SNS COLLEGE OF ENGINEERING

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Department of CSE-IOT

Course Name – 23ITT204 & Computer Networks

II Year / III Semester

Unit 1 – Introduction and Application Layer

Topic 7 – FTP

FTP

FTP

File Transfer Protocol (FTP) is the standard protocol provided by TCP/IP for copying a file from one host to another.

Challenges in Transferring file

- Two systems may use different file name conventions
- Two systems may have different ways to represent data.
- Two systems may have different directory structures.

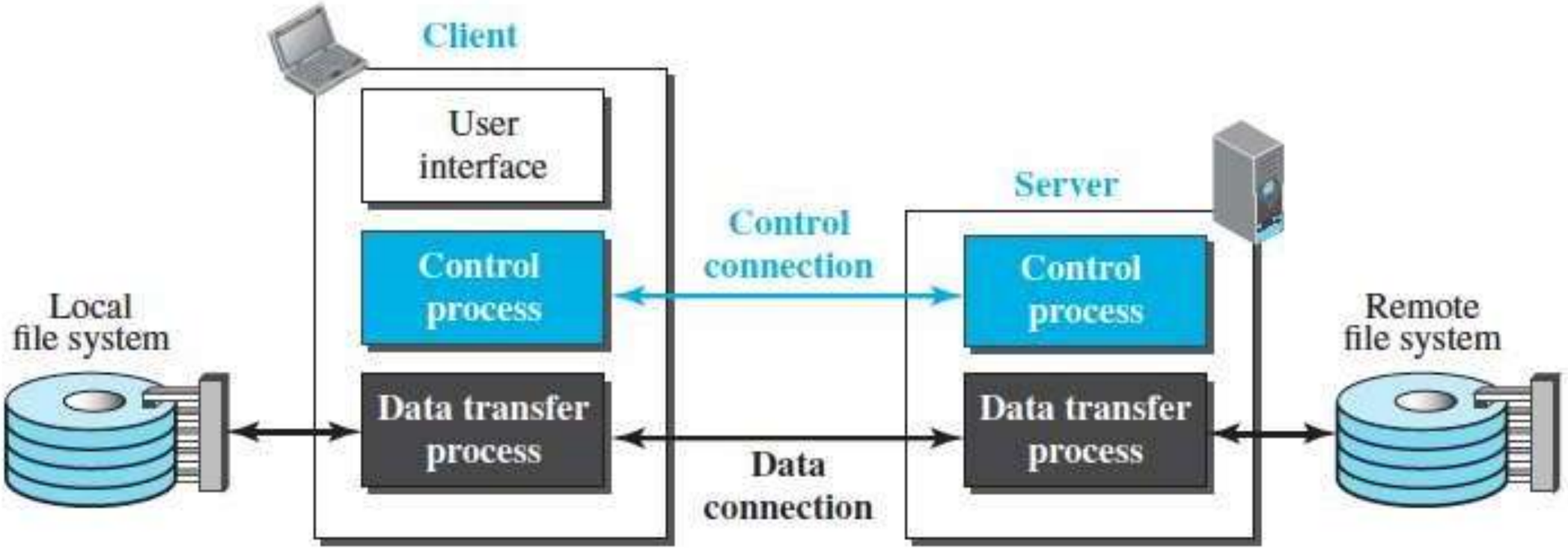
All these issues solved by FTP.

FTP is client / server model.

The client has three components: **the user interface**, **the client control process**, and the **client data transfer process.**

The server has two components: **the server control process and the server data transfer process.**

FTP


Client
User interface
Control process
Data transfer process
Control connection
Data connection
Server
Control process
Data transfer process
Local file system
Remote file system

FTP

Two Connection

1. Control Connection
2. Data Connection

- The control connection remains connected during the entire interactive FTP session.
- The data connection is opened and then closed for each file transfer activity.
- It opens each time commands that involve transferring files are used, and it closes when the file is transferred.

