

**CCNA**

640-802

**Managing a Cisco Internetwork**



Revision no.: PPT/2K804/04

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**The Internal Components of a Cisco Router**

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| --- | --- | --- | --- |
|  | Component | Description | |
|  |  |  | |
|  | Bootstrap | Stored in the microcode of the ROM, the bootstrap is used to | |
|  |  | bring a router up during initialization. It will boot the router and | |
|  |  | then load the IOS. | |
|  |  |  | |
|  | POST (power-on self- | Stored in the microcode of the ROM, the POST is used to check | |
|  | test) | the basic functionality of the router hardware and determines | |
|  |  | which interfaces are present | |
|  |  |  | |
|  | ROM | monitor Stored in the microcode of the ROM, the ROM monitor is | |
|  |  | used for manufacturing, testing, and troubleshooting | |
|  |  |  | |
|  | Mini-IOS | Called the RXBOOT or bootloader by Cisco, the mini-IOS is a | |
|  |  | small IOS in ROM that can be used to bring up an interface and | |
|  |  | load a Cisco IOS into flash memory. The mini-IOS can also | |
|  |  | perform a few other maintenance operations. | |
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**The Internal Components of a Cisco Router (contd.)**

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|  | Component | Description |  |
|  |  |  |  |
|  | RAM (randomaccess | Used to hold packet buffers, ARP cache, routing tables, and also the |  |
|  | memory) | software and data structures that allow the router to function. |  |
|  |  | running-config is stored in RAM, and the IOS can also be run from |  |
|  |  | RAM in some routers. |  |
|  |  |  |  |
|  | ROM (read-only | Used to start and maintain the router |  |
|  | memory). |  |  |
|  |  |  |  |
|  | Flash memory | Used on the router to hold the Cisco IOS. Flash memory is not |  |
|  |  | erased when the router is reloaded. It is EEPROM (electronically |  |
|  |  | erasable programmable read-only memory) created by Intel. |  |
|  |  |  |  |
|  | NVRAM | Used to hold the router and switch configuration. NVRAM is not |  |
|  | (nonvolatile RAM) | erased when the router or switch is reloaded. |  |
|  |  |  |  |
|  | Configuration | Used to control how the router boots up. This value can be seen |  |
|  | Register | with the show version command and typically is 0x2102, which tells |  |
|  |  | the router to load the IOS from flash memory as well as tell the |  |
|  |  | router to load the configuration from NVRAM. |  |
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**Router Booting Sequence**

* Power on self test (POST) : This test verifies that all router’s components are functional. During this test, the router also determines what hardware is present. POST executes from microcode resident in the system ROM.
* Load and run bootstrap code : Bootstrap code is used to perform subsequent events, such as finding the IOS software,loading it and then running it.After the IOS software is loaded and running, the Bootstrap code is not used until the next time the router is reloaded or powered-up.



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**Router Booting Sequence (contd.)**

* Find the IOS software : The bootstrap code determines where the IOS software to be run is located. The Flash memory is the normal place where the IOS image is found. The configuration register and configuration file in NVRAM help determine where the IOS images are and what image file should be used.
* Load the IOS software : After the bootstrap code has found the proper image, it then loads that image into RAM and starts the IOS running. Some routers (such as 2500 series) do not load the IOS image into RAM, but execute it directly from Flash memory.



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**Router Booting Sequence (contd.)**

* Find the configuration : the default is to look in NVRAM for a valid configuration. A parameter can be set to have the router attempt to locate a configuration file from another location, such as a TFTP server.
* Load the configuration : The desired configuration for the router is loaded and executed. If no configuration exists or is being ignored, the router will enter the setup utility or attempt an Autoinstall. Autoinstall will be attempted if a router is connected to a functioning serial link and can resolve an address through a process of SLARP (serial line address resolution protocol)
* RUN : The router is now running the configured IOS.



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**Managing Configuration Registers**

* Understanding the Configuration Register Bits
* Checking the Current Configuration Register Value
* Changing the Configuration Register
* Recovering Passwords



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**Understanding the Configuration Register Bits**

* **Configuration register bits 3, 2, 1, and 0 set boot option.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Configuration Register | Meaning |  |
|  | boot field value |  |  |
|  |  |  |  |
|  | 0x0 | Use Rom monitor mode |  |
|  |  | (Manually Boot using the I Command) |  |
|  |  |  |  |
|  | 0x1 | Automatically boot from Rom |  |
|  |  | (Provides Cisco IOS Software Subset) |  |
|  |  |  |  |
|  | 0x2 to 0xf | Examine NVRAM for Boot System |  |
|  |  | Commands (0x2 default if router has |  |
|  |  | flash) |  |
|  |  |  |  |
|  |  |  |  |



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**Checking the Current Configuration Register Value**

* Router# show version
* Cisco Internetwork Operating System Software
* IOS (tm) C2600 Software (C2600-I-M), Version 12.1(8)T3,RELEASE SOFTWARE (fc1)
* [output cut]
* Configuration register is 0x2102



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**Changing the Configuration Register**

* Force the system into the ROM monitor mode.
* Select a boot source and default boot filename.
* Enable or disable the Break function.
* Control broadcast addresses.
* Set the console terminal baud rate.
* Load operating software from ROM.
* Enable booting from a Trivial File Transfer Protocol (TFTP) server.

