

Chapter 6

CLI Operational Mode

When you log in to the router and the command-line interface (CLI) starts, you are at the top level of operational mode. Operational mode is indicated by the presence of the > prompt, which is preceded by a string that defaults to the name of the user and the name of the router. For example:

```
user@host>
```

At this level, there are a number of broad groups of CLI commands:

Commands for controlling the CLI environment—The commands in the set hierarchy configure the CLI display screen. For information about these commands, see “Controlling the CLI Environment” on page 193.

Commands for monitoring and troubleshooting—The following commands let you display information and statistics about the software and test network connectivity. Using these commands is discussed in the *JUNOS Network and Services Interfaces Command Reference*.

clear—Clear statistics and protocol database information.

mtrace—Trace mtrace packets from source to receiver.

monitor—Perform real-time debugging of various software components, including the routing protocols and interfaces.

ping—Determine the reachability of a remote network host.

show—Display the current configuration and information about interfaces, routing protocols, routing tables, routing policy filters, and the chassis.

test—Test the configuration and application of policy filters and autonomous system (AS) path regular expressions.

traceroute—Trace the route to a remote network host.

Commands for connecting to other network systems—The ssh command opens secure shell connections, and the telnet command opens telnet sessions to other hosts on the network. For information about these commands, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

Commands for copying files—The copy command copies files from one location on the router to another, from the router to a remote system, or from a remote system to the router. For information about these commands, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

Commands for restarting software processes—The commands in the restart hierarchy restart the various JUNOS software processes, including the routing protocol, interface, and Simple Network Management Protocol (SNMP). For information about these commands, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

A command—request—for performing system-level operations, including stopping and rebooting the router and loading JUNOS software images. For information about this command, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

A command—start—to exit the CLI and start a UNIX shell. For information about this command, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

A command—configure—for entering configuration mode, which provides a series of commands that configure the JUNOS software, including the routing protocols, interfaces, network management, and user access. For information about the CLI configuration commands, see “Configuring the Router with the CLI” on page 197.

A command—quit—to exit the CLI. For information about this command, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

For more information about the CLI operational mode commands, see the *JUNOS Network and Services Interfaces Command Reference* and the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

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Using the CLI

This section describes how to use the JUNOS software CLI. It discusses the following topics:

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Getting Help about Commands

The CLI provides context-sensitive help at every level of the command hierarchy. The help information tells you which commands are available at the current level in the hierarchy and provides a brief description of each.

To get help while in the CLI, type ?. You do not need to press Enter after typing the question mark.

If you type the question mark at the command-line prompt, the CLI lists the available commands and options. For example, to view a list of top-level operational mode commands, type a question mark (?) at the command-line prompt.

```
user@host> ?
Possible completions:
clear          Clear information in the system
configure     Manipulate software configuration information
file          Perform file operations
help          Provide help information
mtrace        Trace mtrace packets from source to receiver.
monitor       Real-time debugging
ping          Ping a remote target
quit          Exit the management session
request       Make system-level requests
restart       Restart a software process
set           Set CLI properties, date, time, craft display text
show          Show information about the system
ssh           Open a secure shell to another host
start         Start a software process
telnet        Telnet to another host
test          Diagnostic debugging commands
traceroute    Trace the route to a remote host
user@host>
```

If you type the question mark after entering the complete name of a command or command option, the CLI lists the available commands and options, then redisplay the command names and options that you typed.

```
user@host> clear ?
Possible completions:
arp          Clear address-resolution information
bgp          Clear BGP information
chassis      Clear chassis information
firewall     Clear firewall counters
igmp         Clear IGMP information
interfaces   Clear interface information
ilmi         Clear ILMI statistics information
isis         Clear IS-IS information
ldp          Clear LDP information
log          Clear contents of a log file
mpls         Clear MPLS information
msdp         Clear MSDP information
multicast    Clear Multicast information
ospf         Clear OSPF information
pim          Clear PIM information
rip          Clear RIP information
route        Clear routing table information
rsvp         Clear RSVP information
snmp         Clear SNMP information
system       Clear system status
vrrp         Clear VRRP statistics information
user@host> clear
```

If you type the question mark in the middle of a command name, the CLI lists possible command completions that match the letters you have entered so far, then redisplay the letters that you typed. For example, to list all operational mode commands that start with the letter c, type the following:

```
user@host> c?
Possible completions:
clear          Clear information in the system
configure      Manipulate software configuration information
user@host> c
```

For introductory information on using the question mark or the help command, you can also type **help** and press Enter:

help

Getting Help Based on a String in a Statement Name

In operational mode, you can use the help command to display help based on a text string contained in a statement name. This command displays help for statements at the current hierarchy level and below:

help apropos *string*

string is a text string about which you want to get help. This string is used to match statement names as well as the help strings that are displayed for the statements. If the string contains spaces, enclose it in quotation marks (" "). You also can specify a regular expression for the string, using standard UNIX-style regular expression syntax.

You can display help based on a text string contained in a statement name using the help topic and help reference commands:

```
help topic string
help reference string
```

The help topic command displays usage guidelines for the statement, while the help reference command displays summary information about the statement.

You can display help based on a system log tag using the help syslog command:

```
help syslog syslog-tag
```

The help syslog command displays the contents of a syslog message.

Displaying Tips About CLI Commands

To get tips about CLI commands, issue the help tip cli command. For example:

```
user@host> help tip cli <number>
JUNOS tip:
Use 'request system software validate' to validate the incoming software
against the current configuration without impacting the running system.
```

< number> associates a tip with a number.

