a couple of ways to accomplish matching LU names for direct PUs:

- **LU seed configuration**—To ensure that the LU seed configurations in the router and VTAM match for direct PUs, you need to define the value for the **lu-seed** parameter in the **pu** (TN3270) or **pu** (listen-point) command in the router, the same as the LUSEED value in the VTAM PU definition.
- **INCLUDE0E function** available as of VTAM version 4.4—To allow the XCA to provide the LU name in the ACTLU message, use the INCLUDE0E function. The TN3270 server then uses the LU name provided by the ACTLU.

## DLUR PUs

When the SNA network uses APPN and the TN3270 server can reach multiple hosts, the DLUR function of the TN3270 server is recommended. Note that by using the DLUR function of the TN3270 server, all of the LUs in the server can be defined and owned by a controlling VTAM. When a client requests an application residing on a different VTAM host, the controlling VTAM will issue the request to the target host which will send a BIND directly to the client. All LU-LU data will then flow directly between the target host and the client without needing to go through the controlling VTAM.

DLUR allows the routing of TN3270 LUs to be performed in the CMCC adapter card using SNA session switching to multiple VTAM hosts rather than routing the sessions on the VTAM hosts. This feature is especially important with the multi-CPU CMOS mainframe, which comprises up to 16 CPUs that appear as separate VTAMs.

The implementation of TN3270 server LUs under DLUR also allows the server to learn about the LU names from VTAM in the ACTLU message, which greatly simplifies the configuration to support specifically requestable LUs such as printers.

## Supported LU Types

The TN3270 server supports two types of LUs:

- **Static LUs**—Defined explicitly within VTAM. Allocation of static LUs requires a client to specify the PU and LU name. LU name requests are only supported by TN3270E clients.
- **Dynamic LUs**—Use the DDDL feature of VTAM. Allocation of dynamic LUs requires a client to specify only a terminal type. LU name requests to be fulfilled by DDDLs for PUs configured with the **generic-pool deny** command are supported.

The type of LU that is allocated is defined only in the VTAM switched major node. The TN3270 server does not specify the LU type.

## LU Names in the TN3270 Server

Where SNA session switching is configured using DLUR PUs, the TN3270 server learns the LU names (static or dynamic) from VTAM in the ACTLU message. Direct PUs can also learn names from VTAM in the ACTLU message if the INCLUDE0E parameter (available in VTAM version 4.4) is used in the switched major node definition.

However, for direct PUs, the TN3270 server can also specify a naming convention that it will use for any dynamic LUs that are allocated. For direct PUs a “seed” name can be configured on the PU in the TN3270 server configuration by using the **lu-seed** argument of the **pu** (TN3270) or **pu** (listen-point)

command. The LU seed name defines a prefix for the LU name. The TN3270 server uses the LU seed name in conjunction with the LOCADDR to generate the name by which the TN3270 server recognizes that LU. It is important to note that VTAM also generates LU names using its own LUSEED parameter.

When using the **lu-seed** parameter in the TN3270 server configuration, it is best to use the same naming convention as the host to prevent situations where the LU name that the TN3270 server recognizes differs from the corresponding LU name assigned in VTAM.

Several factors determine how LUs are assigned and named. For more information about the different factors that influence LU naming, see the *TN3270 Design and Implementation Guide* available on Cisco.com.

## LU Allocation

This section provides information about the following aspects of LU allocation:

- [Formation of LU Model Type and Number, page 6](#)
- [Static LU Allocation, page 7](#)
- [Dynamic LU Allocation, page 7](#)
- [Dynamic LU Naming, page 8](#)
- [LU Nailing, page 8](#)
- [Inverse DNS Nailing, page 9](#)
- [LU Pooling and ASSOCIATE Requests, page 9](#)
- [Pooled LU Allocation, page 12](#)

## Formation of LU Model Type and Number

VTAM requires a model type and number in the Reply PSID NMVT from the TN3270 server to find an appropriate LU template in the LUGROUP major node. The model type is a four character string and the model number is a two or three character string.

The TN3270 server translates the following formats of terminal type string from a client:

- IBM-<XXXX>-<Y>[-E]: Specifies “XXXX0Y” or “XXXX0YE” in the model type and number field of the Reply PSID NMVT.



### Note

The “E” in the model string refers to 3270 Extended Datastream. It has no association with the “E” in “TN3270E.”

- IBM-DYNAMIC: Specifies “DYNAMIC” in the model type and number field of the Reply PSID NMVT. The VTAM configuration also must have “DYNAMIC” defined as a template in the LUGROUP.

All other terminal strings that do not match the above syntax examples are forwarded as is to VTAM. For example, a string of “IBM-ZZ..Z,” where “ZZ..Z” does not match the preceding syntax, is forwarded as “ZZ..Z.”

In all cases, the string is translated from ASCII to EBCDIC and truncated at seven characters.

Clients that do not support TN3270E typically require a 3270 datastream on the System Services Control Point (SSCP)-LU flow. Clients that are TN3270E compliant typically use the SNA Character Set (SCS) on the SSCP-LU session. In order to accommodate these two classes of clients, the TN3270 server

directs them to different LUGROUP entries at the host. To make this as easy as possible, the SCS requirement is also encoded into the model string sent to the host. Following the previously described terminal type string formats accepted by the server, this additional condition is applied:

If the client has negotiated TN3270E support, the character “S” is overlaid on the fifth character of the string, or appended if the string is less than five characters as shown in [Table 1](#).

**Table 1** Examples of Model String Mapping

String from Client (ASCII)	BIND-IMAGE Requested?	String to Host (EBCDIC)
IBM-3278-4	No	327804
IBM-3279-5E	No	327905E
IBM-3279-3-E	Yes	3279S5E
IBM-DYNAMIC	Yes	DYNASIC
ABC	Yes	ABCS
ABCDEFGH	Yes	ABCDSFG

## Static LU Allocation

A TN3270E client can request a specific LU name by using the TN3270E command CONNECT as documented in RFC 2355. The name requested must match the name by which the TN3270 server knows the LU and the host must have activated the LU with an ACTLU.

TN3270 clients can also use static LUs if client nailing is configured on the TN3270 server.

## Dynamic LU Allocation

Dynamic LU allocation, using VTAM’s DDDLU feature, is the most common form of request from TN3270 clients emulating a TN3270 terminal. The user typically requests connection as a particular terminal type and normally is not interested in what LOCADDR or LU name is allocated by the host, as long as a network solicitor logon menu is presented. In fact, only TN3270E clients can request specific LUs by name.

The TN3270 server performs the following functions with this type of session request:

- Forms an EBCDIC string based on the model type and number requested by the client (see the [“Formation of LU Model Type and Number”](#) section on page 6 for information about the algorithm used). This string is used as a field in a Reply product set ID (PSID) network management vector transport (NMVT).
- Allocates a LOCADDR from the next available LU in the generic LU pool. This LOCADDR is used in the NMVT.
- Sends the formatted Reply PSID NMVT to VTAM.

To support DDDLU, the PUs used by the TN3270 server have to be defined in VTAM with LUSEED and LUGROUP parameters. When VTAM receives the NMVT it uses the EBCDIC model type and number string to look up an LU template under the LUGROUP. For example, the string “327802E” finds a match in the sample VTAM configuration shown in [Figure 5](#) in the [“VTAM Host Configuration Considerations”](#) section on page 18. An ACTLU is sent and a terminal session with the model and type requested by the client is established.

LU name requests to be fulfilled by DDDLUs for PUs configured with the **generic-pool deny** command are supported.

For more information about defining the LUSEED and LUGROUP parameters in VTAM, see the [“VTAM Host Configuration Considerations” section on page 18](#).

## Dynamic LU Naming

The Dynamic LU Naming enhancement allows the user to configure named logical units (LUs) from the TN3270 server side. This enhancement allows the TN3270 server to pass an LU name to the Virtual Telecommunications Access Method (VTAM) software running on the mainframe and have VTAM dynamically create an LU with that name. The LU name is then sent to the mainframe as part of subvector 86 in the Reply PSID NMVT power-on frame. The TN3270 client can connect to any of the available TN3270 servers and the selected server can request a specific LU name for the client. In addition, the LU naming conventions have been modified to allow for more flexibility when specifying lu-seed names.

## LU Nailing

The TN3270 server allows a client IP address to be mapped or “nailed” to one or more LU local addresses on one or more physical units (PUs) by means of router configuration commands. LU nailing allows you to control the relationship between the TN3270 client and the LU.

Using LU nailing, clients from traditional TN3270 (non-TN3270E) devices can connect to specific LUs, which overcomes a limitation of TN3270 devices that cannot specify a “CONNECT LU.” LU nailing is useful for TN3270E clients because it provides central control of your configuration at the router rather than at the client.

The “model matching” feature of Cisco’s TN3270 server is designed for efficient use of dynamic LUs. Each TN3270E client specifies a terminal model type at connection. When a non-nailed client connects and does not request a specific LU, the LU allocation algorithm attempts to allocate an LU that operated with that terminal model the last time it was used. If no such model is available, the next choice is an LU that has not been used since the PU was last activated. Failing that, any available LU is used; however, for dynamic LUs only, there is a short delay in connecting the session.

When a client or set of clients is nailed to a set of more than one LU, the same logic applies. If the configured LU nailing maps a screen client to a set of LUs, the LU nailing algorithm attempts to match the client to a previously used LU that was most recently used with the same terminal model type as requested by the client for this connection. If a match is found, then that LU is used. If a match is not found, any LU in the set that is not currently in use is chosen. If there is no available LU in the set, the connection is rejected.

For example, the following LUs are nailed to clients at address 192.195.80.40, and LUs BAGE1004 and BAGE1005, which were connected but are now disconnected.

lu	name	client-ip:tcp	nailed	state	model	frames in	frames out	idle for
1	BAGE1001	192.195.80.40:3822	Y	P-BIND	327904E	4	4	0:22:35
2	BAGE1002	192.195.80.40:3867	Y	ACT/SESS	327904E	8	7	0:21:20
3	BAGE1003	192.195.80.40:3981	Y	ACT/SESS	327803E	13	14	0:10:13
4	BAGE1004	192.195.80.40:3991	Y	ACT/NA	327803E	8	9	0:0:7
5	BAGE1005	192.195.80.40:3997	Y	ACT/NA	327805	8	9	0:7:8

If a client at IP address 192.195.80.40 requests a terminal model of type IBM-3278-5, LU BAGE1005 will be selected over BAGE1004.

lu	name	client-ip:tcp	nailed	state	model	frames in	frames out	idle for
1	BAGE1001	192.195.80.40:3822	Y	P-BIND	327904E	4	4	0:23:29
2	BAGE1002	192.195.80.40:3867	Y	ACT/SESS	327904E	8	7	0:22:14



3	BAGE1003	192.195.80.40:3981	Y	ACT/SESS	327803E	13	14	0:11:7
4	BAGE1004	192.195.80.40:3991	Y	ACT/NA	327803E	8	9	0:1:1
5	BAGE1005	192.195.80.40:4052	Y	ACT/SESS	327805	13	14	0:0:16

## Inverse DNS Nailing

The Inverse DNS Nailing enhancement enables the TN3270 server to nail a pool of LUs to client machine names or to an entire domain. This enhancement allows dynamic IP addressing on the TN3270 client machines. This addressing is used in network design scenarios (for example, a Dynamic Host Configuration Protocol [DHCP] environment) and in individual network configuration scenarios (for example, a machine is moved and needs a new network address).

The Cisco IOS software inverse nailing support uses the DNS in routers to look up the symbolic name associated with a client IP address. The TN3270 server uses this symbolic name to assign a predefined LU pool for the user. This eliminates the need for nailed TN3270 clients to have statically defined IP addresses. If you configure inverse DNS nailing on the TN3270 server, you do not need to modify the DNS nailing statements in the router configuration.

## LU Pooling and ASSOCIATE Requests

The TN3270 server enhancements introduced in Cisco IOS Release 12.0(5)T add support for the ASSOCIATE request through LU pooling. The LU pooling feature enables the TN3270 server to identify the relationships between screen and printer LUs.

The LU pool configuration is an option to the LU nailing feature that allows clients to be nailed to LUs. The LU pooling feature allows you to configure clients in the router and nail clients into groups of LUs. These groups of LUs are called clusters. Each cluster is given a unique pool name. An LU pool consists of one or more LU clusters that are related to each other. This allows logically related clients to connect to LUs that have the same logical relationship with the host. A cluster can contain screen LUs and their associated printer LUs. The pool name can be used instead of a device name on a CONNECT request. LU nailing is supported for LU pools.

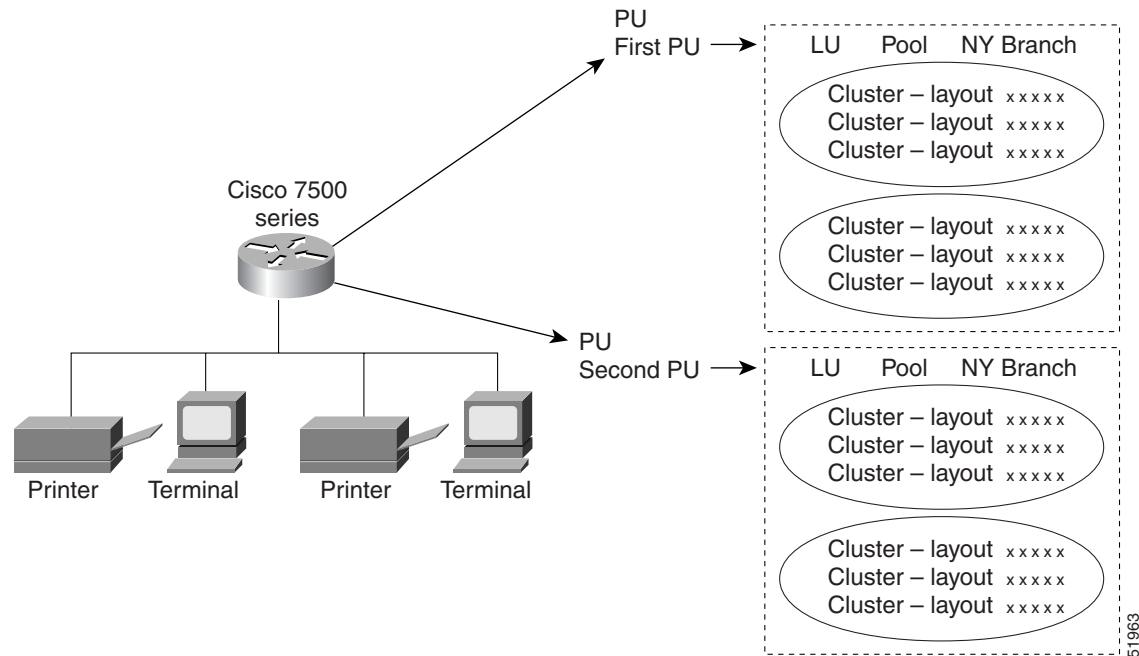
The pool name can be used instead of a device name on a CONNECT request. The pool name must be eight characters or less in length and must comply with VTAM naming rules, which allow the following characters (alphabetic characters are not case sensitive):

- 1st character—Alphabetic (A-Z) and national characters '@', '#', and '\$'
- 2nd-8th characters—Alphabetic (A-Z), numeric (0-9), and national characters '@', '#', and '\$'

These naming rules are enforced by the TN3270 server when configuring a pool name and when processing the name received on a CONNECT request from the client. The TN3270 server rejects an invalid name and truncates the name received in the CONNECT request from the client to eight characters or at an invalid character (whichever comes first) when processing the CONNECT request.

Figure 2 provides an overview of clusters configured within PUs.

**Figure 2 LU Pooling**



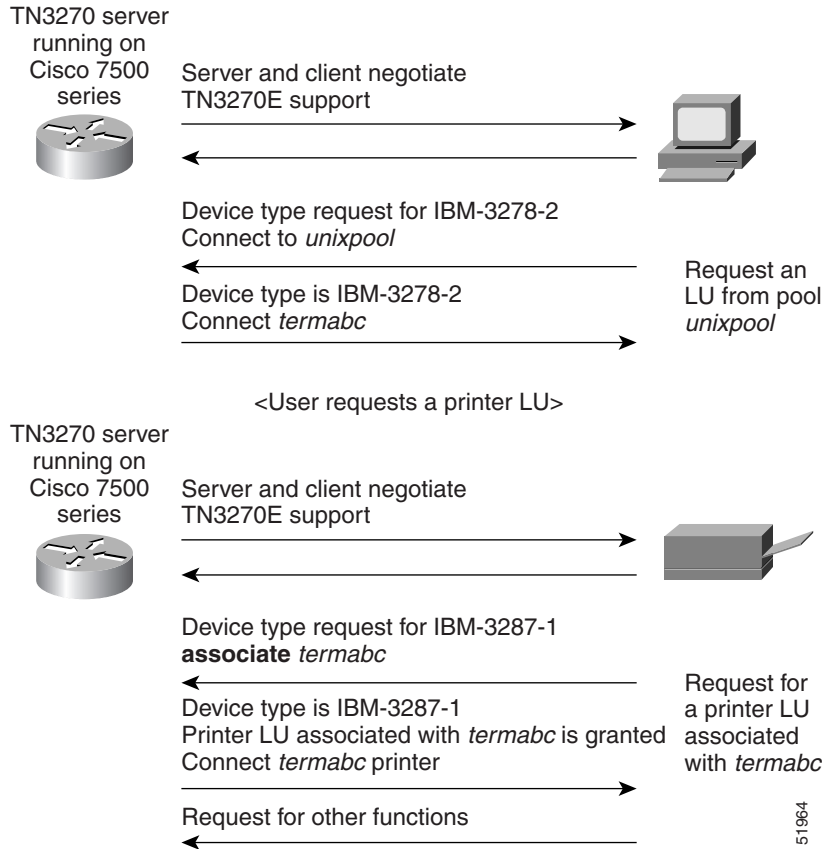
Support for the ASSOCIATE request enables you to define a partner printer in the TN3270 server for a given terminal LU pool or single terminal. As a result, the TN3270 server maintains a knowledge of printer and terminal relationships. The client does not need to know the LU name of the partner printer in advance. Typically, a client can request a pool name, a specific LU, or a resource without citing a pool name or LU name.

If the client sends an ASSOCIATE request for a resource name to the TN3270 server, the server provides the client with a resource LU name.

In [Figure 3](#), the client requests an LU from *unixpool* and is granted an LU from the specified pool. The client then initiates a new process by requesting the printer device associated with the given resource LU name.

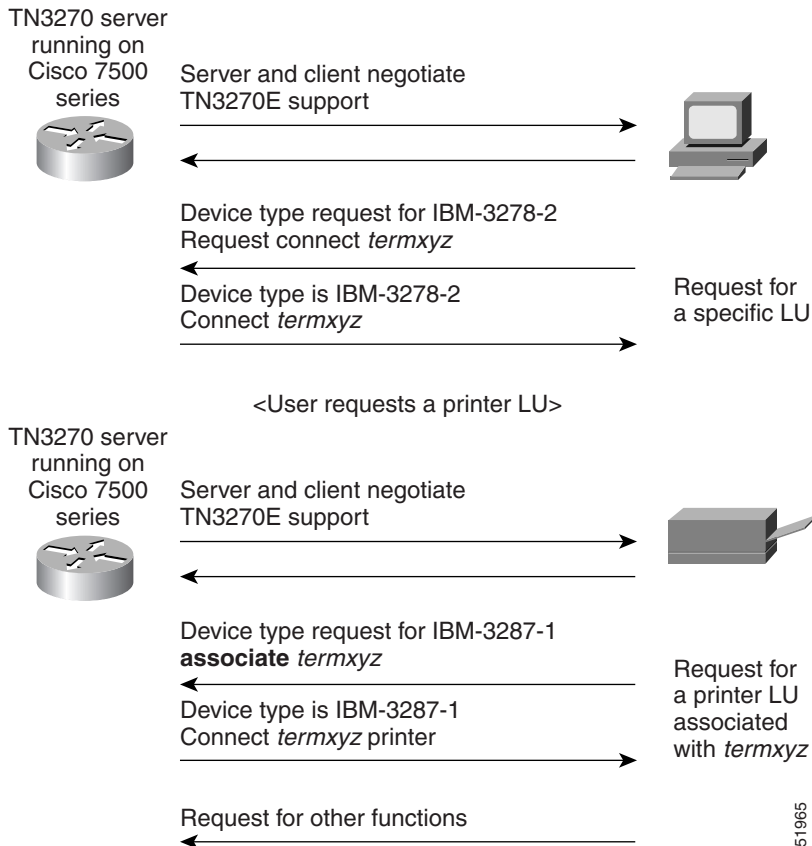
The client requests a printer LU associated with *termabc* and the server grants the printer LU associated with *termabc*. Based on the configuration in the router that specifies the clusters of printer and screen LUs for pools, the TN3270 server assigns and allows the client to use the printer LU associated with its terminal LU.

