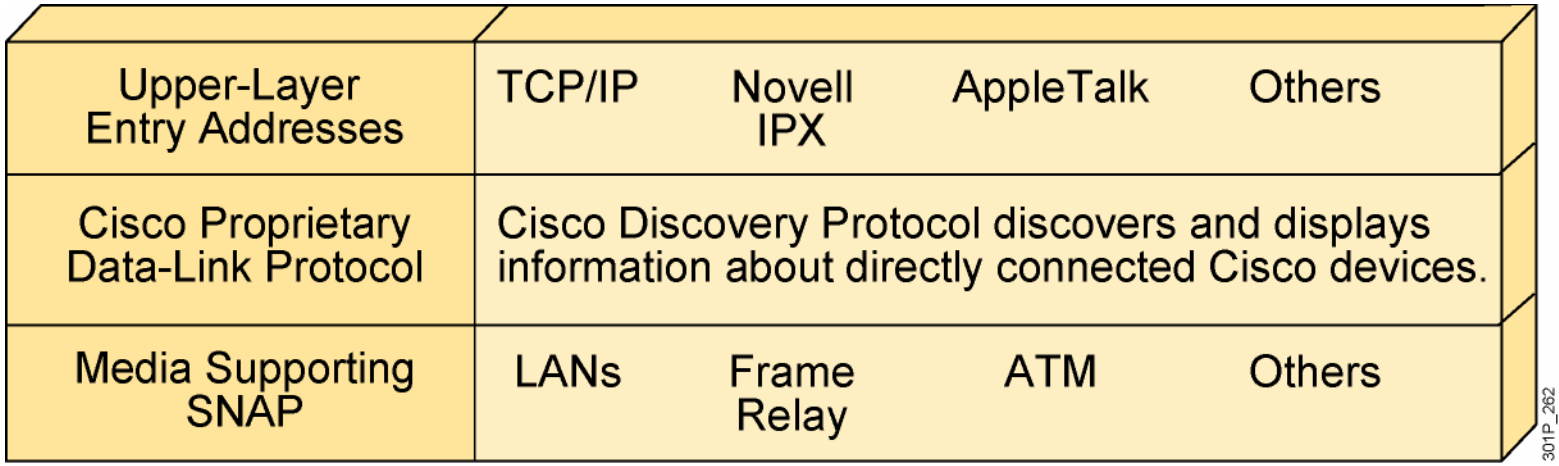
Discovering Neighbors on the Network

Network Environment Management

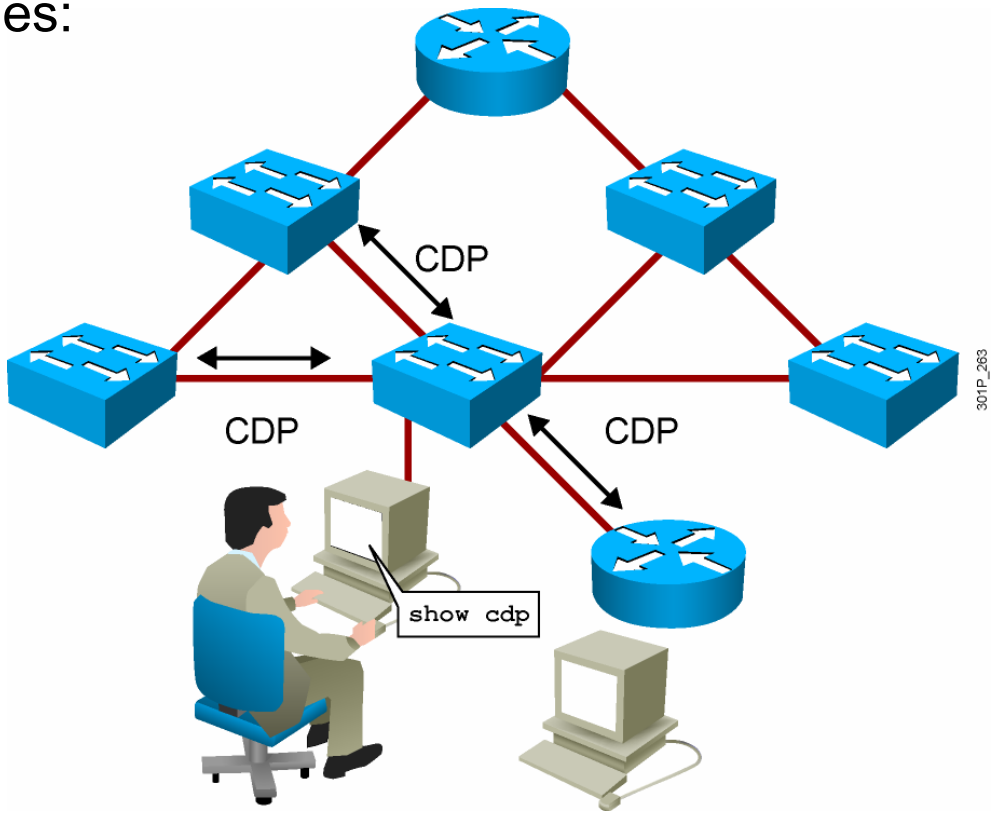
Cisco Discovery Protocol



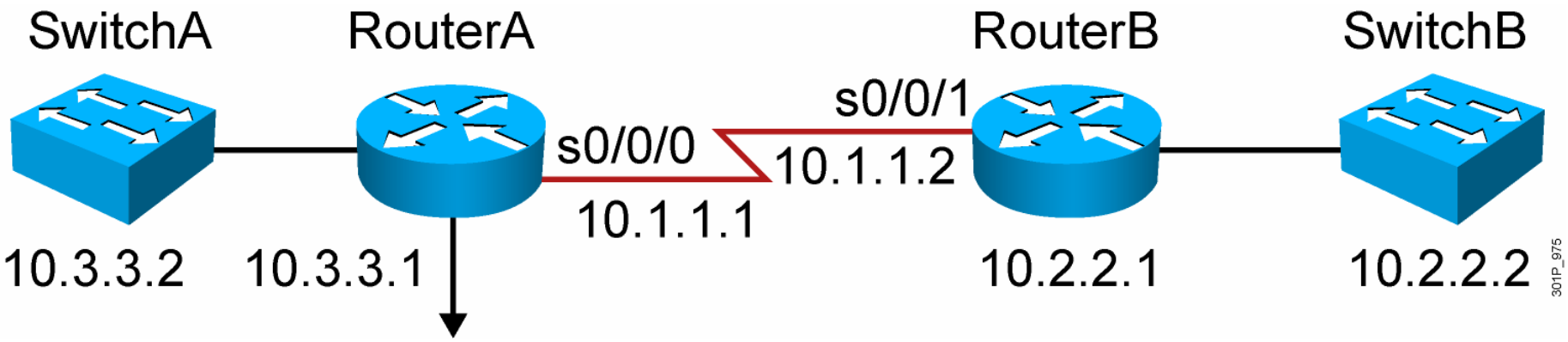
- Cisco Discovery Protocol is a proprietary utility that provides a summary of directly connected switches, routers, and other Cisco devices.
- Cisco Discovery Protocol discovers neighboring devices, regardless of which protocol suite they are running.
- Physical media must support the SNAP encapsulation.

Discovering Neighbors with Cisco Discovery Protocol

- Cisco Discovery Protocol runs on Cisco IOS devices.
- Summary information includes:
  - Device identifiers
  - Address list
  - Port identifier
  - Capabilities list
  - Platform

