

# **Cisco TN3270 to z/OS TN3270 Migration**

---

**IBM Corporation**

Cisco TN3270 to z/OS TN3270 Migration .....	- 0 -
1 INTRODUCTION .....	- 2 -
1.1 Current configuration using CISCO router as TN3270 server .....	- 3 -
1.2 TN3270 Server on z/OS .....	- 4 -
2 Migration.....	- 5 -
2.1 Migration Tasks .....	- 5 -
2.2 Migration details .....	- 5 -
2.2.1 Convert PU/LU definitions .....	- 5 -
2.2.2 Evaluate and Convert Security Parameters .....	- 9 -
3 Command/Configuration Comparison.....	- 11 -
3.1 client lu maximum .....	- 11 -
3.2 client ip lu.....	- 12 -
3.3 client ip pool .....	- 13 -
3.4 dlur .....	- 14 -
3.5 domain-id .....	- 14 -
3.6 generic-pool .....	- 16 -
3.7 idle-time .....	- 17 -
3.8 Ip precedence.....	- 18 -
3.9 keepalive.....	- 19 -
3.10 listen-point .....	- 21 -
3.11 Lu deletion/termination .....	- 22 -
3.12 maximum-lus .....	- 23 -
3.13 pool .....	- 24 -
3.14 pu .....	- 26 -
3.15 response-time group .....	- 27 -
3.16 tcp-port .....	- 28 -
3.17 timing-mark .....	- 29 -
3.18 unbind-action.....	- 30 -
4 Terminal Types/Logmodes .....	- 31 -
5 Commands.....	- 32 -
6 Examples .....	- 36 -
6.1 Simple DLUR connection .....	- 36 -
6.2 Simple DLUR connection, with LU nailing .....	- 37 -
6.3 Direct Connect Listen-Point with LU nailing .....	- 37 -
6.4 Security Parameters .....	- 38 -

# 1 INTRODUCTION

---

The objective of this document is to help systems programmers make the transition from the Cisco Channel Interface Processor (CIP)/Channel Port Adapter (CPA) TN3270 server (which will be referred to as Cisco TN3270) to the Communications Server for z/OS TN3270 server (which will be referred to as z/OS TN3270).

The first couple of pages compare the current configuration with the future configuration. You will note that definition of the second configuration is much simpler..

## Current configuration using CISCO TN3270 server

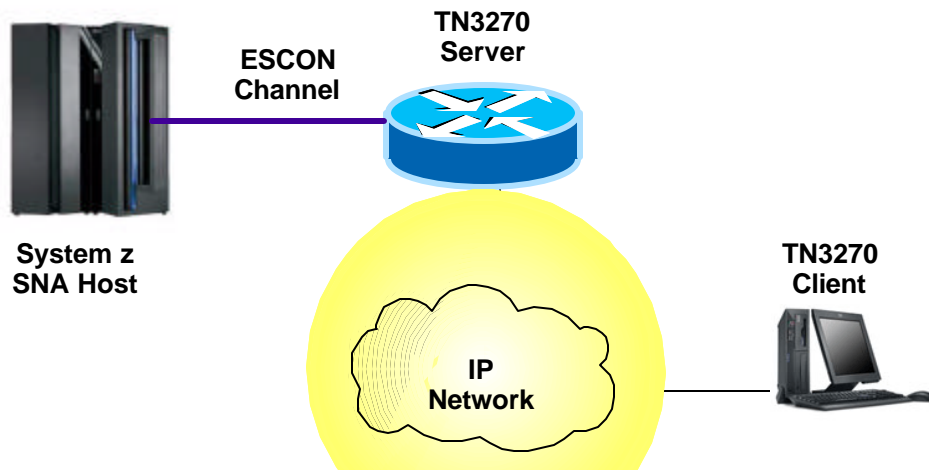


Figure 1.

### Definitions required

Router	z/OS
DLUR	XCA Major Node
Link	DLUR PU Switched Major Node
PU	TN3270 PU Switched Major Node
TN3270 options/definitions	USS Table

## 1.1 z/OS TN3270 Server

TN3270  
Server



System z  
SNA Host



TN3270  
Client



### Definitions required

<b>z/OS</b>
SNA Application Major Node
TN3270 Server Profile
USS Table (Note: The same table that was previously used can still be used)

## 2 Migration

### 2.1 Migration Tasks

You should consider the following items when changing your configuration from using a Cisco TN3270 server to a z/OS TN3270 server

- Convert CIP/CPA PU/LU definitions to LU definitions on z/OS
  - Evaluate and convert LISTEN POINTs and tcp-ports
    - Create ports and/or qualified ports
  - Define LUs/LUGROUPs
    - Create DEFAULTLUS if no nailed LUs are defined
  - Define VTAM application major node that corresponds with the LUs/LUGROUPS defined above.  
*Note: You can use wildcards*
  - Evaluate and convert nailed LUs.
    - Map LUs/LUGROUPs to clients
    - Optionally define various client types
      - IPGROUPs
      - HNGROUPs
      - USERGROUPs
      - Etc...
  - Evaluate and convert LUGROUP Major Node
    - This is related to TELNETDEVICE statements on z/OS TN3270
- Evaluate and convert security parameters
  - Encryptorder translates to ENCRYPTion parameter in TelnetGlobals/Telnetparms/Parmsgroup
  - Servercert translates to KEYRING parameter in Telnetglobals/Telnetparms
- Evaluate and convert other settings

These are discussed in the section entitled *Command/Configuration Comparison*.

### 2.2 Migration details

#### 2.2.1 Convert PU/LU definitions

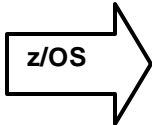
PUs are used on the CIP/CPA to define connectivity to the z/OS system. As part of the PU definition, LUs are defined. For z/OS TN3270, PUs are not defined. The following assumes you have TCP/IP connectivity to z/OS.

### 2.2.1.1 Evaluate and convert listen points and tcp-ports

You can define TN3270 ports in 2 ways on a CIP/CPA server. Both methods require defining a TCP/IP address and then associating a port number with it. For the sake of simplicity, we will just discuss the listen-point method here. The result on z/OS is the same.