**Figure 3 Client Request for LU from a Specific Pool and Printer LU Association**



[Figure 4](#) shows the client request for a specific LU *termxyz* and then a request for a printer LU associated with the LU *termxyz*. The TN3270 server grants the screen LU and connects the printer associated with *termxyz*.

**Figure 4** Client Request for a Specific LU and Printer LU Association



## Pooled LU Allocation

When configured, the pool becomes one of several criteria used by the TN3270 server to assign an LU to a client. When a client requests a connection, the TN3270 server determines the authorized capabilities of the client. For example, the TN3270 server attempts to determine whether LU nailing definitions exist for the client.

When the client criteria is processed, the TN3270 server assigns the first available LU in the group to the client. If an appropriate LU is not found, the TN3270 connection is closed.

Screen and printer LUs for a cluster in a pool are allocated according to the following connection scenarios in the TN3270 server:

- The first client with an IP address that is nailed to a pool connects to the TN3270 server—A cluster is reserved for that client IP address. The first appropriate LU in the cluster that satisfies the client connection request is assigned.
- A client, with the same nailed IP address as a currently connected client, connects to the TN3270 server.
  - Depending on the type of LU requested by the client (screen or printer LU), the first available screen or printer LU within a cluster that is reserved for that nailed IP address is allocated.
  - If there is not an available screen or printer LU in an assigned cluster for the client connection, a new cluster is reserved for clients with that IP address. Then, the first appropriate LU in the cluster that satisfies the client connection request is assigned.

- A client, with a new IP address that is nailed to the same pool as other clients, connects to the TN3270 server—The next available cluster is reserved for that client IP address.
- A client requests a specific pool when connecting to the TN3270 server, but the client IP address is not nailed to the pool—The first available LU in the generic pool is allocated to the client.

For a detailed example of these LU allocation scenarios for a TN3270 server configuration using LU pooling, see the “[LU Pooling Configuration Example](#)” section on page 65.

## Session Termination

The TN3270 server supports two configuration options that determine how the server responds when a client turns off the device or disconnects:

- [LU Termination, page 13](#)
- [LU Deletion, page 13](#)

## LU Termination

In Cisco IOS Release 12.0(5)T and later, the TN3270 server supports LU termination options for sending either an UNBIND or a TERMSELF RU when a client turns off the device or disconnects from the server.

The **termself** keyword for the **lu termination** command orders termination of all sessions and session requests associated with an LU when a user turns off the device or disconnects from the server. This is an important feature for applications such as IBM’s Customer Information Control System (CICS).

If you use an UNBIND request for session termination with CICS, Virtual Telecommunication Access Method (VTAM) security problems can arise. When CICS terminates a session from an UNBIND request, the application may reestablish a previous user’s session with a new user, who is now assigned to the same freed LU.

## LU Deletion

In Cisco IOS Release 12.0(5)T and later, the TN3270 server adds support for LU deletion options.

The **lu deletion** command specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM when a client disconnects. This command is recommended in host environments running VTAM version 4.4.1. Previous versions of VTAM are not compatible with Network Management Vector Transport (NMVT) REPLY-PSID.

## Session Termination Scenarios

Sessions are terminated in the following conditions:

- The client logs off the LU-LU session and the LU is configured to disconnect on UNBIND.
- The client disconnects at the TCP layer.
- The client is idle too long or will not respond to a DO TIMING MARK message.

Any of the above conditions cause the server to do one of the following, depending upon how the **lu termination** command is configured:

- **Unbind** is configured—The TN3270 server sends an UNBIND followed by a NOTIFY (Secondary LU (SLU) DISABLED) message to the host. If the **lu deletion** command is configured to send a REPLY-PSID poweroff request, then the TN3270 server sends the request upon receipt of the NOTIFY response from the host.
- **Termself** is configured—The TN3270 server sends a NOTIFY (SLU DISABLED) to the host. Upon receipt of the NOTIFY response from the host, the TN3270 server sends a TERMSELF request to the host. If the **lu deletion** command is configured to send a REPLY-PSID poweroff request, then the TN3270 server sends the request upon receipt of the TERMSELF response.

## Response-Time Collection

Response-time MIB support enables you to capture response-time statistics on the router for either individual sessions and clients or for groups of sessions and clients.

If SNMP is enabled on the router, a network management system (NMS) or users can use well-known and router-configured client group names to obtain response-time statistics. Response-time data collection is always enabled for all in-session clients, excluding printer clients. [Table 2](#) shows the types of client groups that are monitored:

**Table 2** Client Group Types and Names

Client Group Type	Description	Client Group Name
Client Subnet	All clients belonging to one or more IP subnets, where the IP subnets and client group name are configured on the router.	User defined
Other	All clients not belonging to an IP subnet configured for a Client Subnet-type group.	CLIENT SUBNET OTHER
Global	All in-session clients.	CLIENT GLOBAL
Application	All clients in session with a specific VTAM APPL ID.	APPL VTAM- <i>application-name</i>
Host Link	All clients using a specific host link in use by a PU configured on the router.	DIRECT LINK <i>pu-name</i> DLUR LINK <i>link-name</i>
Listen Point	All clients connected to a specific listen point configured on the router.	LP <i>ip-address: tcp-port</i>

The names and IP subnets for the “client subnet” type of response-time group are user-defined. All other client groups are established dynamically by the TN3270 server as clients enter and exit applications. These client groups are named according to the format shown in the column labeled Client Group Name in [Table 1](#).

In Cisco IOS Release 12.2, traps are not generated by the MIB.

Response-time data is collected using the following methods:

- [Sliding-Window Average Response Times, page 15](#)
- [Response-Time Buckets, page 15](#)

## Sliding-Window Average Response Times

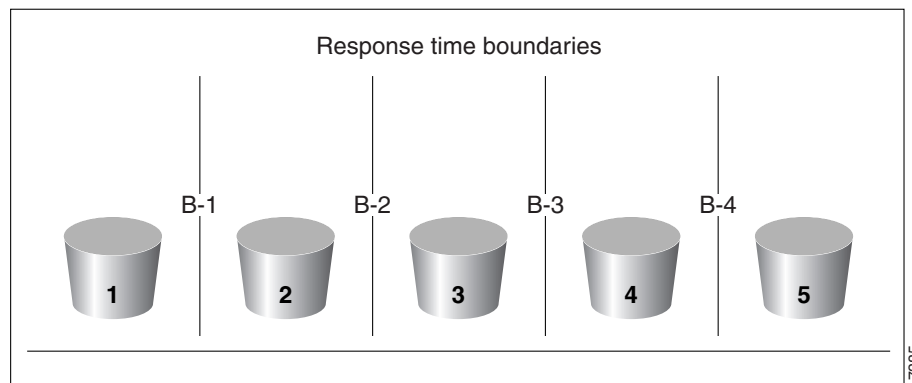
The sliding-window response-time method uses a moving average. It reflects the most recent response time and discounts the old response times. When there is no activity, this method preserves the old response times. The algorithm used for the sliding-window method is similar to the moving-average method. For detailed information about sliding-window average times, refer to the TN3270E-RT-MIB.

## Response-Time Buckets

Response-time buckets contain counts of transactions with total response times that fall into a set of specified ranges. Response-time data gathered into a set of five buckets is suitable for verifying service-level agreements or for identifying performance problems through a network management application. The total response times collected in the buckets is governed by whether IP network transit times are included in the totals.

In [Figure 5](#), four bucket boundaries are specified for a response-time collection, which results in five buckets.

**Figure 5** Response-Time Boundaries



The first response-time bucket counts transactions with total response times that are less than or equal to boundary 1 (B-1), the second bucket counts transactions with response times greater than B-1 but less than or equal to B-2, and so on. The fifth bucket is unbounded, and it counts all transactions with response times greater than boundary 4.

The four bucket boundaries have default values of 1 second, 2 seconds, 5 seconds, and 10 seconds, respectively.

For a detailed explanation of response-time buckets, refer to the *TN3270E-RT-MIB*.

## SSL Encryption Support

The SSL Encryption Support enhancement allows TN3270 clients and servers to negotiate authentication and encryption schemes using the Secure Socket Layer (SSL) technology. The TN3270 server uses SSL version 3.0 to establish secure sessions.

# Preparing to Configure the TN3270 Server

Read the following sections to find important information that is useful to know before you configure the TN3270 server:

- [Hardware and Software Requirements, page 16](#)
- [Design Considerations, page 18](#)
- [Configuring Host Connections, page 18](#)
- [VTAM Host Configuration Considerations, page 18](#)
- [TN3270 Server Configuration Modes, page 21](#)

## Hardware and Software Requirements

This section provides the following information about the hardware and software required to use the TN3270 server:

- [Router Requirements, page 16](#)
- [Mainframe Requirements, page 17](#)
- [TN3270 Client Requirements, page 18](#)

## Router Requirements

The Cisco TN3270 server consists of a system image and a microcode image, which are virtually bundled as one combined image.

The following versions of hardware microcode are supported for the CIP and CPA in Cisco IOS Release 12.1:

- CIP hardware microcode—CIP27-2 and later
- CPA hardware microcode—XCPA27-2 and later

The following versions of hardware microcode are supported for the TN3270 Server Connectivity Enhancements feature on the CIP and CPA in Cisco IOS Release 12.1(5)T:

- CIP hardware microcode—CIP28-1 and later
- CPA hardware microcode—XCPA28-1 and later

To enable the TN3270 server feature, you must have a CMCC adapter installed in a Cisco 7000 with RSP7000, Cisco 7200 series router, or a Cisco 7500 series router.

For additional information about what is supported in the various releases of the Cisco IOS software and the CIP microcode, see the information on [Cisco.com](http://Cisco.com).

## Inverse DNS Nailing

To use inverse DNS Nailing on the TN3270 server, you must specify which DNS servers are required to resolve the TN3270 server client IP addresses. To specify the DNS servers, use the following commands:

- **ip domain-lookup**
- **ip domain-name**
- **ip name-server**



## SSL Encryption

To use TN3270 server SSL encryption, you must be running an IOS image with IPSec support. The strength of the SSL encryption support on the TN3270 server is determined by the strength of the IPSec image.

A server digital certificate loaded on the TN3270 router is also required.

## Mainframe Requirements

Mainframe hosts using SNA with the TN3270 server must be running VTAM V4R2 or later.



### Note

You can use VTAM V3R4, but DLUR operation is not supported in V3R4 and proper DDDLU operation may require program temporary fixes (PTFs) to be applied to VTAM.

## Dynamic LU Naming

The TN3270 server creates and deletes LUs dynamically on VTAM by sending Reply PSID poweron and Reply PSID poweroff messages when the named LU is connected and disconnected. To properly delete the dynamically created LUs, VTAM requires the following APARS:

- OW41274
- OW41686
- OW40315

You must replace the default exit ISTEXCSD with the VTAM User Exit for TN3270 Name Pushing, which you can download from the IBM website: <http://www.ibm.com>. This exit causes VTAM to ignore the LUSEED parameter on the PU statement, and instead use the SLU name sent by the router in the subvector 86 when a client connects in. If you do not configure this exit, VTAM ignores the subvector 86 and the specified LU name.

- If you specify the LUSEED operand for the PU definition in VTAM, and the subvector 86 specifies an LU name, the VTAM User Exit for TN3270 Name Pushing ignores the LUSEED operand.
- If you do not specify the LUSEED operand for the PU definition in VTAM, and the subvector 86 is not present, then the VTAM User Exit for TN3270 Name Pushing cannot generate an LU name. VTAM does not log this failure, and the TN3270 server does not receive the ACTLU request. The TN3270 server displays the following message:

```
*Apr 17 12:40:53:%CIP2-3-MSG:slot2 :  
%TN3270S-3-NO_DYN_ACTLU_REQ_RCVD  
  No ACTLU REQ received on LU JJDL1.6
```

## Inverse DNS Nailing

If there are legacy and inverse DNS nailing statements, the inverse DNS nailing statements take precedence. The TN3270 server attempts an inverse DNS lookup before it checks for any legacy nailing configuration.

Cisco strongly recommends that you configure inverse DNS nailing on a PU that does *not* support generic LUs, or on a PU that has the **generic-pool** command configured but also has the **deny** keyword specified.

## TN3270 Client Requirements

Based on the RFC standards, the Cisco TN3270 server supports any client that implements the TN3270 or TN3270E protocols.

## Design Considerations

The number of sessions that a single TN3270 server can handle is directly related to the number of transactions per second and the amount of memory available to the CIP or CPA. There are other issues to be considered depending upon the environment that you want to support with the TN3270 server.

For comprehensive information about VTAM and router configuration issues and implementing specific TN3270 server scenarios, refer to the *TN3270 Design and Implementation Guide*.

## Handling Large Configurations

The maximum size nonvolatile random-access memory (NVRAM) for the Cisco 7000, Cisco 7200, and Cisco 7500 series routers is 128 KB. The maximum number of nailing commands (commands that map IP addresses to LUs) that can be stored in a 128 KB NVRAM is approximately 4000. However, large configurations may contain as many as 10,000 nailing commands.

To maintain a configuration file that exceeds 128 KB there are two alternatives:

- Store the configuration file compressed in NVRAM.
- Store the configuration file in Flash memory (either internal Flash or on a PCMCIA card).

For more information about maintaining configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*. For information about router hardware and memory, refer to the hardware configuration guide for your Cisco router series.

## Configuring Host Connections

Before configuring the TN3270 server, host connectivity must be configured using one of the following methods:

- Configuring CMPC support
- Configuring CSNA support
- Configuring Token Ring attachment to an FEP

For information about configuring CMPC or CSNA, see the “Configuring CSNA and CMPC” chapter in this publication.

## VTAM Host Configuration Considerations

Other non-Cisco implementations of TN3270 support depend on predefined, static pools of LUs to support different terminal types requested by the TN3270 clients. The Cisco TN3270 server implementation on the CMCC adapter removes the static nature of these configurations by using a VTAM release 3.4 feature called DDDL. DDDL dynamically requests LUs using the terminal type provided by TN3270 clients. The dynamic request eliminates the need to define any LU configuration in the server to support TN3270 clients emulating a generic TN3270 terminal.

To support DDDL, the PUs used by the TN3270 server have to be defined in VTAM with LUSEED and LUGROUP parameters, as shown in the following sample configuration:

Example VTAM host values defining LUSEED and LUGROUP name parameters:

TN3270PU	PU	.	*	Defines other PU parameters
		IDBLK=05D, IDNUM=30001, LUSEED=TN3X1###,	*	Defines the seed component of the LU names created by DDDL (e.g. LOCADDR 42 will have the name TN3X1042)
		LUGROUP=AGROUP	*	Defines the LU group name
*				
TN3X1100	LU	LOCADDR=100, MODETAB=AMODETAB	*	Defines a terminal which requires a specific LU name
*				
TN3X1101	LU	LOCADDR=101, DLOGMODE=M3287CS	*	Defines a printer which requires a specific LU name

Example VTAM host values defining LUGROUPname, AGROUP:

AGROUP	LUGROUP		*	Defines LU group to support various terminal types
327802E	LU	USSTAB=USSXXX, LOGAPPL=TPXP001, DLOGMOD=SNX32702, SSCPFM=USS3270	*	Defines template to support IBM 3278 terminal model 2 with Extended Data Stream. Note that the USS messages in USSXXX should be in 3270 datastream.
3278S2E	LU	USSTAB=USSYYY, LOGAPPL=TPXP001, DLOGMOD=SNX32702, SSCPFM=USSSCS	*	Defines template to support IBM 3278 terminal model 2 with Extended Data Stream, for TN3270E clients requesting BIND-IMAGE.
327805	LU	USSTAB=USSXXX, LOGAPPL=TPXP001, DLOGMOD=D4C32785, SSCPFM=USS3270	*	Defines template to support IBM 3279 terminal model 5
@	LU	USSTAB=USSXXX, LOGAPPL=TPXP001, DLOGMOD=D4A32772, SSCPFM=USS3270		Defines the default template to match any other terminal types

With the configuration shown above defined in the host, the ACTPU sent by VTAM for the PU TN3270PU will have the “Unsolicited NMVT Support” set in the SSCP capabilities control vector. This allows the PU to dynamically allocate LUs by sending network management vector transport (NMVT) with a “Reply Product Set ID” control vector.

After the TN3270 server sends a positive response to the ACTPU, it will wait for VTAM to send ACTLUs for all specifically defined LUs. In the sample configuration shown in [Figure 5](#), ACTLUs will be sent for TN3X1100 and TN3X1101. The server sends a positive response and sets SLU DISABLED. The LOCADDRs of the TN3X1100 and TN3X1101 LUs are put into the specific LU cache and reserved for specific LU name requests only.

To allow sufficient time for the VTAM host to send all the ACTLUs, a 30-second timer is started and restarted when an ACTLU is received. When the timer expires it is assumed that all ACTLUs defined in VTAM for the PU have been sent. All LUs that have not been activated are available in a generic LU pool to be used for DDDLUs unless they have been reserved by the configuration using the **generic-pool deny** TN3270 configuration command.

After the VTAM activation, the server can support session requests from clients using dynamic or specific LU allocation.

For more information about DDDLUs in VTAM, refer to the VTAM operating system manuals for your host system under the descriptions for LUGROUP.


**Note**

If your host computer is customized for a character set other than U.S. English EBCDIC, you might need to code some VTAM configuration tables differently than indicated in the examples provided by Cisco.

Some VTAM configurations include the number sign (#) and at symbol (@). In the U.S. English EBCDIC character set, these characters are stored as the hexadecimal values 7B and 7C, respectively. VTAM will look for those hexadecimal values when processing the configuration file.

The characters used to enter these values are different in other EBCDIC National Language character sets. [Table 3](#) lists the languages that have different characters for the 7B and 7C hexadecimal values and the corresponding symbols used to enter the characters.

For example, a parameter with a value of TN3X1### would have a value of TN3X1£££ for the French National Language character set.