For information about how to disable this command, see “Configuring Tips” on page 386.

Using CLI Complete Commands

You do not always have to remember or type the full command or option name for the CLI to recognize it. To display all possible command or option completions, type the partial command followed immediately by a question mark.

To complete a command or option that you have partially typed, press the tab key or the spacebar. If the partially typed letters begin a string that uniquely identifies a command, the complete command name appears. Otherwise, a beep indicates that you have entered an ambiguous command, and the possible completions are displayed.

Command completion also applies to other strings, such as filenames and usernames. To display all possible values, type a partial string followed immediately by a question mark. However, to complete these strings, press the tab key; pressing the space bar does not work.

Examples: Using CLI Command Completion

Issue the show interfaces command:

```
user@host> sh<Space>ow i<Space>
'i' is ambiguous.
Possible completions:
  igmp      Show information about IGMP
  interface Show interface information
  isis      Show information about IS-IS
user@host> show in<Space>terfaces <Enter>
Physical interface: at-0/1/0, Enabled, Physical link is Up
Interface index: 11, SNMP ifIndex: 65
Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode
Speed: OC12, Loopback: None, Payload scrambler: Enabled
Device flags   : Present Running
Link flags     : 0x01
...
user@host>
```

Display a list of all log files whose names start with the string “messages,” and then display the contents of one of the files:

```
user@myhost> show log mes?
Possible completions:
<filename>      Log file to display
messages        Size: 1417052, Last changed: Mar  3 00:33
messages.0.gz   Size: 145575, Last changed: Mar  3 00:00
messages.1.gz   Size: 134253, Last changed: Mar  2 23:00
messages.10.gz  Size: 137022, Last changed: Mar  2 14:00
messages.2.gr   Size: 137112, Last changed: Mar  2 22:00
messages.3.gz   Size: 121633, Last changed: Mar  2 21:00
messages.4.gz   Size: 135715, Last changed: Mar  2 20:00
messages.5.gz   Size: 137504, Last changed: Mar  2 19:00
messages.6.gz   Size: 134591, Last changed: Mar  2 18:00
messages.7.gz   Size: 132670, Last changed: Mar  2 17:00
messages.8.gz   Size: 136596, Last changed: Mar  2 16:00
messages.9.gz   Size: 136210, Last changed: Mar  2 15:00
user@myhost> show log mes<Tab>sages.4<Tab>.gz<Enter>
Jan 15 21:00:00 myhost newsyslog[1381]: logfile turned over
...
```

CLI Messages

Messages appear when you enter and exit from configuration mode, when you commit a configuration, and when you type a string or value that is not valid.

When you commit a configuration, the JUNOS software checks the configuration you are committing. If there are no problems, a message indicates that the configuration was accepted. If there are problems, a message indicates where the errors are.

In the top-level CLI commands and in configuration mode, if you type an invalid string—for example, the name of a command or statement that does not exist—you see the message “syntax error” or “unknown command.” A caret (^) indicates where the error is. Examples:

```

user@host> clear route
                ^
syntax error, expecting <command>.

[edit]
user@host# telnet
                ^
unknown command.

```

When the number of choices is limited, a message might display the commands you can enter to correct the syntax error. For example:

```

[edit]
user@host# load myconfig-file<Enter>
                ^
syntax error, expecting 'merge', 'override', or 'replace'.

```

Moving Around and Editing the Command Line

In the CLI, you can use keyboard sequences to move around on a command line and edit the command line. You can also use keyboard sequences to scroll through a list of recently executed commands. Table 3 lists some of the CLI keyboard sequences. They are the same as those used in Emacs.

Table 3: CLI Keyboard Sequences

Category	Action	Keyboard Sequence
Move the Cursor	Move the cursor back one character.	Ctrl-b
	Move the cursor back one word.	Esc-b or Alt-b
	Move the cursor forward one character.	Ctrl-f
	Move the cursor forward one word.	Esc-f or Alt-f
	Move the cursor to the beginning of the command line.	Ctrl-a
	Move the cursor to the end of the command line.	Ctrl-e
Delete Characters	Delete the character before the cursor.	Ctrl-h, Delete, or Backspace
	Delete the character at the cursor.	Ctrl-d
	Delete all characters from the cursor to the end of the command line.	Ctrl-k
	Delete all characters on the command line.	Ctrl-u or Ctrl-x
	Delete the word before the cursor.	Ctrl-w, Esc-Backspace, or Alt-Backspace
	Delete the word after the cursor.	Esc-d or Alt-d
Insert Recently Deleted Text	Insert the most recently deleted text at the cursor.	Ctrl-y

Category	Action	Keyboard Sequence
Redraw the Screen	Redraw the current line.	Ctrl-l
Display Previous Command Lines	Scroll backward through the list of recently executed commands.	Ctrl-p
	Scroll forward through the list of recently executed commands.	Ctrl-n
	Search the CLI history in reverse order for lines matching the search string.	Ctrl-r
	Search the CLI history by typing some text at the prompt, followed by the keyboard sequence. The CLI attempts to expand the text into the most recent word in the history for which the text is a prefix.	Esc-/
Repeat Keyboard Sequences	Specify the number of times to execute a keyboard sequence. <i>number</i> can be from 1 through 9.	Esc- <i>number sequence</i> or Alt- <i>number sequence</i>

How Output Appears on the Screen

When you issue commands in operational mode, or when you issue the show command in configuration mode, the output appears on the screen. You can also filter the output of commands, either to perform simple commands on the output or to place the output into a file.