To define an IP address for the TN3270 server, use the **listen-point** command.

```
listen-point 9.42.88.194 tcp-port 323
```



This equates to defining a port, or qualified port in z/OS Telnet. In order to define a port, the telnet profile must contain a TELNETPARMS definition for the port, and a corresponding BEGINVTAM definition. If the port is not qualified with an IP address, then any server address can be used. Therefore, if your server only has one address associated with it, there is no reason to qualify the port(s) with an IP address. The optional port qualifiers are shown below in bold.

```
TELNETPARMS
  Port 323,9.42.88.194
  .
  .
ENDTELNETPARMS

BEGINVTAM
  Port 323,9.42.88.194
  .
  .
ENDVTAM
```

### 2.2.1.2 Define LUs/LUGROUPS

You assign LUs in z/OS Telnet using LU Groups of various types. However, you must also define the LUs contained in these groups to VTAM. As opposed to Cisco LUs, which you define in VTAM via Locaddr/Switched Major Nodes, you define the z/OS LUs via an Application Major Node.

For example, if you had the following TN3270 statements in your profile

```
BEGINVTAM PORT 23
  LUGROUP GROUP1 TN0001..TN0010 ENDLUGROUP
ENDVTAM
```

You would need the following, corresponding VTAM major node defined

```
*****
* TELNET LU APPLICATIONS                                     *
*****
*
```

```

                VBUILD TYPE=APPL
*
TN0001          APPL
AUTH=NVPACE , EAS=1 , PARSESS=NO , MODETAB=ISTINCLM , SESSLIM=YES
TN0002          APPL
AUTH=NVPACE , EAS=1 , PARSESS=NO , MODETAB=ISTINCLM , SESSLIM=YES
.
.
.

```

This could also be coded using a wildcard:

```

*****
* TELNET LU APPLICATIONS *
*****
*
                VBUILD TYPE=APPL
*
TN*              APPL
AUTH=NVPACE , EAS=1 , PARSESS=NO , MODETAB=ISTINCLM , SESSLIM=YES

```

You need to consider the above when defining LUs in your TCP/IP Telnet profile. The following items in the Command/Configuration Comparison section relate to LU definition.

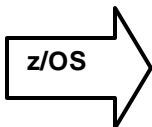
- client ip lu
- client ip pool
- generic-pool
- pool

### 2.2.1.3 Evaluate and Convert Nailed LUs

“TN3270 Server Client to LU Nailing” is also known as “Client IP Address Nailing,” a feature that allows the network administrator to restrict what client IP addresses can connect to particular LUs.

The Cisco TN3270 Server supports static and dynamic LUs.

- Static LUs are defined individually within VTAM and are known by the client. Static LUs require a specific LU/PU name to be supplied. Static LUs are typically printers or secure terminals.
- Dynamic LUs use the DDDL feature of VTAM. These LUs are given to the TN3270 client without the client knowing the PU or LU name of the session defined in VTAM. If the PU allows dynamic LUs, any LOCADDR not defined as a static LU, within a PU definition, can be used as a dynamic LU.



LU “Nailing” is equivalent to LU “Mapping” on the Z/OS TN3270 server.

You assign LUs and LUGROUPs to specific clients via the LUMAP command, which has two flavors: Generic and Specific.



When an LU or LUGroup is mapped to a client generically (which is the default), the client does not have to specify the LU/Group name when establishing a connection. This is comparable to CIP/CPA dynamic LUs. For example:

```
LUMAP GROUP1 9.42.88.29
LUMAP LU1 9.42.88.30
```

When establishing a connection from address 9.42.88.29 you will be assigned an LU from GROUP1. When establishing a session from address 9.42.88.30 you will be assigned the LU named LU1.

Alternately, you can SPECIFICALLY map an LU/Group to a client. This is comparable to CIP/CPA static LUs. This means that a client has to specifically request the LU or group when establishing a connection. For example:

```
LUMAP GROUP1 9.42.88.29 SPECIFIC
LUMAP LU1 9.42.88.30 SPECIFIC
```

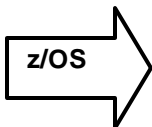
When establishing a connection from address 9.42.88.29 you must specify that you want to use GROUP1 or one of the LUs within GROUP1, or your session will be denied (assuming no other mappings for this client exist, and no defaultlus are coded). And when establishing a session from address 9.42.88.30 you must specify LU1.

#### 2.2.1.4 Evaluate and Convert LUGROUP Major Node

On Cisco, when LU nailing is coded, you can specify which LUs you want to assign to a particular client. Associated with these LUs are various characteristics such as terminal type and size which are coded in LUGROUP major nodes on the MVS host.

For example the following LUGROUP major node is referenced by various PUs defined in the Cisco TN3270 server.

```
LUGRP01  VBUILD TYPE=LUGROUP
LUG01    LUGROUP
@        LU      MODETAB=AMODETAB,
          DLOGMOD=D6327802,
          USSTAB=USSTNP,
          SSCPFM=USSSCS
*
LUG02    LUGROUP
3@7@0@  LU      SSCPFM=USS3270, DLOGMOD=D6327802, USSTAB=USSTNP
3@7@S@  LU      SSCPFM=USSSCS, DLOGMOD=D6327802, USSTAB=USSSCS
```



The TELNETDEVICE and USSTCP statements provide equivalent function in z/OS Telnet.

The TELNETDEVICE parameter statement lets you specify a logmode for a device type. This statement accepts two logmodes: one for TN3270 connections and one for TN3270E connections.

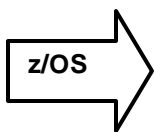
The optional USSTCP mapping statement allows you to map a customized USS table to a Client Identifier. You have the ability to code a 3270 table and an SCS table, which is used for TN3270E clients. This is equivalent to the “S” terminal type in the Cisco definition.

## 2.2.2 Evaluate and Convert Security Parameters

Configure Security in the TN3270 server

Cisco TN3270	z/OS TN3270
Obtain digital certificate from Certificate Authority	Create server self-signed certificate or obtain certificate from Certificate Authority
Load server digital certificate onto the flash of the router.	Create keyring file and add server certificate to the file
Configure security (enable or disable)	Define a telnet port as a SECUREPORT via Telnetparms block
Configure the profile none Configure no security ssl Configure SSL security tls Configure TLS security	Encryption statement coded in the TELNETGLOBALS, TELNETPARMS or PARMSGROUP blocks
Configure the profile options Keylen Encryptorder Servercert certificate reload	The Encryption statements address these options as well.  The location of the server certificate is indicated via the KEYRING statement which can be coded in the TELNETGLOBALS, TELNETPARMS or PARMSGROUP blocks.
Configure a listen point for security	Define a telnet port as SECUREPORT

```
tn3270-server
security
  profile CERT40 SSL
  servercert slot0:verisign187.pem
listen-point 172.18.5.187
sec-profile CERT40
pu BMPU5 91946821 token-adaptor 15 08 rmac 4000.b0ca.0016
```



To configure the above example for z/OS telnet, you would code the following, where the SERVERRING contains the verisign certificate:

```
TELNETGLOBALS
  KEYRING SAF SERVERRING
ENDTELNETGLOBALS
TELNETPARMS
  SECUREPORT 23,172.18.5.187
  .
  .
  .
ENDTELNETPARMS
```

```
BEGINVTAM
  PORT 23,172.18.5.187
  .
  .
ENDVTAM
```

### 2.2.2.1 Basic z/OS Telnet SSL setup steps

The following are the basic steps required to get SSL up and running on a telnet port. This assumes that you are using RACF as your security product.