**Table 3** International Character Sets for Hexadecimal Values

	Hexadecimal Value			
	7B		7C	
Language	Symbol	Description	Symbol	Description
German	#	Number sign	§	Section symbol
German (alternate)	Ä	A-dieresis	Ö	O-dieresis
Belgian	#	Number sign	à	a-grave
Brazilian	Õ	O-tilde	Ã	A-tilde
Danish/Norwegian	Æ	AE-ligature	Ø	O-slash
English (U.S./UK)	#	Number sign	@	At symbol
Finnish/Swedish	Ä	A-dieresis	Ö	O-dieresis
French	£	Pound sterling	à	a-grave
Greek	£	Pound sterling	§	Section symbol
Icelandic	#	Number sign	D	Uppercase eth
Italian	£	Pound sterling	§	Section symbol
Portuguese	Õ	O-tilde	Ã	A-tilde
Spanish	Ñ	N-tilde	@	At symbol
Turkish	Ö	O-dieresis	S	S-cedilla

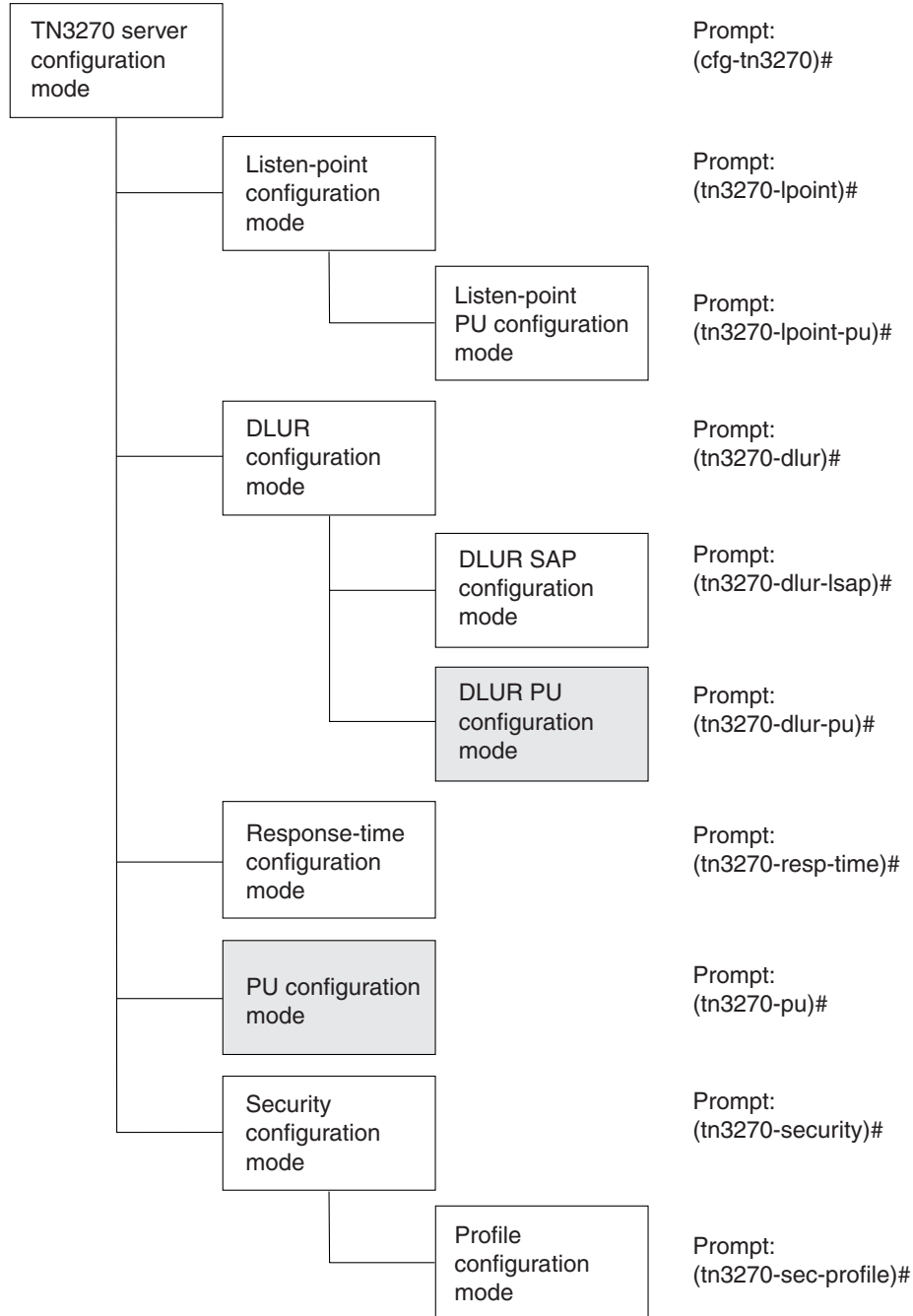
## TN3270 Server Configuration Modes

Figure 6 shows the TN3270 configuration modes that are supported in Cisco IOS Release 12.2 and which are described in the following sections of this topic:

- [TN3270 Server Configuration Mode, page 23](#)
- [Listen-Point Configuration Mode, page 23](#)
- [Listen-Point PU Configuration Mode, page 23](#)
- [DLUR Configuration Mode, page 23](#)
- [DLUR PU Configuration Mode, page 24](#)
- [DLUR SAP Configuration Mode, page 24](#)
- [Response-Time Configuration Mode, page 24](#)
- [PU Configuration Mode, page 24](#)
- [Security Configuration Mode, page 25](#)
- [Profile Configuration Mode, page 25](#)

The TN3270 server can be configured only on the virtual interface of a CMCC adapter. Some configuration commands create entities on the CMCC adapter. For most of these commands, the command changes to the mode associated with that entity (for example, a PU).

When preparing to configure the TN3270 server it is important to understand how to access and move between these different configuration modes. See the [“Moving Between Configuration Modes” section on page 25](#) for more information.

**Figure 6** TN3270 Configuration Modes

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**Note**

The DLUR, DLUR SAP, DLUR PU and PU configuration modes existed in Cisco IOS Release 12.0(5)T and earlier. DLUR PU and PU configuration modes (shown in the shaded boxes) are legacy configuration modes, whose functions can be replaced by the listen-point configuration modes in Cisco IOS Release 12.0(5)T and later. For more information about the relationship of these legacy configuration modes to the new listen-point configuration modes, see the [“Configuring the TN3270 Server with LU Pooling”](#) section on page 41.

## TN3270 Server Configuration Mode

From interface configuration mode, the following **tn3270-server** command puts you in TN3270 server configuration mode:

```
router(config-if)# tn3270-server
```

The following prompt appears:

```
(cfg-tn3270)#
```



### Note

For the CIP, enter interface configuration mode from the virtual channel interface using port 2; For the CPA, enter interface configuration mode from the physical channel interface using port 0.

## Listen-Point Configuration Mode

From the TN3270 server configuration mode, the following **listen-point** command puts you in listen-point configuration mode:

```
router(cfg-tn3270)# listen-point ip-address [tcp-port [number]]
```

The following prompt appears:

```
(tn3270-lpoint)#
```

## Listen-Point PU Configuration Mode

From listen-point configuration mode, you can create direct PUs and DLUR PUs:

- From the listen-point configuration mode, the following **pu** (listen-point) command creates a new direct PU:

```
router#(tn3270-lpoint)# pu pu-name idblk-idnum type adapno lsap [rmac rmac] [rsap rsap] [lu-seed lu-name-stem]
```

The **pu** (listen-point) command puts you in listen-point PU configuration mode and the following prompt appears:

```
(tn3270-lpoint-pu)#
```

- From listen-point configuration mode, the following **pu dlur** command creates a new PU for DLUR:

```
router#(tn3270-lpoint)# pu pu-name idblk-idnum dlur
```

The **pu dlur** command puts you in the listen-point PU configuration mode and the following prompt appears:

```
(tn3270-lpoint-pu)#
```

## DLUR Configuration Mode

From TN3270 server configuration mode, the following **dlur** command puts you in DLUR configuration mode:

```
router(cfg-tn3270)# dlur fq-cpname fq-dlusname
```

The following prompt appears:

```
(tn3270-dlur)#
```

## DLUR PU Configuration Mode



### Note

DLUR PU configuration mode is a legacy configuration mode whose function to define DLUR PUs can be replaced by using the listen-point configuration modes in Cisco IOS Release 12.0(5)T and later. When you define listen-point configurations, you can create DLUR PUs within listen-point PU configuration mode using the **pu dlur** command instead.

From DLUR configuration mode, the following **pu** (DLUR) command creates a new PU for DLUR:

```
router(tn3270-dlur)# pu pu-name idblk-idnum ip-address
```

The **pu** (DLUR) command puts you in the DLUR PU configuration mode and the following prompt appears:

```
(tn3270-dlur-pu)#
```

## DLUR SAP Configuration Mode

From DLUR server configuration mode, the following **lsap** command puts you in DLUR SAP configuration mode:

```
router(tn3270-dlur)# lsap type adapno [lsap]
```

The following prompt appears:

```
(tn3270-dlur-lsap)#
```

## Response-Time Configuration Mode

From TN3270 server configuration mode, the following **response-time group** command puts you in response-time configuration mode:

```
router(cfg-tn3270)# response-time group name [bucket boundaries t1 t2 t3 t4...] [multiplier m]
```

The following prompt appears:

```
(tn3270-resp-time)#
```

## PU Configuration Mode



### Note

PU configuration mode is a legacy configuration mode whose function to define direct PUs can be replaced by using the listen-point configuration modes in Cisco IOS Release 12.0(5)T and later. When you define listen-point configurations, you can create direct PUs within listen-point PU configuration mode using the **pu** (listen-point) command instead.

From TN3270 server configuration mode, the following **pu** (TN3270) command creates a new direct PU:

```
router(cfg-tn3270)# pu pu-name idblk-idnum ip-address type adapno lsap [rmac rmac] [rsap rsap] [lu-seed lu-name-stem]
```

The **pu** (TN3270) command puts you in PU configuration mode and the following prompt appears:

```
(tn3270-pu)#
```



## Security Configuration Mode

From the TN3270 server configuration mode, the following **security** command puts you in security configuration mode:

```
router(cfg-tn3270)# security
```

The following prompt appears:

```
(tn3270-security)#
```

## Profile Configuration Mode

From security configuration mode, the following **profile** command puts you in profile configuration mode:

```
router(cfg-tn3270)# profile profilename {ssl | none}
```

The following prompt appears:

```
(tn3270-sec-profile)#
```

## Moving Between Configuration Modes

In general, the parameters within a configuration mode can be grouped into two categories:

- Parameters to identify the specific instance of the entity (for example, a PU name).
- Parameters to set operating options.

To return to a mode later in the configuration process, use the same configuration command but specify only the first set of identification parameters. The following examples show how to create, access, and remove different TN3270 entities in their associated configuration modes.

### Working with a Listen-Point Direct PU

The following example shows how to create, access, and remove a listen-point PU entity:

1. To create a listen-point direct PU entity called PU1 and enter listen-point PU configuration mode from listen-point configuration mode, use the **pu** (listen-point) command as shown in the following example:

```
router(tn3270-lpoint)# pu PU1 94201231 tok 1 10
```

2. To return later to the listen-point PU configuration mode for the PU1 entity, use the same **pu** (listen-point) command without the “94201231 tok 1 10” parameters from listen-point configuration mode:

```
router(tn3270-lpoint)# pu PU1
```

3. To remove the listen-point PU entity called PU1, use the same command with the **no** keyword:

```
router(tn3270-lpoint)# no pu PU1
```

### Working with a Listen-Point DLUR PU

The following example shows how to create, access, and remove a listen-point DLUR PU entity:

1. To create a listen-point DLUR PU entity called PU2 and enter listen-point PU configuration mode from listen-point configuration mode, use the **pu dlur** command as shown in the following example:

```
router(tn3270-lpoint)# pu PU2 017ABCDE dlur
```

2. To return later to the listen-point PU configuration mode for the PU2 entity, use the same **pu dlur** command without the “017ABCDE dlur” parameters from listen-point configuration mode:

```
router(tn3270-lpoint)# pu PU2
```

3. To remove the listen-point PU entity called PU2, use the same command with the **no** keyword:

```
router(tn3270-lpoint)# no pu PU2
```

### Working with a DLUR Entity

The following example shows how to create, access, and remove a DLUR entity:

1. To create a DLUR entity with a control point name NETA.RTR1 and enter DLUR configuration mode from TN3270 server configuration mode, use the **dlur** command as shown in the following example:

```
router(cfg-tn3270)# dlur NETA.RTR1 NETA.HOST
```

2. To return later to the DLUR configuration mode for the NETA.RTR1 entity, use the same **dlur** command without the “NETA.RTR1 and NETA.HOST” parameters from TN3270 server configuration mode:

```
router(cfg-tn3270)# dlur
```

3. To remove the NETA.RTR1 DLUR entity, use the same **dlur** command with the **no** keyword:

```
router(cfg-tn3270)# no dlur
```

### Working with a DLUR LSAP Entity

The following example shows how to create, access, and remove a DLUR LSAP entity:

1. To create a DLUR LSAP entity and enter DLUR SAP configuration mode from DLUR mode, type the following command:

```
router(tn3270-dlur)#lsap token-adapter 1 84
```

2. To return later to the DLUR SAP configuration mode on the same entity, use the same **lsap** command without the “84” parameter from TN3270 DLUR mode:

```
router(tn3270-dlur)#lsap token-adapter 1
```

3. To remove the DLUR LSAP entity, use the same identification parameters with the **no** keyword:

```
router(tn3270-dlur)#no lsap token-adapter 1
```

# Configuring the TN3270 Server

This section provides information about configuring and verifying the TN3270 server. It describes how to configure the commands that are applicable in multiple configuration modes, and how to configure the many options that are available in the TN3270 server.

This section also describes the tasks to configure the TN3270 server in certain environments, and references the configuration options that are available there. Older TN3270 server configurations that are still supported but are replaced by newer methods of configuration are discussed in the legacy configuration topic.

Finally, this section includes a basic procedure for verifying the TN3270 server configuration.

This section includes the following topics:

- [Configuring TN3270 Siftdown Commands, page 27](#)
- [Configuring the TN3270 Server Options, page 29](#)
- [Configuring the TN3270 Server with LU Pooling, page 41](#)
- [Migrating from Legacy TN3270 Server Configuration Methods, page 52](#)
- [Verifying the TN3270 Server Configuration, page 54](#)

See the “TN3270 Server Configuration Examples” section on page 63 for examples.

## Configuring TN3270 Siftdown Commands

There are many siftdown commands supported by the TN3270 server in multiple configuration modes. Values that you enter for a siftdown command in a subsequent configuration mode might override the values that you have entered for the same command (for the applicable PU only) in a previous configuration mode as shown in the hierarchy in [Figure 6](#).

Consider the following example in which the **keepalive** (TN3270) command is configured in more than one command mode:

```
tn3270-server
keepalive 300
listen-point 10.10.10.1 tcp-port 40
  pu PU1 94223456 tok 1 08
    keepalive 10 send timing-mark 5
  pu PU2 94223457 tok 2 12
```

In this example the **keepalive** (TN3270) command is first configured in TN3270 server configuration mode, which applies to all PUs supported by the TN3270 server. The **keepalive** command is specified again under the listen-point PU configuration mode for PU1, which overrides the previously specified **keepalive** 300 value, for PU1 only. PU2 continues to use the value of the **keepalive** command in the TN3270 server configuration level.

Table 4 provides a list of the TN3270 siftdown commands and the associated configuration modes in which they are supported. An X in the column indicates that the command is supported. A “–” indicates that the command is not supported.

**Table 4** Supported Configuration Modes for TN3270 Siftdown Commands

Siftdown Command	TN3270 Server (cfg-tn3270)#	Listen-Point (tn3270-lpoint)#	Listen-Point PU (tn3270-lpoint-PU)#	DLUR PU (tn3270-dlur-pu)	PU (tn3270-pu)#
generic-pool	X	X	X	X	X
idle-time	X	X	X	X	X
ip precedence	X	X	–	X	X
ip tos	X	X	–	X	X
keepalive	X	X	X	X	X
lu deletion	X	X	X	X	X
lu termination	X	X	X	X	X
tcp-port	X	–	–	X	X
unbind-action	X	X	X	X	X



**Note**

You cannot configure the siftdown commands shown in Table 4 while in DLUR, DLUR SAP, or response-time configuration modes for the TN3270 server.

The siftdown commands apply to the corresponding PUs, according to the configuration mode in which they are entered:

- TN3270 server configuration—The siftdown command at this level applies to all PUs supported by the TN3270 server.
- Listen-point configuration—The siftdown command at this level applies to all PUs defined at the listen point.
- Listen-point PU configuration—The siftdown command at this level applies to only the specified PU.
- PU configuration—The siftdown command at this level applies only to the specified PU.

The **no** form of a siftdown command typically inherits the value from the previously configured siftdown value from the entity above it according to the configuration mode hierarchy shown in Figure 6, or it returns to the default value.

## Configuring the TN3270 Server Options

The TN3270 server supports many options, some of which are available in multiple configuration modes. The topics in this section explain background information about the TN3270 server options including why an option is useful and how you can configure it. The configuration procedures that are provided later in this chapter also indicate where the options are available in the configuration task list.

This section describes how to configure the following options for the TN3270 server:

- [Configuring a Generic Pool of LUs, page 29](#)
- [Configuring Idle-Time, page 30](#)
- [Configuring IP Precedence, page 31](#)
- [Configuring IP ToS, page 31](#)
- [Configuring Keepalive, page 32](#)
- [Configuring LU Allocation and LU Nailing, page 33](#)
- [Configuring LU Deletion, page 34](#)
- [Configuring LU Termination, page 35](#)
- [Configuring the Maximum Number of Sessions Supported by the Server, page 35](#)
- [Configuring the Maximum Number of Sessions That Can be Obtained by a Single Client, page 36](#)
- [Configuring the TCP Port, page 37](#)
- [Configuring Timing Marks, page 37](#)
- [Configuring the Unbind Action, page 38](#)
- [Configuring SSL Encryption Support, page 38](#)

Most of these options are available in multiple command modes and are called “siftdown” commands. For more information about how siftdown commands work, see the “[Configuring TN3270 Siftdown Commands](#)” section on page 27.

Refer to the “TN3270 Server Commands” chapter of the *Cisco IOS Bridging and IBM Networking Command Reference* (Volume 2 of 2) for additional information about the commands described in this section and chapter.

### Configuring a Generic Pool of LUs

Configuring a generic pool of LUs in the TN3270 server specifies that “leftover” LUs from a pool of dynamic LUs are available to TN3270 sessions that do not request a specific LU or LU pool through TN3270E. All LUs in a generic pool are DDDLU capable.

A leftover LU is an inactive LU from a pool of dynamic LUs, which are defined in the switched major node in VTAM using the LU-SEED parameter and the LUGROUP parameter. A leftover LU is defined as an LU where all of the following conditions are true:

- The SSCP did not send an ACTLU during PU start-up.
- The PU controlling the LU is capable of carrying product set ID (PSID) vectors on NMVT messages, thus allowing DDDLU operation for that LU.

The default behavior is to permit a generic pool of LUs in the TN3270 server and allow leftover LUs to be used for dynamic connections. You might deny the use of the generic pool for security reasons.

To configure a generic pool of LUs for the TN3270 server, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>generic-pool</b> { <b>permit</b>   <b>deny</b> }	<p>(Optional) Specifies whether leftover LUs can be used from a generic LU pool. The available options for this command are:</p> <ul style="list-style-type: none"> <li>• <b>permit</b>—Specifies that leftover LUs can be used by clients that request a generic session. Inactive LUs are immediately available for dynamic connections. This is the default.</li> <li>• <b>deny</b>—Specifies that the TN3270 server does not allow any further dynamic connections of any LUs on the PU. That is, only static LUs are supported.</li> </ul>

The **generic-pool** command takes effect immediately for all upcoming connections, but existing sessions are unaffected. Once the existing sessions are terminated, then future connections will abide by the latest generic pool configuration for that PU. Use the **no** form of this command to selectively remove the permit or deny condition of generic pool use for the corresponding PU and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **generic-pool** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Configuring Idle-Time

The idle time option in the TN3270 server specifies the allowable duration of inactivity in the client-server session before the TN3270 server disconnects an LU.

To prevent an LU session from being disconnected due to inactivity, specify an idle time value of 0 seconds. Note that TIMING-MARKS generated by the TN3270 server keepalive function are not considered “activity” on the client connection.



### Note

There are two TN3270 server options that can affect when a session is disconnected—idle time and keepalive. These two options operate independently of each other and both can be used to clean up partially disconnected sessions. Whichever option first detects that a session is eligible for disconnect immediately causes the TN3270 server to disconnect that session. If you are specifying both the idle time and keepalive options, then you might consider how the values for these options determine when client sessions are disconnected to achieve the response that you want.

To configure the allowable amount of idle time before the TN3270 server disconnects an LU, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>idle-time</b> <i>seconds</i>	(Optional) Specifies the number of seconds of inactivity before the TN3270 server disconnects an LU.

The default behavior in TN3270 server configuration mode is that the session is never disconnected (or, a value of 0). The default value in other configuration modes is the value currently configured for that PU in a previously supported mode. Use the **no** form of this command to cancel the idle time period and return to the default for the corresponding PU.

The **idle-time** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Configuring IP Precedence

Configuring the IP precedence option in the TN3270 server allows you to assign different priority levels to IP traffic on a PU in the TN3270 server. IP precedence values are used with the weighted fair queueing (WFQ) or priority queueing features on a Cisco router to allow you to prioritize traffic. IP precedence and IP ToS values are used together to manage network traffic priorities.

