

Computer Network

Lecture-50

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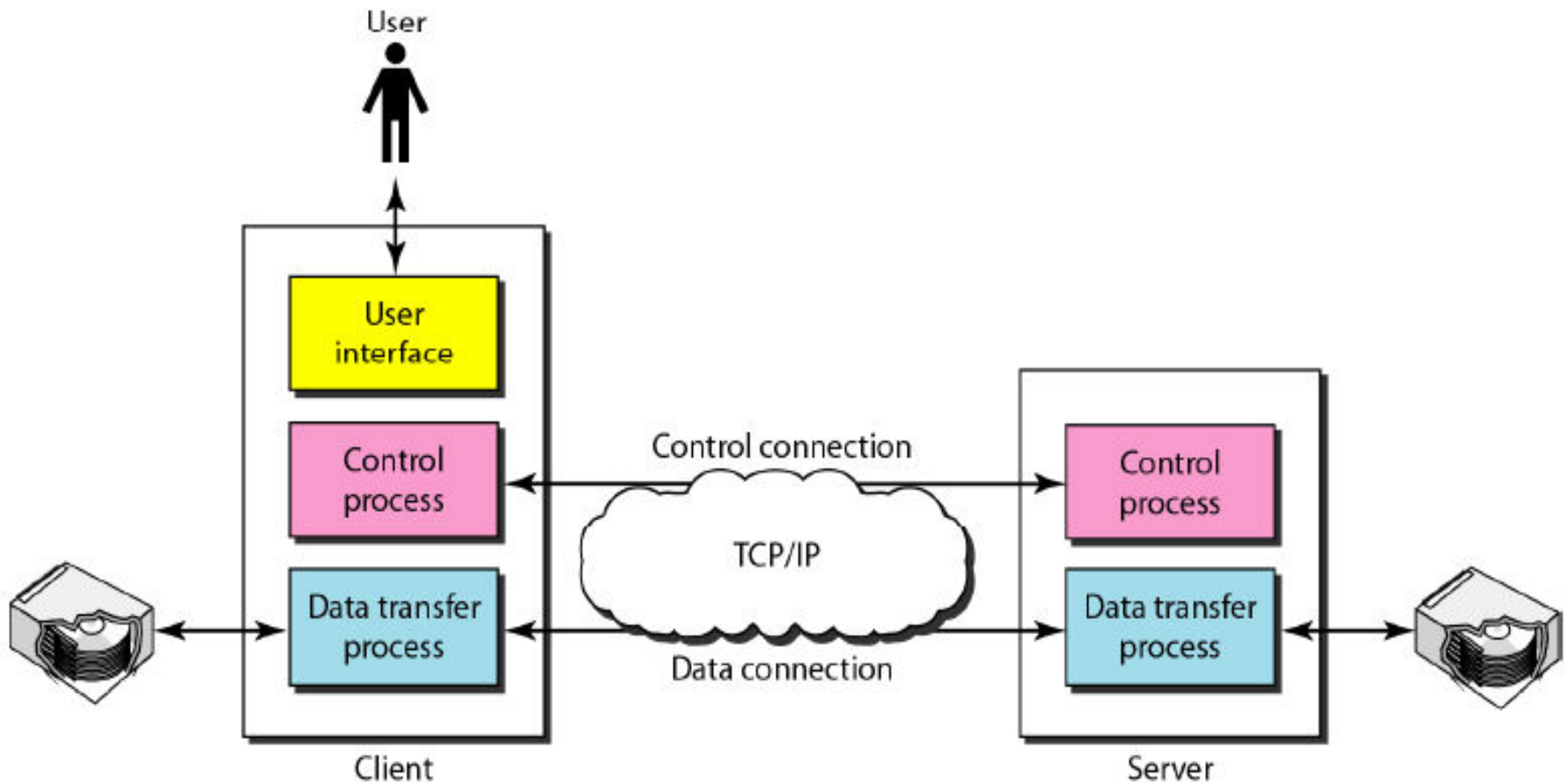
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File Transfer Protocol (FTP)

- File Transfer Protocol (FTP) is the standard mechanism provided by TCP/IP for copying a file from one host to another.
- FTP differs from other client/server applications in that it establishes two connections between the hosts. One connection is used for data transfer, the other for control information (commands and responses). Separation of commands and data transfer makes FTP more efficient.
- The control connection uses very simple rules of communication. We need to transfer only a line of command or a line of response at a time.
- The data connection, on the other hand, needs more complex rules due to the variety of data types transferred.
- However, the difference in complexity is at the FTP level, not TCP.
- For TCP, both connections are treated the same.