- Create a self-signed certificate  
RACDCERT ID(*userid*) GENCERT SUBJECTSDN(CN('cert') OU('org unit') C('country'))  
SIZE(1024) WITHLABEL('label')

-OR-

Obtain a certificate from Verisign or another certificate authority.

- Create a keyring file, if you don't already have one  
RACDCERT ID(IBMUSER) ADDRING(*ring*)
- Add certificate to the keyring file  
RACDCERT ID(*userid*) CONNECT(LABEL('label') RING(*ring*) DEFAULT)
- Export the certificate to a dataset so that it can be sent to your clients  
RACDCERT ID(*userid*) EXPORT(LABEL('label')) DSN('dataset name')  
FORMAT(CERTDER)

The certificate should then be sent to clients, who will then install the certificate in their keyring files.

Define the port as a SECURE telnet port in the TELNETPARMS section of your profile via the SECUREPORT keyword.

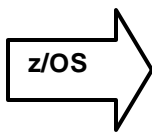
## 3 Command/Configuration Comparison

### 3.1 *client lu maximum*

This command configures the maximum number of LU sessions that a particular TN3270 client at a specified IP address or subnet can establish with the TN3270 server.

```
CLIENT 9.42.90.29 255.255.255.255 LU MAX 5
```

In the above example, the client at IP address 9.42.90.29 is limited to 5 LU sessions.



The simplest way to accomplish this on the z/OS TN3270 server is the following:

Explicitly define 5 LUs, via an LUGROUP, which will be assigned to this client when it connects.

```
BEGINVTAM
.
.
LUGROUP MYLUGR TNLU001..TNLU005 ENDLUGROUP
LUMAP 9.42.90.29 MYLUGR
.
.
ENDVTAM
```

The corresponding VTAM Application Major Node

```
*****
* TELNET LU APPLICATIONS *
*****
*
          VBUILD TYPE=APPL
*
TNLU*      APPL AUTH=NVPACE , EAS=1 , PARSESS=NO , MODETAB=ISTINCLM
```

## 3.2 client ip lu

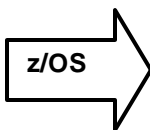
To define a specific logical unit (LU) or range of LUs to a client at the IP address or subnet

In the following example, local addresses 1 to 40 are reserved for screen devices in the 10.69.176.0 subnet, and 41 to 50 are reserved for printers in that subnet:

```
interface channel 2/2
  tn3270-server
  .
  .
  pu TESTPU 05D33333 dlur
  client ip 10.69.176.0 255.255.255.0 lu 1 40
  client printer ip 10.69.176.0 255.255.255.0 lu 41 50
```

Assume that the definition for TESTPU is as follows:

```
&SYSCLONE.DLLC PU ADDR=C1,ANS=CONT,ASDP=YES,IDBLK=05D,IDNUM=33333,
  LOGTAB=INTERP,MAXDATA=256,MAXPATH=1,MODETAB=AMODETAB,
  PUTYPE=2,USSTAB=USS10R,DLOGMOD=D6327802,DISCNT=DELAY,
  REGISTER=CDSERVR
&SYSCLONE.DLLC01 LU LOCADDR=001
&SYSCLONE.DLLC02 LU LOCADDR=002
&SYSCLONE.DLLC03 LU LOCADDR=003
&SYSCLONE.DLLC04 LU LOCADDR=004
.
.
&SYSCLONE.DLLC50 LU LOCADDR=050
```



The equivalent definition on z/OS is:

```
BEGINVTAM
  LUGROUP DISPLAY &SYSCLONE.DLLC01..&SYSCLONE.DLLC40 ENDLUGROUP
  PRTGROUP PRINT &SYSCLONE.DLLC41..&SYSCLONE.DLLC50 ENDPRTGROUP
  IPGROUP MYGROUP 255.255.255.0:10.69.176.28 ENDIPGROUP
  LUMAP DISPLAY MYGROUP
  PRTMAP PRINT MYGROUP
ENDVTAM
```

The corresponding VTAM Application Major Node

```
*****
* TELNET LU APPLICATIONS *
*****
*
  VBUILD TYPE=APPL
*
&SYSCLONE.DLLC*          APPL AUTH=NVPACE,EAS=1,PARSESS=NO,
MODETAB=ISTINCLM
```

### 3.3 *client ip pool*

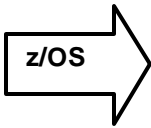
To nail clients to pools.

```
tn3270-server
  pool POOL-1 cluster layout 10slp
  listen-point 172.18.4.18
  client ip 10.1.2.3 255.255.255.0 pool POOL-1
```

Again, assume the PU/LU definition is as follows:

```
&SYSCLONE.DLLC PU ADDR=C1,ANS=CONT,ASDP=YES,IDBLK=05D,IDNUM=33333,
  LOGTAB=INTERP,MAXDATA=256,MAXPATH=1,MODETAB=AMODETAB,
  PUTYPE=2,USSTAB=USS10R,DLOGMOD=D6327802,DISCNT=DELAY,
  REGISTER=CDSERVR
&SYSCLONE.DLLC01 LU LOCADDR=001
&SYSCLONE.DLLC02 LU LOCADDR=002
&SYSCLONE.DLLC03 LU LOCADDR=003
&SYSCLONE.DLLC04 LU LOCADDR=004
.
.
&SYSCLONE.DLLC50 LU LOCADDR=050
```

Note that the LUs do not have to be defined outright. They can also be dynamically defined.