The TN3270 server allows you to specify different IP precedence values for screen and printer clients because the communication requirements for each type of client is different. Screen clients are characterized by interactive communication which normally demands a higher priority of data transfer than printers. Printers are characterized by bulk data transfer where priority of sending the data is not as high.

To configure the traffic priority for screen and printer clients in the TN3270 server, use the following command in TN3270 server, listen-point, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>ip precedence</b> { <b>screen</b>   <b>printer</b> } <i>value</i>	(Optional) Specifies the precedence level (from 0 to 7) for IP traffic in the TN3270 server. The default value is 0.

Use the **no** form of this command to remove the screen or printer precedence value for the corresponding PU and return to the previously configured siftdown value applicable to the PU, or to the default value. However, you can enter new or different values for IP precedence without first using the **no** form of the command.

The **ip precedence** command in the TN3270 server is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Configuring IP ToS

Configuring the IP ToS option in the TN3270 server allows you to assign different levels of service to traffic on a PU in the TN3270 server. IP ToS values are used with the WFQ and NetFlow switching features on a Cisco router. The Open Shortest Path First (OSPF) protocol can also discriminate between different routes based on IP ToS values. IP ToS and IP precedence values are used together to manage network traffic priorities.

The TN3270 server allows you to specify different IP ToS values for screen and printer clients because the communication requirements for each type of client is different. Screen clients are characterized by interactive communication which normally demands a higher priority of data transfer than printers. Printers are characterized by bulk data transfer where priority of sending the data is not as high.

To configure the level of service for screen and printer clients in the TN3270 server, use the following command in TN3270 server, listen-point, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>ip tos</b> { <b>screen</b>   <b>printer</b> } <i>value</i>	(Optional) Specifies a type of service level (from 0 to 15) for IP traffic in the TN3270 server.

Use the **no** form of this command to remove the screen or printer ToS value for the corresponding PU and return to the previously configured siftdown value applicable to the PU, or to the default value. However, you can enter new or different values for IP ToS without first using the **no** form of the command.

The **ip tos** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Configuring Keepalive

The keepalive options for the TN3270 server allow you to monitor the availability of a TN3270 client session by sending timing marks or Telnet no operation (**nop**) commands. You can configure the frequency and the type of keepalive that the TN3270 server sends to a client and when the TN3270 server determines that a client is inactive.

When you configure the **keepalive** command to send Telnet **nop** commands, no response is required by the client. If you specify only the keepalive interval, then the TN3270 server sends timing marks.

The default behavior of the TN3270 server is to send timing marks every 30 minutes if there is no other traffic flowing between the TN3270 client and server. The TN3270 server disconnects a session if the client does not respond within 30 seconds.

The **keepalive** command affects currently active and future TN3270 sessions. For example, reducing the keepalive interval for timing marks to a smaller nonzero value causes an immediate burst of DO TIMING-MARKS on those sessions that have been inactive for a period of time greater than the new, smaller value.



### Note

There are two TN3270 server options that can affect when a session is disconnected—idle time and keepalive. These two options operate independently of each other and both can be used to clean up partially disconnected sessions. Whichever option first detects that a session is eligible for disconnect immediately causes the TN3270 server to disconnect that session. If you are specifying both the idle time and keepalive options, then you might consider how the values for these options determine when client sessions are disconnected to achieve the response that you want.



To configure the keepalive options for the TN3270 server, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
<pre>Router# <b>keepalive</b> <i>seconds</i> [<b>send</b> {<b>nop</b>   <b>timing-mark</b> [<i>max-response-time</i>]}]</pre>	<p>(Optional) Specifies the number of seconds (from 0 to 65535) of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client. A value of 0 means that no keepalive signals are sent. The default interval is 1800 seconds (30 minutes). The following options are available:</p> <ul style="list-style-type: none"> <li>• <b>send nop</b>—Sends the Telnet command for no operation to the TN3270 client to verify the physical connection.</li> <li>• <b>send timing-mark</b> [<i>max-response-time</i>]—Sends timing marks to verify the status of the client session and specifies the number of seconds (from 0 to 32767) within which the TN3270 server expects a response. The default maximum response time is 30 seconds if the keepalive interval is greater than or equal to 30 seconds. If the value of the keepalive interval is less than 30 seconds, then the default <i>max-response-time</i> is the value of the interval. The value of <i>max-response-time</i> should be less than or equal to the interval.</li> </ul>

Use the **no** form of the command to cancel the current keepalive period and type and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **keepalive** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Configuring LU Allocation and LU Nailing

With the addition of the LU pooling and listen-point configuration methods in Cisco IOS Release 12.0(5)T, the TN3270 server supports multiple methods of allocating LUs and assigning or “nailing” those LUs to a particular client or group of clients.

The TN3270 server supports nailing individual clients to a specific LU and nailing clients to pools. The individual nailing method is useful when a particular client must use a specific LU. Nailing clients to pools is useful when a client needs to have one of a group of LUs associated with a particular PU. For more information about these methods of LU nailing, see the [“Methods of LU Nailing” section on page 53](#).

LU pooling configuration methods using listen points provides an efficient means of configuring clusters of screens and printer LUs into pools, and allocating LOCADDRs. Then, multiple clients can be assigned or “nailed” to those pools to be given access to those LUs.



### Note

You cannot specify the same LOCADDR in both an individual LU nailing statement and in a pool. The CMCC adapter does not allow a LOCADDR to be allocated multiple times, so the LU allocations in the TN3270 server must not overlap.

## Nailing Clients to Specific LUs

To nail a client to a specific LU use the following command in PU configuration mode or listen-point PU configuration mode:

Command	Purpose
Router# <b>client</b> [ <b>printer</b> ] <b>ip</b> <i>ip-address</i> [ <i>mask</i> ] <b>lu</b> <i>first-locaddr</i> [ <i>last-locaddr</i> ]	(Optional) Allocates a specific LU or range of LUs to a client located at the IP address or subnet.

## Nailing Clients to Pools

To nail a client to a pool of LUs use the following command in listen-point configuration mode:

Command	Purpose
Router(tn3270-lpoint)# <b>client ip</b> <i>ip-address</i> [ <i>mask</i> ] <b>pool</b> <i>poolname</i>	(Optional) Nails a client located at the IP address or subnet to a pool.

## Allocating LUs to Pools

To allocate LUs to a pool use the following command in listen-point PU configuration mode:

Command	Purpose
Router(tn3270-lpoint-pu)# <b>allocate lu</b> <i>lu-address</i> <b>pool</b> <i>poolname</i> <b>clusters</b> <i>count</i>	(Optional) Assigns LUs to the pool beginning with the LOCADDR specified by <i>lu-address</i> for a total of <i>count</i> LUs.

## Configuring LU Deletion

The LU deletion options for the TN3270 server specify whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects. The LU deletion command is useful to prevent screen LUs from attaching to an LU that was used by a previous session that designates an incompatible screen size for the current LU.

The default behavior of the TN3270 server is to never delete LUs upon disconnect. This option is useful when you only have screen LUs and they all use the same screen size.

To configure the LU deletion options for the TN3270 server, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b> }	(Optional) Specifies when the TN3270 server sends a REPLY-PSID poweroff request for an LU upon disconnect. The following options are available: <ul style="list-style-type: none"> <li>• <b>always</b>—Specifies deletion of all dynamic LUs upon disconnect.</li> <li>• <b>normal</b>—Specifies deletion of only screen LUs upon disconnect.</li> <li>• <b>non-generic</b>—Specifies deletion of specified LUs. (Available when VTAM supports deletion of specifically-named LUs. Not available as of VTAM version 4.4.1.)</li> <li>• <b>never</b>—Specifies that LUs are never deleted upon disconnect. This is the default.</li> </ul>

Use the **no** form of the command to remove LU deletion from the current configuration scope and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **lu deletion** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

For additional information about how sessions are terminated, see the [“Session Termination” section on page 13](#).

## Configuring LU Termination

The LU termination options for the TN3270 server specify the type of RU sent by the TN3270 server upon LU disconnect. The default behavior of the TN3270 server is to send an UNBIND request to the application to terminate the session.

With some applications (such as CICS), VTAM security problems can arise from an UNBIND request. In some cases the application might reestablish a previous user’s session with a new user, who is now assigned to the same freed LU. To prevent this you can configure the TN3270 server to send a TERMSELF RU.

Use the **termself** keyword of the **lu termination** command when you want to be sure that the application terminates the session when the LU disconnects.

To configure the LU termination options for the TN3270 server, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
Router# <b>lu termination</b> { <b>termself</b>   <b>unbind</b> }	<p>(Optional) Specifies the type of RU sent by the TN3270 server when a client turns off the device or disconnects. The following options are available:</p> <ul style="list-style-type: none"> <li>• <b>termself</b>—Orders termination of all sessions and session requests associated with an LU upon disconnect.</li> <li>• <b>unbind</b>—Requests termination of the session by the application upon LU disconnect. This is the default.</li> </ul>

Use the **no** form of the command to remove LU termination from the current configuration scope and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **lu termination** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

For additional information about how sessions are terminated, see the [“Session Termination” section on page 13](#).

## Configuring the Maximum Number of Sessions Supported by the Server

Configuring the maximum number of LU control blocks on the TN3270 server determines the limit on the number of sessions that the TN3270 server can support on the CMCC adapter. The practical limit (within the allowable range for the option) is determined in part by your licensing structure for the CMCC and on your hardware and usage characteristics.

Each control block uses about 1 KB of memory, with a possible 2 KB per LU additionally required for data during session activity. The TN3270 server attempts to allocate one LU control block for each LU activated by the host. For DDDL, the control block is allocated when the client requests the LU, in anticipation of an ACTLU from the SSCP host.

By limiting the number of LU control blocks allocated, you can limit how much memory is used for the TN3270 server and be sure that memory is available to support other CMCC functions.

To configure the maximum number of LUs allowed for the TN3270 server, use the following command in TN3270 server configuration mode:

Command	Purpose
Router(cfg-tn3270)# <b>maximum-lus</b> <i>number</i>	(Optional) Specifies the maximum number (between 0 and 32000) of LU control blocks allowed for the TN3270 server. The default is 2100.

Use the **no** form of the command to restore the default value. Although you can change the value of the **maximum-lus** command at any time, you must deactivate the PU (DACTPU) or use the **no pu** command to free allocated control blocks if you reduce the maximum number below the current number of allowable LU control blocks.

## Configuring the Maximum Number of Sessions That Can be Obtained by a Single Client

Configuring the maximum number of LU sessions for a TN3270 client limits the number of LU sessions that a client at a specified IP address or IP subnet can establish with the TN3270 server. Establishing this limit prevents a single workstation from using all of the available resources on the TN3270 server. If you configure LU pools and maximum LU sessions, the maximum LU session value limits the number of LOCADDRs that a client can connect to across all pools to which the client belongs.

If you do not configure the maximum number of LU sessions, the default configuration specifies no limit on the number of concurrent sessions from one client IP address.

To configure the maximum number of LU sessions allowed for a TN3270 client, use the following command in TN3270 server configuration mode:

Command	Purpose
Router(cfg-tn3270)# <b>client</b> [ <i>ip</i> [ <i>ip-mask</i> ]] <b>lu maximum</b> <i>number</i>	(Optional) Specifies the maximum number of LU sessions (between 0 and 65535) for each client IP address or IP subnet address.

Use the **no** form of the command to remove a single LU limit associated with a particular IP address, or to restore a default value of 65535.



### Note

There is no relationship between the **allocate lu** command and the **client lu maximum** command. The **allocate lu** command assigns named LOCADDRs to a pool. More than one TN3270 client can access pools and there is no relationship between the number of LUs assigned to a pool and the maximum number of LUs that one client can use.

## Configuring the TCP Port

Configuring the TCP port option allows you to override the default TCP port setting of 23, which is the Internet Engineering Task Force (IETF) standard. The value of 65535 is reserved by the TN3270 server.

There are two ways that you can configure the TCP port:

- Using TN3270 server or PU configuration modes for the PU. This is the only method supported in legacy configurations, prior to Cisco IOS Release 12.0(5)T.
- In Cisco IOS Release 12.0(5)T and later, the TCP port can alternatively be configured in a listen point for the PU.

### Legacy Configuration

To configure the TCP port in legacy configurations that do not implement a listen point, use the following command in TN3270 server, PU, or DLUR PU configuration modes:

Command	Purpose
Router(cfg-tn3270)# <b>tcp-port</b> <i>number</i>	(Optional) Specifies the TCP port (between 0 and 65534) to be used for the PU. The default TCP port number is 23.

Use the **no** form of the command to remove the TCP port from the current configuration scope and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **tcp-port** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

### Listen-point Configuration

To configure the TCP port in listen-point configurations, use the following command in TN3270 server configuration mode:

Command	Purpose
Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> [ <i>number</i> ]]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.

Use the **no** form of the command to remove a listen point for the TN3270 server.

## Configuring Timing Marks

Configuring the timing marks option for the TN3270 server specifies whether the TN3270 server sends a WILL TIMING-MARK in response to a definite or pacing request by a host application.

The default behavior of the TN3270 server is to send timing marks only for the keepalive function. If you configure the TN3270 server to send timing marks to achieve an end-to-end response protocol, then a WILL TIMING-MARK is sent by the TN3270 server when any of the following conditions are true:

- The host application requests a pacing response.
- The host application requests a definite response (DR), and either the client is not using TN3270E, or the request is not Begin Chain.

The use of timing marks can degrade performance. Some clients do not support timing marks used in this way. Therefore you should only configure timing marks when both of the following conditions are true:

- All clients support this timing mark usage.
- The application benefits from end-to-end acknowledgment.

To configure the timing marks option for the TN3270 server, use the following command in TN3270 server configuration mode:

Command	Purpose
Router (cfg-tn3270) # <b>timing-mark</b>	(Optional) Specifies that the TN3270 server sends a WILL TIMING-MARK in response to an application request for a pacing or definite response.

Use the **no** form of the command to disable the sending of WILL TIMING-MARK except as used by the keepalive function.

## Configuring the Unbind Action

Configuring the unbind action for the TN3270 server allows you to specify how the TN3270 server responds when it receives an UNBIND request. The TN3270 server can either keep the session or disconnect.

The default behavior in TN3270 server configuration mode is to disconnect the client session upon receipt of an UNBIND. In other configuration modes the default behavior is the currently configured value in the configuration mode applicable to the PU.

To configure the unbind action for the TN3270 server, use the following command in TN3270 server, listen-point, listen-point PU, PU, or DLUR PU configuration modes:

Command	Purpose
Router (cfg-tn3270) # <b>unbind-action</b> { <b>keep</b>   <b>disconnect</b> }	(Optional) Specifies whether the TN3270 session disconnects when an UNBIND request is received.

Use the **no** form of the command to remove the unbind action from the current configuration scope and return to the previously configured siftdown value applicable to the PU, or to the default value.

The **unbind-action** command is a siftdown command that is available in multiple command modes. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands”](#) section on page 27.

## Configuring SSL Encryption Support

Perform the tasks in the following sections to configure the SSL Encryption feature:

- [Obtaining Server Digital Certificate from Certificate Authority, page 39](#) (Required)
- [Loading Server Digital Certificate onto the Flash of the TN3270 Router, page 39](#) (Required)
- [Configuring Security, page 39](#) (Required)
- [Configuring the Profile, page 39](#) (Required)
- [Configuring the Profile Options, page 40](#) (Optional)

- [Configuring the Default Profile, page 40](#) (Optional)
- [Configuring a Listen Point for Security, page 40](#) (Optional)

### Obtaining Server Digital Certificate from Certificate Authority

To obtain a server digital certificate, first create a certificate signing request pointer to the Readme.csr file. The certificate must be in PEM or Base 64 format.

After you obtain the server digital certificate, append the private key file to the digital certificate.

### Loading Server Digital Certificate onto the Flash of the TN3270 Router

Copy the digital certificate to the Flash card on the TN3270 router.

### Configuring Security

To configure security on the TN3270 server, use the following command beginning in TN3270 server configuration mode:

Command	Purpose
Router(cfg-tn3270)# <b>security</b>	Enables security on the TN3270 server and enters security configuration mode.

To enable and disable security on the TN3270 server, use the following commands beginning in security configuration mode:

Command	Purpose
Router(tn3270-security)# <b>enable</b>	(Optional) Enables security in the TN3270 server.
Router(tn3270-security)# <b>disable</b>	(Optional) Disables the security feature in the TN3270 server.

### Configuring the Profile

To configure a security profile on the TN3270 server, use the following command beginning in security configuration mode:

Command	Purpose
Router(tn3270-security)# <b>profile</b> <i>profilename</i> { <b>ssl</b>   <b>none</b> }	Specifies a name and a security protocol for a security profile.

## Configuring the Profile Options

To configure the security profile options, use the following commands beginning in profile configuration mode:

Command	Purpose
Router(tn3270-sec-profile)# <b>keylen</b> {40   128}	Specifies the maximum bit length for the session encryption key for the TN3270 server.
Router(tn3270-sec-profile)# <b>encryptorder</b> [DES] [3DES] [RC4] [RC2] [RC5]	Specifies the encryption algorithm for the TN3270 SSL Encryption Support.
Router(tn3270-sec-profile)# <b>servercert</b> <i>location</i>	Specifies the location of the TN3270 server's security certificate in the Flash memory. This command reads the security certificate from the specified location.
Router(tn3270-sec-profile)# <b>certificate</b> <b>reload</b>	(Optional) Reads the profile security certificate from the file specified in the <b>servercert</b> command.

## Configuring the Default Profile

To configure the default security profile name to be applied to the listen-points, use the following command beginning in security configuration mode:



### Note

The **profile** command must be specified before configuring a default-profile.

Command	Purpose
Router(tn3270-security)# <b>default-profile</b> <i>profilename</i>	Specifies the name of the profile to be applied to the listen-points by default.

## Configuring a Listen Point for Security

To configure a listen-point for security, use the following command beginning in TN3270 listen-point configuration mode:



### Note

The **sec-profile** command is optional if the **default-profile** command has been configured.

Command	Purpose
Router(tn3270-lpoint)# <b>sec-profile</b> <i>profilename</i>	Specifies the security profile to be associated with a listen-point.



## Configuring the TN3270 Server with LU Pooling

This section describes the required tasks to configure the TN3270 server with LU pooling in an APPN environment using DLUR PUs and in a non-APPN environment using direct PUs.

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- Step 1** Before configuring the TN3270 server, follow the [“Guidelines for Configuring LU Pooling”](#) section on page 42.
- Step 2** Before you begin configuring the TN3270 server, be sure that you have configured host connectivity to the router. For more information about configuring host connectivity, see the [“Configuring Host Connections”](#) section on page 18.
- Step 3** Complete the following tasks to configure the TN3270 server with LU pooling in an APPN environment using DLUR:
- [Configuring the TN3270 Server and Defining a Pool](#), page 42
  - [Configuring DLUR](#), page 43
  - [Configuring SAPs Under DLUR](#), page 44
  - [Configuring a Listen Point and Nailing Clients to Pools](#), page 44
  - [Configuring Inverse DNS Nailing](#), page 45
  - [Configuring a Listen-Point PU to Define DLUR PUs and Allocate LUs](#), page 47
  - [Configuring a Listen-Point PU to Define DLUR PUs using Dynamic LU Naming](#), page 48



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**Note** You can also use DLUR to reach a mix of APPN and non-APPN hosts. The host owning the PUs must be an APPN network node that also supports the subarea (that is, an interchange node). When an SLU starts a session with any of the APPN hosts, it can use session switching to reach that host directly. When it starts a session with a non-APPN host, the traffic will be routed through the owning host.

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- Step 4** Complete the following tasks to configure the TN3270 server with LU pooling in a non-APPN environment:
- [Configuring the TN3270 Server and Defining a Pool](#), page 49
  - [Configuring a Listen Point and Nailing Clients to Pools](#), page 50
  - [Configuring a Listen-Point PU to Define Direct PUs and Allocate LUs](#), page 51
  - [Configuring a Listen-Point PU to Define Direct PUs using Dynamic LU Naming](#), page 52



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**Note** The differences between the configuration tasks in a non-APPN environment and the APPN configuration tasks are that you do not configure DLUR or SAPs under DLUR, and you configure direct PUs at the listen point instead of DLUR PUs. All other options are the same.