Router(config)#**config-register 0x101**

Router(config)#**^Z**

Router#**show version**

*[output cut]*

Configuration register is 0x2102 (will be 0x0101 at next reload)



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**Recovering Passwords**

* Boot the router and interrupt the boot sequence by performing a break.
* Change the configuration register to turn on bit 6 (with the value 0x2142).
* Reload the router.
* Enter privileged mode.
* Copy the startup-config file to running-config.
* Change the password.
* Reset the configuration register to the default value.
* Save the router configuration.
* Reload the router.



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**Interrupting the Router Boot Sequence**

* Boot Router and perform a Break.
  + Typically you perform break by pressing CTRL+Break key combination when using Hyper Terminal.
  + Note that Windows NT’s default Hyper Terminal program will not perform the break. So either upgrade or use Windows 95 /98
* You should see something like this:

System Bootstrap, Version 11.3(2)XA4, RELEASE SOFTWARE (fc1) Copyright (c) 1999 by cisco Systems, Inc. TAC:Home:SW:IOS:Specials for info

PC = 0xfff0a530, Vector = 0x500, SP = 0x680127b0 C2600 platform with 32768 Kbytes of main memory PC = 0xfff0a530, Vector = 0x500, SP = 0x80004374 monitor: command "boot" aborted due to user interrupt rommon 1 >



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**Changing the Configuration Register**

* To change the configuration register on a 2500 series router, type o after creating a break sequence on the router.
* This brings up a menu of configuration register option settings. To change the configuration register, enter the command o/r , followed by the new register value.
* Next slide is an example of turning on bit 6 on a 2500 series router:



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**Changing the Configuration Register (contd.)**

System Bootstrap, Version 11.0(10c), SOFTWARE Copyright (c) 1986-1996 by cisco Systems

2500 processor with 14336 Kbytes of main memory

Abort at 0x1098FEC (PC)

>**o**

Configuration register = 0x2102 at last boot

Bit# Configuration register option settings:

15 Diagnostic mode disabled

14 IP broadcasts do not have network numbers

1. Boot default ROM software if network boot fails 12-11 Console speed is 9600 baud
2. IP broadcasts with ones
3. Break disabled
4. OEM disabled
5. Ignore configuration disabled

03-00 Boot file is cisco2-2500 (or 'boot system' command) >**o/r 0x2142**



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**Changing the Configuration Register (contd.)**

* Cisco 2600 Series Commands

To change the bit value on a Cisco 2600 series router, you just enter the

command at the rommon

1> prompt:

rommon 1 > **confreg 0x2142**

You must reset or power cycle for new config to take effect



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**Reloading the Router and Entering Privileged Mode**

* At this point, you need to reset the router like this:
* From the 2600 series router, type reset.
* From the 2500 series router, type I (for initialize).
* The router will reload and ask if you want to use setup mode (because no startup-config is used). Answer No to entering setup mode, press Enter to go into user mode, and then type enable to go into privileged mode.



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**Viewing and Changing the Configuration**

* Now you are past where you would need to enter the user mode and privileged mode passwords in a router.
* Copy the startup-config file to the running-config file:

copy startup-config running-config

or

copy start run

* The configuration is now running in RAM, and you are in privileged mode, which means that you can view and change the configuration.
* Although you cannot view the enable secret setting for the password, you can change the password, as follows:

config t

enable secret todd



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**Resetting the Configuration Register and Reloading the Router**

* After you are finished changing passwords, set the configuration register back to the default value with the config-register command:
  + config t
  + config-register 0x2102
* Finally, save the new configuration with a copy running-config startup-config and reload the router.



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**Backing Up and Restoring the Cisco IOS**

* Before you upgrade or restore a Cisco IOS, you really should copy the existing file to a TFTP host as a backup just in case the new image crashes and burns.
  + Make sure you can access the network server.
  + Ensure that the network server has adequate space for the code image.
  + Verify the file naming and path requirement.



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**Verifying Flash Memory**

* Router#sh flash
* System flash directory:
* File Length Name/status
* 1 8121000 c2500-js-l.112-18.bin
* [8121064 bytes used, 8656152 available, 16777216 total]
* 16384K bytes of processor board System flash (Read ONLY)
* Router#



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**Verifying Flash Memory (contd.)**

* Notice that the filename in this example is c2500-js-l.112-18.bin. The name of the file is platform-specific and derived as follows:

c 2500 is the platform.

j indicates that the file is an enterprise image.

s indicates that the file contains extended capabilities.

l indicates that the file can be moved from flash memory if needed

and is not compressed.

