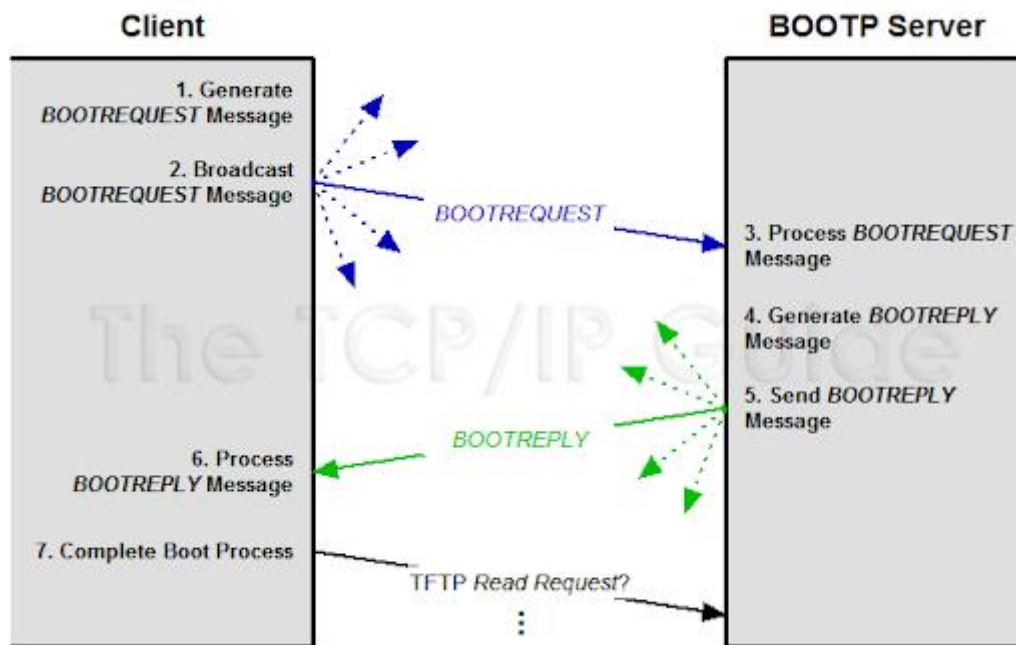## BOOTP

Bootstrap Protocol is used to establish a network connection during a computer's initial boot up during the bootstrap process. Originally, the protocol used floppy disks, but it was soon integrated into computer hardware in motherboards and network adapters, so that no external drive is needed.

Bootstrap protocol was intended to allow computers to find what they need to function properly after booting up. BOOTP uses a relay agent, which allows packet forwarding from the local network using standard IP routing, allowing one BOOTP server to serve hosts on multiple subnets.
BOOTP was largely replaced by the more efficient Dynamic Host Configuration Protocol (DHCP), which has more options and flexibility. However, it has found renewed utility in diskless media center PCs.

BOOTP is a broadcast protocol as it needs to send messages out to all the available hosts in the network in order to get answers or resources. BOOTP is used during the bootstrap process when the computer is initially starting up, hence the name. BOOTP initially required the use of floppy disks to establish the initial network connection but soon the process was integrated into the BIOS of network interface cards and motherboards to allow direct network booting. BOOTP uses UDP port 67 and 68.

How does BOOTP Work?

When a BOOTP client is started, it has no IP address, so it broadcasts a message containing its MAC address onto the network. This message is called a "BOOTP request," and it is picked up by the BOOTP server, which replies to the client with the following information that the client needs:

- The client's IP address, subnet mask, and default gateway address
- The IP address and host name of the BOOTP server
- The IP address of the server that has the boot image, which the client needs to load its operating system
- When the client receives this information from the BOOTP server, it configures and initializes its TCP/IP protocol stack, and then connects to the server on which the boot image is shared. The client loads the boot image and uses this information to load and start its operating system.