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Refer to the [“Configuring the TN3270 Server Options”](#) section on page 29 of this publication and the [“TN3270 Server Commands”](#) chapter of the *Cisco IOS Bridging and IBM Networking Command Reference* (Volume 2 of 2) for additional information about the commands described in this section and chapter.

## Guidelines for Configuring LU Pooling

To configure LU pools on the TN3270 server on a CMCC adapter, perform the following tasks:

1. Define a pool using the **pool** command.
2. Allocate specific LOCADDRs or LUs to the pool using the **allocate lu** command.
3. (Optional) Nail clients to the pool using the **client ip pool** command.

When configured, the pool becomes one of the several criteria used by the TN3270 server to assign an LU to a client. When a client requests a connection, the TN3270 server determines the authorized capabilities of the client. For example, the TN3270 server attempts to determine whether LU nailing definitions exist for the client.

Client preferences are taken into consideration. Examples of client preferences are:

- Device name on CONNECT request (TN3270E)
- LU name on **TERMINAL-TYPE** command (RFC 1576)
- Model type

When the client criteria is processed, the TN3270 server assigns the first available LU in the group to the client. If an appropriate LU is not found, the TN3270 connection is closed.

For more information about LU allocation in the TN3270 server, see the [“LU Allocation” section on page 6](#). For an example of how LUs are allocated within LU pools, see the [“LU Pooling Configuration Example” section on page 65](#).

## Configuring the TN3270 Server and Defining a Pool

To establish a TN3270 server on the internal LAN interface on the CMCC adapter and configure LU pooling, use the following commands beginning in global configuration mode. When you use the **tn3270-server** command, you enter TN3270 server configuration mode and can use all other commands in the task list.

	Command	Purpose
<b>Step 1</b>	Router(config)# <b>interface channel slot/port</b>	Selects the interface on which to configure the TN3270 server and enters interface configuration mode. The <i>port</i> value differs by the type of CMCC adapter: <ul style="list-style-type: none"> <li>• CIP—<i>Port</i> value corresponds to the virtual interface, which is port 2.</li> <li>• CPA—<i>Port</i> value corresponds to port 0.</li> </ul>
<b>Step 2</b>	Router(config-if)# <b>tn3270-server</b>	Specifies a TN3270 server on the internal LAN interface and enters TN3270 server configuration mode.
<b>Step 3</b>	Router(cfg-tn3270)# <b>pool poolname [cluster layout [layout-spec-string]]</b>	Defines clusters of LUs and allocates LOCADDRs.
<b>Step 4</b>	Router(cfg-tn3270)# <b>generic-pool {permit   deny}</b>	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
<b>Step 5</b>	Router(cfg-tn3270)# <b>idle-time seconds</b>	(Optional) Specifies the idle time for server disconnect.

	Command	Purpose
Step 6	Router(cfg-tn3270)# <b>ip precedence</b> {screen   printer} value	(Optional) Specifies the precedence level for IP traffic in the TN3270 server.
Step 7	Router(cfg-tn3270)# <b>ip tos</b> {screen   printer} value	(Optional) Specifies the ToS level for IP traffic in the TN3270 server.
Step 8	Router(cfg-tn3270)# <b>keepalive</b> seconds [send {nop   timing-mark [max-response-time]]	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
Step 9	Router(cfg-tn3270)# <b>lu deletion</b> {always   normal   non-generic   never}	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
Step 10	Router(cfg-tn3270)# <b>lu termination</b> {termself   unbind}	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off or disconnects a device.
Step 11	Router(cfg-tn3270)# <b>maximum-lus</b> number	(Optional) Specifies the maximum number (between 0 and 32000) of LU control blocks allowed for the TN3270 server. The default is 2100.
Step 12	Router(cfg-tn3270)# <b>client</b> [ip [ip-mask]] <b>lu maximum</b> number	(Optional) Specifies the maximum number (between 0 and 65535) of LU sessions allowed for a client at an IP address or IP subnet address.
Step 13	Router(cfg-tn3270)# <b>timing-mark</b>	(Optional) Specifies that the TN3270 server sends a WILL TIMING-MARK in response to an application request for a pacing or definite response.
Step 14	Router(cfg-tn3270)# <b>unbind-action</b> {keep   disconnect}	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.

## Configuring DLUR

This task is required when configuring DLUR connected hosts. To configure DLUR parameters for the TN3270 server, use the following commands beginning in TN3270 server configuration mode:

	Command	Purpose
Step 1	Router(cfg-tn3270)# <b>dlur</b> fq-cpname fq-dlusname	Creates a DLUR function in the TN3270 server and enters DLUR configuration mode.
Step 2	Router(tn3270-dlur)# <b>dlus-backup</b> dlusname2	(Optional) Specifies a backup DLUS for the DLUR function.
Step 3	Router(tn3270-dlur)# <b>preferred-nnserver</b> NNserver	(Optional) Specifies the preferred network node (NN) server.

## Configuring SAPs Under DLUR

To configure SAPs under the DLUR function, use the following commands beginning in DLUR configuration mode:

	Command	Purpose
<b>Step 1</b>	Router(tn3270-dlur)# <b>lsap</b> type adapno [ <i>lsap</i> ]	Creates a SAP function under DLUR and enters DLUR SAP configuration mode.
<b>Step 2</b>	Router(tn3270-dlur-lsap)# <b>vrn</b> vrn-name	(Optional) Identifies an APPN virtual routing node (VRN).
<b>Step 3</b>	Router(tn3270-dlur-lsap)# <b>link</b> name [ <b>r</b> mac rmac] [ <b>rsap</b> rsap]	(Optional) Creates named links to hosts. A link should be configured to each potential NN server. (The alternative is to configure the NN servers to connect to DLUR.) If VRN is used it is not necessary to configure links to other hosts. Do not configure multiple links to the same host.

## Configuring a Listen Point and Nailing Clients to Pools

To configure a listen point on the internal LAN interface on the CMCC adapter and nail clients to pools, use the following commands beginning in TN3270 server configuration mode.

When you use the **listen-point** command, you enter listen-point configuration mode and can use all other commands in this task list. Values that you enter for sift-down commands in listen-point configuration mode will override values that you previously entered in TN3270 server configuration mode.

	Command	Purpose
<b>Step 1</b>	Router(cfg-tn3270)# <b>listen-point</b> ip-address [ <b>tcp-port</b> number]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 2</b>	Router(tn3270-lpoint)# <b>client ip</b> ip-address [ <i>mask</i> ] pool poolname	Nails a client located at the IP address or subnet to a pool.
<b>Step 3</b>	Router(tn3270-lpoint)# <b>generic-pool</b> { <b>permit</b>   <b>deny</b> }	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
<b>Step 4</b>	Router(tn3270-lpoint)# <b>idle-time</b> seconds	(Optional) Specifies the idle time for server disconnect.
<b>Step 5</b>	Router(tn3270-lpoint)# <b>ip precedence</b> { <b>screen</b>   <b>printer</b> } value	(Optional) Specifies the precedence level for IP traffic in the TN3270 server.
<b>Step 6</b>	Router(tn3270-lpoint)# <b>ip tos</b> { <b>screen</b>   <b>printer</b> } value	(Optional) Specifies the ToS level for IP traffic in the TN3270 server.

Command	Purpose
<b>Step 7</b> Router(tn3270-lpoint)# <b>keepalive</b> <i>seconds</i> [ <b>send</b> { <b>nop</b>   <b>timing-mark</b> [ <i>max-response-time</i> ]}]	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>• Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>• Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
<b>Step 8</b> Router(tn3270-lpoint)# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b> }	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
<b>Step 9</b> Router(tn3270-lpoint)# <b>lu termination</b> { <b>termself</b>   <b>unbind</b> }	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off or disconnects a device.
<b>Step 10</b> Router(tn3270-lpoint)# <b>unbind-action</b> { <b>keep</b>   <b>disconnect</b> }	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.

## Configuring Inverse DNS Nailing

Perform the tasks in the following section to configure the different methods of Inverse DNS Nailing feature:

- [Nailing Clients to Pools by IP Address, page 45](#)
- [Nailing Clients to Pools by Device Name, page 46](#)
- [Nailing Clients to Pools by Device Name using a Domain ID, page 46](#)
- [Nailing Clients to Pools by Domain Name, page 46](#)
- [Nailing Clients to Pools by Domain Name Using a Domain ID, page 47](#)



### Note

You can configure Inverse DNS Nailing five different ways by using the same commands. This task table section presents the five different configuration methods as separate task tables.

Use the **domain-id** command only when you are going to configure the **client pool** command with the **name** keyword and *DNS-domain-identifier* option specified or with the **domain-id** keyword specified.

### Nailing Clients to Pools by IP Address

To nail a client to a pool of LUs by IP address, use the following commands beginning in TN3270 server configuration mode.

	Command	Purpose
<b>Step 1</b>	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 2</b>	Router(tn3270-lpoint)# <b>client ip</b> <i>ip-address</i> [ <i>ip-mask</i> ] <b>pool</b> <i>poolname</i>	Nails a client located at the IP address to a pool.

### Nailing Clients to Pools by Device Name

To nail a client to a pool of LUs by device name, use the following commands beginning in TN3270 server configuration mode.

	Command	Purpose
<b>Step 1</b>	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 2</b>	Router(tn3270-lpoint)# <b>client name</b> <i>DNS-name</i> <b>pool</b> <i>poolname</i>	Nails a client located at the DNS device name to a pool.

### Nailing Clients to Pools by Device Name using a Domain ID

To nail a client to a pool of LUs by device name using a domain ID, use the following commands beginning in TN3270 server configuration mode.

	Command	Purpose
<b>Step 1</b>	Router(cfg-tn3270)# <b>domain-id</b> <i>DNS-domain-identifier</i> <i>DNS-domain</i>	(Optional) Specifies a domain name suffix to be appended to the configured machine names to form a fully qualified name.
<b>Step 2</b>	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 3</b>	Router(tn3270-lpoint)# <b>client name</b> <i>DNS-name</i> <i>DNS-domain-identifier</i> <b>pool</b> <i>poolname</i>	Nails a client located at the IP address to a pool.

### Nailing Clients to Pools by Domain Name

To nail a client to a pool of LUs by domain name, use the following commands beginning in TN3270 server configuration mode.

	Command	Purpose
Step 1	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
Step 2	Router(tn3270-lpoint)# <b>client domain-name</b> <i>DNS-domain</i> <b>pool</b> <i>poolname</i>	Nails a client located at the domain-name to a pool.

### Nailing Clients to Pools by Domain Name Using a Domain ID

To nail a client to a pool of LUs by domain name using a domain ID, use the following commands beginning in TN3270 server configuration mode.

	Command	Purpose
Step 1	Router(cfg-tn3270)# <b>domain-id</b> <i>DNS-domain-identifier</i> <i>DNS-domain</i>	(Optional) Specifies a domain name suffix to be appended to the configured machine names to form a fully qualified name.
Step 2	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
Step 3	Router(tn3270-lpoint)# <b>client domain-id</b> <i>DNS-domain-identifier</i> <b>pool</b> <i>poolname</i>	Nails a client located at the domain ID to a pool.

### Configuring a Listen-Point PU to Define DLUR PUs and Allocate LUs

To configure a listen-point PU on the internal LAN interface on the CMCC adapter and define DLUR PUs, use the following commands beginning in listen-point configuration mode.

When you use the **pu** command, you enter listen-point PU configuration mode and can use all other commands in this task list. Values that you enter for siftdown commands in listen-point PU configuration mode will override values that you previously entered in listen-point or TN3270 server configuration mode.

	Command	Purpose
Step 1	Router(tn3270-lpoint)# <b>pu</b> <i>pu-name</i> <i>idblk-idnum</i> <b>dlur</b>	Creates a DLUR PU. This command changes the configuration mode from listen-point to listen-point PU.
Step 2	Router(tn3270-lpoint-pu)# <b>allocate lu</b> <i>lu-address</i> <b>pool</b> <i>poolname</i> <b>clusters</b> <i>count</i>	Assigns LUs to the pool beginning with the LOCADDR specified by <i>lu-address</i> for a total of <i>count</i> LUs.
Step 3	Router(tn3270-lpoint-pu)# <b>generic-pool</b> { <b>permit</b>   <b>deny</b> }	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
Step 4	Router(tn3270-lpoint-pu)# <b>idle-time</b> <i>seconds</i>	(Optional) Specifies the idle time for server disconnect.

Command	Purpose
<b>Step 5</b> Router(tn3270-lpoint-pu)# <b>keepalive</b> <i>seconds</i> [ <b>send</b> { <b>nop</b>   <b>timing-mark</b> [ <i>max-response-time</i> ]}]	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
<b>Step 6</b> Router(tn3270-lpoint-pu)# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b> }	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
<b>Step 7</b> Router(tn3270-lpoint-pu)# <b>lu termination</b> { <b>termself</b>   <b>unbind</b> }	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off or disconnects a device.
<b>Step 8</b> Router(tn3270-lpoint-pu)# <b>unbind-action</b> { <b>keep</b>   <b>disconnect</b> }	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.

## Configuring a Listen-Point PU to Define DLUR PUs using Dynamic LU Naming

To configure a listen-point PU on the internal LAN interface on the CMCC adapter, and to define DLUR PUs using dynamic LU naming, use the following commands beginning in TN3270 server configuration mode.

Command	Purpose
<b>Step 1</b> Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> [ <i>number</i> ]]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 2</b> Router(tn3270-lpoint)# <b>pu</b> <i>pu-name idblk-idnum</i> <b>dlur</b> [ <b>lu-seed</b> <i>lu-name-stem</i> ]	Creates a DLUR PU and enters listen-point PU configuration mode.  The <b>lu-seed</b> optional keyword specifies the LU name that the client uses when a specific LU name request is needed.
<b>Step 3</b> Router(tn3270-lpoint-pu)# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b>   <b>named</b> }	Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.  <b>Note</b> You must specify the <b>named</b> option when configuring dynamic LU naming on the PU.

When you use the **pu** command, you enter listen-point PU configuration mode and can use all other commands in this task list. Values that you enter for sift-down commands (such as the **lu deletion** command) in listen-point PU configuration mode will override values that you previously entered in listen-point or TN3270 server configuration mode. For more information about configuring sift-down commands, see the [“Configuring TN3270 Sift-down Commands” section on page 27](#).



## Configuring the TN3270 Server and Defining a Pool

To establish a TN3270 server on the internal LAN interface on the CMCC adapter and configure LU pooling, use the following commands beginning in global configuration mode:

	Command	Purpose
<b>Step 1</b>	<code>Router(config)# interface channel slot/port</code>	Selects the interface on which to configure the TN3270 server and enters interface configuration mode. The <i>port</i> value differs by the type of CMCC adapter: <ul style="list-style-type: none"> <li>• CIP—<i>port</i> value corresponds to the virtual interface, which is port 2.</li> <li>• CPA—<i>port</i> value corresponds to port 0.</li> </ul>
<b>Step 2</b>	<code>Router(config-if)# tn3270-server</code>	Specifies a TN3270 server on the internal LAN interface and enters TN3270 server configuration mode.
<b>Step 3</b>	<code>Router(cfg-tn3270)# pool poolname [cluster layout [layout-spec-string]]</code>	Defines clusters of LUs and allocates LOCADDRs.
<b>Step 4</b>	<code>Router(cfg-tn3270)# idle-time seconds</code>	(Optional) Specifies the idle time for server disconnect.
<b>Step 5</b>	<code>Router(cfg-tn3270)# keepalive seconds [send {nop   timing-mark [max-response-time]]</code>	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>• Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>• Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
<b>Step 6</b>	<code>Router(cfg-tn3270)# ip precedence {screen   printer} value</code>	(Optional) Specifies the precedence level for IP traffic in the TN3270 server.
<b>Step 7</b>	<code>Router(cfg-tn3270)# ip tos {screen   printer} value</code>	(Optional) Specifies the ToS level for IP traffic in the TN3270 server.
<b>Step 8</b>	<code>Router(cfg-tn3270)# unbind-action {keep   disconnect}</code>	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.
<b>Step 9</b>	<code>Router(cfg-tn3270)# generic-pool {permit   deny}</code>	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
<b>Step 10</b>	<code>Router(cfg-tn3270)# lu deletion {always   normal   non-generic   never}</code>	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
<b>Step 11</b>	<code>Router(cfg-tn3270)# lu termination {termself   unbind}</code>	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off or disconnects a device.

## Configuring a Listen Point and Nailing Clients to Pools

To configure a listen point on the internal LAN interface on the CMCC adapter and nail clients to pools, use the following commands beginning in TN3270 server configuration mode.

When you use the **listen-point** command, you enter listen-point configuration mode and can use all other commands in this task list. Values that you enter for siftdown commands in listen-point configuration mode will override values that you previously entered in TN3270 server configuration mode.

	Command	Purpose
<b>Step 1</b>	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
<b>Step 2</b>	Router(tn3270-lpoint)# <b>client ip</b> <i>ip-address</i> [ <i>mask</i> ] <b>pool</b> <i>poolname</i>	Nails a client located at the IP address or subnet to a pool.
<b>Step 3</b>	Router(tn3270-lpoint)# <b>idle-time</b> <i>seconds</i>	(Optional) Specifies the idle time for server disconnect.
<b>Step 4</b>	Router(tn3270-lpoint)# <b>keepalive</b> <i>seconds</i> [ <b>send</b> { <b>nop</b>   <b>timing-mark</b> [ <i>max-response-time</i> ]}]	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>• Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>• Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
<b>Step 5</b>	Router(tn3270-lpoint)# <b>ip precedence</b> { <b>screen</b>   <b>printer</b> } <i>value</i>	(Optional) Specifies the precedence level for IP traffic in the TN3270 server.
<b>Step 6</b>	Router(tn3270-lpoint)# <b>ip tos</b> { <b>screen</b>   <b>printer</b> } <i>value</i>	(Optional) Specifies the ToS level for IP traffic in the TN3270 server.
<b>Step 7</b>	Router(tn3270-lpoint)# <b>unbind-action</b> { <b>keep</b>   <b>disconnect</b> }	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.
<b>Step 8</b>	Router(tn3270-lpoint)# <b>generic-pool</b> { <b>permit</b>   <b>deny</b> }	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
<b>Step 9</b>	Router(tn3270-lpoint)# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b> }	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
<b>Step 10</b>	Router(tn3270-lpoint)# <b>lu termination</b> { <b>termself</b>   <b>unbind</b> }	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off or disconnects a device.

## Configuring a Listen-Point PU to Define Direct PUs and Allocate LUs

To configure a listen-point PU on the internal LAN interface on the CMCC adapter and configure direct PUs, use the following commands beginning in listen-point configuration mode.

When you use the **pu** command, you enter listen-point PU configuration mode and can use all other commands in this task list. Values that you enter for siftdown commands in listen-point PU configuration mode will override values that you previously entered in listen-point or TN3270 server configuration mode.

	Command	Purpose
Step 1	<code>Router(tn3270-lpoint)# pu pu-name idblk-idnum type adapter-number lsap [rmac rmac] [rsap rsap] [lu-seed lu-name-stem]</code>	Creates a direct PU. This command changes the configuration mode from listen-point to listen-point PU.
Step 2	<code>Router(tn3270-lpoint-pu)# allocate lu lu-address pool poolname clusters count</code>	Assigns LUs to the pool beginning with the LOCADDR specified by <i>lu-address</i> for a total of <i>count</i> LUs.
Step 3	<code>Router(tn3270-lpoint-pu)# idle-time seconds</code>	(Optional) Specifies the idle time for server disconnect.
Step 4	<code>Router(tn3270-lpoint-pu)# keepalive seconds [send {nop   timing-mark [max-response-time]}]</code>	(Optional) Specifies the following keepalive parameters: <ul style="list-style-type: none"> <li>Number of seconds of inactivity to elapse before the TN3270 server transmits a DO TIMING-MARK or Telnet nop to the TN3270 client.</li> <li>Maximum time within which the TN3270 server expects a response to the DO TIMING-MARK from the TN3270 client before the server disconnects.</li> </ul>
Step 5	<code>Router(tn3270-lpoint-pu)# unbind-action {keep   disconnect}</code>	(Optional) Specifies whether the TN3270 session will disconnect when an UNBIND request is received.
Step 6	<code>Router(tn3270-lpoint-pu)# generic-pool {permit   deny}</code>	(Optional) Selects whether “leftover” LUs can be used from a generic LU pool.
Step 7	<code>Router(tn3270-lpoint-pu)# lu deletion {always   normal   non-generic   never}</code>	(Optional) Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.
Step 8	<code>Router(tn3270-lpoint-pu)# lu termination {termself   unbind}</code>	(Optional) Specifies the type of termination request that is sent by the TN3270 server when a client turns off his device or disconnects.