This section discusses the following topics:

Displaying Output One Screen at a Time on page 168

Filtering Command Output on page 170

Displaying Output One Screen at a Time

If the output is longer than the screen length, it appears one screen at a time by means of a UNIX more-type interface. The prompt `--More--` indicates that more output is available. The output buffer for the prompt is restricted to 32 megabytes (MB). Any new data that exceeds the buffer limit replaces the oldest data in the memory buffer. When the buffer limit is exceeded, attempts to search backward or navigate to the beginning of the output generate a warning indicating that the output is truncated. Because of the buffer size restriction, use of the Scroll Up and Search functions might be limited.

Table 4 lists the keyboard sequences you can use at the `--More--` prompt. As soon as the CLI knows how long the output is (usually by the second screen), it displays the percentage of the command output above the prompt.

Table 4: --More-- Prompt Keyboard Sequences

Category	Action	Keyboard Sequence
Get Help	Display information about the keyboard sequences you can display at the --More-- prompt.	h
Scroll Down	Scroll down one line.	Enter, Return, k, Ctrl-m, Ctrl-n, or down arrow
	Scroll down one-half screen.	Tab, d, Ctrl-d, or Ctrl-x
	Scroll down one whole screen.	Space or Ctrl-f
	Scroll down to the bottom of the output.	Ctrl-e or G
	Display the output all at once instead of one screen at a time. (Same as specifying the no-more command.)	N
Scroll Up	Display the previous line of output.	j, Ctrl-h, Ctrl-p, or up arrow
	Scroll up one-half screen.	u or Ctrl-u
	Scroll up one whole screen.	b or Ctrl-b
	Scroll up to the top of the output.	Ctrl-a or g
Search	Search forward for a string.	/string
	Search backward for a string.	?string
	Repeat the previous search for a string.	n
	Search for a text string. You are prompted for the string to match. (Same as specifying the match string command.)	m or M
	Search, ignoring a text string. You are prompted for the string to not match. (Same as specifying the except string command.)	e or E
Interrupt or End Output, Redraw the Output, and Save the Output to a File	Interrupt the display of output.	Ctrl-C, q, Q, or Ctrl-k
	Do not redisplay the CLI prompt immediately after displaying the output, but remain at the --More-- prompt. (Same as specifying the hold command.)	H
	Clear any match conditions and display the complete output.	c or C
	Redraw the output on the screen.	Ctrl-l
	Save the command output to a file. You are prompted for a filename. (Same as specifying the save filename command.)	s or S

Filtering Command Output

For operational and configuration commands that display output, such as the show commands, you can filter the output. When you display help about these commands, one of the options listed is |, called a *pipe*, which allows you to filter the command output. For example:

```
user@host> show configuration ?
Possible completions:
  <[Enter]>Execute this command
  |       Pipe through a command
user@host> show configuration | ?
Possible completions:
  count    Count occurrences
  except   Show only text that does not match a pattern
  find     Search for the first occurrence of a pattern
  hold     Hold text without exiting the ---More--- prompt
  last     Show the specified number of lines from the end of the output
  match    Show only text that matches a pattern
  no-more  Don't paginate output
  resolve  Resolve IP addresses
  save     Save output text to a file
  trim     Trim specified number of columns from the start line
```

In configuration mode, two additional filters appear, display and compare:

```
[edit]
user@host # show | ?
Possible completions:
  compare Compare configuration changes with a prior version
  count   Count occurrences
  display Display additional configuration information
  except  Show only text that does not match a pattern
  find    Search for the first occurrence of a pattern
  hold    Hold text without exiting the ---More--- prompt
  last    Show specified number of lines from the end of the output
  match   Show only text that matches a pattern
  no-more Don't paginate output
  resolve Resolve IP addresses
  save    Save output text to a file
  trim    Trim specified number of columns from the start line
```

The following filtering operations are available:

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Comparing Configuration Changes with a Prior Version on page 174

Counting the Number of Lines in the Output on page 176

Displaying All Output at Once on page 176

Displaying the Lines You Want to View from the End of the Output on page 176

Retaining the Output After the Last Screen on page 177

Displaying Additional Information About the Configuration on page 177

Filtering Command Output Multiple Times on page 179

Placing Command Output in a File

When command output is very long, when you need to store or analyze the output, or when you need to send the output in e-mail or by FTP, you can place the output into a file. Doing this is useful when the output scrolls off the screen, making it difficult to cut the output from a window and paste it into another.

To save the output to a file, specify the save command after the pipe:

```
user@host> command | save filename
```

By default, the file is placed in your home directory on the router. For information about how you can specify the name of the file, see “Specifying Filenames and URLs” on page 336.

This example stores the output of the request support information command in a file:

```
user@host> request support information | save filename
Wrote 1143 lines of output to 'filename'
user@host>
```

Searching for a String in the Output

You can search for text matching a regular expression by filtering output. You can make a regular expression match everything except a regular expression, or find the first occurrence of text matching a regular expression. Searches are not case-sensitive.

To match a regular expression, specify the match command after the pipe:

```
user@host> command | match regular-expression
```

To ignore text that matches a regular expression, specify the except command after the pipe:

```
user@host> command | except regular-expression
```

If the *regular-expression* contains any spaces, operators, or wildcard characters, enclose it in quotation marks.