11.2-18 is the revision number.

.bin indicates that the Cisco IOS is a binary executable file.

* The last line in the router output shows that the flash is 16,384KB (or 16MB). So if the new
* file that you want to use is, say, 10MB in size, you know that there’s plenty of room for it.



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**Backing Up the Cisco IOS**

* To back up the Cisco IOS to a TFTP server, you use the copy flash tftp command. The key to success in this backup routine is to make sure that you’ve got good, solid connectivity to the TFTP server.



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**Backing Up the Cisco IOS (contd.)**

* Router#copy flash tftp
* System flash directory:
* File Length Name/status
* 1 8121000 c2500-js-l.112-18.bin
* [8121064 bytes used, 8656152 available, 16777216 total]
* Address or name of remote host [255.255.255.255]?
* 192.168.0.120
* Source file name?c2500-js-l.112-18.bin
* Destination file name [c2500-js-l.112-18.bin]?[Enter]
* Verifying checksum for 'c2500-js-l.112-18.bin')file #1)
* ...OK
* Copy '/c2500-js-l.112-18' from Flash to server
* as '/c2500-js-l.112-18'? [yes/no]y
* !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
* !!!!!!!!!!!!!!!!!!!! [output cut]
* Upload to server done
* Flash copy took 00:02:30 [hh:mm:ss]
* Router#



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**Restoring or Upgrading the Cisco Router IOS**

Router#***copy tftp flash***

\*\*\*\* NOTICE \*\*\*\*

Flash load helper v1.0

This process will accept the copy options and then terminate the current system image to use the ROM based image for the copy. Routing functionality will not be available during that time. If you are logged in via telnet, this connection will terminate. Users with console access can see the results of the copy operation.

---- \*\*\*\*\*\*\*\* ----

Proceed? ***[confirm][Enter]***



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**Using the Cisco IOS File System (Cisco IFS)**



* Cisco has created a file system called Cisco IFS that allows you to work with files and directories just as you would from a Windows DOS prompt. The commands you use are dir, copy, more, delete, erase or format, cd and pwd, and mkdir and rmdir.
* We use Cisco IFS commands the same way that we used the **copy** command in the IOS section
* For backing up the IOS
* For upgrading the IOS
* For viewing text files



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**Some common IFS commands available for managing the IOS.**



* **dir:** Same as with Windows, this command lets you view files in adirectory. Type dir, hit Enter, and by default you get the contents of the flash:/ directory output.
* **copy:** This is one popular command, often used to upgrade, restore, orback up an IOS. While using this command it’s really important to focus on the details—what you’re copying, where it’s coming from, and where it’s going to land.
* **more:** Same as with Unix, this will give you a text file and let you look atit on a card. You can use it to check out your configuration file or your backup configuration file.
* **show file:** This command will give you the skinny on a specified file orfile system.



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**IFS commands** (contd…)

* **delete:** It deletes stuff. It whacks the file, but it doesn’t always free upthe space it was using. To actually get the space back, you have to use something called the squeeze command too.
* **erase/format:** Use these with care.
* **cd/pwd:** Same as with Unix and DOS, cd is the command you use tochange directories. Use the pwd command to print (show) the working directory.
* **mkdir/rmdir:** Use these commands on certain routers and switches tocreate and delete directories—the mkdir command for creation and the rmdir command for deletion. Use the cd and pwd commands to change into these directories.



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**Using the Cisco IFS to Upgrade an IOS**

**Some Cisco IFS commands on a router with hostname of R1.**

R1#**pwd**

flash:

R1#**dir**

Directory of flash:/

1. -rw- 13937472 Dec 20 2006 19:58:18 +00:00 c1841-ipbasemz.124-1c.bin
2. -rw- 1821 Dec 20 2006 20:11:24 +00:00 sdmconfig-18xx.cfg
3. -rw- 4734464 Dec 20 2006 20:12:00 +00:00 sdm.tar
4. -rw- 833024 Dec 20 2006 20:12:24 +00:00 es.tar
5. -rw- 1052160 Dec 20 2006 20:12:50 +00:00 common.tar
6. -rw- 1038 Dec 20 2006 20:13:10 +00:00 home.shtml
7. -rw- 102400 Dec 20 2006 20:13:30 +00:00 home.tar
8. -rw- 491213 Dec 20 2006 20:13:56 +00:00 128MB.sdf
9. -rw- 1684577 Dec 20 2006 20:14:34 +00:00 securedesktopios-

3.1.1.27-k9.pkg

1. -rw- 398305 Dec 20 2006 20:15:04 +00:00 sslclient-win-1.1.0.154.pkg 32071680 bytes total (8818688 bytes free)



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Let’s check the size of the file that’s in flash with the show file command (show flash would also work):

R1#**show file info flash:c1841-ipbase-mz.124-1c.bin** flash:c1841-ipbase-mz.124-1c.bin: type is image (elf) []

file size is 13937472 bytes, run size is 14103140 bytes Runnable image, entry point 0x8000F000, run from ram



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To erase IOS file (c1841-advipservicesk9-mz.124-12.bin), we use the delete command.