File Transfer Protocol (FTP)

- FTP uses two well-known TCP ports: Port **21** is used for the control connection, and port **20** is used for the data connection.
- Following figure shows the basic model of FTP:-



File Transfer Protocol (FTP)

- The client has three components: user interface, client control process, and the client data transfer process.
- The server has two components: the server control process and the server data transfer process.
- The control connection is made between the control processes. The data connection is made between the data transfer processes.

File Transfer Protocol (FTP)

- The control connection remains connected during the entire interactive FTP session.
- The data connection is opened and then closed for each file transferred. It opens each time commands that involve transferring files are used, and it closes when the file is transferred.
- In other words, when a user starts an FTP session, the control connection opens. While the control connection is open, the data connection can be opened and closed multiple times if several files are transferred.

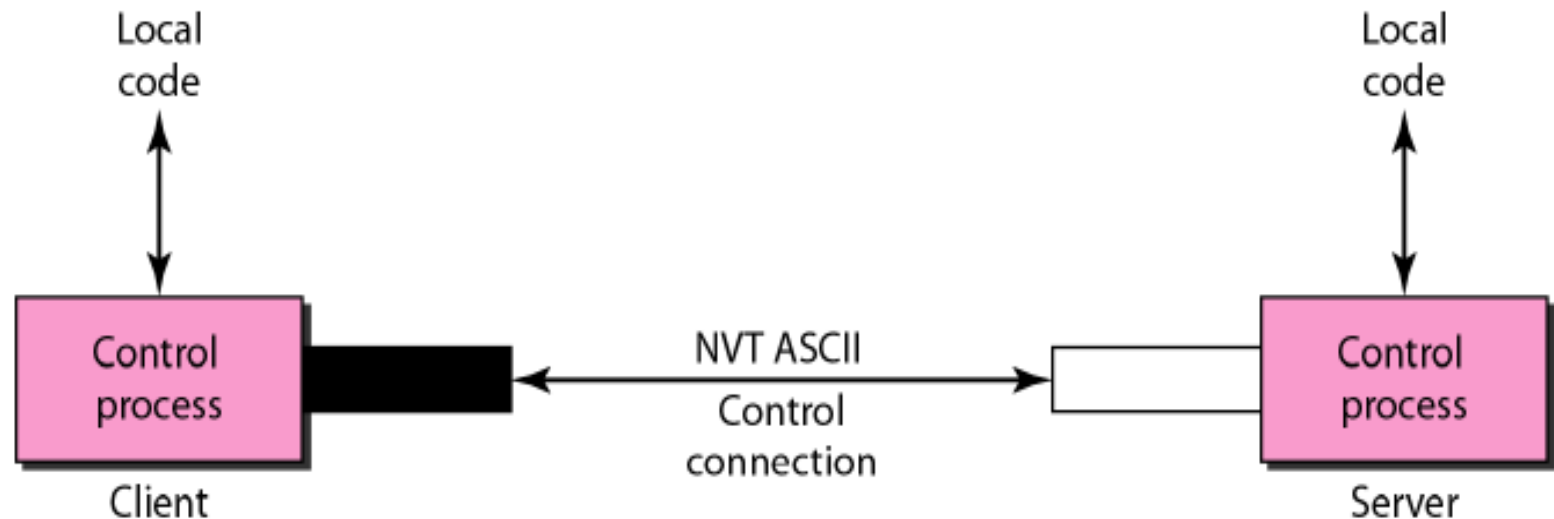
File Transfer Protocol (FTP)

Communication over Control Connection

- FTP uses the same approach as SMTP to communicate across the control connection.
- It uses the 7-bit ASCII character set.
- Communication is achieved through commands and responses.
- This simple method is adequate for the control connection because we send one command (or response) at a time.

File Transfer Protocol (FTP)

- Each command or response is only one short line, so we need not worry about file format or file structure.
- Each line is terminated with a two-character (carriage return and line feed) end-of-line token.