You use extended regular expressions to specify what text in the output to match. Command regular expressions implement the extended (modern) regular expressions as defined in POSIX 1003.2. Table 5 lists common regular expression operators.

Table 5: Common Regular Expression Operators

Operator	Match...
	One of the two terms on either side of the pipe.
^	At the beginning of an expression, used to denote where the command begins, where there might be some ambiguity.
\$	Character at the end of a command. Used to denote a command that must be matched exactly up to that point. For example, allow-commands "show interfaces \$" means that the user cannot issue show interfaces detail or show interfaces extensive.
[]	Range of letters or digits. To separate the start and end of a range, use a hyphen (-).
()	A group of commands, indicating an expression to be evaluated; the result is then evaluated as part of the overall expression.

For example, if a command produces the following output:

```
one two
two two
three two one
four
```

The match two command displays:

```
one two
two two
three two one
```

The except one command displays:

```
two two
four
```

List all the Asynchronous Transfer Mode (ATM) interfaces in the configuration:

```
user@host> show configuration | match at-
  at-2/1/0 {
  at-2/1/1 {
  at-2/2/0 {
  at-5/2/0 {
  at-5/3/0 {
```

Display a skeleton of your router configuration:

```
[edit]
user@host # show | match {
system {
  root-authentication {
    name-server {
    login {
      class super-user {
        user juniper {
          authentication {
        services {
        syslog {
          file messages {
        processes {
chassis {
  alarm {
  sonet {
  images {
    scb {
    fpc {
interfaces {
  at-2/1/1 {
    atm-options {
    unit 0 {
  at-2/2/0 {
  ...
snmp {
  community public {
  clients {
routing-options {
  static {
    route 0.0.0.0/0 {
    route 192.168.0.0/16 {
    route 208.197.169.0/24 {
protocols {
  rsvp {
    interface so-5/1/0 {
  mpls {
    interface so-5/1/0 {
  bgp {
    group internal {
  ospf {
    area 0.0.0.0 {
      interface so-5/1/0 {
```

List all users who are logged in to the router except for the user “root”:

```
user@host> show system users | except root
8:28PM up 1 day, 13:59, 2 users, load averages: 0.01, 0.01, 0.00
USER  TTY FROM          LOGIN@  IDLE WHAT
sheep p0 baa.juniper.net 7:25PM  - cli
```

Save the configuration, except for encrypted passwords, to a file:

```
user@host> show configuration | except SECRET-DATA | save my.output.file
```

Display the output, starting not at the beginning but rather at the first occurrence of text matching a regular expression, using the find command after the pipe:

```
user@host> command | find regular-expression
```

If the regular expression contains spaces, operators, or wildcard characters, enclose the expression in quotation marks.

List the routes in the routing table starting at 208.197.169.0:

```
user@host> show route | find 208.197.169.0
208.197.169.0/24 *[Static/5] 1d 13:22:11
    > to 192.168.4.254 via so-3/0/0.0
224.0.0.5/32    *[OSPF/10] 1d 13:22:12, metric 1

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

47.0005.80ff.f800.0000.0108.0001.1921.6800.4015.00/160
    *[Direct/0] 1d 13:22:12
    > via lo0.0
```

Comparing Configuration Changes with a Prior Version

In configuration mode only, when you have made changes to the configuration and want to compare the candidate configuration with a prior version, you can use the compare command to display the configuration. The compare command compares the candidate configuration with either the current committed configuration or a configuration file and displays the differences between the two configurations. To compare configurations, specify the compare command after the pipe:

```
[edit]
user@host# show | compare [filename | rollback n]
```

filename is the full path to a configuration file. The file must be in the proper format: a hierarchy of statements. For information about how to save a configuration to a file, see “Saving a Configuration to a File” on page 243. For information about formatting the hierarchy of statements, see “Configuration Statement Hierarchy” on page 199.

n is the index into the list of previously committed configurations. The most recently saved configuration is number 0, and the oldest saved configuration is number 9. If you do not specify arguments, the candidate configuration is compared against the active configuration file (/config/juniper.conf).

The comparison output uses the following conventions:

Statements that are only in the candidate configuration are prefixed with a plus sign (+).

Statements that are only in the comparison file are prefixed with a minus sign (-).

Statements that are unchanged are prefixed with a single blank space ().

The following example shows various changes, then a comparison of the candidate configuration with the active configuration, showing only the changes made at the [edit protocols bgp] hierarchy level:

```
[edit]
user@host# edit protocols bgp

[edit protocols bgp]
user@host# show
group my-group {
  type internal;
  hold-time 60;
  advertise-inactive;
  allow 1.1.1.1/32;
}
group fred {
  type external;
  peer-as 33333;
  allow 2.2.2.2/32;
}
group test-peers {
  type external;
  allow 3.3.3.3/32;
}
[edit protocols bgp]
user@host# set group my-group hold-time 90
[edit protocols bgp]
user@host# delete group my-group advertise-inactive
[edit protocols bgp]
user@host# set group fred advertise-inactive
[edit protocols bgp]
user@host# delete group test-peers
[edit protocols bgp]
user@host# show | compare
[edit protocols bgp group my-group]
-   hold-time 60;
+   hold-time 90;
-   advertise-inactive;
[edit protocols bgp group fred]
+   advertise-inactive;
[edit protocols bgp]
- group test-peers {
-   type external;
-   allow 3.3.3.3/32;
- }
```

```
[edit protocols bgp]
user@host# show
group my-group {
  type internal;
  hold-time 90;
  allow 1.1.1.1/32;
}
group fred {
  type external;
  advertise-inactive;
  peer-as 3333;
  allow 2.2.2.2/32;
}
```