R1#**delete flash:c1841-ipbase-mz.124-1c.bin**

Delete filename [c1841-ipbase-mz.124-1c.bin]?**[enter]**

Delete flash:c1841-ipbase-mz.124-1c.bin? [confirm]**[enter]**



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To check IOS file after delete



R1#**sh flash**

-#- --length-- -----date/time------ path

1 1821 Dec 20 2006 20:11:24 +00:00 sdmconfig-18xx.cfg

2 4734464 Dec 20 2006 20:12:00 +00:00 sdm.tar

3 833024 Dec 20 2006 20:12:24 +00:00 es.tar

4 1052160 Dec 20 2006 20:12:50 +00:00 common.tar

5 1038 Dec 20 2006 20:13:10 +00:00 home.shtml

6 102400 Dec 20 2006 20:13:30 +00:00 home.tar

7 491213 Dec 20 2006 20:13:56 +00:00 128MB.sdf

1. 1684577 Dec 20 2006 20:14:34 +00:00 securedesktop-ios-3.1.1.27-k9.pkg
2. 398305 Dec 20 2006 20:15:04 +00:00 sslclient-win-1.1.0.154.pkg 22757376 bytes available (9314304 bytes used)

R1#**sh file info flash:c1841-ipbase-mz.124-1c.bin**

%Error opening flash:c1841-ipbase-mz.124-1c.bin (File not found) R1#



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Let’s add the new file with the copy command.

R1#**copy tftp://1.1.1.2//c1841-advipservicesk9-mz.124-12.bin/**

**flash:/**

**c1841-advipservicesk9-mz.124-12.bin**

Source filename [/c1841-advipservicesk9-mz.124-12.bin/]?**[enter]**

Destination filename [c1841-advipservicesk9-mz.124-12.bin]?**[enter]**

Loading /c1841-advipservicesk9-mz.124-12.bin/ from 1.1.1.2 (via



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FastEthernet0/0): !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

[output cut]

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

[OK - 22103052 bytes]

22103052 bytes copied in 72.008 secs (306953 bytes/sec)



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R1#**sh flash**



-#- --length-- -----date/time------ path

1. 1821 Dec 20 2006 20:11:24 +00:00 sdmconfig-18xx.cfg
2. 4734464 Dec 20 2006 20:12:00 +00:00 sdm.tar
3. 833024 Dec 20 2006 20:12:24 +00:00 es.tar
4. 1052160 Dec 20 2006 20:12:50 +00:00 common.tar
5. 1038 Dec 20 2006 20:13:10 +00:00 home.shtml
6. 102400 Dec 20 2006 20:13:30 +00:00 home.tar
7. 491213 Dec 20 2006 20:13:56 +00:00 128MB.sdf
8. 1684577 Dec 20 2006 20:14:34 +00:00 securedesktop-ios-3.1.1.27-k9.pkg
9. 398305 Dec 20 2006 20:15:04 +00:00 sslclient-win-1.1.0.154.pkg
10. 22103052 Mar 10 2007 19:40:50 +00:00 c1841-advipservicesk9-mz.124-12.bin 651264 bytes available (31420416 bytes used) R1#



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We can check the file information as well with the **show file** command: R1#**sh file information flash:c1841-advipservicesk9-mz.124-12.bin** flash:c1841-advipservicesk9-mz.124-12.bin: type is image (elf) []



file size is 22103052 bytes, run size is 22268736 bytes

Runnable image, entry point 0x8000F000, run from ram

**Note:** Remember that the IOS is expanded into RAM when the router boots,so the new IOS will not run until you reload the router.

**Using the SDM to Manage the Flash Memory**

We can use SDM to Upgrade/Restore/Back Up the IOS on router but the SDM allows management of *all* the files in flash memory (as well as NVRAM), not just the IOS.



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**Backing Up the Cisco Router Configuration**

* Verifying the Current Configuration

To verify the configuration in DRAM, use the show running-config command (sh run for short) like this:

Router#**sh run**

Building configuration...

Current configuration:

!

version 12.0

The current configuration information indicates that the router is now running version 12.0 of the IOS.



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**Backing Up the Cisco IOS (contd.)**

* Verifying the Stored Configuration

To check the configuration stored in NVRAM. To see this, use the show startup-config command (sh start for short) like this:

Router#sh start

Using 366 out of 32762 bytes

!

version 11.2



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**Backing Up the Cisco Router Configuration**

**(contd.)**

* Copying the Current Configuration to NVRAM

Router#**copy run start**

Destination filename [startup-config]?***[Enter]***

Warning: Attempting to overwrite an NVRAM configuration previously written by a different version of the system image.

Overwrite the previous NVRAM configuration?

[confirm]***[Enter]***

Building configuration...