## Configuring a Listen-Point PU to Define Direct PUs using Dynamic LU Naming

To configure a listen-point PU on the internal LAN interface on the CMCC adapter and configure direct PUs using dynamic LU naming, use the following commands beginning in listen-point configuration mode.

	Command	Purpose
Step 1	Router(cfg-tn3270)# <b>listen-point</b> <i>ip-address</i> [ <b>tcp-port</b> <i>number</i> ]	Specifies the IP address and TCP port number to create a listen point. The default TCP port number is 23. This command changes the configuration mode from TN3270 to listen-point.
Step 2	Router(tn3270-lpoint)# <b>pu</b> <i>pu-name idblk-idnum type adapter-number lsap</i> [ <b>rmac rmac</b> ] [ <b>rsap rsap</b> ] [ <b>lu-seed</b> <i>lu-name-stem</i> ]	Creates a direct PU and enters listen-point PU configuration mode.  The <b>lu-seed</b> optional keyword specifies the LU name that the client uses when a specific LU name request is needed.
Step 3	Router(tn3270-lpoint-pu)# <b>lu deletion</b> { <b>always</b>   <b>normal</b>   <b>non-generic</b>   <b>never</b>   <b>named</b> }	Specifies whether the TN3270 server sends a REPLY-PSID poweroff request to VTAM to delete the corresponding LU when a client disconnects.  <b>Note</b> You must specify the <b>named</b> option when configuring dynamic LU naming on the PU.

When you use the **pu** command, you enter listen-point PU configuration mode and can use all other commands in this task list. Values that you enter for siftdown commands (such as the **lu deletion** command) in listen-point PU configuration mode will override values that you previously entered in listen-point or TN3270 server configuration mode. For more information about configuring siftdown commands, see the [“Configuring TN3270 Siftdown Commands” section on page 27](#).

## Migrating from Legacy TN3270 Server Configuration Methods

Prior to Cisco IOS Release 12.0(5)T, TN3270 server configuration did not directly support listen points and LU pool configurations. These earlier methods for configuring PUs are referred to as “legacy” configuration methods. The TN3270 server commands to configure PUs vary slightly depending on whether or not you are using legacy configuration methods or listen points and LU pooling to configure PUs. While the legacy TN3270 server configuration commands are still supported, it is important to understand these variations in configuration so that you are not confused by the similar, but distinct command usages implemented for LU pooling.



### Note

Be sure that you use only a single configuration method for any particular IP address. Do not configure the same IP address using legacy methods and the newer listen-point configuration methods.

## Methods of Configuring Direct PUs

For example, there are two ways in which you can configure direct PUs in the TN3270 server:

- TN3270 server configuration—In this legacy configuration mode you can use the **pu** (TN3270) command with the *ip-address* argument to create a PU entity that has its own direct link to a host at that IP address.
- Listen-point configuration—In this configuration mode you can use a different version of the **pu** command, but without an *ip-address* argument, to also create a PU entity that has its own direct link to a host defined at the listen point. In this configuration scenario, the IP address of the host is defined using the **listen-point** command and not in the **pu** (listen-point) command. This usage of direct PU configuration at a listen point allows you to eliminate repetitive configuration of the host IP address for each PU.

For examples of these methods of direct PU configuration see the “[Basic Configuration Example](#)” section on page 63 and the “[Listen-Point Direct PU Configuration Example](#)” section on page 64.

## Methods of Configuring DLUR PUs

Similarly, there are also two ways in which you can configure DLUR PUs in the TN3270 server:

- DLUR configuration—In this legacy configuration mode you can use a version of the **pu** command—**pu** (DLUR)—with *pu-name*, *idblk-idnum*, and *ip-address* arguments to create a PU entity that uses the SNA session switching facility to communicate with a host.
- Listen-point configuration—In this configuration mode you use a different command—the **pu dlur** command—with *pu-name* and *idblk-idnum* arguments to create a PU entity that uses the SNA session switching facility to communicate with a host addressed at the listen point.

For an example of these methods of DLUR PU configuration see the “[Listen-Point DLUR PU Configuration Example](#)” section on page 64.

## Methods of LU Nailing

LU nailing is a method by which you can associate a client’s connection request with a specific LU or pool of LUs. Use the following different methods to nail LUs in the TN3270 server:

- [Nailing Clients to Specific LUs, page 34](#)
- [Nailing Clients to Pools, page 34](#)
- [Using a Combination of Nailing Methods, page 54](#)

### Nailing Clients to Specific LUs

Use the **client ip lu** legacy command when you want to assign a specific LOCADDR to a particular client at an IP address or subnet. This method of nailing is useful when a particular client must use a specific LU. You can use the **client printer ip lu** command to assign a particular LOCADDR to a client printer at an IP address or subnet.

### Nailing Clients to Pools

Use the **client ip pool** command in listen-point configuration mode when you want to assign a group of LUs from a pool defined in the TN3270 server for a client at an IP address or subnet. This method of nailing is useful when a client needs to have one of a group LUs associated with a particular PU.

This configuration method uses the **allocate lu** listen-point PU configuration command to assign the range of LOCADDRES to the pool. The **pool** command defines the pool as a cluster of screen and printer LUs. In this method, clients can use the ASSOCIATE request to access printers defined to the pool.

### Using a Combination of Nailing Methods

You can use both methods of LU nailing in a particular TN3270 server configuration, but there is no precedence in the configuration statements. Therefore when you nail a client to a specific LU or to a pool, you must be sure that the LOCADDR has not already been allocated. You cannot specify the same LOCADDR in both an individual LU nailing statement and in a pool. The CMCC adapter does not allow a LOCADDR to be allocated multiple times, so the LU allocations in the TN3270 server must not overlap.

For example, the following configuration statements are in error because LU 5 is allocated to both the pool and to an individual client at IP address 10.20.30.40:

```
tn3270-server
pool MYPOOL cluster layout 4slp
pu PU1 12345678 tok 0 10
allocate lu 5 pool MYPOOL clusters 2
client ip 10.20.30.40 lu 5
```

The following example shows a valid configuration where a client at IP address 10.20.30.40 is nailed to the pool named EXAMPLE, which is allocated LOCADDRs 1 through 10, and an individual client at IP address 10.20.30.50 that is nailed only to LU 150:

```
tn3270-server
pool EXAMPLE cluster layout 2s2p
listen-point 80.80.80.81
client ip 10.20.30.40 pool EXAMPLE
pu PU1 12345678 tok 0 10
allocate lu 1 pool EXAMPLE clusters 10
client ip 10.20.30.50 lu 150
```

## Verifying the TN3270 Server Configuration

This section provides basic steps that you can use to verify TN3270 server configurations. For detailed examples of configuration verification procedures for specific TN3270 server scenarios, see the Cisco *TN3270 Design and Implementation Guide*.

- [Verify a Server Configuration that Uses LU Pooling, page 54](#)
- [Verify Dynamic LU Naming on the TN3270 Server, page 55](#)
- [Verifying Inverse DNS Nailing on the TN3270 Server, page 57](#)
- [Verifying SSL Encryption Support on the TN3270 Server, page 58](#)

### Verify a Server Configuration that Uses LU Pooling

**Step 1** To display the current router configuration, enter the **show run** command:

```
router#show run
Building configuration...

interface Channel6/1
no ip address
no keepalive
csna E160 40
!
interface Channel6/2
ip address 172.18.4.17 255.255.255.248
no keepalive
lan TokenRing 15
```

```

source-bridge 15 1 500
adapter 15 4000.b0ca.0015
lan TokenRing 16
source-bridge 16 1 500
adapter 16 4000.b0ca.0016
tn3270-server
pool PCPOOL cluster layout 4s1p
pool SIMPLE cluster layout 1a
pool UNIXPOOL cluster layout 49s1p
dlur NETA.SHEK NETA.MVSD
lsap token-adapter 15 04
link SHE1 rmac 4000.b0ca.0016
listen-point 172.18.4.18 tcp-port 23
pu PU1 91903315 dlur
allocate lu 1 pool PCPOOL clusters 10
allocate lu 51 pool UNIXPOOL clusters 2
allocate lu 200 pool SIMPLE clusters 50
listen-point 172.18.4.19 tcp-port 2023
pu PU2 91913315 token-adapter 16 08
allocate lu 1 pool UNIXPOOL clusters 2
allocate lu 101 pool SIMPLE clusters 100
allocate lu 201 pool PCPOOL clusters 10

```

**Step 2** To display information about the client LUs associated with a specific PU including the cluster layout and pool name, enter the **show extended channel tn3270-server pu** command:

```
Router#show extended channel 6/2 tn3270-server pu pu1 cluster
```

```

name(index)  ip:tcp          xid  state  link  destination  r-lsap
PU1(1)       172.18.4.18:23        91903315 ACTIVE  dlur  NETA.SHPU1
idle-time    0      keepalive 1800    unbind-act discon  generic-pool perm
ip-preced-screen 0 ip-preced-printer 0 ip-tos-screen 0 ip-tos-printer 0
lu-termination unbind lu-deletion never
bytes 27489 in, 74761 out; frames 1164 in, 884 out; NegRsp 0 in, 0 out
actlus 5, dactlus 0, binds 5
Note: if state is ACT/NA then the client is disconnected

```

```

lu  name  client-ip:tcp  nail state  cluster  pool  count
1  SHED1001 161.44.100.162:1538  N  ACT/SESS 1/4s1p  PCPOOL  1/5
51 SHED1051 161.44.100.162:1539  N  ACT/SESS 1/49s1p UNIXPOOL 1/50
151 SHED1151 161.44.100.162:1536  N  ACT/SESS 1/1a  :GENERIC 1/1
152 SHED1152 161.44.100.162:1537  N  ACT/SESS 1/1a  :GENERIC 1/1
200 SHED1200 161.44.100.162:1557  N  ACT/SESS 1/1a  SIMPLE  1/1

```

## Verify Dynamic LU Naming on the TN3270 Server

Complete the following steps to verify the Dynamic LU Naming enhancement:

**Step 1** Issue the **show extended channel tn3270-server** command. Confirm that lu-deletion is set to **named**.

```
Router# show extended channel 3/2 tn3270-server
```

```

<current stats> < connection stats > <response time(ms)>
server-ip:tcp      lu in-use  connect disconn fail  host  tcp
172.28.1.106:23    510      1      12      11      0      54      40
172.28.1.107:23    511      0      0      0      0      0      0
172.28.1.108:23    255      0      0      0      0      0      0
total              1276     1
configured max_lu 20000

```

```
idle-time 0      keepalive 1800      unbind-action disconnect
tcp-port 23      generic-pool permit no timing-mark
lu-termination unbind lu-deletion named
```

**Step 2** To verify that dynamic LU naming is configured on the PU named **PU1**, issue the **show extended channel tn3270-server pu pu1** command. Confirm that lu-deletion is set to **named**.

```
Router# show extended channel 6/2 tn3270-server pu pu1
```

```
name(index)  ip:tcp      xid  state  link  destination r-lsap
PU1(1)       172.18.4.18:23  91903315 ACTIVE  dlur  NETA.SHPU1
```

```
idle-time 0      keepalive 1800      unbind-act discon  generic-poolperm
ip-prec-ed-screen 0 ip-prec-ed-printer 0 ip-tos-screen 0 ip-tos-printer 0
lu-termination unbind lu-deletion named
```

---

## Troubleshooting Tips for Dynamic LU Naming

To troubleshoot dynamic LU naming, use the following tips:

- You must replace the default exit ISTEXCSD with the VTAM User Exit for TN3270 Name Pushing, which you can download from the IBM website: <http://www.ibm.com>. This exit causes VTAM to ignore the LUSEED parameter on the PU statement, and instead use the SLU name sent by the router in the subvector 86 when a client connects in. If you do not configure this exit, VTAM ignores the subvector 86 and the specified LU name.
- If the LUSEED operand is specified on the mainframe, but the subvector 86 requires an LU name, the VTAM User Exit for TN3270 Name Pushing ignores the LUSEED operand.
- If the LUSEED operand is not specified on the mainframe, and the subvector 86 is not present, then the VTAM User Exit for TN3270 Name Pushing cannot generate an LU name. VTAM does not log this failure, and the TN3270 server does not receive the ACTLU request. The TN3270 server displays the following message:

```
*Apr 17 12:40:53:%CIP2-3-MSG:slot2 :
%TN3270S-3-NO_DYN_ACTLU_REQ_RCVD
No ACTLU REQ received on LU JJDL1.6
```

Specify the INCLUD0E=YES parameter on VTAM so that the TN3270 server will always receive the LU name generated by the VTAM User Exit for TN3270 Name Pushing.



## Verifying Inverse DNS Nailing on the TN3270 Server

Complete the following steps to verify the Inverse DNS Nailing enhancement:

- Step 1** To list all nailing statements with a specific nailed-domain name, enter the **show extended channel tn3270-server nailed-domain** command:

```
Router# show extended channel 1/2 tn3270-server nailed-domain .cisco.com
CISCO.COM listen-point 172.18.4.18 pool PCPOOL
```

- Step 2** To list all nailing statements with a specific nailed machine name, enter the **show extended channel tn3270-server nailed-name** command:

```
Router# show extended channel 1/2 tn3270-server nailed-name myclient.cisco.com
MYCLIENT.CISCO.COM    listen-point 172.18.4.18 pool PCPOOL
HISCLIENT.CISCO.COM   listen-point 172.18.4.18 pool UNIXPOOL
HERCLIENT.CISCO.COM   listen-point 172.18.4.19 pool GENERALPOOL
```

### Troubleshooting Tips for Inverse DNS Nailing

To troubleshoot inverse DNS nailing, use the following tips:

- If an inverse DNS lookup fails it could be because the DNS server is unavailable (either because it was not configured, or because it is down). In this case, you cannot tell if the client is nailed because it does not have a name. To complicate the scenario, assume there was not a legacy nailing match, but the PU supports LUs that have been assigned from a generic pool. In this situation, the client disconnects and the router displays the following console message:

```
A connection attempt from client <ip address> was refused because its DNS name could not be obtained.
```

This action removes any potential security risk but presents potential disadvantages—the client could be denied a valid LU, and the generic-pool permit and deny settings might be ignored. For these reasons, it is strongly recommended that users configure the Inverse DNS Nailing enhancement on a PU that does *not* support LUs that have been assigned from a generic pool or a PU that has the **generic-pool** command configured with the **deny** keyword specified.

- If an inverse DNS lookup succeeds, but the name is not nailed or the client has no machine name, then the client is not nailed and the TN3270 server reverts to the legacy LU nailing process.

## Verifying SSL Encryption Support on the TN3270 Server

Complete the following steps to verify the SSL Encryption Support enhancement:

- Step 1** To verify the security profile on the TN3270 server, enter the **show extended channel tn3270-server security** command using the **sec-profile** option. Confirm that the status is enabled (status: ENABLE), and that the security certificate is loaded (Certificate Loaded: YES).

```
Router# show extended channel 3/2 tn3270-server security sec-profile cert40
status:ENABLE Default Profile: (Not Configured)
Name                Active LUs  keylen encryptorder      Mechanism
CERT40              0          40    RC4 RC2 RC5 DES 3DES    SSL
Servercert:slot0:coach188.pem
Certificate Loaded:YES Default-Profile:NO
```

- Step 2** To verify the security profile on the TN3270 server listen-point, enter the **show extended channel tn3270-server security** command using the **listen-point** option. Confirm that the status is enabled (status: ENABLE) and that the state is active (State ACTIVE).

```
Router# show extended channel 3/2 tn3270-server security listen-point 172.18.5.188
status:ENABLE Default Profile: (Not Configured)
IPAddress    tcp-port  Security-Profile  active-sessions  Type  State
172.18.5.188  23       CERT40            0                Secure ACTIVE
Active Sessions using Deleted Profile:0
```

## Configuring the TN3270 Server for Response-Time Monitoring

To configure client subnet response-time groups, use the following commands in response-time configuration mode:

	Command	Purpose
<b>Step 1</b>	Router(tn3270-resp-time)# <b>response-time group</b> <i>name</i> [ <b>bucket boundaries</b> <i>t1 t2 t3 t4</i> ] [ <b>multiplier</b> <i>m</i> ]	Configures the client subnet response-time group.
<b>Step 2</b>	Router(tn3270-resp-time)# <b>client ip</b> <i>ip-address</i> [ <i>ip-mask</i> ]	Specifies the IP address of the subnet being added to this client group.

## Verifying Response-Time Configuration

To verify the configuration of the client subnet response-time groups, use the **show extended channel tn3270-server response-time subnet** command.

To display a complete list of client subnet groups and their response-time collection control parameters, use the following form of the command:

```
Router# show extended channel 3/2 tn3270-server response-time subnet
group SUBNETGROUP1
  subnet 10.10.10.0 255.255.255.192
  aggregate NO excludeip NO dynamic definite response NO
  sample period multiplier 30
  bucket boundaries 10 20 50 100
group SUBNETGROUP2
  subnet 10.10.10.128 255.255.255.192
  subnet 10.10.10.192 255.255.255.192
  aggregate NO exclude ip NO dynamic definite response NO
  sample period multiplier 40
  bucket boundaries 20 30 60 120
group CLIENT SUBNET OTHER
  aggregate NO exclude ip NO dynamic definite response NO
  sample period multiplier 30
  bucket boundaries 10 20 50 100
```

To display the response-time collection parameters for a specific subnet, along with a list of the client members and their response-time statistics, use the following form of the command:

```
Router# show extended channel 3/2 tn3270-server response-time subnet
10.10.10.0 255.255.255.192 detail

group SUBNETGROUP1
  subnet 10.10.10.0 255.255.255.192
  aggregate NO excludeip NO dynamic definite response NO
  sample period multiplier 30
  bucket boundaries 10 20 50 100
  client 10.10.10.129:23
    buckets 5 8 11 9 4
    average total response time 33 average IP response time 24
    number of transactions 37
  client 10.10.10.130:23
    buckets 6 9 10 10 2
    average total response time 32 average IP response time 25
    number of transactions 37
  client 10.10.10.131:23
    buckets 11 14 10 8 7
    average total response time 27 average IP response time 19
    number of transactions 50
```

# Monitoring and Maintaining the TN3270 Server

Use the following **show** commands in the privileged EXEC mode to monitor the TN3270 server. The *port* value differs by the type of CMCC adapter:

- CIP—*port* value corresponds to the virtual interface, which is port 2
- CPA—*port* value corresponds to port 0

Command	Purpose
Router# <b>show extended channel slot/port tn3270-server</b>	Displays the current server configuration parameters and the status of the PUs defined in each server.
Router# <b>show extended channel slot/port tn3270-server client-ip-address ip-address [disconnected   in-session   pending]</b>	Displays information about all clients at a specific IP address.
Router# <b>show extended channel slot/port tn3270-server dlur</b>	Displays information about the SNA session switch.
Router# <b>show extended channel slot/port tn3270-server dlur link name</b>	Displays information about the DLUR components.
Router# <b>show extended channel slot/port tn3270-server nailed-ip ip-address</b>	Displays mappings between a nailed client IP address and nailed LUs.
Router# <b>show extended channel slot/virtual channel tn3270-server pu pu-name [cluster]</b>	Displays information about the client LUs associated with a specified PU including the cluster layout and pool name.
Router# <b>show extended channel tn3270-server pu pu-name lu lu-number [history]</b>	Displays the status of the LU.
Router# <b>show extended channel slot/port tn3270-server response-time application [appl-name [detail]]</b>	Displays information about each client group application for the specified VTAM appl name. List each member of the client group with its individual response-time statistics.
Router# <b>show extended channel slot/port tn3270-server response-time global</b>	Displays information about the global client groups.
Router# <b>show extended channel slot/port tn3270-server response-time link [link-name]</b>	Displays information about the specified per-host-link client group.
Router# <b>show extended channel slot/port tn3270-server response-time listen-point</b>	Displays information about listen-point type client groups.
Router# <b>show extended channel slot/port tn3270-server response-time subnet [ip-address ip-mask [detail]]</b>	Displays information about the specified client group.