Counting the Number of Lines in the Output

To count the number of lines in the output, specify the count command after the pipe:

```
user@host> command | count
```

For example:

```
user@host> show configuration | count
Count: 269 lines
user@host> show route | count
Count: 67 lines
```

Displaying All Output at Once

To display the output all at once instead of one screen at a time, specify the no-more command after the pipe. This command is equivalent to the set cli screen-length 0 command, but affects the output of the one command only.

```
user@host> command | no-more
```

Displaying the Lines You Want to View from the End of the Output

By default, the last command displays the lines from the end of the output. You can also specify the number of lines to display from the end of the output. If the number of specified lines is less than a screen full, the command will display a screen full of output. This feature is most useful for viewing log files where the end of the files contain the most recent entries.

To view the most recent entries from the end of the output, use the | last command after the pipe:

```
user@host> show command | last lines
```

lines specifies the number of lines to display from the end of output.

Retaining the Output After the Last Screen

When you view output one screen at a time, you typically return to the CLI prompt after viewing the last screen.

To not return immediately to the CLI prompt, use the hold command after the pipe. This feature is useful, for example, when you want to scroll or search through the output.

```
user@host> command | hold
```

Displaying Additional Information About the Configuration

In configuration mode only, to display additional information about the configuration, use the display detail command after the pipe in conjunction with a show command. The additional information includes the help string that explains each configuration statement and the permission bits required to add and modify the configuration statement.

```
user@host# show <hierarchy-level> | display detail
```

For example:

```
[edit]
user@host# show | display detail
##
## version: Software version information
## require: system
##
version "3.4R1 [tlim]";
system {
##
## host-name: Host name for this router
## match: ^[:alnum:]._]+$
## require: system
##
host-name router-name;
##
## domain-name: Domain name for this router
## match: ^[:alnum:]._]+$
## require: system
##
domain-name isp.net;
##
## backup-router: Address of router to use while booting
##
backup-router 192.168.100.1;
root-authentication {
##
## encrypted-password: Encrypted password string
##
encrypted-password "$1$BYJQE$/ocQof8pmcm7MSGK0"; # SECRET-DATA
}
##
## name-server: DNS name servers
## require: system
##
```

```

name-server {
  ##
  ## name-server: DNS name server address
  ##
  208.197.1.0;
}
login {
  ##
  ## class: User name (login)
  ## match: ^[[:alnum:]-_]+$
  ##
  class super-user {
    ##
    ## permissions: Set of permitted operation categories
    ##
    permissions all;
  }
  ...
  ##
  ## services: System services
  ## require: system
  ##
  services {
    ## services: Service name
    ##
    ftp;
    ##
    ## services: Service name
    ##
    telnet;
    ##
  }
  syslog {
    ##
    ## file-name: File to record logging data
    ##
    file messages {
      ##
      ## Facility type
      ## Level name
      ##
      any notice;
      ##
      ## Facility type
      ## Level name
      ##
      authorization info;
    }
  }
}

```

```

chassis {
  alarm {
    sonet {
      ##
      ## lol: Loss of light
      ## alias: loss-of-light
      ##
      lol red;
    }
  }
}
interfaces {
  ##
  ## Interface name
  ##
  at-2/1/1 {
    atm-options {
      ##
      ## vpi: Virtual path index
      ## range: 0 .. 255
      ## maximum-vcs: Maximum number of virtual circuits on this VP
      ##
      vpi 0 maximum-vcs 512;
    }
    ##
    ## unit: Logical unit number
    ## range: 0 .. 16384
    ##
    unit 0 {
      ##
      ## vci: ATM point-to-point virtual circuit identifier ([vpi.]vci)
      ## match: ^([[[:digit:]]+.){0,1}[[[:digit:]]+)$
      ##
      vci 0.128;
    }
  }
}
...

```

Filtering Command Output Multiple Times

For the output of a single command, you can filter the output one or more times. For example:

```

user@host> command | match regular-expression | except regular-expression |
match other-regular-expression | find regular-expression | hold

```

Setting the Current Date and Time

To set the current date and time on the router, use the set date command:

```
user@host> set date YYYYMMDDhhmm.ss
```

YYYY is the four-digit year, MM is the two-digit month, DD is the two-digit date, hh is the two-digit hour, mm is the two-digit minute, and ss is the two-digit second. At a minimum, you must specify the two-digit minute. All other parts of the date and time are optional.

To set the time zone, see “Setting the Time Zone” on page 392. To configure time synchronization, see “Configuring the Network Time Protocol” on page 393.

Setting the Date and Time from NTP Servers

If the Network Time Protocol (NTP) server is unable to synchronize the current date and time on the router, a system log message similar to the following appears:

```
"time error %.Of over %d seconds; set clock manually".
```

To set the date and time from all NTP servers configured at the [edit system ntp server] hierarchy level to determine the correct time, use the set date ntp command:

```
user@host> set date ntp
```



NOTE: You do not need to reboot the router when you use the set date ntp command.