[OK]

Now when you run show startup-config, the version shows 12.0:

Router#**sh start**

Using 487 out of 32762 bytes

!

version 12.0



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**Backing Up the Cisco Router Configuration**

**(contd.)**

**Copying the Configuration to a TFTP Server**

Router#**copy run tftp**

Address or name of remote host []?**192.168.0.120**

Destination filename [router-confg]?**todd1-confg**

!!

487 bytes copied in 12.236 secs (40 bytes/sec)

Router#



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**Restoring the Cisco Router Configuration**

* If you’ve changed your router’s running-config file and want to restore the configuration to the version in the startup-config file, the easiest way to do this is to use the copy startup-config running-config command



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**Restoring the Cisco Router Configuration (contd.)**

Router#**copy tftp run**

Address or name of remote host []?**192.168.0.120** Source filename []?**todd1-confg**

Destination filename [running-config]?**[Enter]**

Accessing tftp://192.168.0.120/todd1-confg...

Loading todd1-confg from 192.168.0.120 (via Ethernet0):

!!

[OK - 487/4096 bytes]

487 bytes copied in 5.400 secs (97 bytes/sec)

Router#

00:38:31: %SYS-5-CONFIG: Configured from tftp://192.168.0.120/todd1-confg Router#



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**Using the Cisco IOS File System to Manage Your Router’s Configuration (Cisco IFS)**

show file command to see the contents of NVRAM and RAM: R3#**show file information nvram:startup-config** nvram:startup-config:

type is config

R3#**cd nvram:**

R3#**pwd**

nvram:/

R3#**dir**

Directory of nvram:/

1. -rw- 830 <no date> startup-config
2. ---- 5 <no date> private-config
3. -rw- 830 <no date> underlying-config
4. -rw- 0 <no date> ifIndex-table 196600 bytes total (194689 bytes free)



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R3#**cd system:**



R3#**pwd**

system:/

R3#**dir ?**

/all List all files

/recursive List files recursively

all-filesystems List files on all filesystems

archive: Directory or file namecns: Directory or file name

flash: Directory or file name

null: Directory or file name

nvram: Directory or file name

system: Directory or file name

xmodem: Directory or file name

ymodem: Directory or file name

<cr>

R3#**dir**

Directory of system:/

3 dr-x 0 <no date> lib

33 dr-x 0 <no date> memory

1. -rw- 750 <no date> running-config
2. dr-x 0 <no date> vfiles



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copy command with the Cisco IFS to copy a file from a TFTP host to RAM. R3#**copy tftp://1.1.1.2/todd-confg system://running-config** Destination filename [running-config]?**[enter]**



Accessing tftp://1.1.1.2/todd-confg...Loading todd-confg from 1.1.1.2

(via FastEthernet0/0): !

[OK - 776 bytes]

[OK]

776 bytes copied in 13.816 secs (56 bytes/sec)

R3#

\*Mar 10 22:12:59.819: %SYS-5-CONFIG\_I:

Configured from tftp://1.1.1.2/todd-confg by console



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* Using the SDM to Back Up/Restore and Edit the Router’s Configuration
* Using the SDM rather than the copy command no TFTP host is needed. By using the SDM, you can http or https to a router and keep all files local on your PC instead of having to configure a TFTP host.



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**Erasing the Configuration**

* To delete the startup-config file on a Cisco router, use the command erase startup-config, like this:

Router#**erase startup-config**

Erasing the nvram filesystem will remove all files!

Continue? [confirm]**[Enter]**

[OK]

Erase of nvram: complete

Router#

* This command deletes the contents of NVRAM on the router, so the next time the router boots, it’ll run the setup mode.



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**Using Cisco Discovery Protocol (CDP)**

* Getting CDP Timers and Holdtime Information
* Gathering Neighbor Information
* Gathering Interface Traffic Information
* Gathering Port and Interface Information



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**Getting CDP Timers and Holdtime Information**

* The show cdp command (sh cdp for short) gives you information about two CDP global parameters that can be configured on Cisco devices:
  + *CDP timer* is how often CDP packets are transmitted to allactive interfaces.
  + *CDP holdtime* is the amount of time that the device will holdpackets received from neighbor devices.



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**Getting CDP Timers and Holdtime Information**

**(contd.)**

* Both Cisco routers and Cisco switches use the same parameters. The output on a router looks like this:

Router#**sh cdp**

Global CDP information:

Sending CDP packets every 60 seconds

Sending a holdtime value of 180 seconds

Router#

Router#**config t**

Enter configuration commands, one per line. End with

CNTL/Z.