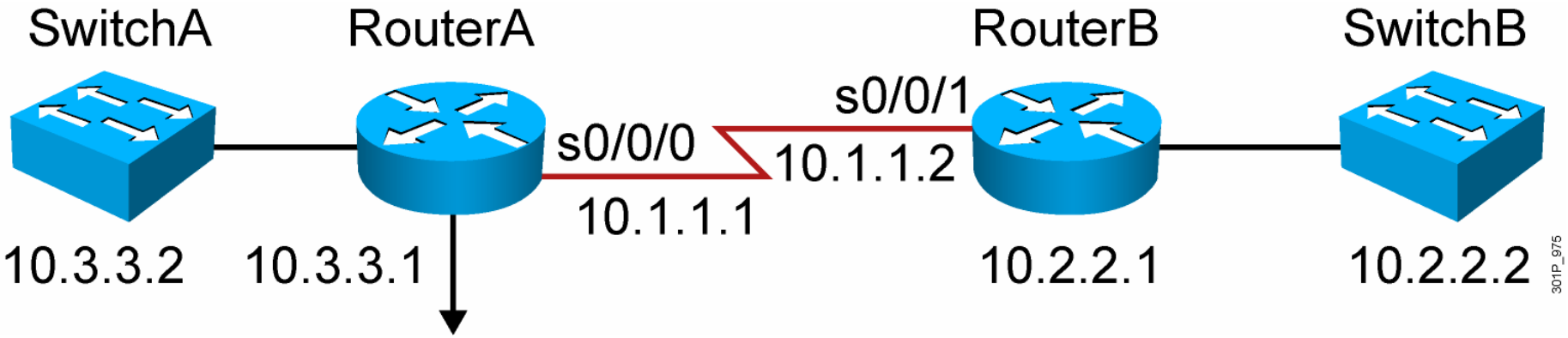


Using Cisco Discovery Protocol



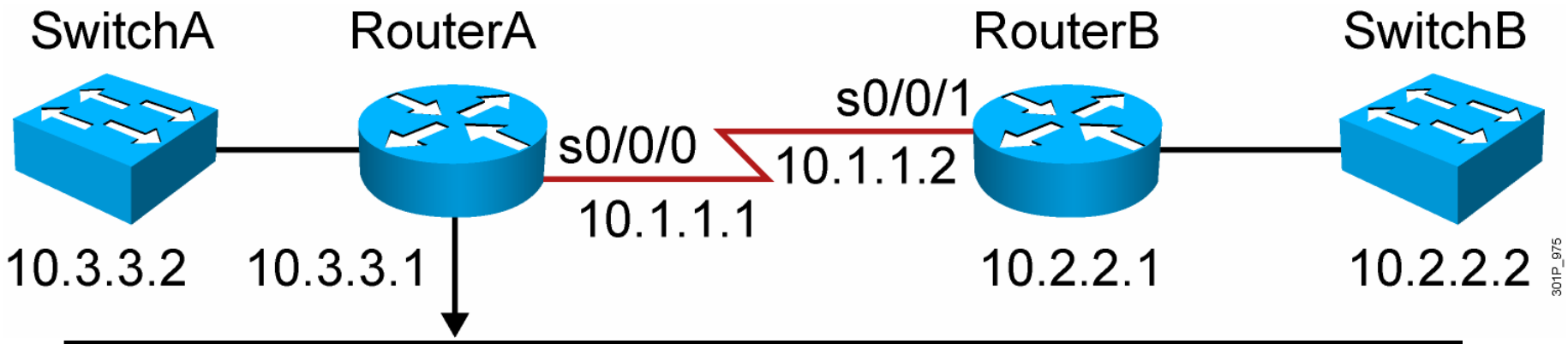

```
RouterA#show cdp ?
  entry      Information for specific neighbor entry
  interface  CDP interface status and configuration
  neighbors  CDP neighbors entries
  traffic    CDP statistics
  <cr>
RouterA(config)#no cdp run
RouterA(config)#interface serial0/0/0
RouterA(config-if)#no cdp enable
```

Using Cisco Discovery Protocol




```
RouterA#show cdp ?
  entry      Information for specific neighbor entry
  interface  CDP interface status and configuration
  neighbors  CDP neighbor entries
  traffic    CDP statistics
  …
RouterA(config)#no cdp run
! Disable CDP Globally
RouterA(config)#interface serial0/0/0
RouterA(config-if)#no cdp enable
! Disable CDP on just this interface
```

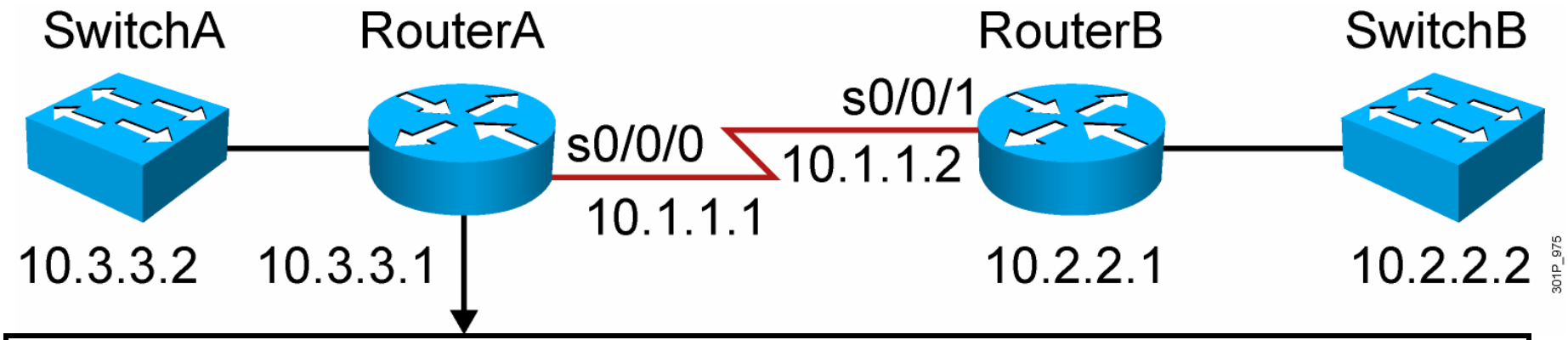
Using the show cdp neighbors Command




```
RouterA#show cdp neighbors
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
SwitchA          fa0/0        122          S I       WS-C2960- fa0/2
RouterB          s0/0/0        177         R S I      2811      s0/0/1
```

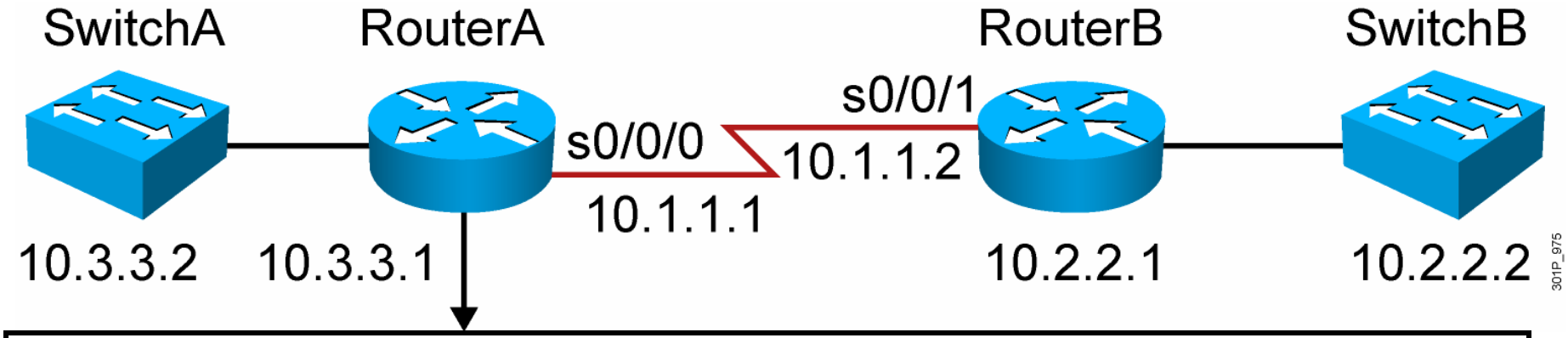
Using the show cdp entry Command




```
Device ID: RouterB
Entry address(es):
  IP address: 10.1.1.2
Platform: Cisco 2811,  Capabilities: Router Switch IGMP
Interface: Serial0/0/0,  Port ID (outgoing port): Serial0/0/1
Holdtime : 155 sec

Version :
Cisco IOS Software, 2800 Software (C2800NM-ADVIPSERVICESK9-M), Version
12.4(12), RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Fri 17-Nov-06 12:02 by prod_rel_team
```