To set the date and time from a NTP server configured at the [edit system ntp server] hierarchy level to determine the correct time, use the set date ntp command:

```
user@host> set date ntp ntp-server
```

To set the date and time from multiple NTP servers configured at the [edit system ntp server] hierarchy level to determine the correct time, use the set date ntp command:

```
user@host> set date ntp ntp-server
```

ntp-server is the IP address of one or more NTP servers to query. When querying more than one server, enclose the IP addresses in quotes using the format “ip-address ip-address”. For example:

```
user@host> set date ntp "200.49.40.1 129.127.28.4"
10 Feb 13:50:21 ntpdate[794]: step time server 129.127.28.4 offset 0.000163
sec
```

For more information about how to configure NTP, see “Configuring the Network Time Protocol” on page 393 and the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

Setting the Source Address to Contact the NTP Server

To specify a source address that the JUNOS software uses to contact the remote NTP server configured at the [edit system ntp server], use the set date ntp *source-address* command:

```
user@host> set date ntp source-address source-address
```

source-address is a valid IP address.

Displaying CLI Command History

You can display a list of recent commands that you issued. To display the command history, use the show cli history command:

```
user@host> show cli history
03-03 01:00:50 -- show cli history
03-03 01:01:12 -- show interfaces terse
03-03 01:01:22 -- show interfaces lo0
03-03 01:01:44 -- show bgp next-hop-database
03-03 01:01:51 -- show cli history
```

By default, this command displays the last 100 commands issued in the CLI. If you specify a number with the command, it displays that number of recent commands. For example:

```
user@host> show cli history 3
01:01:44 -- show bgp next-hop-database
01:01:51 -- show cli history
01:02:51 -- show cli history 3
```

Monitoring Who Uses the CLI

Depending upon how you configure the JUNOS software, multiple users can log in to the router, use the CLI, and configure or modify the software configuration.

The JUNOS software provides a general syslog-like mechanism to log system operations, such as when users log in to the router and when they issue CLI commands. To configure system logging, include the syslog statement in the configuration, as described in “Configuring System Log Messages” on page 401.

If, when you enter configuration mode, another user is also in configuration mode, a notification message is displayed that indicates who the user is and what portion of the configuration they are viewing or editing:

```
user@host> configure
Entering configuration mode
Current configuration users:
  root terminal p3 (pid 1088) on since 1999-05-13 01:03:27 EDT
  [edit interfaces so-3/0/0 unit 0 family inet]
The configuration has been changed but not committed
```

Using the Comment Character

You can copy operational mode commands that include comments from a file and paste them into the command-line interface. A # at the beginning of the command line indicates a comment line. This is useful for describing frequently used operational mode commands; for example, a user's work instructions on how to monitor the network. To add a comment to a command file, the first character of the line must be #. When you start a command with #, the rest of the line is ignored by the JUNOS software.

To add comments in operational mode, start with a # and end with a new line (carriage return):

```
user@host> # comment-string
```

comment-string is the text of the comment. The comment text can be any length, and you must type it on a single line.

Example: Using Comments

File with comments	#Command 1: Show the router version show version #Command 2: Show all router interfaces show interfaces terse
Copy and paste contents of the file into the command line interface	user@host> #Command 1: Show the router version user@host> show version Hostname: myhost Model: m5 JUNOS Base OS boot [6.4-20040511.0] JUNOS Base OS Software Suite [6.4-20040511.0] JUNOS Kernel Software Suite [6.4-20040511.0] JUNOS Packet Forwarding Engine Support (M5/M10) [6.4-20040511.0] JUNOS Routing Software Suite [6.4-20040511.0] JUNOS Online Documentation [6.4-20040511.0] JUNOS Crypto Software Suite [6.4-20040511.0]

```

user@host> # Command 2: Show all router interfaces
regress@fbi> show interfaces terse
Interface          Admin Link   Proto Local          Remote
fe-0/0/0           up   up
fe-0/0/1           up   down
fe-0/0/2           up   down
mo-0/1/0           up
mo-0/1/0.16383    up   up     inet 10.0.0.1    --> 10.0.0.17
so-0/2/0           up   up
so-0/2/1           up   up
dsc                up   up
fxp0               up   up
fxp0.0            up   up     inet 192.168.70.62/21
fxp1              up   up
fxp1.0            up   up     tnp 4
gre               up   up
pip               up   up
lo0               up   up
lo0.0             up   up     inet 127.0.0.1    --> 0/0
lo0.16385         up   up     inet inet6

```

Routing Matrix CLI Enhancements

This section describes how the CLI has been enhanced to accommodate managing a routing matrix. Rather than listing all routing matrix commands and options, it gives key examples to help you understand how managing the routing matrix can differ from managing a standalone T640 routing node. Table 6 lists the topics covered in this section.

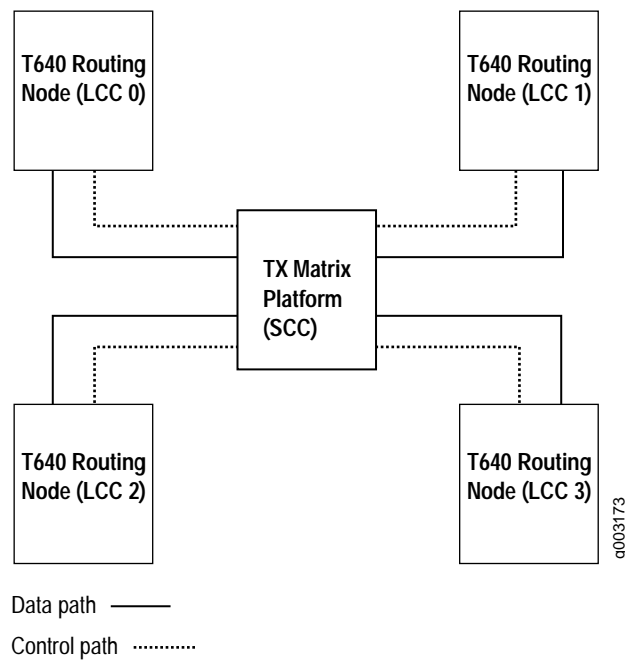
Table 6: Routing Matrix CLI Enhancements