Router(config)#**cdp ?**

holdtime Specify the holdtime (in sec) to be sent in packets

timer Specify the rate at which CDP packets are sent (in sec)

run

Router(config)#**cdp timer 90**

Router(config)#**cdp holdtime 240**

Router(config)#**^Z**



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**Gathering Neighbor Information**

* The show cdp neighbor command (sh cdp nei for short) delivers information about directly connected devices.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Todd2509#**sh cdp nei** | |  |  |  |  |
| Capability Codes: R - Router, T - Trans Bridge, | | | | |  |
| B - Source Route Bridge, S - Switch, H - Host, | | | | |  |
| I - IGMP, r - Repeater | |  |  |  |  |
| Device ID | Local Intrfce Holdtme Capability Platform Port ID | | | | |
| 1900Switch | Eth 0 | 238 | T S | 1900 | 2 |
| 2500B | Ser 0 | 138 | R | 2500Ser 0 | |



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**Gathering Neighbor Information (contd.)**

Todd2509#

Todd2509#**sh cdp neighbor detail**

-------------------------

Device ID: 1900Switch

Entry address(es):

IP address: 0.0.0.0

Platform: cisco 1900, Capabilities: Trans-Bridge Switch

Interface: Ethernet0, Port ID (outgoing port): 2

Holdtime : 166 sec

Version :V9.00



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**Gathering Neighbor Information (contd.)**

Todd2509#**sh cdp entry \***

-------------------------

Device ID: 1900Switch

Entry address(es):

IP address: 0.0.0.0

Platform: cisco 1900, Capabilities: Trans-Bridge Switch

Interface: Ethernet0, Port ID (outgoing port): 2

Holdtime : 223 sec

Version :

V9.00



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**Gathering Interface Traffic Information (contd.)**

* The show cdp traffic command displays information about interface traffic, including the number of CDP packets sent and received and the errors with CDP.
* **Todd2509#sh cdp traffic**
* **CDP counters:**
* **Packets output: 13, Input: 8**
* **Hdr syntax: 0, Chksum error: 0, Encaps failed: 0**
* **No memory: 0, Invalid packet: 0, Fragmented: 0**
* **Todd2509#**



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**Gathering Port and Interface Information**

* The show cdp interface command gives you the CDP status on router interfaces or switch ports.

Todd2509#**sh cdp interface**

Ethernet0 is up, line protocol is up Encapsulation ARPA

Sending CDP packets every 60 seconds Holdtime is 180 seconds

Serial0 is administratively down, line protocol is down Encapsulation HDLC

Sending CDP packets every 60 seconds Holdtime is 180 seconds

Serial1 is administratively down, line protocol is down Encapsulation HDLC

Sending CDP packets every 60 seconds Holdtime is 180 seconds



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**Gathering Port and Interface Information (contd.)**

* To turn off CDP on one interface on a router, use the ***no cdp*** ***enable*** command from interface configuration mode.

Todd2509#**config t**

Enter configuration commands, one per line. End with

CNTL/Z.

Router(config)#**int s0**

Router(config-if)#**no cdp enable**

Router(config-if)#**^Z**



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**Gathering Port and Interface Information (contd.)**

* Verify the change with the show cdp interface command:

Todd2509#**sh cdp int**

Ethernet0 is up, line protocol is up

Encapsulation ARPA

Sending CDP packets every 60 seconds

Holdtime is 180 seconds

Serial1 is administratively down, line protocol is down Encapsulation HDLC

Sending CDP packets every 60 seconds

Holdtime is 180 seconds

Todd2509#



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**Using Telnet**

* Telnetting into Multiple Devices Simultaneously
* Checking Telnet Connections
* Checking Telnet Users
* Closing Telnet Sessions



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**Telnetting into Multiple Devices Simultaneously**

* If you telnet to a router or switch, you can end the connection by typing exit at any time.
* If you want to keep your connection to a remote device but still come back to your original router console? To do that, you can press the Ctrl+Shift+6 key combination, release it, and then press X.

Todd2509#**telnet 172.16.10.2**

Trying 172.16.10.2 ... Open

User Access Verification

Password:

2501B>**[Cntl+Shift+6, then X]**

Todd2509#



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**Telnetting into Multiple Devices Simultaneously**

**(contd.)**

* Telnetting to a 1900 switch gives the console output of the switch:

Todd2509#**telnet 192.168.0.148**

Trying 192.168.0.148 ... Open

Catalyst 1900 Management Console

Copyright (c) Cisco Systems, Inc. 1993-1999

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| Enterprise | Edition Software |  |
| Ethernet Address: | | 00-B0-64-75-6B-C0 |
| PCA Number: |  | 73-3122-04 |
| PCA Serial | Number: | FAB040131E2 |
| Model Number: | | WS-C1912-A |
| System Serial Number: | | FAB0401U0JQ |
| Power Supply S/N: | | PHI033108SD |
| PCB Serial | Number: | FAB040131E2,73-3122-04 |

-------------------------------------------------

1 user(s) now active on Management Console.