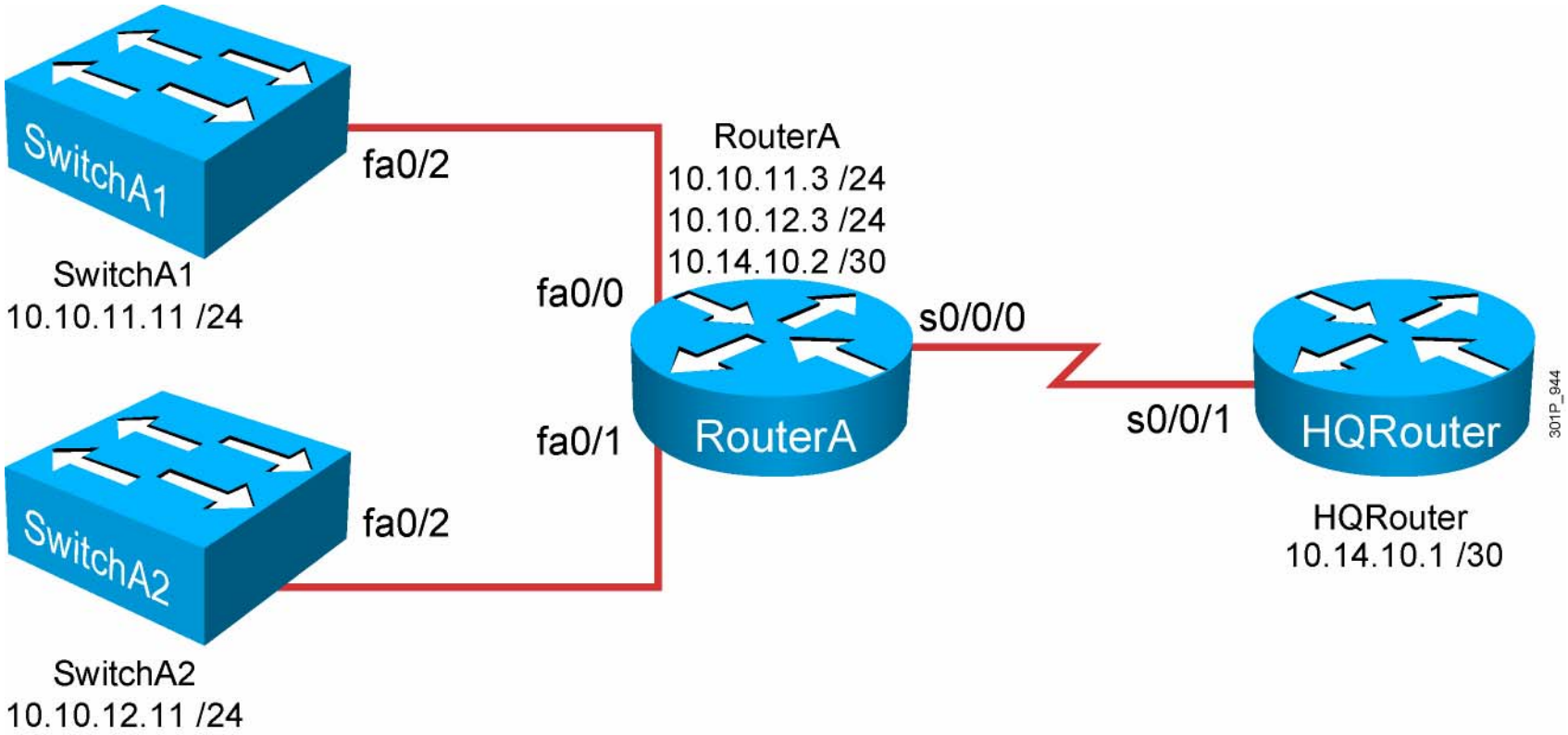
Additional Cisco Discovery Protocol Commands




```
RouterA#show cdp traffic
CDP counters :
        Total packets output: 8680, Input: 8678
        Hdr syntax: 0, Chksum error: 0, Encaps failed: 5
        No memory: 0, Invalid packet: 0, Fragmented: 0
        CDP version 1 advertisements output: 0, Input: 0
        CDP version 2 advertisements output: 8680, Input: 8678

RouterA#show cdp interface s0/0/0
Serial0/0/0 is up, line protocol is up
  Encapsulation PPP
  Sending CDP packets every 60 seconds
  Holdtime is 180 seconds
```

Creating a Network Map



Summary

- Cisco Discovery Protocol is an information-gathering tool used by network administrators to obtain information about directly connected devices.
- Cisco Discovery Protocol exchanges hardware and software device information with its directly connected Cisco Discovery Protocol neighbors.
- Cisco Discovery Protocol on a router can be enabled or disabled as a whole or on a port-by-port basis.
- The **show cdp neighbors** command displays information about the Cisco Discovery Protocol neighbors of a router.
- The **show cdp entry**, **show cdp traffic**, and **show cdp interface** commands display detailed Cisco Discovery Protocol information on a Cisco device.
- Using the information obtained from the **show cdp** command output, a network topology map can be created to aid troubleshooting.

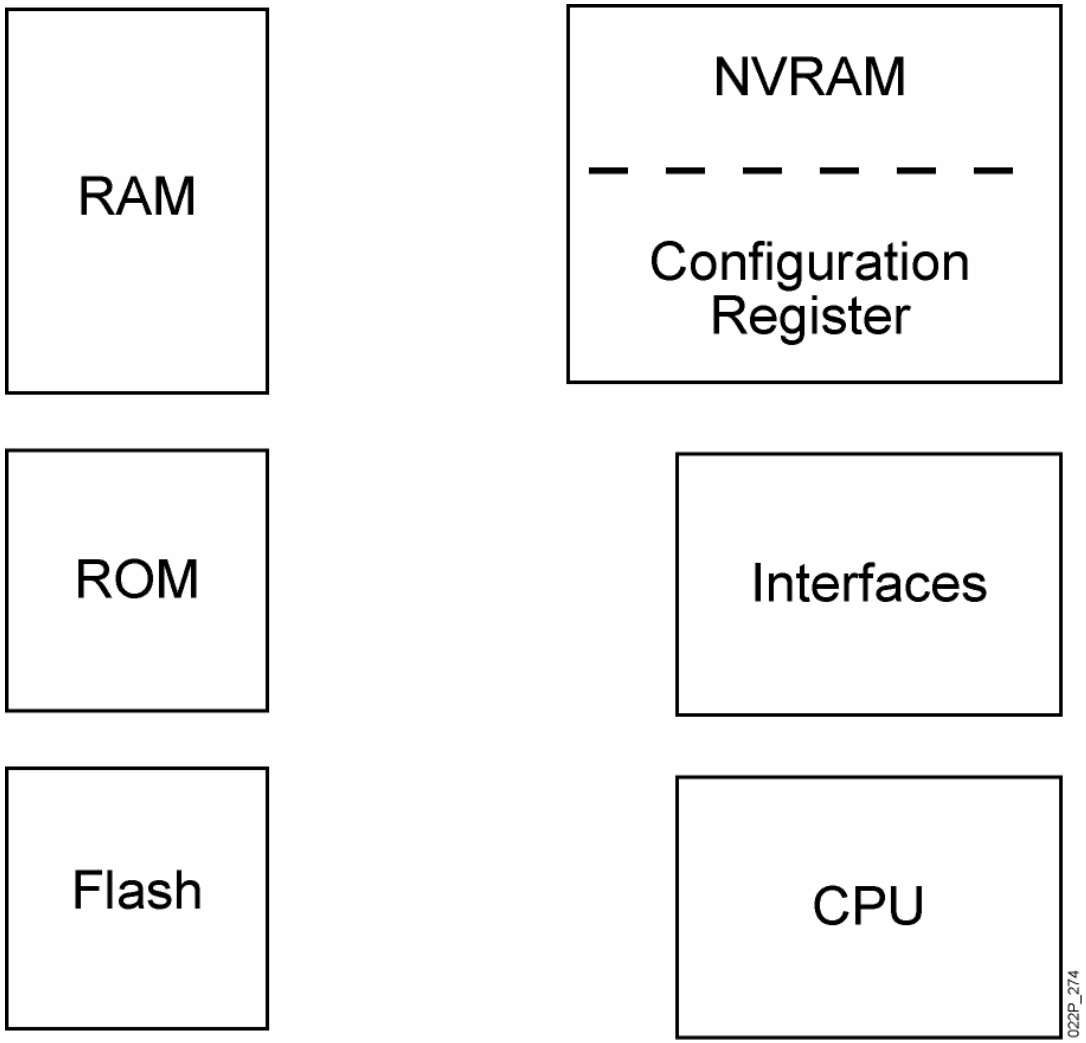
Managing Router Startup and Configuration