Topics
Routing Matrix Overview on page 184
How the Routing Matrix Is Identified in the CLI on page 184
Viewing the Routing Matrix as a Single Router on page 184
CLI Options for Selecting Routing Matrix Components on page 185
Using of FPC Numbers in Routing Matrix CLI Commands on page 187
Operational Commands Issued on Routing Engines on page 188
Upgrading Software on a Routing Matrix on page 189
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Halting and Rebooting Routing Matrix Components on page 189
Bringing Routing Nodes Offline or Online on page 189
Managing Files on Routing Engines on page 189
Displaying Logs on Any Routing Engine on page 190
Checking the Status of T640 Routing Nodes on page 190
Configuring the Routing Matrix on page 190

Routing Matrix Overview

A routing matrix is a multichassis architecture consists of one TX Matrix platform, and from one to four T640 routing nodes, as shown in Figure 3. Each component has two Routing Engines.

Figure 3: Routing Matrix



How the Routing Matrix Is Identified in the CLI

The CLI uses the terms SCC and scc (which stand for *switch-card chassis*) to refer to the TX Matrix platform. Similarly, the CLI uses the terms LCC and lcc (which stand for *line-card chassis*) to refer to the T640 routing nodes in a routing matrix.

The T640 routing nodes are assigned index numbers, LCC0 through LCC3, depending on the hardware setup and how they are connected to the TX Matrix platform. For more information, see the *TX Matrix Platform Hardware Guide*.

Viewing the Routing Matrix as a Single Router

From the CLI, you can view the routing matrix as a single router with many Flexible PIC Concentrators (FPCs) and Physical Interface Cards (PICs).

For example, you can view a list of all hardware components in the routing matrix, view alarms for the entire routing matrix, view interfaces on all T640 routing nodes, and so on. To do so, issue standard operational commands on the TX Matrix platform.

CLI Options for Selecting Routing Matrix Components

When you issue operational mode commands on the TX Matrix platform, CLI command options allow you to apply the command to a component of the routing matrix rather than to the routing matrix as a whole.

These are the options shown in the CLI:

scc—The TX Matrix platform.

lcc *number*—A specific T640 routing node.

all-lcc—All T640 routing nodes.

If you specify none of these options, then the command applies by default to the whole routing matrix: the TX Matrix platform and all connected T640 routing nodes.

Examples of Routing Matrix Command Options

The following output samples, using the show version command, demonstrate the four different options for viewing information about the routing matrix: none, scc, lcc *number*, and all-lcc.

```
user@host> show version ?
Possible completions:
<[Enter]>      Execute this command
all-lcc       Show software version on all LCC chassis
brief        Display brief output
detail       Display detailed output
lcc          Show software version on specific LCC (0..3)
scc          Show software version on the SCC
|           Pipe through a command
```

Sample Output: No routing matrix options specified

```
user@host> show version
scc-re0:
-----
Hostname: scc
Model: TX Matrix
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]

lcc0-re0:
-----
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

```
lcc1-re0:
-----
Hostname: lcc1
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

**Sample Output: TX
Matrix platform only
(scc option)**

```
user@host> show version scc
Hostname: scc
Model: TX Matrix
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
```

**Sample Output: Specific
T640 routing node (lcc
number option)**

```
user@host> show version lcc 0
lcc0-re0:
-----
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

**Sample Output: All
T640 routing nodes
(all-lcc option)**

```
user@host> show version all-lcc
lcc0-re0:
-----
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

```
lcc1-re0:
-----
Hostname: lcc1
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

Using of FPC Numbers in Routing Matrix CLI Commands

A standalone T640 routing node can be configured with up to eight FPCs (numbered 0 through 7). Since a routing matrix can have up to four T640 routing nodes, and each T640 routing node has up to eight FPCs, the routing matrix as a whole can have up to 32 FPCs (0 through 31).

Table 7 shows the correspondence between the FPC hardware slot numbers in the T640 routing nodes and the FPC assignments recognized by the JUNOS software for a routing matrix.

Table 7: FPC Correspondence Between T640 Routing Nodes and the Routing Matrix

T640 Routing Node	T640 FPC Range	Routing Matrix FPC Range
LCC 0	0–7	0–7
LCC 1	0–7	8–15
LCC 2	0–7	16–23
LCC 3	0–7	24–31

The FPC slot numbers appear in two main ways in the CLI:

In chassis (hardware-based) commands, such as the operational mode show chassis commands and the configuration mode [edit chassis] hierarchy level.

When configuring or displaying information about interfaces, such as in the configuration mode [edit interfaces] hierarchy level and as part of the interface name in operational mode show interfaces commands.

Using FPC Numbers in Operational Mode Chassis Commands

You can specify the FPC slot number in operational mode chassis commands in two ways:

Specify the number of the T640 routing node using the *lcc number* option and use a value from 0 through 7 for the FPC slot number.

This is the recommended method. The show command output also lists information in this way, sorted first by LCC index number and then by FPC slot 0 through 7.

The *lcc number* option and use a value from 0 through 31 for the FPC slot number.

For example, the following commands have the same result, but the first is the recommended usage:

```
user@host>request chassis fpc lcc 1 slot 1 offline
user@host>request chassis fpc slot 9 offline
```

Specifying FPC Numbers at the [edit chassis lcc *number*] Hierarchy Level

When you are configuring at the [edit chassis lcc *number*] hierarchy level, you must specify the LCC index number and the actual FPC hardware slot number as labeled on the T640 routing node chassis (0 through 7). For more information on configuring the chassis on the routing matrix, see the “TX Matrix Platform and T640 Routing Node Configuration Guidelines” on page 742.