The equivalent z/OS Telnet definition is:

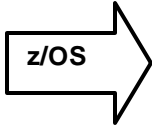
```
BEGINVTAM
  PORT 23,172.18.4.18
  LUGROUP DISPLAY &SYSCLONE.DLLC01..&SYSCLONE.DLLC10 ENDLUGROUP
  PRTGROUP PRINT &SYSCLONE.DLLC11 ENDPRTGROUP
  LUMAP DISPLAY 10.1.2.3
  PRTMAP PRINT 10.1.2.3
  .
  .
  .
ENDVTAM
```

The corresponding VTAM Application Major Node

```
*****
* TELNET LU APPLICATIONS *
*****
*
  VBUILD TYPE=APPL
*
&SYSCLONE.DLLC*      APPL AUTH=NVPACE,EAS=1,PARSESS=NO,
MODETAB=ISTINCLM
```

### **3.4 dlur**

Configure the TN3270 server Dependent LU Requester (DLUR) feature.

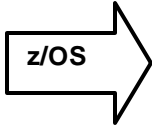


There is no equivalent z/OS Telnet statement. Due to the close integration of VTAM and TCP/IP on z/OS, this statement does not need to be defined in the TN3270 server.

### **3.5 domain-id**

To specify a domain name suffix that the TN3270 server appends to a configured machine name to form a fully qualified name when configuring inverse Domain Name System (DNS) nailing

```
DOMAIN-ID 99 .IBM.COM
```

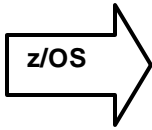


There is no equivalent z/OS telnet configuration statement.



### 3.6 *generic-pool*

To specify whether leftover logical unit (LU) s will be made available to TN3270 sessions that do not request a specific LU or LU pool through TN3270E



There is no such thing as “leftover” LUs in the z/OS TN3270 server. You can, however, define a default LU group which is used to assign LUs to clients which do not have specifically mapped LUs or LU Groups defined.

The DEFAULTLUS statement defines such a pool. Clients who do not specify an LU name at session initialization time, and for which the profile does not contain a specific mapping statement, will be assigned LUs from this pool.

The DEFAULTLUSSPEC statement defines a similar LU pool. However, in order to be assigned LUs in this pool, clients must specify the LU name at session initialization time.

Further, if you restrict and allow specific clients to use different applications (via ALLOWAPPL/RESTRICTAPPL statements), you can, in essence, restrict/allow clients that are using the default LUs.

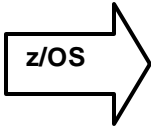
In the following example, any client with an IP address in the 9.0.0.0 domain will be assigned an LU from LUGROUP MYCORPLU. Other clients will obtain an LU from DEFAULTLUS and will not be allowed to use TSO, due to the ALLOWAPPL.

```
TELNETPARMS PORT 23 ENDTELNETPARMS
BEGINVTAM PORT 23
  DEFAULTLUS TNLU0001..TNLU01000 ENDDEFAULTLUS
  LUGROUP MYCORPLU TILU0001..TILU9999 ENDLUGROUP
  IPGROUP MYCORP 255.0.0.0:9.0.0.0 ENDIPGROUP
  ALLOWAPPL TSO LUG MYCORPLU
  .
  .
ENDVTAM
```

### 3.7 *idle-time*

To specify seconds of logical unit (LU) inactivity, from both host and client, before the TN3270 session is disconnected

```
idle-time 1800
```



To achieve this same result using z/OS Telnet, use the INACTIVE parameter, which you can code in the TELNETGLOBALS, TELNETPARMS or PARMSGROUP sections of the profile.

```
TELNETGLOBALS
```

```
.  
. INACTIVE 1800  
.
```

```
ENDTELNETGLOBALS
```

or -

```
TELNETPARMS
```

```
PORT 23  
INACTIVE 1800  
ENDTELNETPARMS
```

Or -

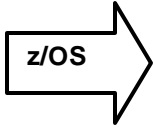
```
BEGINVTAM
```

```
.  
. PARMSGROUP INACT INACTIVE 1800 ENDPARMSGROUP  
PARMSMAP INACT 9.42.90.29  
.
```

```
ENDVTAM
```

### **3.8 *Ip precedence***

To specify the precedence level for voice over IP traffic in the TN3270 server.

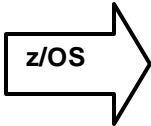


There is no equivalent z/OS TN3270 configuration statement.

### 3.9 *keepalive*

To specify how many seconds of inactivity elapse before the TN3270 server sends a DO TIMING-MARK or Telnet no operation (nop) to the TN3270 client

```
KEEPALIVE 300
```



To achieve the same result using z/OS Telnet, use a combination of the SCANINTERVAL and TIMEMARK parameters, which can be coded in the TELNETGLOBALS, TELNETPARMS and PARMSGROUP sections of the profile.

```
TELNETGLOBALS
  SCANINTERVAL 300
  TIMEMARK 300
ENDTELNETGLOBALS
```

SCANINTERVAL and TIMEMARK are used together to determine if a connection has been lost. These parameters can be specified in TELNETGLOBALS, TELNETPARMS, and PARMSGROUP. The smallest SCANINTERVAL value is used to define how often the connections are checked. If TIMEMARK is smaller than SCANINTERVAL, TIMEMARK is set equal to SCANINTERVAL. Whenever data is received from the client, Telnet records the time. Telnet checks all connections at regular intervals defined by the SCANINTERVAL value. Each connection is checked to see if any data has been received from the client in the past TIMEMARK period of time. If not, a TIMEMARK command is sent to the client which acts as an "are you there" and Telnet remembers a TIMEMARK was sent to this client. During the next check at SCANINTERVAL time later, each connection is again checked to see if any data has been received from the client. If not, and a TIMEMARK was sent on the previous check, the connection is dropped with DEBUG SUMMARY message CONN DROP reason TIMEMARK.

For example, assume the values for SCANINTERVAL and TIMEMARK are 1800 and 10800, respectively. That means every 30 minutes all connections are checked to see if any data has been received in the last 3 hours. If not, a TIMEMARK is sent to the client. 30 minutes later Telnet checks the connections again. If the client responded to the TIMEMARK or sent in actual data of some type Telnet leaves the connection active. If nothing has been received Telnet drops the connection.

**Note:** If your KEEPALIVE value on Cisco is a small value, used for detection of lost connections and to allow quick recovery, you may want to consider using the CheckClientConn function of z/OS TN3270. This function was introduced in Communications Server for z/OS V1R8.

```
CHECKCLIENTCONN sec,maxconns
```

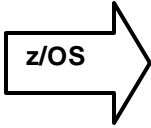
This parameter statement triggers the checking of the connectivity of all preexisting connections associated with the client identifier of the new connection being established. The new connection will be delayed early in the connection negotiation (before TN3270E LU assignment) until either all existing connections have responded or the specified wait time has elapsed. The number of existing connections checked can be limited with the *maxconns* parameter. No specific order is used when a limited number of connections are checked. This statement may be coded in the Telnetglobals, Telnetparms and Parmsgroup sections of the profile.