Network Environment Management

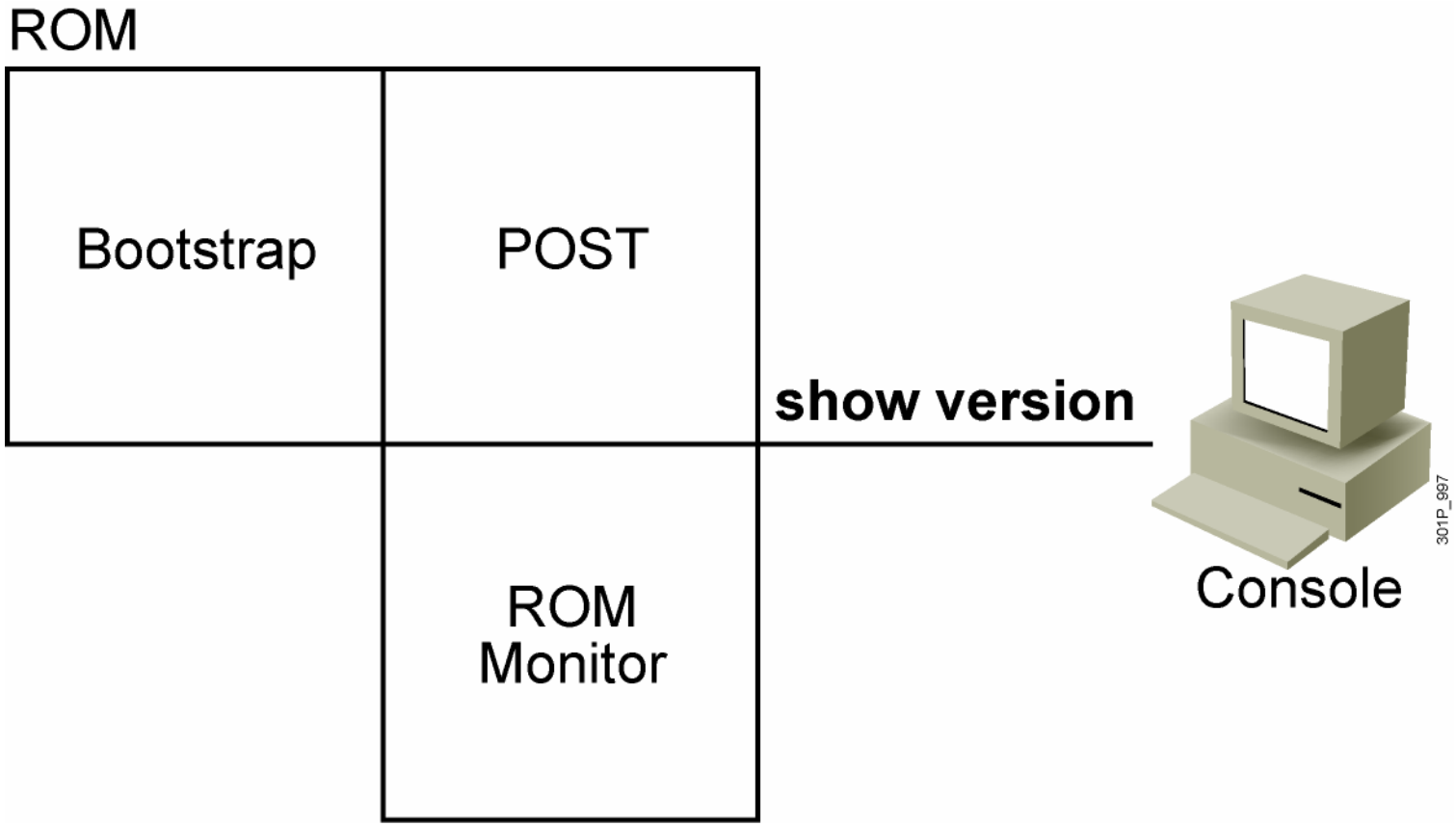
Router Power-On Boot Sequence

1. Perform power-on self-test (POST).
2. Load and run bootstrap code.
3. Find the Cisco IOS Software.
4. Load the Cisco IOS Software.
5. Find the configuration.
6. Load the configuration.
7. Run the configured Cisco IOS Software.

Router Internal Components

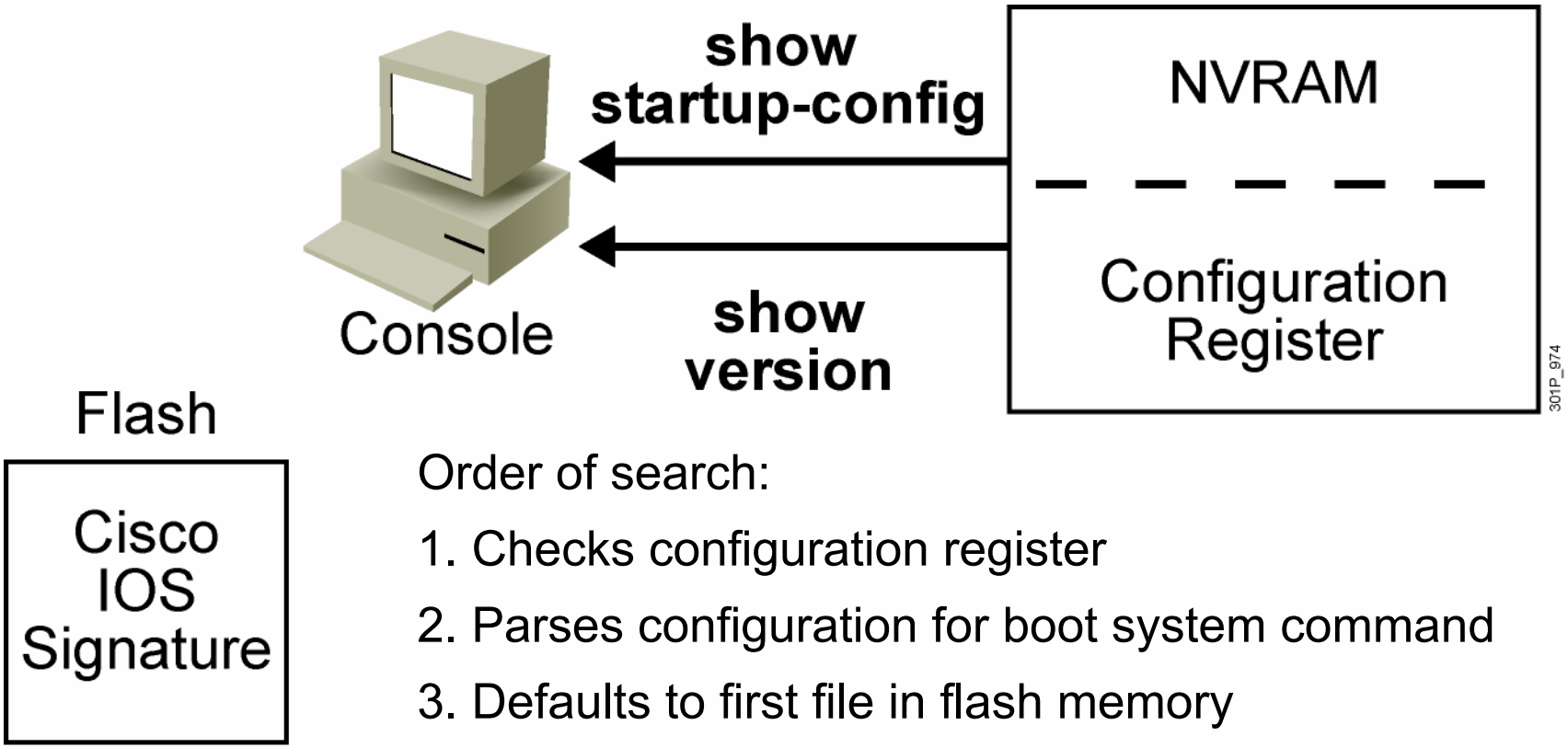


ROM Functions



Contains microcode for basic functions

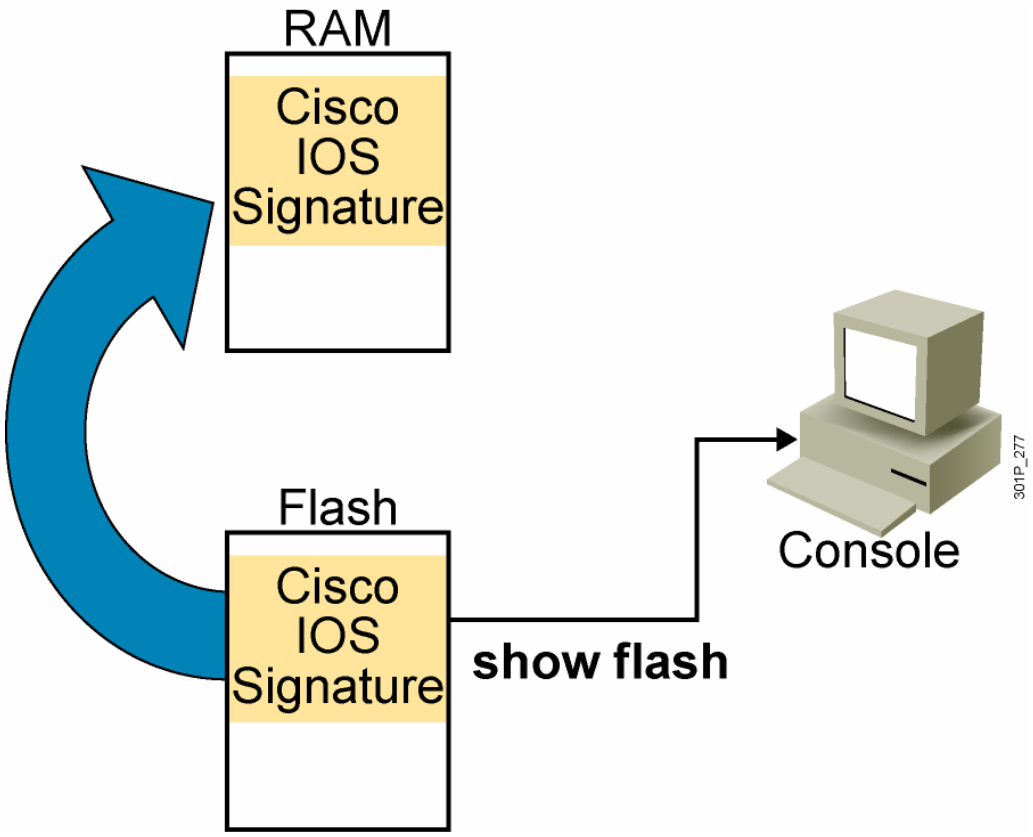
Finding the Cisco IOS Image



Order of search:

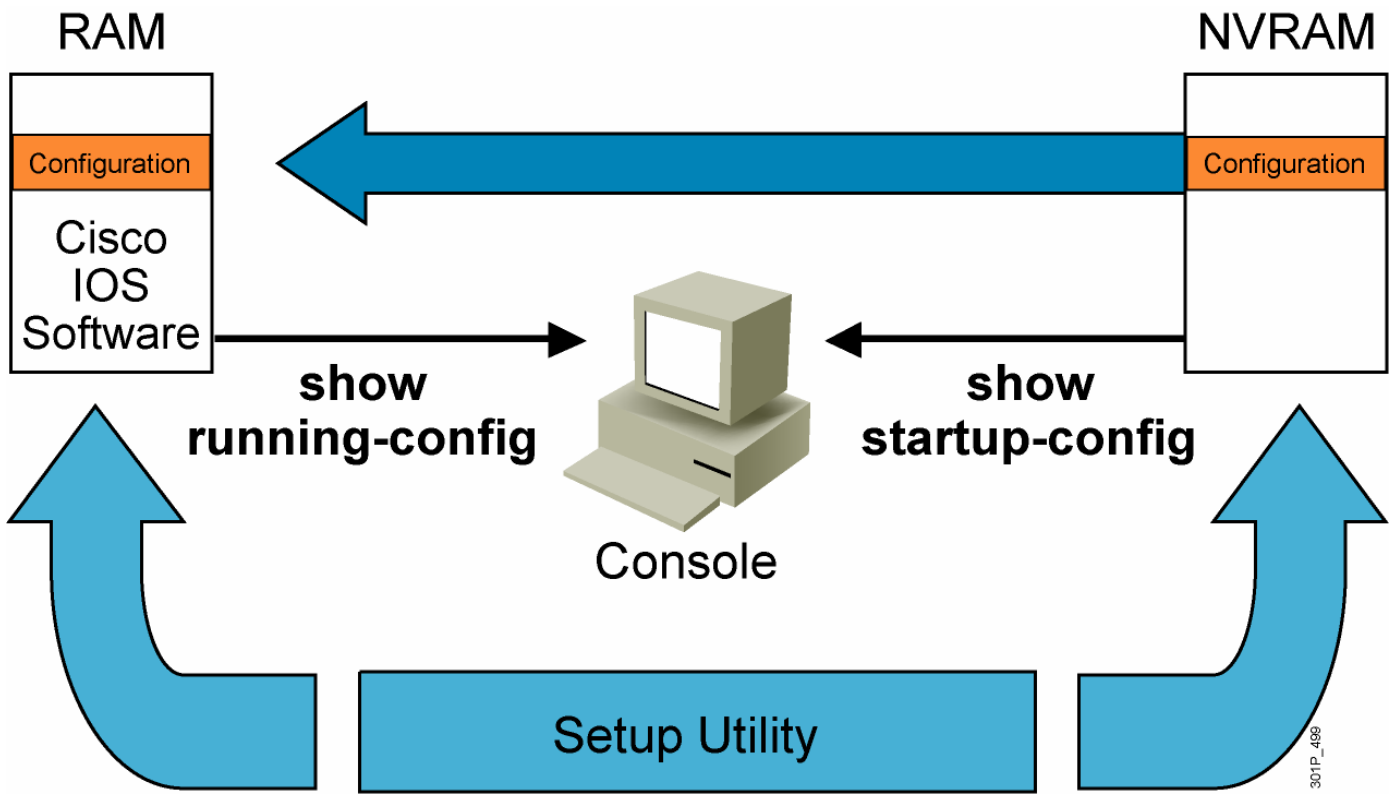
1. Checks configuration register
2. Parses configuration for boot system command
3. Defaults to first file in flash memory
4. Attempts to boot from network server
5. Boot helper image
6. ROMMON

Loading the Cisco IOS Image from Flash Memory



The flash memory file is loaded into RAM.

Loading the Configuration



- Load and execute the configuration from NVRAM
- If no configuration is present in NVRAM, enter setup mode

show running-config **and** show startup-config **Commands**

In RAM

```
RouterX#show running-config
Building configuration...??
Current configuration:?
!?
version 12.2
!
     -- More --
```

In NVRAM

```
RouterX#show startup-config
Using 1359 out of 32762 bytes
!
version 12.2
!
     -- More --
```


Displays the current and saved configuration

Determining the Current Configuration Register Value

```
Cisco IOS Software, 2800 Software (C2800NM-IPBASE-M), Version
12.4(5a), RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Sat 14-Jan-06 03:19 by alnguyen

ROM: System Bootstrap, Version 12.4(1r) [hqluong 1r], RELEASE
SOFTWARE (fc1)

RouterX uptime is 1 week, 5 days, 21 hours, 30 minutes
System returned to ROM by reload at 23:04:40 UTC Tue Mar 13 2007
System image file is "flash:c2800nm-ipbase-mz.124-5a.bin"

Cisco 2811 (revision 53.51) with 251904K/10240K bytes of memory.
Processor board ID FTX1013A1DJ
2 FastEthernet interfaces
2 Serial(sync/async) interfaces
DRAM configuration is 64 bits wide with parity enabled.
239K bytes of non-volatile configuration memory.
62720K bytes of ATA CompactFlash (Read/Write)

Configuration register is 0x2102
```

Configuration Register Values

```
Router#configure terminal
Router(config)#config-register 0x2104
[Ctrl-Z]
Router#
```

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

Configuration Register Boot Field Value	Meaning
0x0	Use ROMMON mode (manually boot using the boot command).
0x1	Automatically boot up 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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- Check the configuration register value with the **show version** command

show version **Command**

```
Cisco IOS Software, 2800 Software (C2800NM-IPBASE-M), Version
12.4(5a), RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by Cisco Systems, Inc.
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ROM: System Bootstrap, Version 12.4(1r) [hqluong 1r], RELEASE
SOFTWARE (fc1)

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2 FastEthernet interfaces
2 Serial(sync/async) interfaces
DRAM configuration is 64 bits wide with parity enabled.
239K bytes of non-volatile configuration memory.
62720K bytes of ATA CompactFlash (Read/Write)

Configuration register is 0x2102 (will be 2104 at next reload)
```

show flash **Command**

```
RouterX#sh flash
-#- --length-- -----date/time------ path
1     14951648 Feb 22 2007 21:38:56 +00:00 c2800nm-ipbase-mz.124-5a.bin
2         1823 Dec 14 2006 08:24:54 +00:00 sdmconfig-2811.cfg
3      4734464 Dec 14 2006 08:25:24 +00:00 sdm.tar
4       833024 Dec 14 2006 08:25:38 +00:00 es.tar
5      1052160 Dec 14 2006 08:25:54 +00:00 common.tar
6         1038 Dec 14 2006 08:26:08 +00:00 home.shtml
7       102400 Dec 14 2006 08:26:22 +00:00 home.tar
8       491213 Dec 14 2006 08:26:40 +00:00 128MB.sdf

41836544 bytes available (22179840 bytes used)
```