FTP uses two well-known TCP ports:

- **Port 21** is used for the control connection, and
- **Port 20** is used for the data connection

FTP

Control Connection

- It uses the NVT ASCII character set as used by TELNET.
- Communication is achieved through **commands and responses**
- During this control connection, commands are sent from the client to the server and responses are sent from the server to the client.
- Commands, which are sent from the FTP client control process, are in the form of ASCII uppercase.
- Every FTP command generates at least one response. A response has two parts: **a three-digit number followed by text**. The numeric part defines **the code**; the text part defines **needed parameters**.
- The first digit defines the status of the command.
- The second digit defines the area in which the status applies.
- The third digit provides additional information.

FTP

Command	*Argument(s)*	*Description*
ABOR		Abort the previous command
CDUP		Change to parent directory
CWD	Directory name	Change to another directory
DELE	File name	Delete a file
LIST	Directory name	List subdirectories or files
MKD	Directory name	Create a new directory
PASS	User password	Password
PASV		Server chooses a port
PORT	Port identifier	Client chooses a port
PWD		Display name of current directory
QUIT		Log out of the system
RETR	File name(s)	Retrieve files; files are transferred from server to client
RMD	Directory name	Delete a directory
RNFR	File name (old)	Identify a file to be renamed
RNTO	File name (new)	Rename the file
STOR	File name(s)	Store files; file(s) are transferred from client to server
STRU	**F**, **R**, or **P**	Define data organization (**F**: file, **R**: record, or **P**: page)
TYPE	**A**, **E**, **I**	Default file type (**A**: ASCII, **E**: EBCDIC, **I**: image)
USER	User ID	User information
MODE	**S**, **B**, or **C**	Define transmission mode (**S**: stream, **B**: block, or **C**: compressed

FTP

Common responses

Code	*Description*	*Code*	*Description*
125	Data connection open	**250**	Request file action OK
150	File status OK	**331**	User name OK; password is needed
200	Command OK	**425**	Cannot open data connection
220	Service ready	**450**	File action not taken; file not available
221	Service closing	**452**	Action aborted; insufficient storage
225	Data connection open	**500**	Syntax error; unrecognized command
226	Closing data connection	**501**	Syntax error in parameters or arguments
230	User login OK	**530**	User not logged in

FTP

Data Connection

- Data Connection is used to transfer the files.

Data Connection Steps

1. The client, not the server, issues a passive open using an ephemeral port. This must be done by the client because it is the client that issues the commands for transferring files.

2. Using the PORT command the client sends this port number to the server.

3. The server receives the port number and issues an active open using the well-known port 20 and the received ephemeral port number.

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

FTP

File Type

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

Data Structure

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

- The file structure format (used by default) has no structure. It 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.

FTP

Transmission Mode

- FTP can transfer a file across the data connection using one of the following three transmission modes: **Stream mode, Block mode, or Compressed mode**.

- The stream mode is the default mode; data are delivered from FTP to TCP as a continuous stream of bytes.