### 3.10 *listen-point*

To define an IP address for the TN3270 server, use the **listen-point** command.

```
listen-point 9.42.88.194 tcp-port 323
```



This equates to defining a port, or qualified port in z/OS Telnet. In order to define a port, the telnet profile must contain a TELNETPARMS definition for the port, and a corresponding BEGINVTAM definition. If the port is not qualified with an IP address, then any server address can be used. The optional port qualifiers are shown below in bold.

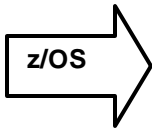
```
TELNETPARMS
  Port 323,9.42.88.194
  .
  .
ENDTELNETPARMS

BEGINVTAM
  Port 323,9.42.88.194
  .
  .
ENDVTAM
```

### **3.11 Lu deletion/termination**

Deletion - To specify whether the TN3270 server sends a REPLY-PSID poweroff request to virtual telecommunications access method (VTAM) to delete the corresponding logical unit (LU) when a client disconnects.

Termination - To specify whether a TERMSELF or UNBIND request/response unit (RU) is sent by the TN3270 server when a client turns off a device or disconnects.



Deletion - Because z/OS TN3270 LUs are really application LUs that are dynamically created (if they are defined with wildcards), they are deleted once a CLOSE ACB occurs.

Termination – The KEEPLU parameter statement keeps the LU reserved for the Client Identifier when the LU is unassigned from the connection. The first reconnection request from the same Client Identifier mimics an end user requesting a specific connection with the kept LU name.

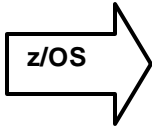
KEEPLU sec

Sec sets the KEEPLU timeout to the specified number of seconds. When the LU has remained unassigned for the specified number of seconds, it becomes generally available. This parameter can be coded in the TELNETGLOBALS, TELNETPARMS or PARMMSGROUP blocks.

## ***maximum-lus***

To limit the number of logical unit (LU) control blocks that will be allocated for the TN3270 server

```
MAXIMUM-LUS 5000
```



The only way to limit the number of connections on z/OS telnet is to limit the number of LUs that you define to the telnet server. As a simple example:

```
BEGINVTAM
.
.
  DEFAULTLUS TLU0001..TLU5000 ENDDEFAULTLUS
ENDVTAM
```

If you don't define any other LU groups on this port, then only 5000 connections could be established. As connections were terminated, the LUs would once again become available for new connections. This is assuming that all connections are TN3270E.

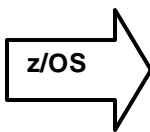
Alternatively, LUs can be limited by implementing policy agent parameters which limit the number of connections on a port basis.



## 3.12 pool

To define pool names for the TN3270 server and specify the number of screens and printers in each logical cluster. The pool and allocate lu commands enable the TN3270 server to know the relationships between screen and printer LUs.

```
tn3270-server
  pool pcpool cluster layout 4slp
  pool unixpool cluster layout 49slp
listen-point 10.20.30.40
  client ip 10.10.10.2 pool pcpool
  pu PU1 91903315 dlur
    allocate lu 1 pool pcpool clusters 50
  pu PU2 91903345 dlur
    allocate lu 1 pool unixpool clusters 5
```



Display LUs and Printer LUs are treated separately in the z/OS TN3270 server. To obtain the same result as the PCPOOL example, above, you would use the following definitions:

```
BEGINVTAM
  PORT 23,10.20.30.40
  LUGROUP PCLUS PCLU0001..PCLU0200 ENDLUGROUP
  PRTGROUP PCPRTS PCPRT01..PCPRT50 ENDPRTGROUP
  LUMAP PCLUS 10.20.30.40
  PRTMAP PCPRTS 10.10.10.2
  .
  .
  .
ENDVTAM
*
TELNETPARMS
  PORT 23,10.20.30.40
ENDTELNETPARMS
```

The end result is that the client at IP address 10.10.10.2 can only start 200 display sessions and 50 printer sessions. Note, that in the Cisco example, depending on how many LUs were actually defined in the VTAM DLUR Switched Major Node, the number of LUs could be less than 250, but this example assumes the maximum are defined.

The z/OS TN3270 server also offers the option of associating printer LUs with terminal LUs. This requires the definition of 2 groups, as above, but both groups must contain the same number of LUs. If the LUGROUP and PRTGROUP contain multiple ranges of LUs, they must also match in both groups.

```
BEGINVTAM
  PORT 23
  LUGROUP PCLUS PCLU001..PCLU200 ENDLUGROUP
  PRTGROUP PCPRTS PRTL001..PRTL020 ENDPRTGROUP
  LUMAP PCLUS 10.20.30.40 PCPRTS
  .
  .
  .
ENDVTAM
```

### 3.13 *pu*

Options that can be configured in PU mode that have analogous definitions in z/OS telnet

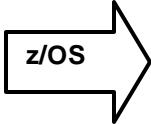
client	Client IP LU Nailing
idle-time	Specify idle-time disconnection
keepalive	Specify keepalive
lu	Configure LU deletion or termination
tcp-port	TCP port number to be used by a TN3270 server telnet session
unbind-action	Specify session action following an UNBIND

The above commands/options are discussed elsewhere in this document. The following compares the concept of LUs between Cisco and z/OS.

### 3.14 response-time group

To configure a client subnet group for response-time measurements.

```
tn3270-server
response-time group MYSUBNET bucket boundaries 15 25 60 120 multiplier
35
  client ip 10.1.1.0 255.255.255.248
  client ip 10.1.2.0 255.255.255.248
```



Telnet collects monitoring data for any client connection that is mapped to a **MONITORGROUP** Object. The collected data can be displayed using the D TCPIP,,TELNET,CONN,CONN=*connid* command, or a network management agent can request the data from the Telnet SNMP subagent once the subagent is started. This information is also available in SMF records and via the Network Management Interface.

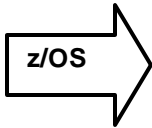
To configure the equivalent of the above example:

```
BEGINVTAM
  MONITORGROUP MYSUBNET
    BOUNDARY1 15
    BOUNDARY2 25
    BOUNDARY3 60
    BOUNDARY4 120
    AVGSAMPMULTIPLIER 35
  ENDMONITORGROUP
  IPGROUP GROUP1 255.255.255.248:10.1.1.0 ENDIPGROUP
  IPGROUP GROUP2 255.255.255.248:10.1.2.0 ENDIPGROUP
  MONITORMAP MYSUBNET GROUP1
  MONITORMAP MYSUBNET GROUP2
  .
  .
  .
ENDVTAM
```

### 3.15 tcp-port

To override the default TCP port setting of 23.

```
Tcp-port 1923
```



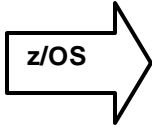
The equivalent definition for z/OS telnet is the PORT statement in the TELNETPARMS and BEGINVTAM blocks.