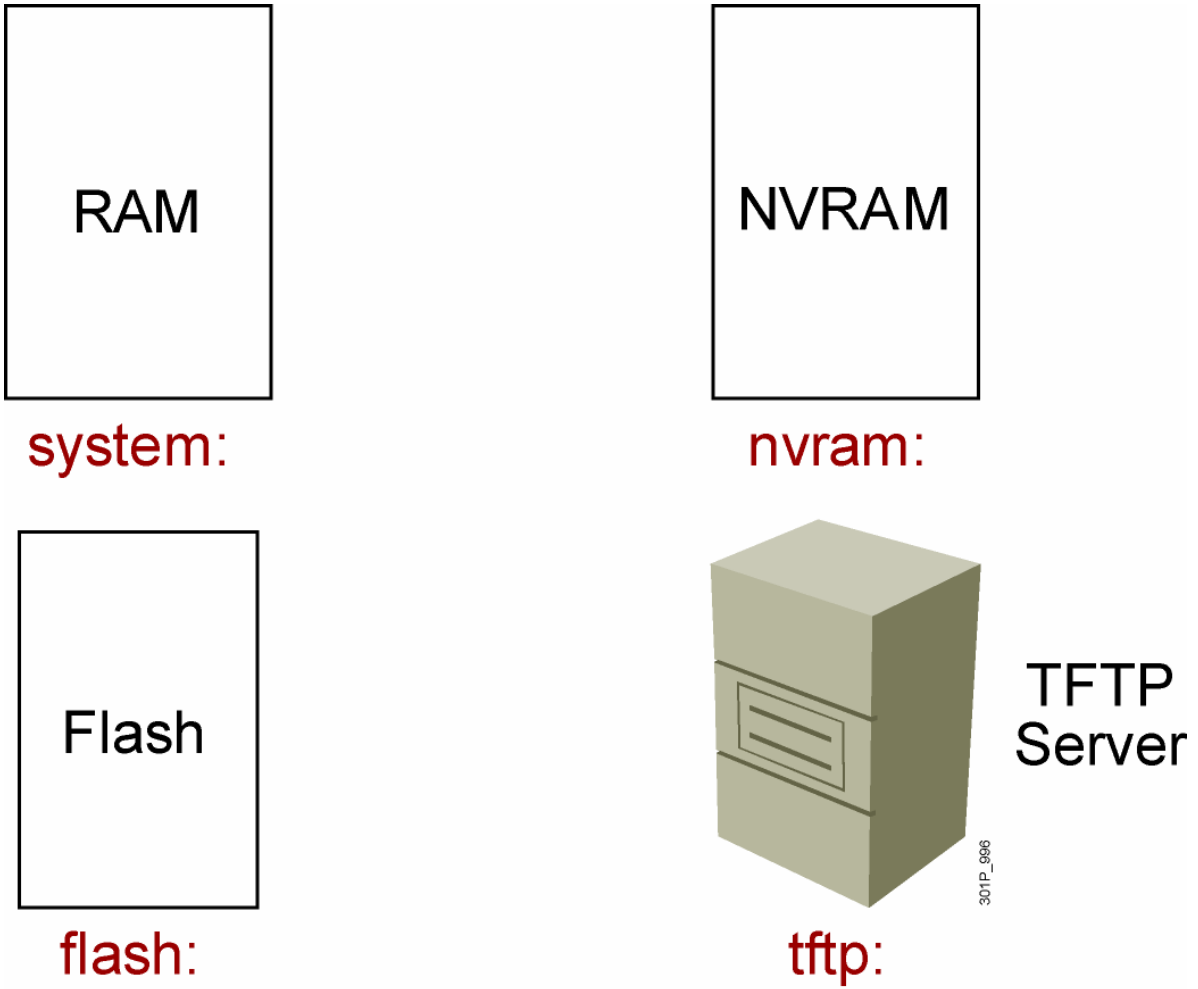
Summary

- When a router boots, it performs tests, finds, and loads software, finds and loads configurations, and finally runs the software.
- The major internal components of a router include RAM, ROM, flash memory, NVRAM, and the configuration register.
- When a router boots, it searches for the Cisco IOS Software image in a specific sequence: location specified in the configuration register, flash memory, a TFTP server, and ROM.
- The configuration register includes boot information specifying where to locate the Cisco IOS Software image. The register can be examined with a **show** command and change the register value with the **config-register** global configuration command.

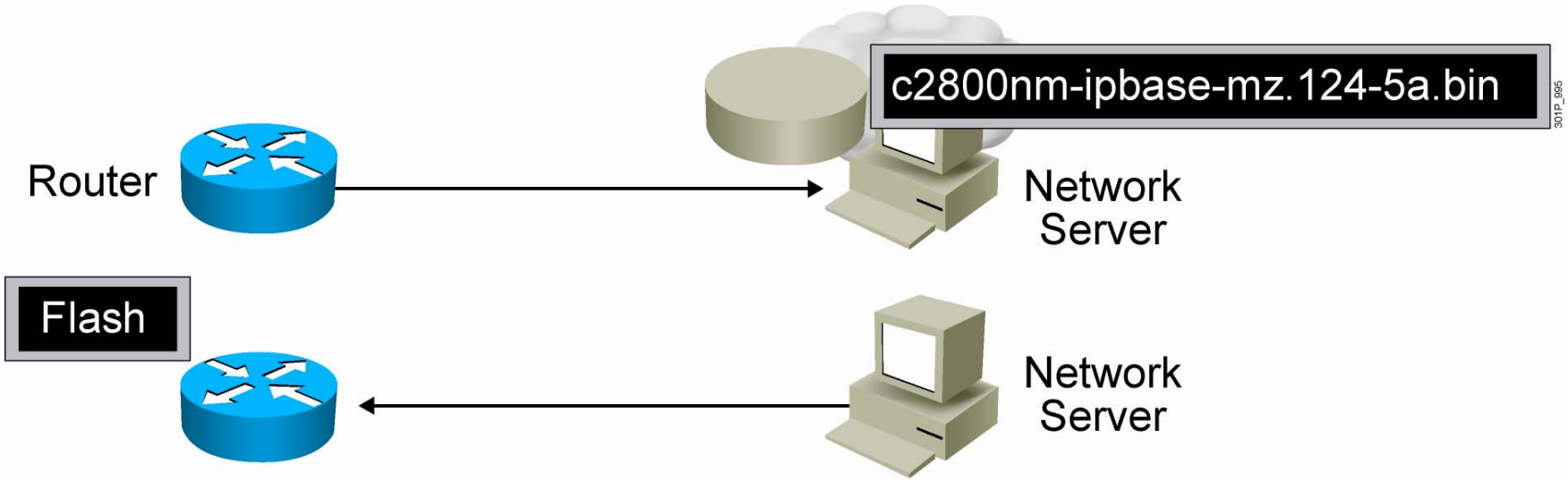
Managing Cisco Devices

Network Environment Management

Cisco IOS File System and Devices



Managing Cisco IOS Images



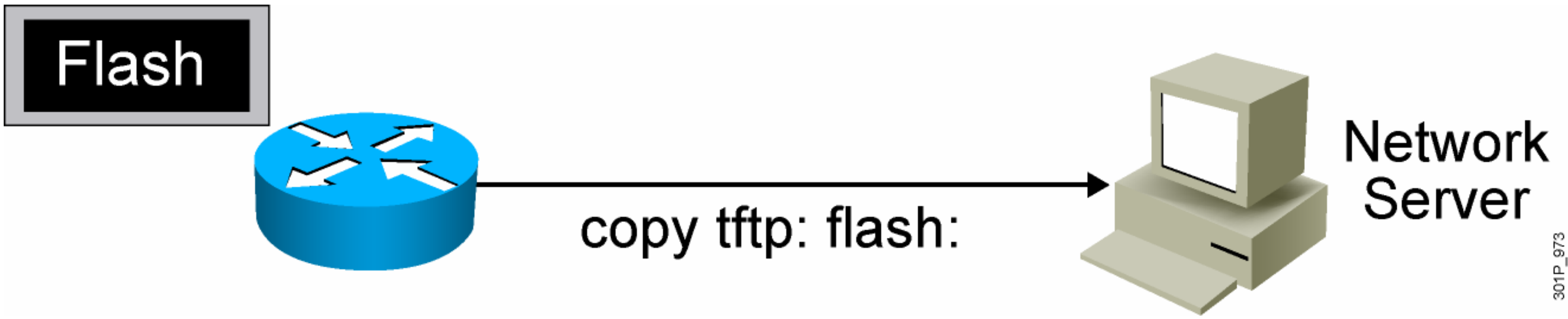
Verifying Memory and Deciphering Image Filenames

```
RouterX#sh flash
-#- --length-- -----date/time------ path
1     14951648 Feb 22 2007 21:38:56 +00:00 c2800nm-ipbase-mz.124-5a.bin
2         1823 Dec 14 2006 08:24:54 +00:00 sdmconfig-2811.cfg
3      4734464 Dec 14 2006 08:25:24 +00:00 sdm.tar
4       833024 Dec 14 2006 08:25:38 +00:00 es.tar
5      1052160 Dec 14 2006 08:25:54 +00:00 common.tar
6         1038 Dec 14 2006 08:26:08 +00:00 home.shtml
7       102400 Dec 14 2006 08:26:22 +00:00 home.tar
8       491213 Dec 14 2006 08:26:40 +00:00 128MB.sdf

41836544 bytes available (22179840 bytes used)
```

Verify that flash memory has room for the Cisco IOS image.

