CCNA 200-301, Volume 2

Chapter 12 Miscellaneous IP Services

Objectives

- Describe the purpose of First Hop Redundancy Protocol
- Explain the function of SNMP in network operations
- Describe the capabilities and function of TFTP/FTP in the network

R1 and the One WAN Link as Single Points of Failure



Higher Availability but with R1 Still as a Single Point of Failure



Removing All Single Points of Failure from the Network Design



Balancing Traffic by Assigning Different Default Routers to Different Clients



Three FHRP Options

Acronym	Full Name	Origin	Redundancy Approach	Load Balancing Per
HSRP	Hot Standby Router Protocol	Cisco	active/standby	subnet
VRRP	Virtual Router Redundancy Protocol	RFC 5798	active/standby	subnet
GLBP	Gateway Load Balancing Protocol	Cisco	active/active	host

All Traffic Goes to .1 (R1, Which is Active); R2 is Standby



Packets Sent Through R2 (New Active) Once It Takes Over for Failed R1



Loading Balancing with HSRP by Using Different Active Routers per Subnet



Elements of Simple Network Management Protocol



SNMP Get Request and Get Response Message Flow



SNMP Trap Notification Process



Management Information Base (MIB)



RO and RW Communities with the Get and Set Commands



Cisco IOS File Systems on a Router

R2# show file systems								
File Systems:								
Size(b)	Free(b)	Туре	Flags	Prefixes				
-	-	opaque	rw	archive:				
-	-	opaque	rw	system:				
-	-	opaque	rw	tmpsys:				
-	-	opaque	rw	null:				
-		network	rw	tftp:				
* 256487424	49238016	disk	rw	flash0: flash:#				
-	-	disk	rw	flash1:				
262136	253220	nvram	rw	nvram:				
-	-	opaque	WO	syslog:				
-	-	opaque	rw	xmodem:				
-	-	opaque	rw	ymodem:				
-	-	network	rw	rcp:				
-	-	network	rw	pram:				
-	-	network	rw	http:				
-	-	network	rw	ftp:				
-	-	network	rw	scp:				
-	-	opaque	ro	tar:				
-	-	network	rw	https:				
-	-	opaque	ro	cns:				
7794737152	7483719680	usbflash	rw	usbflash0:				
74503236 bytes	copied in 187.	876 secs (396555 by	ytes/sec)				

Copying an IOS Image as Part of the Cisco IOS Software Upgrade Process



copy tftp flash Command Copies the IOS Image to Flash Memory

```
R2# copy tftp flash
```

Address or name of remote host []? 2.2.2.1

Source filename []? c2900-universalk9-mz.SPA.152-4.M1.bin

Destination filename [c2900-universalk9-mz.SPA.152-4.M1.bin]?

Accessing tftp://2.2.2.1/c2900-universalk9-mz.SPA.152-4.M1.bin ...

Loading c2900-universalk9-mz.SPA.152-4.M1.bin from 2.2.2.1 (via GigabitEthernet0/1):

[OK - 97794040 bytes]

97794040 bytes copied in 187.876 secs (396555 bytes/sec)

R2#

Command Copies the IOS Image to Flash Memory

R4#	show flash							
-#-	length	d	ate/t:	ime	path			
1	104193476	Jul 21	2015	13:38:06	+00:00	c2900-universalk9-mz.SPA.154-3.M3.bin		
3	3000320	Jul 10	2012	00:05:44	+00:00	cpexpress.tar		
4	1038	Jul 10	2012	00:05:52	+00:00	home.shtml		
5	122880	Jul 10	2012	00:06:02	+00:00	home.tar		
6	1697952	Jul 10	2012	00:06:16	+00:00	securedesktop-ios-3.1.1.45-k9.pkg		
7	415956	Jul 10	2012	00:06:28	+00:00	sslclient-win-1.1.4.176.pkg		
8	1153	Aug 16	2012	18:20:56	+00:00	wo-lic-1		
9	97794040	Oct 10	2014	21:06:38	+00:00	c2900-universalk9-mz.SPA.152-4.M1.bin		
4923	49238016 bytes available (207249408 bytes used)							