The Dynamic Host Configuration Protocol (DHCP) was developed as an extension of BOOTP. BOOTP is defined in Request for Comments (RFC) 951 and 1084.

BOOTP versus DHCP

Following are the important differences between BOOTP and DHCP.

Sr. No.	Key	BOOTP	DHCP
1	Definition	BOOTP stands for Bootstrap protocol.	DHCP stands for Dynamic Host Configuration Protocol.
2	Temporary IP Address	BOOTP has no support for temporary IP Addressing.	DHCP Server support for temporary IP Addressing but for limited period of time.
3	Client Support	BOOTP does not support DHCP Clients.	DHCP server supports BOOTP Clients.
4	Configuration Type	In BOOTP, configuration has to be done manually.	In DHCP, configuration is automatic.
5	Mobile Machine Support	Mobile machine are not supported.	Mobile machines are supported
6	Error Probability	Configuration being manual often leads to errors.	Automatic configuration prevents any error to occur.

FTP

File Transfer Protocol (FTP) is a client/server protocol used for transferring files to or exchanging files with a host computer. It may be authenticated with user names and passwords. FTP is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another.

It is mainly used for transferring the web page files from their creator to the computer that acts as a server for other computers on the internet. It is also used for downloading the files to computer from other servers.

Objectives of FTP

- It provides the sharing of files.
- It is used to encourage the use of remote computers.
- It transfers the data more reliably and efficiently.

Why FTP?

Although transferring files from one system to another is very simple and straightforward, but sometimes it can cause problems. For example, two systems may have different file conventions. Two systems may have different ways to represent text and data. Two systems may have different directory structures. FTP protocol overcomes these problems by establishing two connections between hosts. One connection is used for data transfer, and another connection is used for the control connection.
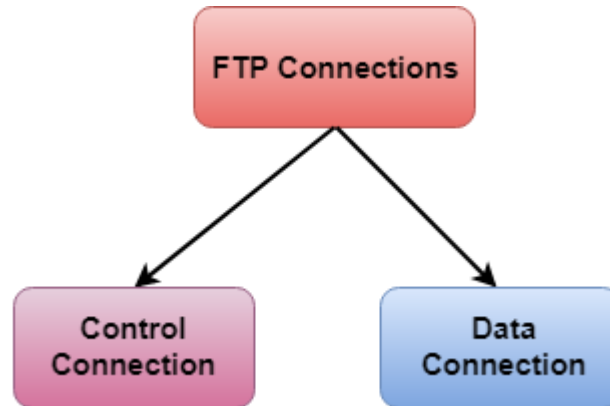
Mechanism of FTP
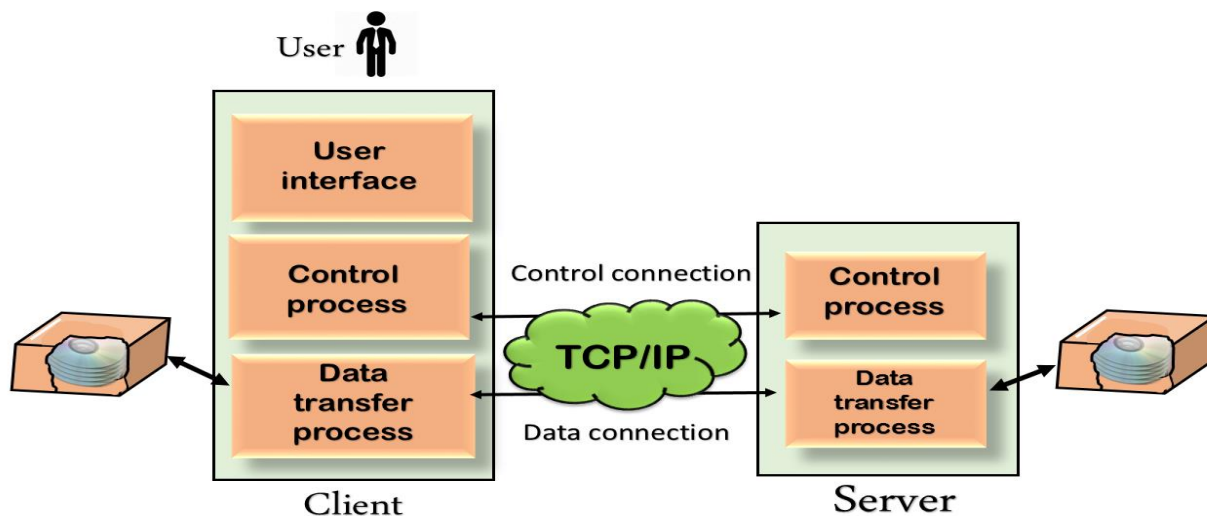
The above figure shows the basic model of the FTP. The FTP client has three components: the user interface, control process, and data transfer process. The server has two components: the server control process and the server data transfer process.