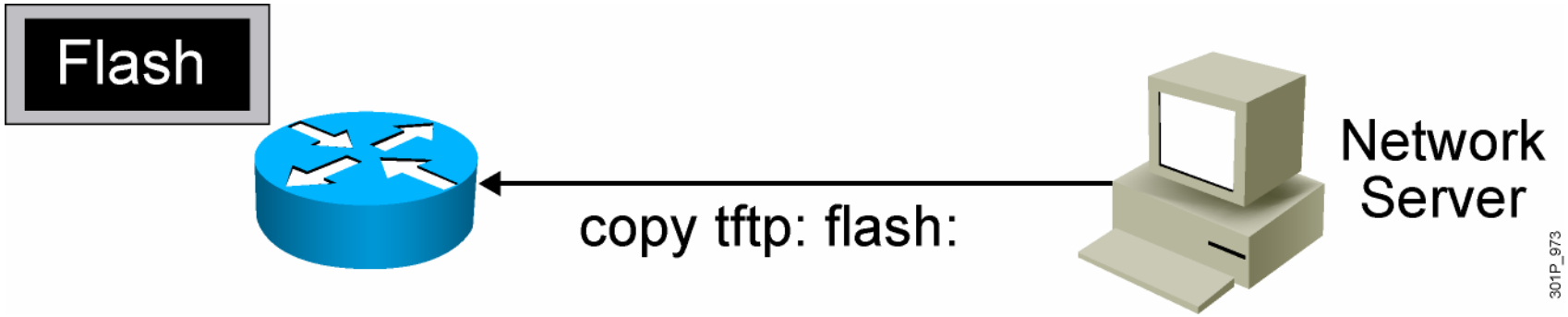
Creating a Software Image Backup




```
RouterX#copy flash tftp:
Source filename []? c2800nm-ipbase-mz.124-5a.bin Address or name of remote host []? 10.1.1.1
Destination filename [c2800nm-ipbase-mz.124-5a.bin]
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!<output omitted>
12094416 bytes copied in 98.858 secs (122341 bytes/sec)
RouterX#
```

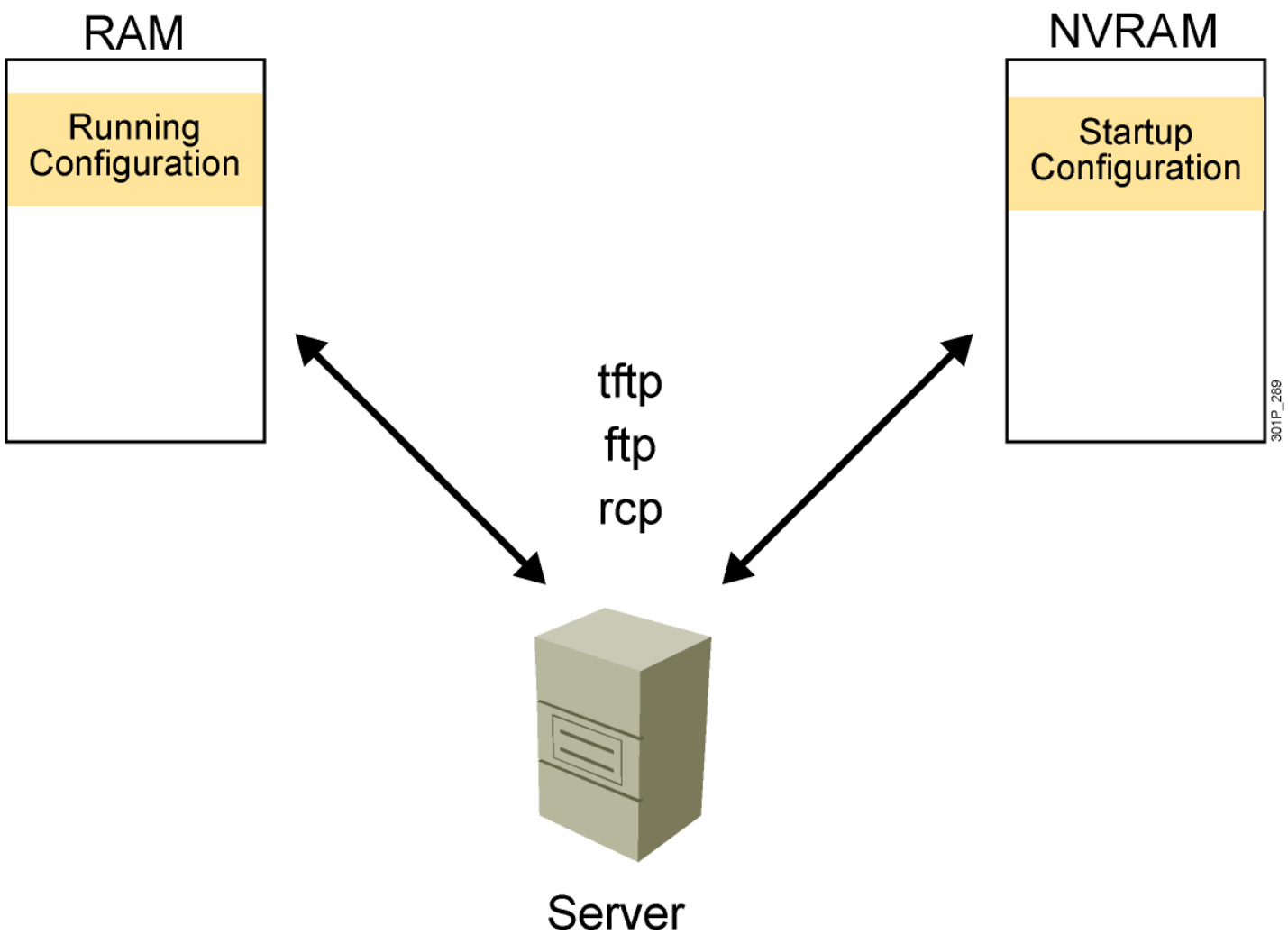
Back up current files prior to updating flash memory.

Upgrading the Image from the Network

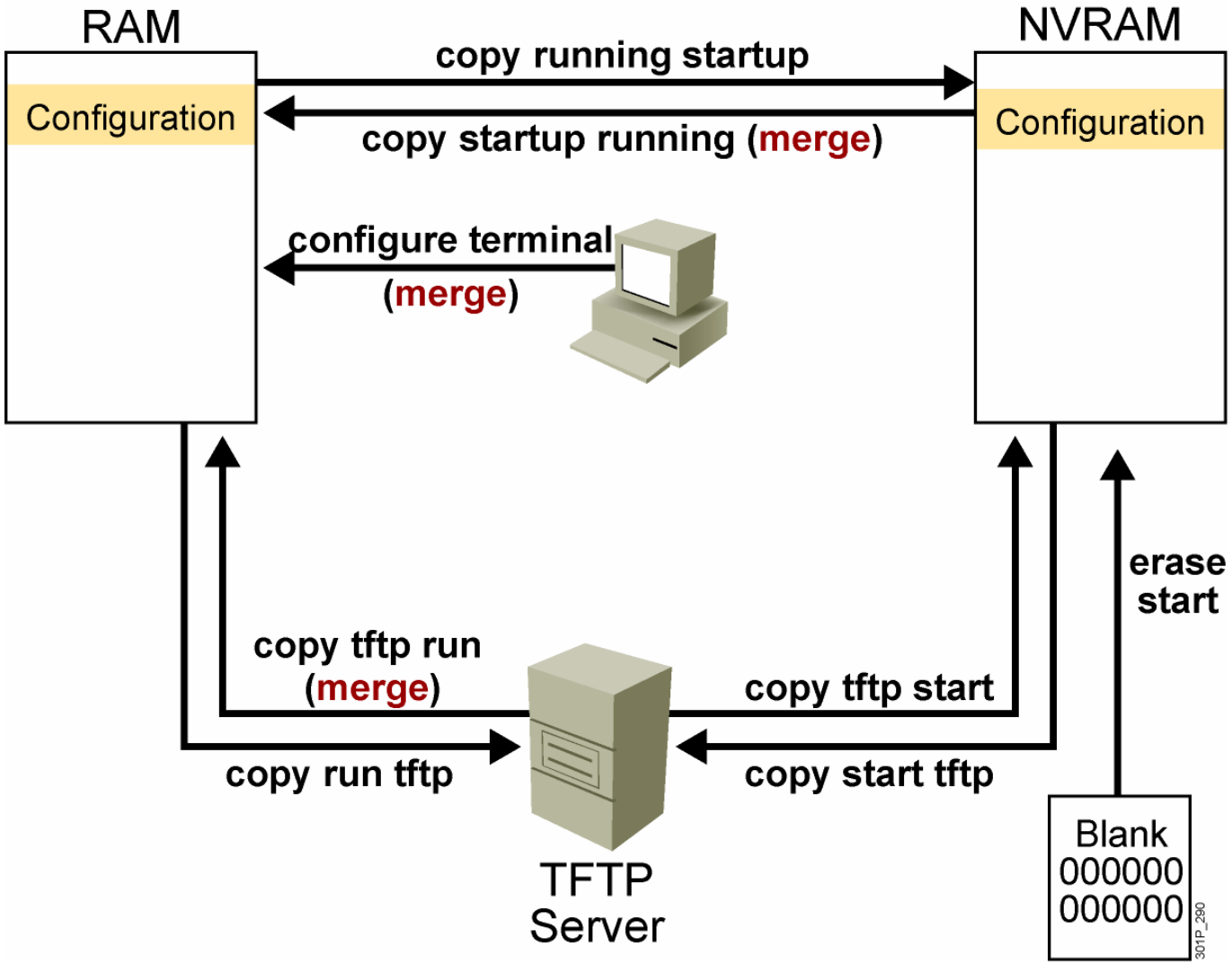



```
RouterX#copy tftp flash:
Address or name of remote host [10.1.1.1]?
Source filename []? c2800nm-ipbase-mz.124-5a.bin
Destination filename [c2800nm-ipbase-mz.124-5a.bin]
Accessing tftp://10.1.1.1/c2600-js-mz.122-21a.bin...
Erase flash: before copying? [confirm]
Erasing the flash filesystem will remove all files! Continue? [confirm]
Erasing device... eeeeeeeeee (output omitted) ...erased
Erase of flash: complete
Loading c2800nm-ipbase-mz.124-5a.bin from  10.1.1.1 (via Ethernet0/0): !!!!!!!!!!!!!!!
(output omited)
[OK - 12094416 bytes]
Verifying checksum...  OK (0x45E2)
12094416 bytes copied in 120.465 secs (100398 bytes/sec)
RouterX
```