User Interface Menu

[M] Menus

1. Command Line Enter Selection:

At this point, I pressed Ctrl+Shift+6, then X, which took me back to my Todd2509 router console: Todd2509#



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**Checking Telnet Connections**

* To see the connections made from your router to a remote device, use the show sessions command.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Todd2509#**sh sessions** | |  |  |  |  |
| Conn Host | | Address | Byte | Idle | Conn Name |
| 1 | 172.16.10.2 | 172.16.10.2 | 0 | 0 | 172.16.10.2 |
| \*2 | 192.168.0.148 | 192.168.0.148 | 0 | 0 | 192.168.0.148 |

Todd2509#

* The (\*) next to connection 2? It means that session 2 was your last session. You can return to your last session by pressing Enter twice. You can also return to any session by typing the number of the connection and pressing Enter twice.



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**Checking Telnet Users**

* You can list all active consoles and VTY ports in use on your router with the show users command:

|  |  |  |
| --- | --- | --- |
| Todd2509#**sh users** | |  |
| Line | User Host(s) | Idle Location |
| \* 0 con 0 | 172.16.10.2 | 00:07:52 |
|  | 192.168.0.148 | 00:07:18 |

* In the command’s output, con represents the local console. In this example, the console is connected to two remote IP addresses, or, in other words, two devices.
* sh users on the 2501B router that the Todd2509 router had telnetted into:

|  |  |  |
| --- | --- | --- |
| 2501B>sh users |  |  |
| Line | User Host(s) | Idle Location |
| 0 con 0 | idle | 9 |
| \*2 vty 0 |  |  |
|  |  |  |



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**Closing Telnet Sessions**



* You can end Telnet sessions a few different ways—typing exit or disconnect is probably the easiest and quickest. To end a session from a remote device, use the exit command:



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**Closing Telnet Sessions (contd.)**

Todd2509#***[Enter]*** *and again* ***[Enter]***

[Resuming connection 2 to 192.168.0.148 ... ] 1900Switch>**exit**

[Connection to 192.168.0.148 closed by foreign host] Todd2509#

Since the 1900Switch was my last session, I just pressed Enter twice to return to that session.

To end a session from a local device, use the disconnect command:

Todd2509#**disconnect ?**

<1-2> The number of an active network connection Resolving Hostnames **419**

WORD The name of an active network connection

<cr>

Todd2509#**disconnect 1**

Closing connection to 172.16.10.2 [confirm]

Todd2509#

**Using SDM to Telnet into Your Router:**

We can use sdm to telnet.



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**Resolving Hostnames**

* Building a Host Table
* Using DNS to Resolve Names



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**Building a Host Table**

* A host table provides name resolution only on the router that it was built upon. The command to build a host table on a router is:
  + ip host *host\_name tcp\_port\_number ip\_address*

Todd2509#**config t**

Todd2509(config)#**ip host 2501B 172.16.10.2** Todd2509(config)#**ip host 1900Switch 192.168.0.148** Todd2509(config)#**^Z**



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**Building a Host Table (contd.)**

* To see the newly built host table, just use the show hosts command:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Todd2509#**sh hosts** |  |  |  |  |
| Default domain is not set | |  |  |  |
| Name/address lookup uses domain service | | |  |  |
| Name servers are 255.255.255.255 | |  |  |  |
| Host | Flags | Age | Type | Address(es) |
| 2501B | (perm, OK) | 0 | IP | 172.16.10.2 |
| 1900Switch | (perm, OK) | 0 | IP | 192.168.0.148 |
| Todd2509# |  |  |  |  |



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**Using DNS to Resolve Names**

* Any time a Cisco device receives a command it doesn’t understand, it will try to resolve it through DNS by default. As shown below:

Todd2509#**todd**

Translating "todd"...domain server (255.255.255.255)

* Unknown command or computer name, or unable to find computer address

Todd2509#



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**Using DNS to Resolve Names (contd.)**

* To make DNS name resolution work in your network you need to perform three steps as follows:

Todd2509#**config t**

Todd2509(config)#**ip domain-lookup**

Todd2509(config)#**ip name-server 192.168.0.70**

Todd2509(config)#**ip domain-name lammle.com**

Todd2509(config)#**^Z**

Todd2509#



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**Using DNS to Resolve Names (contd.)**

* After the DNS configurations are set, you can test the DNS server by using a hostname to ping or telnet a device like this:

Todd2509#**ping 2501b**

Translating "2501b"...domain server (192.168.0.70) [OK]

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.10.2, timeout is

1. seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 28/31/32 ms



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**Using DNS to Resolve Names (contd.)**

* After a name is resolved using DNS, use the show hosts command to see that the device cached this information in the host table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Todd2509#**sh hosts** | |  |  |  |  |
| Default domain is lammle.com | | |  |  |  |
| Name/address lookup uses domain service | | | | |  |
| Name servers are 192.168.0.70 | | |  |  |  |
| Host | Flags |  | Age | Type | Address(es) |
| 2501b.lammle.com | | (temp, OK) 0 | | IP | 172.16.10.2 |
| 1900switch | (perm, OK) 0 | | IP | 192.168.0.148 | |
| Todd2509# |  |  |  |  |  |



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**Checking Network Connectivity**

* Using the *ping* Command

Todd2509#**ping todd2509**

Translating "todd2509"...domain server (192.168.0.70)[OK] Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.121, timeout

is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max

* 32/32/32 ms Todd2509#

Pinging with SDM

We can use sdm for pinging



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**Checking Network Connectivity (contd.)**

* Using the *traceroute* Command

Todd2509#trace 2501b

Type escape sequence to abort.