```
[edit chassis]
lcc lcc-number {
  fpc slot-number { # Use the hardware FPC slot number
    pic pic-number {
      ...
    }
  }
}
```

Specifying FPC Numbers When Configuring Interfaces

When configuring interfaces (or specifying an interface name in show commands), you use the routing matrix FPC range of 0 through 31. For example, the 11 in t1-11/2/0 refers to FPC hardware slot 3 on LCC 1. For more information on configuring interfaces, refer to the *JUNOS Network Interfaces and Class of Service Configuration Guide*.

Operational Commands Issued on Routing Engines

Operational mode commands that you issue on the TX Matrix master Routing Engine are distributed to all master Routing Engines on the T640 routing nodes in the routing matrix.

Commands that you issue on the TX Matrix backup Routing Engine are distributed to all backup Routing Engines on the T640 routing nodes in the routing matrix.

General Operational Tasks

Upgrading Software on a Routing Matrix

By default, when you upgrade software on the TX Matrix platform, the new image is pushed down to the master Routing Engines of the connected T640 routing nodes.

Once installation on the TX Matrix platform is complete, a reboot issued on the TX Matrix platform causes the new software to be activated on the master Routing Engines of the TX Matrix platform and all connected T640 routing nodes.

Managing Backup Routing Engines

To manage the backup Routing Engines on all components (for example, to upgrade JUNOS software on backup routing engines), you must login to the TX Matrix platform backup Routing Engine.

Halting and Rebooting Routing Matrix Components

A reboot issued on the TX Matrix platform will reboot the T640 routing node master Routing Engines.

You can halt the TX Matrix platform or a specific T640 routing node within a routing matrix. However, halting both Routing Engines on a TX Matrix platform will halt both Routing Engines on the T640 routing nodes.

Bringing Routing Nodes Offline or Online

You can bring offline or online a specific T640 routing node within a routing matrix:

```
user@host> request chassis lcc ?
Possible completions:
offline      Take LCC offline
online       Bring LCC online
slot         LCC Slot (0..3)
```

Managing Files on Routing Engines

You can manage files on all Routing Engines, for example, copying a file from the TX Matrix master Routing Engine to a T640 routing node Routing Engine.

```
user@host> file list

/var/home/user/:
.ssh/
fred.txt

user@host> file copy fred.txt lcc0:fred.txt

user@host> file list lcc0:
lcc0-master:
-----

/var/home/user/:
.ssh/
fred.txt
```

Displaying Logs on Any Routing Engine

You can display logs on any Routing Engines from the TX Matrix platform:

```
user@host> show log lcc0:messages
lcc0-master:
-----
Aug 19 17:17:23 lcc0 mgd[7099]: UI_LOAD_EVENT: User 'user' is performing a 'rollback'
Aug 19 17:17:24 lcc0 mgd[7099]: UI_LOAD_EVENT: User 'user' is performing a 'load update'
Aug 19 17:17:25 lcc0 mgd[7099]: UI_COMMIT: User 'user' performed commit: no comment
```

Checking the Status of T640 Routing Nodes

You can check the status of the T640 routing nodes using the following command:

```
user@host> show chassis lccs
Slot State      Uptime
0   Online      39 minutes, 16 seconds
1   Online      39 minutes, 16 seconds
2   Empty
3   Empty
```

Configuring the Routing Matrix

This section summarizes some routing matrix configuration guidelines. For more information, see “TX Matrix Platform and T640 Routing Node Configuration Guidelines” on page 742 and the *JUNOS Network Interfaces and Class of Service Configuration Guide*.

You configure all components of the routing matrix from the TX Matrix platform master Routing Engine:

Only configuration changes committed on the TX Matrix platform are distributed to all connected T640 routing nodes.

Any configuration committed on a T640 routing node is not distributed to the TX Matrix platform or other T640 routing nodes.

A commit on the TX Matrix platform overrides any changes committed on a T640 routing node.

A standard commit on the master Routing Engine of the TX Matrix platform automatically updates all the connected T640 routing node master Routing Engines.

A standard commit on the backup Routing Engine of the TX Matrix platform will automatically update, all the T640 routing node backup Routing Engines.

A commit synchronize on the master Routing Engine of the TX Matrix platform updates the master and backup Routing Engines for all components in the routing matrix.

Additional Groups

You can specify two special group names—re0 and re1. These two special group names apply to the Routing Engines in slots 0 and 1 of the TX Matrix. In addition, the routing matrix supports special group names for the two Routing Engines in each T640 routing node: lcc *number*-re0 and lcc *number*-re1. *number* identifies a T640 routing node from 0 through 3, for example, lcc0-re0. For more information, see “Creating a Configuration Group” on page 538, and “Example: Creating and Applying Configuration Groups on a TX Matrix Platform” on page 541.