Device Configuration Files

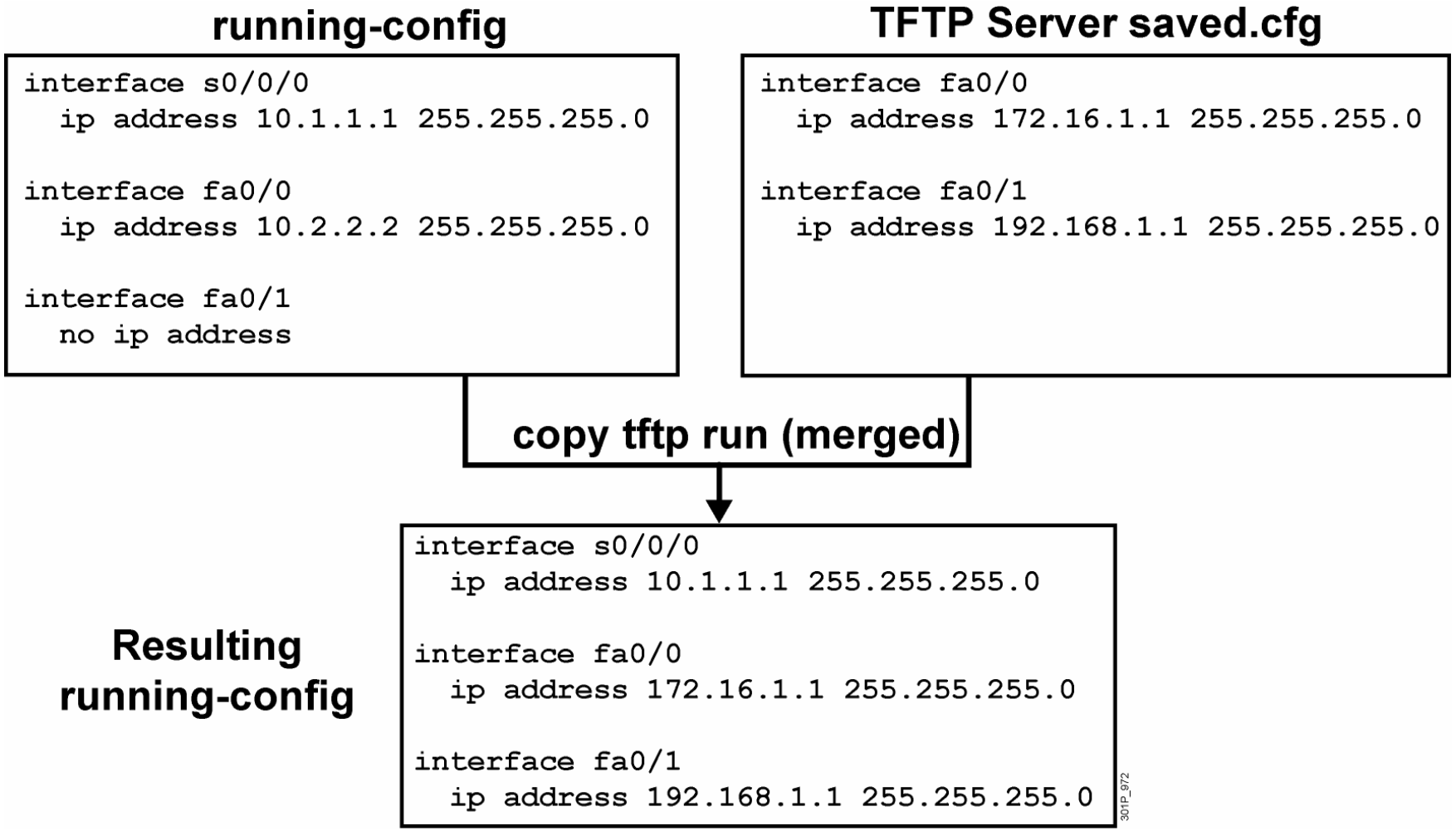


Cisco IOS copy Command



- NVRAM
- Terminal
- TFTP server
- Erase start

Cisco IOS copy Command Example



copy run tftp **and** copy tftp run **Commands**

```
RouterX#copy running-config: tftp:
Address or name of remote host []? 10.1.1.1
Destination filename [running-config]? wgroa.cfg
.!!
1684 bytes copied in 13.300 secs (129 bytes/sec)

RouterX#copy tftp: running-config:
Address or name of remote host []? 10.1.1.1
Source filename []? wgroa.cfg
Destination filename [running-config]?
Accessing tftp://10.1.1.1/wgroa.cfg...
Loading wgroa.cfg from 10.1.1.1 (via Ethernet0): !
[OK - 1684/3072 bytes]

1684 bytes copied in 17.692 secs (99 bytes/sec)
```

show **and** debug **Commands**

	show	debug
Processing characteristic	Static	Dynamic
Processing load	Low overhead	High overhead
Primary use	Gather facts	Observe processes

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Considerations When Using debug Commands

- May generate output in a variety of formats that may not identify the problem
- Require high overhead, possibly disrupting network device operation
- Useful for obtaining information about network traffic and router status

Commands Related to debug

```
RouteX(config)#
```

```
service timestamps debug datetime msec
```

- Adds a time stamp to a debug or log message

```
RouteX#
```

```
show processes
```

- Displays the CPU utilization for each process

```
RouteX#
```

```
no debug all
```

- Disables all **debug** commands

```
RouteX#
```

```
terminal monitor
```

- Displays debug output on your current vty session

Summary

- The Cisco IFS feature provides a single interface to all the file systems (NVRAM, RAM, TFTP, flash) that a router uses.
- As a network grows, storage of the Cisco IOS Software and configuration files on a central server enables control of the number and revision level of software images and configuration files that must be maintained.
- Having proper backup of the current device configuration stored in a TFTP server can help reduce device downtime.

Summary (Cont.)

- The Cisco IOS Software **copy** commands can be used to move configurations from one component or device to another, such as RAM, NVRAM, or a file server.
- The **show** and **debug** commands are built-in tools for troubleshooting. The **show** command is used to display static information, while the **debug** command is used to display dynamic data.

Module Summary

- Cisco Discovery Protocol is an information-gathering tool used to obtain information about directly connected Cisco devices, including the following for each device: device identifier, address list, port identifier, capabilities list, and platform. You can view this information by using the **show cdp** command.
- When a router boots, it performs a series of steps, including performing tests, finding and loading the Cisco IOS Software, finding and loading configurations, and running the Cisco IOS Software.
- The Cisco IFS feature provides a single interface to all the file systems that a router uses. As any network grows, storage of Cisco IOS images and configuration files on a central TFTP server enables control of the number and revision level of Cisco IOS images and configuration files that must be maintained.