Tracing the route to 2501b.lammle.com (172.16.10.2) 1 2501b.lammle.com (172.16.10.2) 16 msec \* 16 msec Todd2509#



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**Debugging**



* Debug is a troubleshooting command that’s available from the privileged exec mode of Cisco
* IOS. It’s used to display information about various router operations and the related traffic generated or received by the router, plus any error messages.
* It can consume a huge amount of resources and the router is forced to process-switch the packets being debugged. So you don’t just use debug as a monitoring tool—it’s meant to be used for a short period of time and only as a troubleshooting tool. You can’t enable debugging from user mode, onlyprivileged mode:
* Corp>**debug ?**



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* Unrecognized command Corp>**en**



Corp#**debug ?**

1. AAA Authentication, Authorization and Accounting access-expression Boolean access expression adjacency adjacency

all Enable all debugging [output cut]



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use the debug all command:



Corp#**debug all**

This may severely impact network performance. Continue? (yes/[no]):**yes** All possible debugging has been turned on 2d20h: SNMP: HC Timer 824AE5CC fired

2d20h: SNMP: HC Timer 824AE5CC rearmed, delay = 20000

2d20h: Serial0/0: HDLC myseq 4, mineseen 0, yourseen 0, line down 2d20h:

2d20h: Rudpv1 Sent: Pkts 0, Data Bytes 0, Data Pkts 0

2d20h: Rudpv1 Rcvd: Pkts 0, Data Bytes 0, Data Pkts 0

2d20h: Rudpv1 Discarded: 0, Retransmitted 0

2d20h:

2d20h: RIP-TIMER: periodic timer expired

2d20h: Serial0/0: HDLC myseq 5, mineseen 0, yourseen 0, line down

2d20h: Serial0/0: attempting to restart

2d20h: PowerQUICC(0/0): DCD is up.

2d20h: is\_up: 0 state: 4 sub state: 1 line: 0

2d20h:

2d20h: Rudpv1 Sent: Pkts 0, Data Bytes 0, Data Pkts 0

2d20h: Rudpv1 Rcvd: Pkts 0, Data Bytes 0, Data Pkts 0

2d20h: Rudpv1 Discarded: 0, Retransmitted 0

2d20h: un all



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* All possible debugging has been turned off Corp#
* To disable debugging on a router, just use the command no in front of the debug command:
* Corp#no debug all
* But I typically just use the undebug all command since it is so easy when using the shortcut:
* Corp#un all
* Remember that instead of using the debug all command, it’s almost always better to use specific commands—and only for short periods of time. Here’s an example of deploying debug ip rip that will show you RIP updates being sent and received on a router:
* Corp#debug ip rip
* RIP protocol debugging is on

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Corp#



1w4d: RIP: sending v2 update to 224.0.0.9 via Serial0/0 (192.168.12.1)

1w4d: RIP: build update entries

1w4d: 10.10.10.0/24 via 0.0.0.0, metric 2, tag 0

1w4d: 171.16.125.0/24 via 0.0.0.0, metric 3, tag 0

1w4d: 172.16.12.0/24 via 0.0.0.0, metric 1, tag 0

1w4d: 172.16.125.0/24 via 0.0.0.0, metric 3, tag 0

1w4d: RIP: sending v2 update to 224.0.0.9 via Serial0/2 (172.16.12.1)

1w4d: RIP: build update entries

1w4d: 192.168.12.0/24 via 0.0.0.0, metric 1, tag 0

1w4d: 192.168.22.0/24 via 0.0.0.0, metric 2, tag 0

1w4d: RIP: received v2 update from 192.168.12.2 on Serial0/0

1w4d: 192.168.22.0/24 via 0.0.0.0 in 1 hops



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**Using the *show processes* Command**



show processes (or show processes cpu) is a good tool for determining a given router’s CPU utilization. Plus, it’ll give you a list of active processes along with their corresponding process ID, priority, scheduler test (status), CPU time used, number of times invoked, and so on.

Corp#**sh processes**

CPU utilization for five seconds: 2%/0%; one minute: 0%; five minutes: 0% PID QTy PC Runtime (ms) Invoked uSecs Stacks TTY Process 1 Cwe 8034470C 0 1 0 5804/6000 0 Chunk Manager

2 Csp 80369A88 4 1856 2 2616/3000 0 Load Meter

3 M\* 0 112 14 800010656/12000 0 Exec

5 Lst 8034FD9C 268246 52101 5148 5768/6000 0 Check heaps

6 Cwe 80355E5C 20 3 6666 5704/6000 0 Pool Manager

7 Mst 802AC3C4 0 2 0 5580/6000 0 Timers [output cut]



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