Scripting with Tcl

This chapter contains the following topics:

About Tcl

Tcl (pronounced "tickle") is a scripting language that increases flexibility of CLI commands. You can use Tcl to extract certain values in the output of a **show** command, perform switch configurations, run Cisco NX-OS commands in a loop, or define Embedded Event Manager (EEM) policies in a script.

This section describes how to run Tcl scripts or run Tcl interactively on switches.

Guidelines and Limitations

Following are guidelines and limitations for TCL scripting:

Some processes and **show** commands can cause a large amount of output. If you are running scripts, and need to terminate long-running output, use Ctrl+C (not Ctrl+Z) to terminate the command output. If you use Ctrl+Z, a SIGCONT (signal continuation) message can be generated, which can cause the script to halt. Scripts that are halted through SIGCONT messages require user intervention to resume operation.

Tclsh Command Help

Command help is not available for Tcl commands. You can still access the help functions of Cisco NX-OS commands from within an interactive Tcl shell.

This example shows the lack of Tcl command help in an interactive Tcl shell:

```
switch# tclsh
switch-tcl# set x 1
switch-tcl# puts ?
             ^
% Invalid command at '^' marker.
switch-tcl# configure ?
  <CR>
  session   Configure the system in a session
```

```
  terminal  Configure the system from terminal input

switch-tcl#
```

Note In the preceding example, the Cisco NX-OS command help function is still available but the Tcl **puts** command returns an error from the help function.

Tclsh Command History

You can use the arrow keys on your terminal to access commands you previously entered in the interactive Tcl shell.

Note The **tclsh** command history is not saved when you exit the interactive Tcl shell.

Tclsh Tab Completion

You can use tab completion for Cisco NX-OS commands when you are running an interactive Tcl shell. Tab completion is not available for Tcl commands.

Tclsh CLI Command

Although you can directly access Cisco NX-OS commands from within an interactive Tcl shell, you can only execute Cisco NX-OS commands in a Tcl script if they are prepended with the Tcl **cli** command.

In an interactive Tcl shell, the following commands are identical and execute properly:

```
switch-tcl# cli show module 1 | incl Mod
switch-tcl# cli "show module 1 | incl Mod"
switch-tcl# show module 1 | incl Mod
```

In a Tcl script, you must prepend Cisco NX-OS commands with the Tcl **cli** command as shown in the following example:

```
set x 1
cli show module $x | incl Mod
cli "show module $x | incl Mod"
```

If you use the following commands in your script, the script fails and the Tcl shell displays an error:

```
show module $x | incl Mod
"show module $x | incl Mod"
```

Tclsh Command Separation

The semicolon (`;`) is the command separator in both Cisco NX-OS and Tcl. To execute multiple Cisco NX-OS commands in a Tcl command, you must enclose the Cisco NX-OS commands in quotes (`""`).

In an interactive Tcl shell, the following commands are identical and execute properly:

```
switch-tcl# cli "configure terminal ; interface loopback 10 ; description loop10"
switch-tcl# cli configure terminal ; cli interface loopback 10 ; cli description loop10
switch-tcl# cli configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

switch(config-tcl)# cli interface loopback 10
switch(config-if-tcl)# cli description loop10
switch(config-if-tcl)#
```

In an interactive Tcl shell, you can also execute Cisco NX-OS commands directly without prepending the Tcl **cli** command:

```
switch-tcl# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

switch(config-tcl)# interface loopback 10
switch(config-if-tcl)# description loop10
switch(config-if-tcl)#
```

Tcl Variables

You can use Tcl variables as arguments to the Cisco NX-OS commands. You can also pass arguments into Tcl scripts. Tcl variables are not persistent.

The following example shows how to use a Tcl variable as an argument to a Cisco NX-OS command:

```
switch# tclsh
switch-tcl# set x loop10
switch-tcl# cli "configure terminal ; interface loopback 10 ; description $x"
switch(config-if-tcl)#
```

Tclquit

The **tclquit** command exits the Tcl shell regardless of which Cisco NX-OS command mode is currently active. You can also press **Ctrl-C** to exit the Tcl shell. The **exit** and **end** commands change Cisco NX-OS command modes. The **exit** command terminates the Tcl shell only from the EXEC command mode.

Tclsh Security

The Tcl shell is executed in a sandbox to prevent unauthorized access to certain parts of the Cisco NX-OS system. The system monitors CPU, memory, and file system resources being used by the Tcl shell to detect events such as infinite loops, excessive memory utilization, and so on.

You configure the initial Tcl environment with the **scripting tcl init** *init-file* command.

