FTP & TFTP

- *FTP (File Transfer Protocol) and TFTP (Trivial File Transfer Protocol) are industry standard protocols used to transfer files over a network.*
- *They both use a client-server model.*
  → Clients can use FTP or TFTP to copy files from a server.
  → Clients can use FTP or TFTP to copy files to a server.
- *As a network engineer, the most common use for FTP/TFTP is in the process of upgrading the operating system of a network device.*
- *You can use FTP/TFTP to download the newer version of IOS from a server, and then reboot the device with the new IOS image.*

TFTP

- *it is simple and has only basic features compared to FTP. → Only allows a client to copy a file to or from a server.*
- *It is not a replacement for FTP. It is another tool to use when lightweight simplicity is more important than functionality.*
- *No authentication (username/PW), so servers will respond to all TFTP requests.*
- *No encryption, so all data is sent in plain text*
- *Best used in a controlled environment to transfer small files quickly.*
- *TFTP servers listen on UDP port 69.*
- *UDP is connectionless and doesn't provide reliability with retransmissions.*

TFTP Reliability

- *Every TFTP data message is acknowledged.*
  → If the client is transferring a file to the server, the server will send Ack messages.
  → If the server is transferring a file to the client, the client will send Ack messages.
- *Timers are used, and if an expected message isn't received in time, the waiting device will re send its previous message.*

TFTP 'Connections'

- *TFTP file transfers have three phases:*

1: Connection: TFTP client sends a request to the server, and the server responds back, initializing the connection.

2: Data Transfer: The client and server exchange TFTP messages. One sends data and the other sends acknowledgments.

3: Connection Termination: After the last data message has been sent, a final acknowledgment is sent to terminate the connection.

File Transfer Protocol

- *FTP uses TCP ports 20 and 21.*
- *Usernames and passwords are used for authentication, however there is no encryption.*
- *For greater security, FTPS (FTP over SSL/TLS) can be used.*
- *SSH File Transfer Protocol (SFTP) can also be used for greater security.*
- *FTP is more complex than TFTP and allows not only file transfers, but clients can also navigate file directories, add and remove directories, list files, etc.*
- *The client sends FTP commands to the server to perform these functions.*

FTP Control Connections

- *FTP uses two types of connections:*
  → An FTP control connection (TCP 21) is established and used to send FTP commands and replies.
  → When files or data are to be transferred, separate FTP data (TCP 20) connections are established and terminated as needed.

Active Mode FTP Data Connections

- *The default method of establishing FTP data connections is active mode, in which the server initiates the TCP connection.*

Passive Mode FTP Data Connections

- *In FTP passive mode, the client initiates the data connection. This is often necessary when the client is behind a firewall, which could block the incoming connection from the server.*

IOS File System

- *A file system is a way of controlling how data is stored and retrieved.*
- *You can view the file systems of a Cisco IOS device with" show file systems" command*

Upgrading Cisco IOS

- *You can view the current version of IOS with show version .*
- *You can view the contents of flash with show flash*
-

Copying Files (TFTP)

copy *source destination*

```
R1#copy tftp: flash:
Address or name of remote host []? 192.168.1.1
Source filename []? c2900-universalk9-mz.SPA.155-3.M4a.bin
Destination filename [c2900-universalk9-mz.SPA.155-3.M4a.bin]?

Accessing tftp://192.168.1.1/c2900-universalk9-mz.SPA.155-3.M4a.bin....
Loading c2900-universalk9-mz.SPA.155-3.M4a.bin from
192.168.1.1: !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 33591768 bytes]

33591768 bytes copied in 4.01 secs (879550 bytes/sec)
```

Enter the TFTP server IP.

Enter the file name on the server

Enter the name you want to save it as on flash (hit enter to accept the default)

Upgrading Cisco IOS

```
R1#show flash

System flash directory:
File  Length   Name/status
  3   33591768 c2900-universalk9-mz.SPA.151-4.M4.bin
  4   33591768 c2900-universalk9-mz.SPA.155-3.M4a.bin
  2   28282    sigdef-category.xml
  1   227537   sigdef-default.xml
[67439355 bytes used, 188304645 available, 255744000 total]
249856K bytes of processor board System flash (Read/Write)


R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#boot system flash:c2900-universalk9-mz.SPA.155-3.M4a.bin
R1(config)#exit
R1#write memory
Building configuration...
[OK]
R1#reload
Proceed with reload? [confirm]
```

boot system *filepath*
*If you don't use this command, the router will use the first IOS file it finds in flash

```
R1#show version
Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.5(3)M4a, RELEASE SOFTWARE(fc1)
[output omitted]

R1#delete flash:c2900-universalk9-mz.SPA.151-4.M4.bin
Delete filename [c2900-universalk9-mz.SPA.151-4.M4.bin]?
Delete flash:/c2900-universalk9-mz.SPA.151-4.M4.bin? [confirm]

R1#show flash

System flash directory:
File  Length   Name/status
  4   33591768 c2900-universalk9-mz.SPA.155-3.M4a.bin
  2   28282    sigdef-category.xml
  1   227537   sigdef-default.xml
[33847587 bytes used, 221896413 available, 255744000 total]
249856K bytes of processor board System flash (Read/Write)
```

delete *filepath*

Copying Files (FTP)

```
R1(config)#ip ftp username cisco

R1(config)#ip ftp password cisco

R1(config)#exit

R1#copy ftp: flash:
Address or name of remote host []? 192.168.1.1
Source filename []? c2900-universalk9-mz.SPA.155-3.M4a.bin
Destination filename [c2900-universalk9-mz.SPA.155-3.M4a.bin]?

Accessing ftp://192.168.1.1/c2900-universalk9-mz.SPA.155-3.M4a.bin…
Loading c2900-universalk9-mz.SPA.155-3.M4a.bin from
192.168.1.1: !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[output omitted]
```

Configure the FTP username/password that the device will use when connecting to an FTP server.