In order for the z/OS telnet server to use a port, a TELNETPARMS and matching BEGINVTAM block must be coded for that port.

```
TELNETPARMS PORT 1923 ENDTELNETPARMS
BEGINVTAM
  PORT 1923
  .
  .
  .
ENDVTAM
```

### **3.16 *timing-mark***

To select whether a WILL TIMING-MARK is sent when the host application needs a Systems Network Architecture (SNA) response (definite or pacing response).

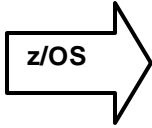


There is no equivalent configuration parameter for z/OS Telnet.

### **3.17 unbind-action**

To select what action to take when the TN3270 server receives an UNBIND request

```
unbind-action keep
```



The z/OS telnet equivalent of this statement is the LUSESSIONPEND configuration statement. The LUSESSIONPEND parameter statement allows the server to redrive the DEFAULTAPPL, USS, or Solicitor screen after LOGOFF of the current session. If the NOLUSESSIONPEND value is specified, the Telnet server connection is dropped after session LOGOFF.

## 4 Terminal Types/Logmodes

When defining LU groups on Cisco, you can code the following:

To cover all combinations of machine, model, and extension type, you would include definitions to cover the following:

- Two machine types: IBM 3278 and 3279
- Four model types: 2, 3, 4, 5
- Two extension types: 0 and S
- Two 3270 data-stream mode types: <> or E

A 0 extension specifies a classic TN3270 connection. The client expects all data to be in a TN3270 data stream. An S extension indicates that the client expects the SSCP-to-LU data to be in SCS control code format. All entries with an S extension to the machine type should have SSCPFM=USSSCS coded. All others should have SSCPFM=USS3270 coded.

An E mode type indicates that the client supports the host sending a read-partition query to the client to determine the client's capabilities.

The combinations of the machine, model, and extension types result in 32 model entries plus the default entry.

However, you can specify an SSCPFM of USSSCS for all clients regardless of type. This reduces the entries to 16. Then if you use the wildcard to represent both the 3278 and 3279 machine types, the number of entries is reduced to eight (plus the default).

The switched major node definition must specify the LUGROUP name of the LUGROUP parameter defined in the major node. The LU names of these dynamic LUs are generated by the LUSEED parameter. Alternatively, you can code the VTAM-exit ISTEXCSD and use an in-house algorithm for assigning LU names.

z/OS telnet has a DEVICETYPE parameter which accomplishes much of the same function. Combined with the USSTCP statement, you can replicate the Cisco definitions.

For example:

```
CBDDDLU VBUILD TYPE=LUGROUP
DDDMVSLU LUGROUP
327802 LU  MODETAB=...,
        DLOGMOD=...,
        SSCPFM=USS3270,
        USSTAB=(label of USSTAB with a USS10 in 3270DS)
3278S2 LU  MODETAB=...,
        DLOGMOD=...,
        SSCPFM=USSSCS,
        USSTAB=(label of USSTAB with a USS10 in SCS)
```

The following are default z/OS telnet server values.

Telnet device type	TN3270 logmode entry	TN3270E logmode entry
--------------------	----------------------	-----------------------



IBM-3277	D4B32782	Not applicable
IBM-3278-2-E	NSX32702	SNX32702
IBM-3278-2	D4B32782	SNX32702
IBM-3278-3-E	NSX32702	SNX32703
IBM-3278-3	D4B32783	SNX32703
IBM-3278-4-E	NSX32702	SNX32704
IBM-3278-4	D4B32784	SNX32704
IBM-3278-5-E	NSX32702	SNX32705
IBM-3278-5	D4B32785	SNX32705
IBM-3279-2-E	NSX32702	SNX32702
IBM-3279-2	D4B32782	SNX32702
IBM-3279-3-E	NSX32702	SNX32703
IBM-3279-3	D4B32783	SNX32703
IBM-3279-4-E	NSX32702	SNX32704
IBM-3279-4	D4B32784	SNX32704
IBM-3279-5-E	NSX32702	SNX32705
IBM-3279-5	D4B32785	SNX32705
IBM-3287-1	Not applicable	D6328904
IBM-DYNAMIC	D4C32XX3	D4C32XX3
LINEMODE	INTERACT	Not applicable
TRANSFORM	D4B32782	Not applicable

These values can be overridden via the TELNETDEVICE statement in the profile.

To address the USSTAB values, z/OS telnet uses a USSTCP mapping statement which allows you to map a customized USS table to a Client Identifier.

If you currently use SCS for TN3270E clients and 3270DS for non-E clients and have created separate LU group entries as follows:

- 327@S2 (old model 2)—specify an SSCPFM of USSSCS
- 327@02 (old model 2)—specify an SSCPFM of 3270DS

You would code USSTCP 3270DS <,USSSCS> in the BEGINVTAM section of your profile. The 3270 USS table is required and the SCS table is optional.

## 5 Commands

### To display information about all clients at a specific IP address

show extended channel *slot/port* tn3270-server client-ip-address *ip-address* [disconnected | in-session | pending]

D TCPIP,,T,CONN,IPADDR=ip-address

### To display information about all connected clients with a specific machine name

show extended channel *slot/virtual-channel* tn3270-server client-name *name*

D TCPIP,,T,CONN,HN=hostname

Note: Your profile needs to include a HNGROUP, even if it encompasses everything..

I.e. HNGROUP ALL \*.\* ENDHNGROUP

This tells the TN3270 server to resolve ip addresses to hostnames.