Command Copies the IOS Image to Flash Memory (continued)

R4# dir flash0:									
Direct	ory of	flash0:/							
1 M3.bin	-rw-	104193476	Jul	21 2	2015	13:38:06	+00:00	c2900-universalk9-mz.SPA.154-3.	
3	-rw-	3000320	Jul	10 2	2012	00:05:44	+00:00	cpexpress.tar	
4	-rw-	1038	Jul	10 2	2012	00:05:52	+00:00	home.shtml	
5 -	rw-	122880	Jul	10 2	2012	00:06:02	+00:00	home.tar	
6 -	rw-	1697952	Jul	10 2	2012	00:06:16	+00:00	securedesktop-ios-3.1.1.45-k9.	
pkg									
7 -	rw-	415956	Jul	10 2	2012	00:06:28	+00:00	sslclient-win-1.1.4.176.pkg	
8 -	rw-	1153	Aug	16 2	2012	18:20:56	+00:00	wo-lic-1	
9 -	rw-	97794040	Oct	10 2	2014	21:06:38	+00:00	c2900-universalk9-mz.SPA.152-4.	
M1.bin	1								
256487	256487424 bytes total (49238016 bytes free)								

MD5 Verification of IOS Images— Concepts



Verifying Flash Memory Contents with the **show flash** Command

R2# verify /md5 flash0:c2900-universalk9-mz.SPA.154-3.M3.bin a79e325e6c498b70829d4d b0afba5041
MD5 of flash0:c2900-universalk9-mz.SPA.154-3.M3.bin Done!
<pre>Verified (flash0:c2900-universalk9-mz.SPA.154-3.M3.bin) = a79e325e6c498b70829d4d b0afba5041</pre>

Common Methods to Copy Files Outside a Router

Method	Method (Full Name)	Encrypted?
TFTP	Trivial File Transfer Protocol	No
FTP	File Transfer Protocol	No
SCP	Secure Copy Protocol	Yes

Installing a New IOS with FTP

R1# copy ftp://wendell:odom@192.168.1.170/c2900-universalk9-mz.SPA.155-2.T1.bin flash

Destination filename [c2900-universalk9-mz.SPA.155-2.T1.bin]?

Accessing ftp://192.168.1.170/c2900-universalk9-mz.SPA.155-2.T1.bin...

[OK - 107410736/4096 bytes]

107410736 bytes copied in 119.604 secs (898053 bytes/sec)

Major Concepts with FTP Clients and Servers



FTP Client Example with Filezilla

Local File	es	Server Files				
Filosomo A	Ellecito Elletuno II O	Filename	Filesize Filetype	Last modif		
Friename A	Fliesize Flietype L	CL114-1.png	107.905 png-file	12/13/201		
 2019-Cert-announcements	Direct0	CL114-2.png	111,682 png-file	12/13/201		
ACL Drills	Direct 0	CL115_Trunk_puzzle_1.jpg	31,156 jpg-file	12/13/201		
CCNA Anniversary	Direct 0	CL116.png	67,020 png-file	12/13/201		
CLUS 2018	Direct 0	CL117-IP-Addr-2-V2.png	163,004 png-file	12/13/201		
CML-VIRL	Direct 0	CL117-IP-Addr-2.jpg	60,182 jpg-file	12/13/201		
Config_Museum	Direct 1'	CL118.png	77,867 png-file	12/13/201		
FR_Drills	Direct 0	CL120.jpg	23,741 jpg-file	12/13/201		
IPv6	Direct 0	CL122.png	90,784 png-file	12/13/201		
Labs	Direct 0	CL123.png	109,179 png-file	12/13/201		
		OI 124 ing	26.147 ing file	12/12/201		
22 files and 16 directories. Total size: 8,482,143	bytes	793 files. Total size: 240,932,609 bytes				

FTP Client Creates an FTP Control Connection



FTP Active Mode Process to Create the Data Connection



FTP Passive Mode Process to Create the Data Connection

192.168.1.102
FTP Server

Image: Algorithm of the server
Image: Algorithm of the server

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192.168.1.11

FTPS Explicit Mode Control and Data Connection Establishment