Other maintenance and monitoring options for the TN3270 include:

- [Managing DLUR Links, page 61](#)
- [Monitoring Dynamic LU Naming, page 62](#)
- [Monitoring Inverse DNS Nailing, page 62](#)
- [Shutting Down the TN3270 Server and Its Entities, page 62](#)

## Managing DLUR Links

The CMCC adapter allows you to convert a dynamic link to a static link while the DLUR subsystem is running. Dynamic links are those links that are established outside of the scope of the TN3270 DLUR configuration. These links are either configured by the host or are established dynamically using the VRN function and are activated by DLUR or activated remotely.

There are several advantages of converting a dynamic link to a static link:

- Supports removing a DLUR link without having to shut down the entire DLUR subsystem.
- In Network Node server configurations, having two or three static links defined allows you to provide adequate redundancy. You might want to convert a dynamic link to a static link to provide this benefit.
- Static links allow better control from the router end to show and control them. Dynamic links cannot be specifically shown or controlled by the router. The links appear in **show** command output, but with locally assigned names such as @DLURnn which make them difficult to identify.

### Converting a Dynamic Link to a Static Link

To convert a dynamic link to a static link the CMCC adapter allows you to re-enter the local/remote MAC/SAP quadruple in the **link** (TN3270) command, which the CMCC accepts as a request to convert the link to a static link, and does not reject the command due to a duplicate local/remote MAC/SAP quadruple.

For example, use the following **link** (TN3270) command to convert the existing dynamic link named HOST at RMAC 4000.0000.0001 and RSAP 4 to a static link:

```
link HOST rmap 4000.0000.0001 rsap 4
```

### Removing a Dynamic Link

To remove a dynamic link use the following commands in DLUR SAP configuration mode to convert the dynamic link to a static link and then to remove the link:

	Command	Purpose
<b>Step 1</b>	Router(tn3270-dlur-lsap)# <b>link</b> <i>name</i> [ <b>rmap</b> <i>rmap</i> ] [ <b>rsap</b> <i>rsap</i> ]	Creates named links to hosts, or if this is an existing dynamic link, converts the dynamic link to a static link.
<b>Step 1</b>	Router(tn3270-dlur-lsap)# <b>no link</b> <i>name</i>	Removes the link definition.

## Monitoring Dynamic LU Naming

To monitor the status of the Dynamic LU Naming enhancement, use the following commands in EXEC mode:

Command	Purpose
Router# <b>show extended channel tn3270-server</b>	Displays current server configuration parameters and the status of the PUs defined for the TN3270 server.
Router# <b>show extended channel tn3270-server pu client-name</b>	Displays configuration parameters for a PU and all the LUs currently attached to the PU, with the client machine name substituted for the client IP address.

## Monitoring Inverse DNS Nailing

To monitor the status of the Inverse DNS Nailing enhancement, use the following commands in EXEC mode:

Command	Purpose
Router# <b>show extended channel tn3270-server client-name</b>	Displays information about all connected clients with a specific machine name.
Router# <b>show extended channel tn3270-server nailed-domain</b>	Lists all nailing statements with a specific nailed-domain name.
Router# <b>show extended channel tn3270-server nailed-name</b>	Lists all nailing statements with a specific nailed- machine name.
Router# <b>show extended channel tn3270-server pu client-name</b>	Displays configuration parameters for a PU and all the LUs currently attached to the PU, with the client machine name substituted for the client IP address.

## Shutting Down the TN3270 Server and Its Entities

To shut down the entire TN3270 server or to shut down individual TN3270 server entities, use the **shutdown** command in the appropriate configuration mode. The **shutdown** command is available in multiple configuration modes, including interface configuration mode for the CMCC adapter. This support allows you to have varying levels of control for different configurable entities.

For TN3270 server configurations, you can use the **shutdown** command in the following command modes:

- TN3270 server configuration mode—Shuts down the entire TN3270 server function.
- PU configuration mode—Shuts down an individual PU entity within the TN3270 server.
- DLUR configuration mode—Shuts down the whole DLUR subsystem within the TN3270 server.
- DLUR PU configuration mode—Shuts down an individual PU within the SNA session switch configuration in the TN3270 server.
- DLUR SAP configuration mode—Shuts down the local SAP and its associated links within the SNA session switch configuration.

- Listen-point configuration mode—Shuts down a listen point and all of its associated configuration entities.
- Listen-point PU configuration mode—Shuts down an individual PU within the listen point configuration.

To shut down the TN3270 server or a specific entity within the TN3270 server configuration, use the following command in the appropriate configuration mode:

Command	Purpose
Router# <b>shutdown</b>	Shuts down the entities corresponding to the configuration level in which the <b>shutdown</b> command is entered.

## TN3270 Server Configuration Examples

This section provides examples of router configurations for the TN3270 server. It provides LU pooling configuration examples with DLUR and with direct PU and legacy configuration examples without LU pooling:

- [Basic Configuration Example, page 63](#)
- [Listen-Point Direct PU Configuration Example, page 64](#)
- [Listen-Point DLUR PU Configuration Example, page 64](#)
- [LU Pooling Configuration Example, page 65](#)
- [TN3270 Server Configuration Without LU Pooling Example, page 68](#)
- [TN3270 DLUR Configuration With CMPC Host Connection Example, page 70](#)
- [Removing LU Nailing Definitions Example, page 70](#)
- [TN3270 Server DLUR Using CMPC Example, page 72](#)
- [Dynamic LU Naming Example, page 74](#)
- [Inverse DNS Nailing Examples, page 75](#)
- [SSL Encryption Support Examples, page 77](#)



### Note

The first three configuration examples in this section apply only to users who are already using TN3270.

## Basic Configuration Example

The following example shows a router with a legacy TN3270 server configuration and PU specification prior to LU pooling and listen-point configuration support:

```
tn3270-server
 pu PU1 94223456 10.10.10.1 tok 1 08
 tcp-port 40
 keepalive 10
```

The following example shows the same router with a later TN3270 server configuration that replaces the existing configuration and uses the **listen-point** command to accomplish LU pooling. The **listen-point** command was first introduced in Cisco IOS Release 11.2(18)BC.

```
tn3270-server
```

```
listen-point 10.10.10.1 tcp-port 40
  pu PU1 94223456 tok 1 08
  keepalive 10
```

**Note**

In the new configuration, the IP address is not configured in the PU. Instead, the IP address is configured as a listen point and the PU is configured within the scope of the listen point. The **tcp-port** command is not configured within the scope of the PU, instead it is specified with the **listen-point** command.

## Listen-Point Direct PU Configuration Example

The following example shows a router with a legacy TN3270 server configuration that contains different PUs configured with the same IP addresses:

```
tn3270-server
  pu PU1 94201231 10.10.10.2 tok 1 10
  pu PU2 94201232 10.10.10.3 tok 1 12
  pu PU3 94201234 10.10.10.3 tok 1 14
  pu PU4 94201235 10.10.10.4 tok 1 16
  tcp-port 40
  pu PU5 94201236 10.10.10.4 tok 2 08
```

The following example shows the same router replaced with a later TN3270 server configuration that uses the **listen-point** command introduced in Cisco IOS Release 11.2(18)BC:

```
tn3270-server
  listen-point 10.10.10.2
    pu PU1 94201231 tok 1 10
  listen-point 10.10.10.3
    pu PU2 94201232 tok 1 12
    pu PU3 94201234 tok 1 14
  listen-point 10.10.10.4
    pu PU5 94201236 tok 2 08
  listen-point 10.10.10.4 tcp-port 40
    pu PU4 94201235 tok 1 16
```

In this example, PU2 and PU3 are grouped into one listen point because they have the same IP address. Note that even though PU4's IP address is identical to PU5's IP address, they are not configured within the same listen point because the listen point indicates a unique IP address and TCP port pair. If you do not specify the TCP port, the default port value is 23.

## Listen-Point DLUR PU Configuration Example

The following example shows a router with a legacy TN3270 server configuration for DLUR:

```
tn3270-server
  dlur NETA.RTR1 NETA.HOST
  dlus-backup NETA.HOST
  lsap token-adapter 15 08
  link MVS2TN rmac 4000.b0ca.0016
  pu PU1 017ABCDE 10.10.10.6
```

The following example shows the same router replaced with a later TN3270 server configuration that uses the new **listen-point** command introduced in Cisco IOS Release 11.2(18)BC:

```
tn3270-server
  dlur NETA.RTR1 NETA.HOST
```



```

dlus-backup NETA.HOST
lsap token-adapter 15 08
link MVS2TN rmac 4000.b0ca.0016
listen-point 10.10.10.6
pu PU1 017ABCDE dlur

```

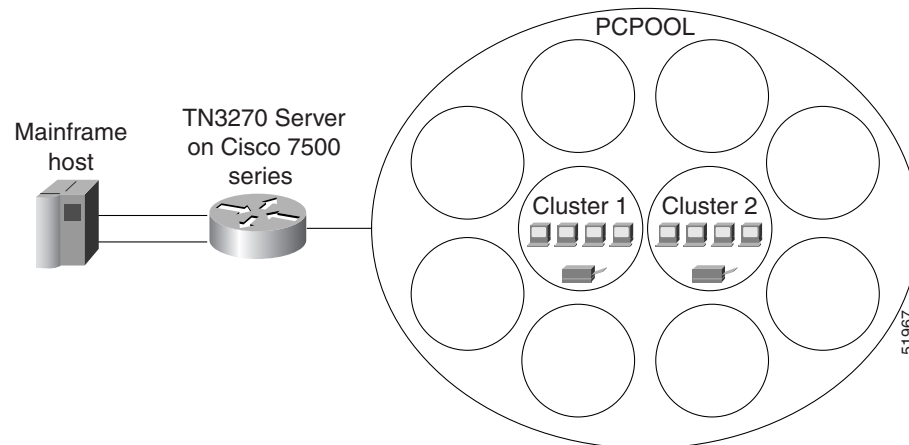
In this example, the PU is not configured within the scope of DLUR. Instead the PU is configured within the listen-point scope. The keyword **dlur** differentiates the listen-point direct PU from the listen-point DLUR PU. Note that the DLUR configuration must be completed before PU1 is configured.

Any siftdown commands configured within the scope of listen point are automatically inherited by the PUs that are configured within the scope of that listen point. To override the siftdown configurations, you can explicitly configure the siftdown configuration commands within the scope of the listen-point PU.

## LU Pooling Configuration Example

Figure 7 shows a router running the TN3270 server (with DLUR PUs) and its LU pooling configuration.

**Figure 7** TN3270 Server Using LU Pooling



To understand how LUs are allocated for clients that are nailed to pools in the TN3270 server, consider the router configuration for PU2 on the following pages, and assume that cluster 1 for PCPOOL has no LUs currently assigned to clients.

For a PC client with IP address 20.40.34.1, the TN3270 server reserves LUs 201–205 for cluster 1 of the PCPOOL. PCPOOL is defined with a cluster layout of “4s1p” for a total of 5 LUs (Figure 9). Because the cluster 1 LUs are reserved, a second PC client with IP address 20.40.34.7 (also nailed to the PCPOOL) is given LUs 206 to 210 for cluster 2 of the PCPOOL (provided that cluster 2 is the next available cluster without LUs currently allocated).

Next, consider that a total of 4 clients with IP address 20.40.34.1 have connected with a request for a screen LU. These clients are allocated LUs 201 to 204 (cluster 1) because according to the cluster definition “4s1p”, the first 4 LUs are screen LUs. According to the cluster definition the last (5th) LU is a printer LU.

This means that cluster 1 is fully allocated for screen LUs. In this example, the next client with IP address 20.40.34.1 that connects with a request for a screen LU reserves the next available cluster, with LUs 211 to 215. This client is allocated LU 211, which is a screen LU.

The first client with IP address 20.40.34.1 to request a printer LU from the TN3270 server is allocated LU 205. LU 205 is the first available printer LU in the first cluster of reserved LUs for IP address 20.40.34.1.

Clients that connect with a request for a specific pool but that are not nailed to that pool are allocated an LU from the generic pool. In this example, an available LU in the range 251 to 255 is allocated.

The following router configuration shows an example of commands used to define the TN3270 server with LU pools.

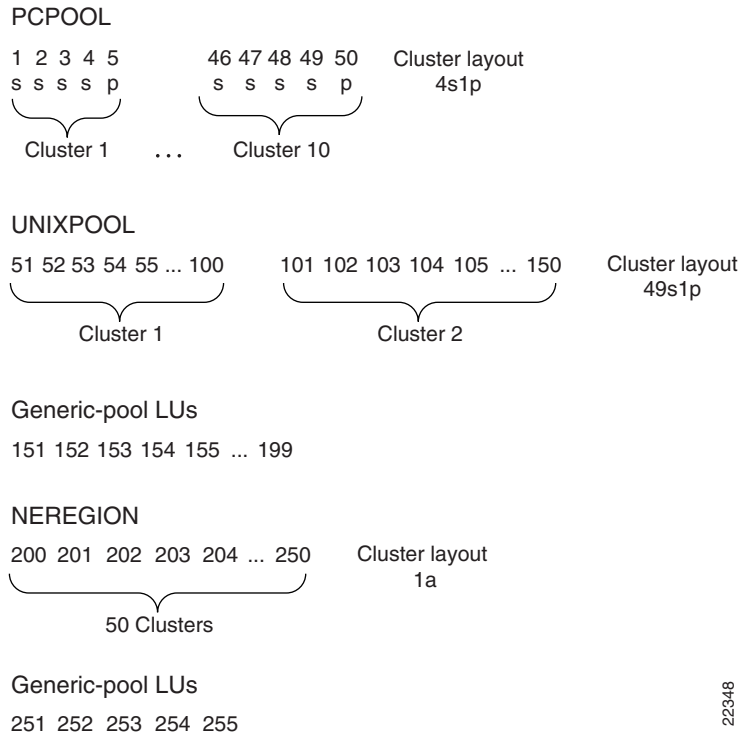
### Router Configuration

```
logging buffered
! logs Cisco IOS software messages to the internal buffer using the default
! buffer size for the router platform
interface Channel 6/1
no ip address
no keepalive
csna E160 40
!
interface Channel 6/2
ip address 172.18.4.17 255.255.255.248
no keepalive
lan TokenRing 15
source-bridge 15 1 500
adapter 15 4000.b0ca.0015
lan TokenRing 16
source-bridge 16 1 500
adapter 16 4000.b0ca.0016
tn3270-server
pool NEREGION cluster layout 1a
pool PCPOOL cluster layout 4s1p
pool UNIXPOOL cluster layout 49s1p
dlur NETA.SHEK NETA.MVSD
lsap token-adapter 15 04
link SHE1 rmac 4000.b0ca.0016
listen-point 172.18.4.18
client ip 10.20.20.30 pool UNIXPOOL
client ip 10.20.40.0 255.255.255.0 pool PCPOOL
client ip 10.20.30.0 255.255.255.128 pool NEREGION
pu PU1 91903315 dlur
allocate lu 1 pool PCPOOL clusters 10
allocate lu 51 pool UNIXPOOL clusters 2
allocate lu 200 pool NEREGION clusters 50

listen-point 172.18.4.19
client ip 20.30.40.40 pool UNIXPOOL
client ip 20.40.34.0 255.255.255.0 pool PCPOOL
client ip 20.40.50.0 255.255.255.128 pool NEREGION
pu PU2 91913315 dlur
allocate lu 1 pool UNIXPOOL clusters 2
allocate lu 101 pool NEREGION clusters 100
allocate lu 201 pool PCPOOL clusters 10
```

Figure 8 shows cluster layouts for PU1 in the TN3270 server.

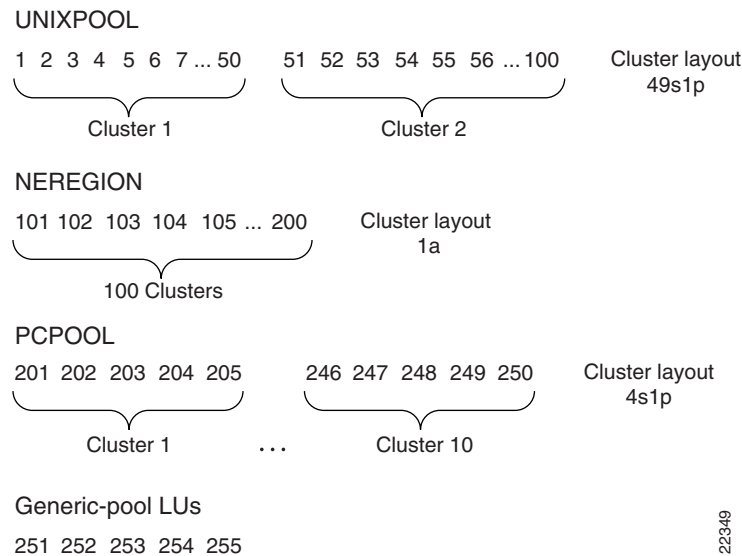
**Figure 8 Cluster Layouts for PU1 in the TN3270 Server**



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Figure 9 shows cluster layouts for PU2 in the TN3270 server.

**Figure 9 Cluster Layouts for PU2 in the TN3270 Server**



## TN3270 Server Configuration Without LU Pooling Example

The following configuration shows three PUs using DLUR and two more with direct connections without LU pooling.