#### **To display all available telnet ports**

Show extended channel *slot/virtual-channel* tn3270-server

D TCPIP,,T,PROF

#### **To list all nailing statements with a specific nailed-domain name**

show extended channel *slot/virtual-channel* tn3270-server nailed-domain *name*

This is equivalent to displaying hostnames or hostname groups and their mappings on z/OS

D TCPIP,,T,CLID,TYPE=HOSTNAME

D TCPIP,,T,CLID,TYPE=HNGRP

*To display further details on each of these displays, ID=name can be added to the end of the command. Where name is a specific host name or group name.*

#### **To display mappings between a nailed client IP address and nailed logical unit (LU)s**

show extended channel *slot/port* tn3270-server nailed-ip *ip-address*

This is equivalent to displaying client IP addresses and client IP address groups on z/OS

D TCPIP,,T,CLID,TYPE=IPADDR

D TCPIP,,T,CLID,TYPE=IPGRP

*To display further details on each of these displays, ID=name can be added to the end of the command. Where name is a specific ip address or ip address group name.*

#### **To display information about the TN3270 server logical unit (LU)s running on the Cisco Mainframe Channel Connection (CMCC) adapter interface**

show extended channel *slot/port* tn3270-server pu *pu-name* lu *locaddr* [history]

Since the objective is to display LUs, this is easily accomplished using the following z/OS telnet commands:

D TCPIP,,T,OBJ,TYPE=LUGRP displays all LU groups that are defined. Adding ID= *groupname* displays specifics about any given group, including specific LU names within the group and an indication of if they are in use.

D TCPIP,,T,OBJ,TYPE=LU displays all LUs that were defined individually (i.e. Not in a group)

D TCPIP,,T,OBJ,TYPE=LUS displays a both individual LUs and LUGROUPs.

#### **To display information for application client groups**

show extended channel *slot/virtual-channel* tn3270-server response-time application [*appl-name* [detail]]

All response-time information for z/OS telnet is related to MONITORGROUP displays.

D TCPIP,,T,OBJ,TYPE=MONGRP displays the monitor groups that are defined and to which clients they are mapped, as well as how many clients are using each group.

To display specifics about the monitor group, such as the values of the boundaries and the average sample period, add ID=*groupname* to this command.

To display values for a particular client which is using the group, use the information from the previous display to display client specifics.

For example:

```
D TCPIP,,T,OBJ,TYPE=MONGRP
EZZ6083I TELNET OBJECT DISPLAY 077
OBJECT          CONNS  CLIENT ID CLIENT ID          ITEM
NAME            USING  TYPE      NAME                SPECIFIC  OPTIONS
-----
MONGRP
TESTMON         0 IPGRP      IPGALL              -----
TESTMON         0 HNGRP      KERSTIN             -----
TESTMON         1 IPADDR     9.42.90.29         -----
----- PORT:    23  ACTIVE                    PROF: CURR CONNS:    1
-----
6 OF 6 RECORDS DISPLAYED
```

Now, to display specifics about the one connection that is using this monitor group, issue the following command :

D TCPIP,,T,CONN,IPADDR=9.42.90.29

This will yield the following display:

```
EZZ6064I TELNET CONNECTION DISPLAY 132
      EN
CONN   TY IPADDR..PORT          LUNAME  APPLID  TSP  LOGMODE
-----
00000046  9.42.90.29..3760          T004N000 ECHOA02A  TAE SNX32702
----- PORT:    23  ACTIVE                    PROF: CURR CONNS:    1
-----
3 OF 3 RECORDS DISPLAYED
```

Now, you can display the specifics of this CONNECTION:

D TCPIP,,T,CONN,CONN=46

This display includes the following information regarding the monitor group values:

```
MONGROUP:   IP 9.42.90.29
            TESTMON
PERIOD:     120 MULT:      5
            S/W AVG LOC AVG  SUM R/T      SSQ R/T  ST DEV
            =====
SNA:        0      0      0      0      0      0
IP:         0      0      0      0      0      0
TOTAL:      0      0      0      0      0      0
COUNT:     0      0
BUCKET1    BUCKET2    BUCKET3    BUCKET4    BUCKET5
```

```

100          200          300          400          NO LMT
  0           0           0           0           0

```

**To display information about the TN3270 security enhancement**

show extended channel *slot/virtual-channel* tn3270-server security [sec-profile *profilename*]  
 [listen-point *ip-address* [tcp-port *number*]]

You can display security information on z/OS by displaying profile details. The best thing to do is to first ascertain that you have secure ports defined;

D TCPIP,,T,PROF,PROF=SECURE

will display secure port information. For example:

```

EZZ6060I TELNET PROFILE DISPLAY 580
  PERSIS      FUNCTION      DIA  SECURITY  TIMERS  MISC
  (LMTGCAK) (OATSKTQSWHRT) (DRF) (PCKLECXN2) (IKPSTS) (SMLT)
-----
  ***RR***   **TSBTQ***RT  EC*   SSS*D****  ***STS  *DD*
-----
  PORT:      323  ACTIVE                                PROF: CURR CONNS:      0
-----
  ***RR***   **TSBTQ***RT  DJ*   SSS*DFX**  ***STS  *DD*
-----
  PORT:      324  ACTIVE                                PROF: CURR CONNS:      0
-----
  FORMAT          SHORT
  TRANSFORM ACTIVE ON PORT      23
  TNSACONFIG      ENABLED
  AGENT           161
  CACHETIME       30
  COMMUNITY       public
  NOTNSATRACE
  KEYRING         SAF TELNETTEST

```

Note the section of the display that contains security flags. You can find the description of these flags in the *IP Messages and Codes* manual under message EZZ6060I as well as displaying more detailed information about the security parameters for each port by issuing

D TCPIP,,T,PROF,PORT=xxx,DET

All of the ports' attributes will be displayed, including the following security section:

```

SECURITY
  SECUREPORT      324
  CONNNTYPE       SECURE
  KEYRING         SAF TELNETTEST
  CRLLDAPSERVER   NONE
  ENCRYPTION      4S,4M,A2,A1,3S,DS,4E,2E,NS,NM,NN (DEF)
  CLIENTAUTH      SAFCERT
  EXPRESSLOGON
  NONACUSERID
  NOSSLV2

```

## 6 Examples

### 6.1 Simple DLUR connection

#### CISCO DEFINITION

```
tn3270-server
  idle-time 1800
  dlur NETA.CISCO NETA.A01N
  lsap token-adapter 0 08
  link TOA01 rmac 4000.7507.2929
  pu DLUR2A01 05D33333 9.42.88.194
```