You can define the looping limits for the Tcl environment with the **scripting tcl recursion-limit** *iterations* command. The default recursion limit is 1000 iterations.

Running the Tclsh Command

You can run Tcl commands from either a script or on the command line using the **tclsh** command.

Note You cannot create a Tcl script file at the CLI prompt. You can create the script file on a remote device and copy it to the bootflash: directory on the Cisco NX-OS device.

SUMMARY STEPS

1. **tclsh** [**bootflash:***filename* [*argument* **...**]]

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**tclsh** [**bootflash:***filename* [*argument* **...**]]
	Example:
	`switch# tclsh ?`
	`  <CR>`
	`  bootflash:  The file to run`
		Starts a Tcl shell.
		If you run the **tclsh** command with no arguments, the shell runs interactively, reading Tcl commands from standard input and printing command results and error messages to the standard output. You exit from the interactive Tcl shell by typing **tclquit** or **Ctrl-C**.
		If you run the **tclsh** command with arguments, the first argument is the name of a script file containing Tcl commands and any additional arguments are made available to the script as variables.

Example

The following example shows an interactive Tcl shell:

```
switch# tclsh
switch-tcl# set x 1
switch-tcl# cli show module $x | incl Mod
Mod  Ports  Module-Type                          Model              Status
1    36     36p 40G Ethernet Module             N9k-X9636PQ        ok
Mod  Sw              Hw
Mod  MAC-Address(es)                         Serial-Num

switch-tcl# exit
switch#
```

The following example shows how to run a Tcl script:

```
switch# show file bootflash:showmodule.tcl
set x 1
while {$x < 19} {
```

```
cli show module $x | incl Mod
set x [expr {$x + 1}]
}

switch# tclsh bootflash:showmodule.tcl
Mod  Ports  Module-Type                          Model              Status
1    36     36p 40G Ethernet Module             N9k-X9636PQ        ok
Mod  Sw              Hw
Mod  MAC-Address(es)                         Serial-Num

switch#
```

Navigating Cisco NX-OS Modes from the Tclsh Command

You can change modes in Cisco NX-OS while you are running an interactive Tcl shell.

SUMMARY STEPS

1. **tclsh**
2. **configure terminal**
3. **tclquit**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**tclsh**
	Example:
	`switch# tclsh`
	`switch-tcl#`
		Starts an interactive Tcl shell.

Step 2	**configure terminal**
	Example:
	`switch-tcl# configure terminal`
	`switch(config-tcl)#`
		Runs a Cisco NX-OS command in the Tcl shell, changing modes.
		Note
		The Tcl prompt changes to indicate the Cisco NX-OS command mode.

Step 3	**tclquit**
	Example:
	`switch-tcl# tclquit`
	`switch#`
		Terminates the Tcl shell, returning to the starting mode.

Example

The following example shows how to change Cisco NX-OS modes from an interactive Tcl shell:

```
switch# tclsh
switch-tcl# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config-tcl)# interface loopback 10
switch(config-if-tcl)# ?
  description  Enter description of maximum 80 characters
  inherit      Inherit a port-profile
  ip           Configure IP features
  ipv6         Configure IPv6 features
  logging      Configure logging for interface
  no           Negate a command or set its defaults
  rate-limit   Set packet per second rate limit
  shutdown     Enable/disable an interface
  this         Shows info about current object (mode's instance)
  vrf          Configure VRF parameters
  end          Go to exec mode
  exit         Exit from command interpreter
  pop          Pop mode from stack or restore from name
  push         Push current mode to stack or save it under name
  where        Shows the cli context you are in

switch(config-if-tcl)# description loop10
switch(config-if-tcl)# tclquit
Exiting Tcl
switch#
```

Tcl References

The following titles are provided for your reference:

- Mark Harrison (ed), *Tcl/Tk Tools*, O'Reilly Media, ISBN 1-56592-218-2, 1997
- Mark Harrison and Michael McLennan, *Effective Tcl/Tk Programming*, Addison-Wesley, Reading, MA, USA, ISBN 0-201-63474-0, 1998
- John K. Ousterhout, *Tcl and the Tk Toolkit*, Addison-Wesley, Reading, MA, USA, ISBN 0-201-63337-X, 1994.
- Brent B. Welch, *Practical Programming in Tcl and Tk*, Prentice Hall, Upper Saddle River, NJ, USA, ISBN 0-13-038560-3, 2003.
- J Adrian Zimmer, *Tcl/Tk for Programmers*, IEEE Computer Society, distributed by John Wiley and Sons, ISBN 0-8186-8515-8, 1998.