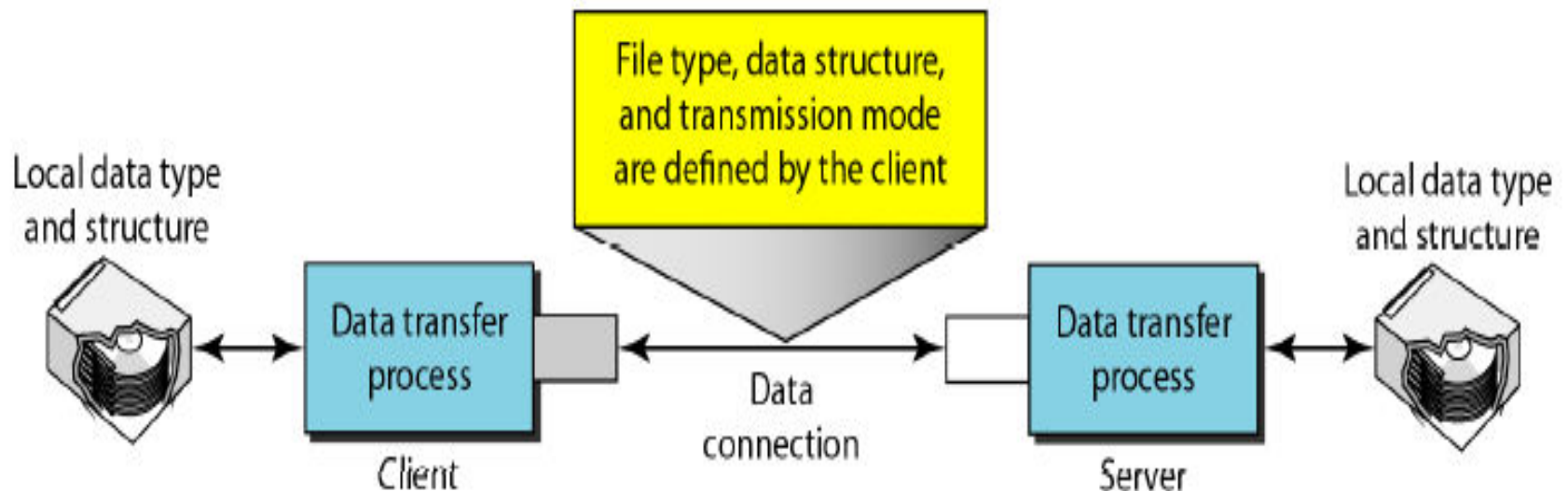
File Transfer Protocol (FTP)

Communication over Data Connection

- File transfer occurs over the data connection under the control of the commands sent over the control connection.
- File transfer in FTP means one of three things:
 - A file is to be copied from the server to the client. This is called retrieving a file. It is done under the supervision of the **RETR** command.
 - A file is to be copied from the client to the server. This is called storing a file. It is done under the supervision of the **STOR** command.
 - A list of directory or file names is to be sent from the server to the client. This is done under the supervision of the **LIST** command.

File Transfer Protocol (FTP)

- The client must define the type of file to be transferred, the structure of the data, and the transmission mode.



File Transfer Protocol (FTP)

File Type

FTP can transfer one of the following file types across the data connection: an ASCII file, EBCDIC file, or image file.

- The ASCII file is the default format for transferring text files. Each character is encoded using 7-bit ASCII. The sender transforms the file from its own representation into ASCII characters, and the receiver transforms the ASCII characters to its own representation.
- If one or both ends of the connection use EBCDIC encoding (the file format used by IBM), the file can be transferred using EBCDIC encoding.
- The image file is the default format for transferring binary files. The file is sent as continuous streams of bits without any interpretation or encoding. This is mostly used to transfer binary files such as compiled programs.

File Transfer Protocol (FTP)

Data Structure

FTP can transfer a file across the data connection by using one of the following interpretations about the structure of the data: file structure, record structure, and page structure.

- In the **file structure** format, the file is a continuous stream of bytes.
- In the **record structure**, the file is divided into records. This can be used only with text files.
- In the **page structure**, the file is divided into pages, with each page having a page number and a page header. The pages can be stored and accessed randomly or sequentially.

File Transfer Protocol (FTP)

Transmission Mode

FTP can transfer a file across the data connection by using one of the following three transmission modes: stream mode, block mode, and compressed mode.

- The **stream mode** is the default mode. Data are delivered from FTP to TCP as a continuous stream of bytes. TCP is responsible for chopping data into segments of appropriate size. If the data are simply a stream of bytes (file structure), no end-of-file is needed. End-of-file in this case is the closing of the data connection by the sender. If the data are divided into records (record structure), each record will have a 1-byte end-of-record (EOR) character and the end of the file will have a 1-byte end-of-file (EOF) character.