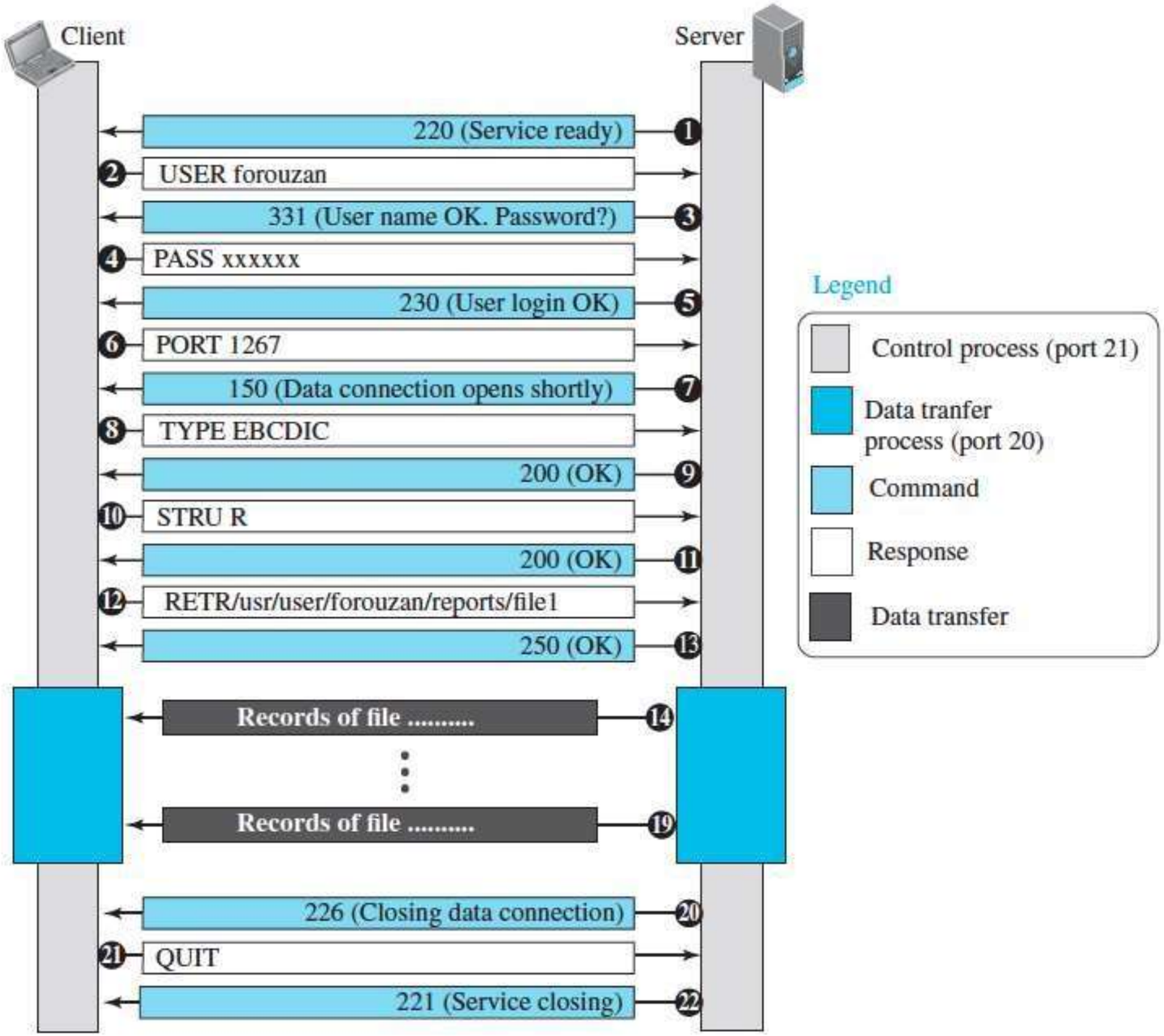
- In the block mode, data can be delivered from FTP to TCP in blocks. In this case, each block is preceded by a 3-byte header.

- The first byte is called the block descriptor; the next two bytes define the size of the block in bytes.

File Transfer

- 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: **retrieving a file (server to client), storing a file (client to server), and directory listing (server to client).**


Client
Server
220 (Service ready)
USER forouzan
331 (User name OK. Password?)
PASS xxxxxx
230 (User login OK)
PORT 1267
150 (Data connection opens shortly)
TYPE EBCDIC
200 (OK)
STRU R
200 (OK)
RETR/usr/user/forouzan/reports/file1
250 (OK)
Records of file .....
Records of file .....
226 (Closing data connection)
QUIT
221 (Service closing)
Legend
Control process (port 21)
Data tranfer process (port 20)
Command
Response
Data transfer

FTP

Security for FTP

- FTP requires a password, the password is sent in plaintext (unencrypted), which means it can be intercepted and used by an attacker.

- The data transfer connection also transfers data in plaintext, which is insecure.

- To be secure, one can add a Secure Socket Layer between the FTP application layer and the TCP layer. In this case FTP is called SSL-FTP.

THANK YOU