FTP Connections

There are two types of connections in FTP:

- **Control Connection:** The control connection uses very simple rules for communication. Through control connection, we can transfer a line of command or line of response at a time. The control connection is made between the control processes. The control connection remains connected during the entire interactive FTP session.
- **Data Connection:** The Data Connection uses very complex rules as data types may vary. The data connection is made between data transfer processes. The data connection opens when a command comes for transferring the files and closes when the file is transferred.

Advantages of FTP:

- **Speed:** One of the biggest advantages of FTP is speed. The FTP is one of the fastest way to transfer the files from one computer to another computer.
- **Efficient:** It is more efficient as we do not need to complete all the operations to get the entire file.
- **Security:** To access the FTP server, we need to login with the username and password. Therefore, we can say that FTP is more secure.
- **Back & forth movement:** FTP allows us to transfer the files back and forth. Suppose you are a manager of the company, you send some information to all the employees, and they all send information back on the same server.

Disadvantages of FTP:

- The standard requirement of the industry is that all the FTP transmissions should be encrypted. However, not all the FTP providers are equal and not all the providers offer encryption. So, we will have to look out for the FTP providers that provides encryption.
- FTP serves two operations, i.e., to send and receive large files on a network. However, the size limit of the file is 2GB that can be sent. It also doesn't allow you to run simultaneous transfers to multiple receivers.
- Passwords and file contents are sent in clear text that allows unwanted eavesdropping. So, it is quite possible that attackers can carry out the brute force attack by trying to guess the FTP password.
- It is not compatible with every system.
- Trivial File Transfer Protocol is a technology that transfers files between network devices and is a simplified version of the more robust File Transfer Protocol. TFTP was developed in the 1970s for computers lacking sufficient memory or disk space to provide full FTP support. Today, TFTP is found on consumer broadband routers and commercial network routers.
- Home network administrators use TFTP to upgrade the router firmware, while professional administrators use TFTP to distribute software across corporate networks.

How TFTP Works

Like FTP, TFTP uses client and server software to make connections between two devices. From a TFTP client, individual files can be copied (uploaded) to or downloaded from the server. The server hosts the files and the client requests or sends files.TFTP can also be used to remotely start a computer and back up network or router configuration files.

Difference between FTP and TFTP

S.NO	FTP	TFTP
1.	FTP stands for File Transfer Protocol.	TFTP stands for Trivial File Transfer Protocol.
2.	The software of FTP is larger than TFTP.	While software of TFTP is smaller than FTP.
3.	FTP works on two ports: 20 and 21.	While TFTP works on 69 Port number.
4.	FTP services are provided by TCP.	While TFTP services are provided by UDP.
5.	The complexity of FTP is higher than TFTP.	While the complexity of TFTP is less than FTP complexity.
6.	There are many commands or messages in FTP.	There are only 5 messages in TFTP.
7.	FTP need authentication for communication.	While TFTP does not need authentication for communication.

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