File Transfer Protocol (FTP)

Transmission Mode(continue)

- In **block mode**, data can be delivered from FTP to TCP in blocks. In this case, each block is preceded by a 3-byte header. The first byte is called the block descriptor; the next 2 bytes define the size of the block in bytes.
- In **the compressed mode**, if the file is big, the data can be compressed. The compression method normally used is run-length encoding. In this method, consecutive appearances of a data unit are replaced by one occurrence and the number of repetitions.

File Transfer Protocol (FTP)

Example

The following shows an actual FTP session for retrieving a list of items in a directory. The colored lines show the responses from the server control connection; the black lines show the commands sent by the client. The lines in white with a black background show data transfer.

File Transfer Protocol (FTP)

```
$ ftp voyager.deanza.fhda.edu
```

```
Connected to voyager.deanza.fhda.edu.
```

```
220 (vsFTPd 1.2.1)
```

```
530 Please login with USER and PASS.
```

```
Name (voyager.deanza.fhda.edu:forouzan): forouzan
```

```
331 Please specify the password.
```

```
Password:
```

```
230 Login successful.
```

```
Remote system type is UNIX.
```

```
Using binary mode to transfer files.
```

```
ftp> ls reports
```

```
227 Entering Passive Mode (153,18,17,11,238,169)
```

```
150 Here comes the directory listing.
```

drwxr-xr-x	2	3027	411	4096	Sep 24 2002	business
drwxr-xr-x	2	3027	411	4096	Sep 24 2002	personal
drwxr-xr-x	2	3027	411	4096	Sep 24 2002	school

```
226 Directory send OK.
```

```
ftp> quit
```

```
221 Goodbye.
```

File Transfer Protocol (FTP)

1. After the control connection is created, the FIP server sends the 220 (service ready) response on the control connection.
2. The client sends its name.
3. The server responds with 331 (user name is OK, password is required).
4. The client sends the password (not shown).
5. The server responds with 230 (user log-in is OK).
6. The client sends the list command (ls reports) to find the list of files on the directory named reports.

File Transfer Protocol (FTP)

7. Now, the server responds with 150 and opens the data connection.
8. The server then sends the list of the files or directories (as a file) on the data connection. When the whole list (file) is sent, the server responds with 226 (closing data connection) over the control connection.
9. The client now has two choices. It can use the QUIT command to request the closing of the control connection, or it can send another command to start another activity (and eventually open another data connection). In our example, the client sends a QUIT command.
10. After receiving the QUIT command, the server responds with 221 (service closing) and then closes the control connection.

AKTU Examination Questions

1. Mention the use of HTTP.
2. List out few email gateways.
3. Elaborate about TELNET and its working procedure.
4. How does FTP work? Differentiate between passive and active FTP.
5. Explain the SNMP protocols in detail.
6. How is TFTP different from FTP?
7. What three functions can SNMP perform to manage network devices?
8. How is the BOOTP different from DHCP?
9. What is the purpose of the Domain Name System? Discuss the three main divisions of the domain name space.
10. Write short notes on any two: (i) SMTP (ii) TELNET (iii) HTTP

AKTU Examination Questions

11. Elaborate about TELNET and its working procedure.
12. Write short notes on any two of the following:
 - i. DNS in the internet
 - ii. Voice Over IP
 - iii. File Transfer Protocol
13. Explain the SNMP protocols in detail.
14. What do you mean by DNS?
15. The symbols & their frequencies are given below

Symbol	A	B	C	D	E	F	G	H
Frequency	20	28	16	15	15	10	4	2

Construct Huffman codes.

AKTU Examination Questions

16. Encrypt “EXTRANETPLANETSOURCE” using a transposition cipher with the following key: 3 5 2 1 4

17. Explain the following:

- (i) Telnet
- (ii) FTP
- (iii) SNMP
- (iv) HTTP
- (v) MIME

18. How does DNS perform data name resolution?
What are the different types of name servers?
Mention the DNS message format for query and reply messages.

AKTU Examination Questions

19. Write short notes on any three of the following:

- (i) DNS in the Internet
- (ii) Voice Over IP
- (iii) SNMP
- (iv) Electronic mail
- (v) File Transfer Protocol