The initial CIP configuration is as follows:

```
interface Channel2/2
ip address 10.10.20.126 255.255.255.128
no ip redirects
no ip directed-broadcast
no keepalive
lan TokenRing 0
source-bridge 223 1 2099
adapter 0 4100.cafe.0001
llc2 N1 2057
adapter 1 4100.cafe.0002
llc2 N1 2057
```

Configuration dialog to configure the TN3270 function follows:

```
! HOSTA is channel-attached and will open SAP 8 on adapter 0.
! HOSTB is reached via token-ring
! HOSTC is channel-attached non-APPN and will open SAP 4 on adapter 0.

! enter interface configuration mode for the virtual interface in slot 2
router(config)#int channel 2/2

! create TN3270 Server entity
router(config-if)#tn3270-server

! set server-wide defaults for PU parameters
router(cfg-tn3270)#keepalive 0
router(cfg-tn3270)#unbind-action disconnect
router(cfg-tn3270)#generic-pool permit
```

```

! define DLUR parameters and enter DLUR configuration mode
router(cfg-tn3270)#dlur SYD.TN3020 SYD.VMG

! create a DLUR LSAP and enter DLUR LSAP configuration mode
router(tn3270-dlur-pu)#lsap token-adapter 1

! specify the VRN name of the network containing this lsap
router(tn3270-dlur-lsap)#vrn syd.lan4

! create a link from this lsap
router(tn3270-dlur-lsap)#link hosta rmac 4100.cafe.0001 rsap 8
router(tn3270-dlur-lsap)#link hostb rmac 4000.7470.0009 rsap 4
router(tn3270-dlur-lsap)#exit
router(tn3270-dlur)#exit

! create listen-points and DLUR PUs
router(cfg-tn3270)#listen-point 10.10.20.1
router(tn3270-lpoint)#pu pu0 05d99001 dlur
router(tn3270-lpoint-pu)#exit
router(tn3270-lpoint)#pu pu1 05d99002 dlur
router(tn3270-lpoint-pu)#exit
router(tn3270-lpoint)#exit

router(cfg-tn3270)#listen-point 10.10.20.2
router(tn3270-lpoint)#pu pu2 05d99003 dlur
router(tn3270-lpoint-pu)#exit
router(tn3270-lpoint)#exit

! create direct pus for the non-APPN Host
! note that they must use different lsaps because they go to the same Host

router(cfg-tn3270)#listen-point 10.10.20.5
router(tn3270-lpoint)#pu pu3 05d00001 tok 1 24 rmac 4100.cafe.0001 lu-seed pu3###
router(tn3270-lpoint-pu)#exit
router(tn3270-lpoint)#pu pu4 05d00002 tok 1 28 rmac 4100.cafe.0001 lu-seed pu4###
router(tn3270-lpoint-pu)#end

```

The following configuration results from the initial CIP configuration and the configuration dialog:

```

interface Channel2/2
 ip address 10.10.20.126 255.255.255.128
 no ip redirects
 no keepalive
 lan TokenRing 0
 source-bridge 223 1 2099
 adapter 0 4100.cafe.0001
 llc2 N1 2057
 adapter 1 4100.cafe.0002
 llc2 N1 2057
 tn3270-server
 dlur SYD.TN3020 SYD.VMG
 lsap token-adapter 1
 vrn SYD.LAN4
 link HOSTB rmac 4000.7470.0009
 link HOSTA rmac 4100.cafe.0001 rsap 08
 listen-point 10.10.20.1
 pu PU0 05D99001 dlur
 pu PU1 05D99002 dlur
 listen-point 10.10.20.2
 pu PU2 05D99003 dlur
 listen-point 10.10.20.5
 pu PU3 05D00001 tok 1 24 rmac 4100.cafe.0001 lu-seed PU3###
 pu PU4 05D00002 tok 1 28 rmac 4100.cafe.0001 lu-seed PU4###

```

## TN3270 DLUR Configuration With CMPC Host Connection Example

The following example shows a DLUR PU with a CMPC host connection:

```

logging buffered
! logs Cisco IOS software messages to the internal buffer using the default
! buffer size for the router platform
interface Channel0/0
no ip address
no keepalive
cmpc C010 E5 LPAR1TG READ
cmpc C010 E6 LPAR1TG WRITE
cmpc C020 00 LPAR2TG READ
cmpc C020 01 LPAR2TG WRITE
!
interface Channel0/2
ip address 172.18.5.1 255.255.255.224
no keepalive
lan TokenRing 0
source-bridge 100 1 8
adapter 0 4000.4040.0000 ! for cmpc
adapter 1 4000.6060.0000 ! TN3270 server
adapter 2 4000.7070.0000
tn3270-server
maximum-lus 20000 ! optional
idle-time 64800 ! optional
timing-mark ! optional
tcp-port 24 ! optional
client 10.10.10.0 255.255.255.0 lu maximum 10000 ! optional

dlur NETA.TN3270CP NETA.CPAC
dlus-backup NETA.MVS2 ! optional
preferred-NNserver NETA.CPAC ! optional
lsap token-adapter 1 04 ! TN3270 server uses cmcc adapter 1 and sap=04
link LINK1 rmac 4000.4040.0000 rsap 08 ! link to cmpc on adapter 0
lsap token-adapter 2 04
link LINK2 rmac 4000.7070.0000 rsap 08 ! link to cmpc on adapter 2
listen-point 172.18.5.2
pu TNPU1 01754321 dlur
!
tg LPAR1TG llc token-adapter 0 08 rmac 4000.6060.0000 rsap 04 ! rsap optional
tg LPAR2TG llc token-adapter 2 08 rmac 4000.7070.0000 ! rsap=04 by default"

```

## Removing LU Nailing Definitions Example

In the following example, locaddrs 1 to 50 are reserved for all remote screen devices in the 171.69.176.0 subnet:

```

interface channel 2/2
tn3270-server
pu BAGE4
client ip 171.69.176.28 255.255.255.0 lu 1 50

```

To remove a nailing definition, the complete range of LOCADDRS must be specified as configured. So for the example above, the following command would remove the LU nailing definition:

```
no client ip 171.69.176.28 255.255.255.0 lu 1 50
```

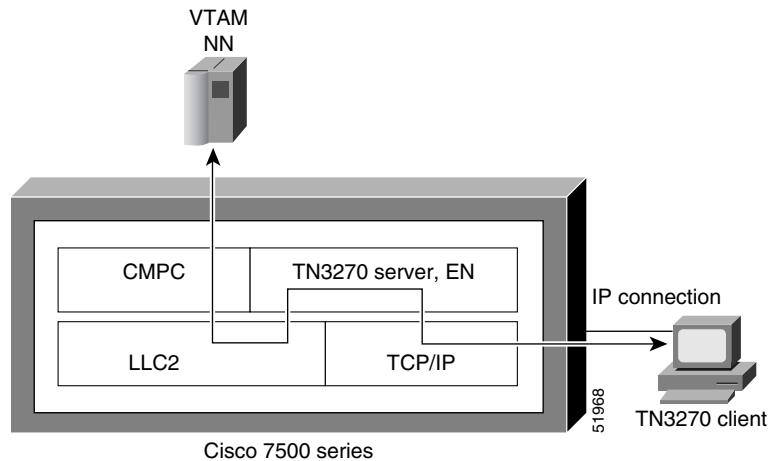
If an attempt is made to remove a subset of the range of configured LOCADDRS then the command is rejected:

```
no client ip 171.69.176.28 255.255.255.0 lu 1 20
% client ip 171.69.176.28 lu not matched with configured lu 1 50
```

## TN3270 Server DLUR Using CMPC Example

Figure 10 shows the physical components for this example. Figure 11 shows the various parameters for each component in the configuration example.

**Figure 10**      **Topology for VTAM-to-TN3270 Server DLUR Using CMPC**



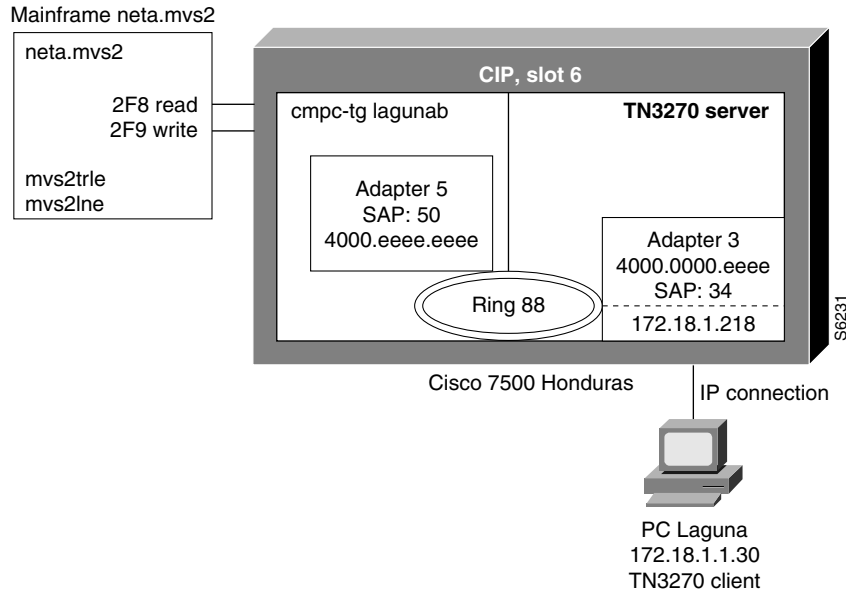
In Figure 10, the following activity occurs:

- The TN3270 server on the CMCC adapter takes on the role of an APPN EN running DLUR.
- The APPN NN in VTAM communicates with the CMPC driver over the channel.
- The CMPC driver on the CMCC adapter passes the data to the LLC2 stack on the CIP via a fast-path loopback driver to the TN3270 server on the CIP.
- The TN3270 server converts the 3270 data stream to a TN3270 data stream and forwards the packets to the IP TN3270 clients in the IP network.

The TN3270 server does not have to be in the same CMCC adapter as the CMPC driver.



**Figure 11 Parameters for VTAM-to-TN3270 DLUR Using CMPC**



The following configurations apply to the example shown in [Figure 11](#).

**mvs2trle**

```
MVS2TRE VBUILD TYPE=TRL
MVS2TRLE TRLE LNCTL=MPC,MAXBFRTU=8,REPLYTO=3.0,
READ=(2F8),
WRITE=(2F9)
```

**mvs2lne**

```
MVS2NNE VBUILD TYPE=LOCAL
MVS2PUE PU TRLE=MVS2TRLE,
ISTATUS=ACTIVE,
XID=YES,CONNTYPE=APPN,CPCP=YES
```

**swlagtn**

```
SWLAGTN VBUILD TYPE=SWNET,MAXGRP=10,MAXNO=10,MAXDLUR=10
LAGTNPU PU ADDR=01, X
MAXPATH=1, X
IDBLK=017, IDNUM=EFEED, X
PUTYPE=2, X
MAXDATA=4096, X
LUGROUP=TNGRP1, LUSEED=LAGLU##
```

**tngrp1**

```
TNGRP1E VBUILD TYPE=LUGROUP
TNGRP1 LUGROUP
DYNAMIC LU DLOGMOD=D4C32XX3, X
MODETAB=ISTINCLM, USSTAB=USSTCPIP, SSCPFM=USS3270
@ LU DLOGMOD=D4C32784, X
MODETAB=ISTINCLM, USSTAB=USSTCPIP, SSCPFM=USS3270
```

**Additional Router Configuration for Router Honduras**

```
logging buffered
! logs Cisco IOS software messages to the internal buffer using the default
```

```

! buffer size for the router platform
interface Channel6/1
  cmpc C020 F8 CONFIGE READ
  cmpc C020 F9 CONFIGE WRITE
!
interface Channel6/2
  lan TokenRing 0
  source-bridge 88 3 100
  adapter 5 4000.eeee.eeee
  adapter 6 4000.0000.eeee
tn3270-server
  dlur NETA.HOND327S NETA.MVS2
  lsap token-adapter 6 54
  link MVS2TN rmac 4000.eeee.eeee rsap 50
  listen-point 172.18.1.218
  pu TNPU 017EFEED dlur
  tg CONFIGE llc token-adapter 6 50 rmac 4000.eeee.eeee rsap 54

```

### Activate the Configuration

On the MVS system, use the following commands to activate the configuration:

```

v net,act,id=mvstrle,update=add
v net,act,id=mvslne
v net,act,id=swhondpu
v net,act,id=swlagtn
v net,act,id=swhondcp
v net,act,id=tngrp1

```

## Dynamic LU Naming Example

### Router configuration

The following router configuration is an example of the TN3270 server configured with LU pooling. A listen-point PU is configured to define DLUR PUs using dynamic LU naming. Note the following lines in the configuration:

- The **lu deletion** command must be configured with the **named** option.
- The PU pu1 is defined with `lu-seed abc##pqr`. Using hexadecimal numbers for `##`, the LU names for this PU are ABC01PQR, ABC02PQR, ABC03PQR.... up to ABCFFPQR. Similarly, the PU pu2 is defined with `lu-seed pqr###`. Using decimal numbers for `###`, the LU names for this PU are PQR001, PQR002... up to PQR255.

The LUs ABC01PQR through ABC32PQR and PQR100 through PQR199 are allocated to the pool SIMPLE. The LUs ABC64PQR through ABC96PQR and PQR010 through PQR035 are allocated to the pool PCPOOL. The remaining LUs are in the generic pool.

```

tn3270-server
  pool simple cluster layout 1s
  pool pcpool cluster layout 4slp
  lu deletion named
  dlur neta.shek neta.mvsd
  lsap tok 15 04
  link she1 rmac 4000.b0ca.0016
  listen-point 172.18.4.18
  pu pu1 91903315 tok 16 08 lu-seed abc##pqr
!
!The following statement allocates LUs ABC01PQR through ABC32PQR to the pool named
!simple.
!
  allocate lu 1 pool simple clusters 50

```

```

!
!The following statement allocates LUs ABC64PQR through ABC96PQR to the pool named
!pcpool.
!
  allocate lu 100 pool pcpool clusters 10
  pu pu2 91913315 dlur lu-seed pqr###
!
!The following statement allocates LUs PQR010 through PQR035 to the pool named pcpool.
!
  allocate lu 10 pool pcpool clusters 5
!
!The following statement allocates LUs PQR100 through PQR199 to the pool named simple.
!
  allocate lu 100 pool simple clusters 100

```

### Mainframe configuration

The following mainframe configuration is an example of the VTAM configuration that can be used if the TN3270 server is configured with the Dynamic LU Naming enhancement.



#### Note

PU's are defined with the LUGROUP command. It is not necessary to specify an LUSEED. If the LUSEED operand is specified, it is ignored.



#### Note

You must specify the INCLUD0E=YES parameter on VTAM so that the TN3270 server receives the LU name generated by the VTAM exit.

```

SWN72022 VBUILD TYPE=SWNET
PU1      PU      ADDR=01,                X
          PUTYPE=2,                    X
          IDBLK=919,                   X
          IDNUM=03315,                 X
          INCLUD0E=YES,                X
          LUGROUP=MYLUS
*
PU2      PU      ADDR=01,                X
          PUTYPE=2,                    X
          IDBLK=919,                   X
          IDNUM=13315,                 X
          INCLUD0E=YES,                X
          LUGROUP=MYLUS

```

## Inverse DNS Nailing Examples

### Nailing Clients to Pools by Device Name, Domain Name, and Domain ID using a Domain ID

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing:

```

tn3270-server
  domain-id 2 .cisco.com
  domain-id 20 .yahoo.com
  pool GENERAL cluster layout 4s1p
  pool TEST cluster layout 4s1p
  listen-point 172.18.5.168
  pu T240CA 91922363 token-adapter 31 12 rmac 4000.4000.0001
  allocate lu 1 pool GENERAL clusters 1
  client name lucy49.cisco.com pool GENERAL
  client name george 20 pool TEST

```

```

client name arthur 20 pool TEST
client name tyson 20 pool TEST
client name daisy 20 pool TEST
listen-point 172.18.5.169
pu T240CB 91922364 token-adapter 31 12 rmac 4000.4000.0002
  allocate lu 1 pool TEST clusters 50
client domain-name cisco.com pool GENERAL
client domain-id 20 pool TEST

```

### Nailing Clients to Pools by IP Address

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing. In this example, the **client pool** command is configured with the **ip** keyword. The command nails the client at IP address 10.1.2.3 with an IP mask of 255.255.255.0 to the pool named OMAHA:

```

tn3270-server
pool OMAHA cluster layout 10s1p
listen-point 172.18.4.18
client ip 10.1.2.3 255.255.255.0 pool OMAHA

```

### Nailing Clients to Pools by Device Name

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing. In this example the **client pool** command is configured with the **name** keyword. The command nails the client at device name george-isdn29.cisco.com to the pool named GENERAL:

```

tn3270-server
pool GENERAL cluster layout 4s1p
listen-point 172.18.5.168
pu T240CA 91922363 token-adapter 31 12 rmac 4000.4000.0001
  allocate lu 1 pool GENERAL clusters 1
client name george-isdn29.cisco.com pool GENERAL

```

### Nailing Clients to Pools by Device Name using a Domain ID

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing. In this example the **client pool** command is configured with the **name** keyword and the optional *DNS-domain-identifier* argument. The command nails the client at device named lucy-isdn49.cisco.com to the pool named GENERAL:

```

tn3270-server
domain-id 23 .cisco.com
pool GENERAL cluster layout 4s1p
listen-point 172.18.5.168
pu T240CA 91922363 token-adapter 31 12 rmac 4000.4000.0001
  allocate lu 1 pool GENERAL clusters 1
client name lucy-isdn49 23 pool GENERAL

```

### Nailing Clients to Pools by Domain Name

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing. In this example the **client pool** command is configured with the **domain-name** keyword. The command nails any client at domain name .cisco.com to the pool named GENERAL:

```

tn3270-server
pool GENERAL cluster layout 4s1p
listen-point 172.18.5.168
pu T240CA 91922363 token-adapter 31 12 rmac 4000.4000.0001
  allocate lu 1 pool GENERAL clusters 1
client domain-name .cisco.com pool GENERAL

```

### Nailing Clients to Pools by Domain Name Using a Domain ID

The following router configuration shows an example of commands used to define the TN3270 server with LU pools using inverse DNS nailing. In this example the **client pool** command is configured with the **domain-id** keyword. The command nails any client at domain name .cisco.com to the pool named GENERAL:

```
tn3270-server
domain-id 23 .cisco.com
  pool GENERAL cluster layout 4slp
  listen-point 172.18.5.168
  pu T240CA 91922363 token-adapter 31 12 rmac 4000.4000.0001
  allocate lu 1 pool GENERAL clusters 1
client domain-id 23 pool GENERAL
```

## SSL Encryption Support Examples

### Mainframe configuration

The following mainframe configuration is an example of the VTAM configuration that can be used if the SSL Encryption Support enhancement is configured:

```
example PU definition:
*
BMPU4  PU      ADDR=01,
           PUTYPE=2,
           LOGAPPL=NETTMVSD,
           LUGROUP=BMCL13 , LUSEED=BMPU4###,
           PACING=8, VPACING=8,
           IDBLK=919,
           IDNUM=36821
*
BMPU5  PU      ADDR=01,
           PUTYPE=2,
           LOGAPPL=NETTMVSD,
           LUGROUP=BMCL13 , LUSEED=BMPU5###,
           PACING=8, VPACING=8,
           IDBLK=919,
           IDNUM=46821
*
BMPU6  PU      ADDR=01,
           PUTYPE=2,
           LOGAPPL=NETTMVSD,
           USSTAB=USSTCPMF,
           DLOGMOD=D4C32782,
           PACING=8, VPACING=8,
           IDBLK=919,
           IDNUM=56821
*
BMPU6001 LU    LOCADDR=01
BMPU6002 LU    LOCADDR=02
BMPU6003 LU    LOCADDR=03
BMPU6004 LU    LOCADDR=04
BMPU6005 LU    LOCADDR=05
BMPU6006 LU    LOCADDR=06
BMPU6007 LU    LOCADDR=07
BMPU6008 LU    LOCADDR=08
BMPU6009 LU    LOCADDR=09
BMPU6010 LU    LOCADDR=10
.
BMPU6255 LU    LOCADDR=255
*
```

### Simple SSL Encryption Support Example

The following router configuration shows an example of commands used to define a simple configuration of the SSL Encryption Support enhancement. In this configuration, listen-point 172.18.5.187 is a secured listen-point using security profile cert40. Note that the security profile is using all of the default parameters.

```
interface Channel3/2
ip address 172.18.5.185 255.255.255.248
no keepalive
lan TokenRing 15
  source-bridge 15 1 500
  adapter 15 4000.b0ca.0015
lan TokenRing 16
  source-bridge 16 1 500
  adapter 16 4000.b0ca.0016
tn3270-server
security
  profile CERT40 SSL
  servercert slot0:verisign187.pem
listen-point 172.18.5.187
  sec-profile CERT40
  pu BMPU5 91946821 token-adapter 15 08 rmac 4000.b0ca.0016
```

### Complex SSL Encryption Support Example

The following router configuration shows an example of commands used to define a more complex configuration of the SSL Encryption Support enhancement:

- Listen-point 172.18.5.186 is a non-secured listen point.
- Listen-point 172.18.5.187 is a secured listen-point using security-profile cert128 with the encryption order specified and a keylen of 128 which implies strong (domestic) encryption.
- Listen-point 172.18.5.188 is a secured listen-point using security profile cert40 with default security-profile parameters.

```
interface Channel3/2
ip address 172.18.5.185 255.255.255.248
no keepalive
lan TokenRing 15
  source-bridge 15 1 500
  adapter 15 4000.b0ca.0015
lan TokenRing 16
  source-bridge 16 1 500
  adapter 16 4000.b0ca.0016
```

```
tn3270-server
security
  profile CERT128 SSL
    servercert slot0:verisign128.pem
    encryptorder RC4 RC2 DES
    keylen 128
  profile CERT40 SSL
    servercert slot0:coach188.pem
listen-point 172.18.5.186
  pu BMPU4 91946821 token-adapter 15 04 rmac 4000.b0ca.0016
listen-point 172.18.5.187
  sec-profile CERT128
  pu BMPU5 91956821 token-adapter 15 08 rmac 4000.b0ca.0016
listen-point 172.18.5.188
  sec-profile CERT40
  pu BMPU6 91966821 token-adapter 15 0C rmac 4000.b0ca.0016
```

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