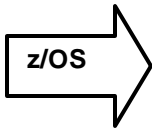
#### CORRESPONDING HOST DEFINITION

```
C7507XCA VBUILD TYPE=XCA
*
C7507PRT PORT CUADDR=E10,MEDIUM=RING,ADAPNO=0,SAPADDR=4,TIMER=60,
*
          MAXSLOW=15
C7507GRP GROUP DIAL=YES,ANSWER=ON,CALL=INOUT,ISTATUS=ACTIVE,
*
          AUTOGEN=(10,L,P)

SWCISCO VBUILD TYPE=SWNET,MAXNO=10,MAXGRP=10
*
SW2CISCO PU ADDR=01,PUTYPE=2,MAXPATH=4,NETID=NETA,MAXDATA=4096,
X

DLOGMOD=D6327802,MAXOUT=3,ANS=CONTINUE,MODETAB=AMODETAB,X
          HPR=YES,CPNAME=CISCO,CPCP=YES,TGP=ESCBKUP

VBUILD TYPE=SWNET,
          MAXGRP=1,
          MAXNO=2
&SYSCLONE.DLLC PU ADDR=C1,ANS=CONT,ASDP=YES,IDBLK=05D,IDNUM=33333,
LOGTAB=INTERP,MAXDATA=256,MAXPATH=1,MODETAB=AMODETAB,
PUTYPE=2,USSTAB=USS10R,DLOGMOD=D6327802,DISCNT=DELAY,
REGISTER=CDSERV
&SYSCLONE.DLLC01 LU LOCADDR=001
&SYSCLONE.DLLC02 LU LOCADDR=002
&SYSCLONE.DLLC03 LU LOCADDR=003
&SYSCLONE.DLLC04 LU LOCADDR=004
&SYSCLONE.DLLC05 LU LOCADDR=005
&SYSCLONE.DLLC06 LU LOCADDR=006
&SYSCLONE.DLLC07 LU LOCADDR=007
&SYSCLONE.DLLC08 LU LOCADDR=008
&SYSCLONE.DLLC09 LU LOCADDR=009
&SYSCLONE.DLLC10 LU LOCADDR=010
```

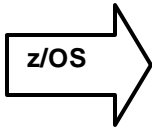


```
TELNETPARMS
  PORT 23
ENDTELNETPARMS
BEGINVTAM
  PORT 23
  DEFAULTTLUS &SYSCLONE.DLLC01..&SYSCLONE.DLLC10 ENDDFAULTLUS
ENDVTAM
```

## 6.2 Simple DLUR connection, with LU nailing

The difference between this configuration and the previous one is that it contains additional client ip statements beneath the PU definition. For example:

```
tn3270-server
  idle-time 1800
  dlur NETA.CISCO NETA.A01N
  lsap token-adapter 0 08
  link TOA01 rmac 4000.7507.2929
  pu DLUR2A01 05D33333 9.42.88.194
  client ip 9.42.89.50 lu 1 5
  client ip 9.42.90.29 lu 6 10
```



```
TELNETPARMS
  PORT 23
ENDTELNETPARMS
BEGINVTAM
  PORT 23
  LUGROUP GROUP1 &SYSCLONE.DLLC01..&SYSCLONE.DLLC05 ENDLUGROUP
  LUGROUP GROUP2 &SYSCLONE.DLLC06..&SYSCLONE.DLLC10 ENDLUGROUP
  LUMAP GROUP1 9.42.89.50
  LUMAP GROUP2 9.42.90.29
ENDVTAM
```

## 6.3 Direct Connect Listen-Point with LU nailing

The following will “reserve” or “nail” 10 LUs to client 9.42.90.29. (a cluster consists of 2 LUs and 5 clusters are allocated).

If another client establishes a connection to this port, they will be assigned LUs beginning at locaddr 11.

```
pool DISPLAY cluster layout 2s
listen-point 9.42.88.194 tcp-port 323
  client ip 9.42.90.29 pool DISPLAY
```

```

pu PU7507B 05D55555 token-adapter 0 16 lu-seed Z29LC##
allocate lu 1 pool DISPLAY clusters 5

```

```

Z29-7507(tn3270-lpoint-pu)#do sh ext ch 6/2 tn pu pu7507b

```

```

name(index)      ip:tcp          xid  state      link  destination  r-lsap
PU7507B(8)      9.42.88.194:323  05D55555 ACTIVE    tok 0  (loopback) 04 16

```

```

luseed Z29LC##
idle-time 1800      keepalive 1800 (send timing-mark 30)
unbind-act disconnect generic-pool permit
ip-preced-screen 0 ip-preced-printer 0 ip-tos-screen 0 ip-tos-printer 0
lu-termination unbind lu-deletion never
bytes 2114 in, 2334 out; frames 52 in, 54 out; NegRsp 0 in, 0 out
actlus 6, dactlus 0, binds 0
Note: state=ACT/NA means client is disconnected. '*' means gateway-ip is
present

```

```

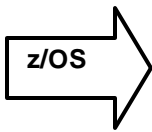
lu  name  client-ip:tcp  nail  state  model frames in out  idle for
1   Z29LC01 9.42.90.29:4800  Y   P-BIND 3278S2E 4 3 0:18:20
11  Z29LC0B 9.42.89.51:1196  N   P-BIND 3278S2E 4 3 0:0:26

```

```

client-ip  mask  pool-name  lu-first  lu-last  clusters
9.42.90.29 255.255.255.255 DISPLAY 1 10 5

```



```

BEGINVTAM PORT 323
DEFAULTTLUS Z29LC11..Z29LC99 ENDDEFAULTTLUS
LUGROUP PU7507B Z29LC00..Z29LC10 ENDLUGROUP
LUMAP PU7507B 9.42.90.29 /* Assign these LUs to this client only */
ENDVTAM

```

```

*****
* TELNET LU APPLICATIONS *
*****
*
*          VBUILD TYPE=APPL
*
Z29LC*      APPL AUTH=NVPACE,EAS=1,PARSESS=NO, MODETAB=ISTINCLM
*

```

## 6.4 Security Parameters

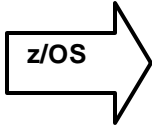
In the following example, when a client tries to connect to address 9.42.88.194 at port 23, they will need to have a certificate which matches that of the one on the TN3270 server (contained in ciscotst.pem)

```

tn3270-server
security
profile TESTSEC SSL

```

```
servercert disk0:ciscotst.pem
pool TESTPOOL cluster layout 2s2p
domain-id 1 nvt.raleigh.ibm.com
idle-time 1800
listen-point 9.42.88.194 tcp-port 23
sec-profile TESTSEC
pu PU7507 05D11111 token-adapter 0 12 lu-seed Z29LU##
```



The following is an equivalent definition for z/OS TN3270. The RACF keyring file, HOSTRING, contains a certificate from a certificate authority which clients will use for validation when they attempt to connect to this port.

```
BEGINVTAM
  PORT 23,9.42.88.194
  DEFAULTTLUS Z29LU00..Z29LU99 ENDDEFAULTLUS
ENDVTAM
TELNETPARMS
  SECUREPORT 23,9.42.88.194
  KEYRING SAF HOSTRING
ENDTELNETPARMS
```