



Network Programming

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Communicating with File Server

Content

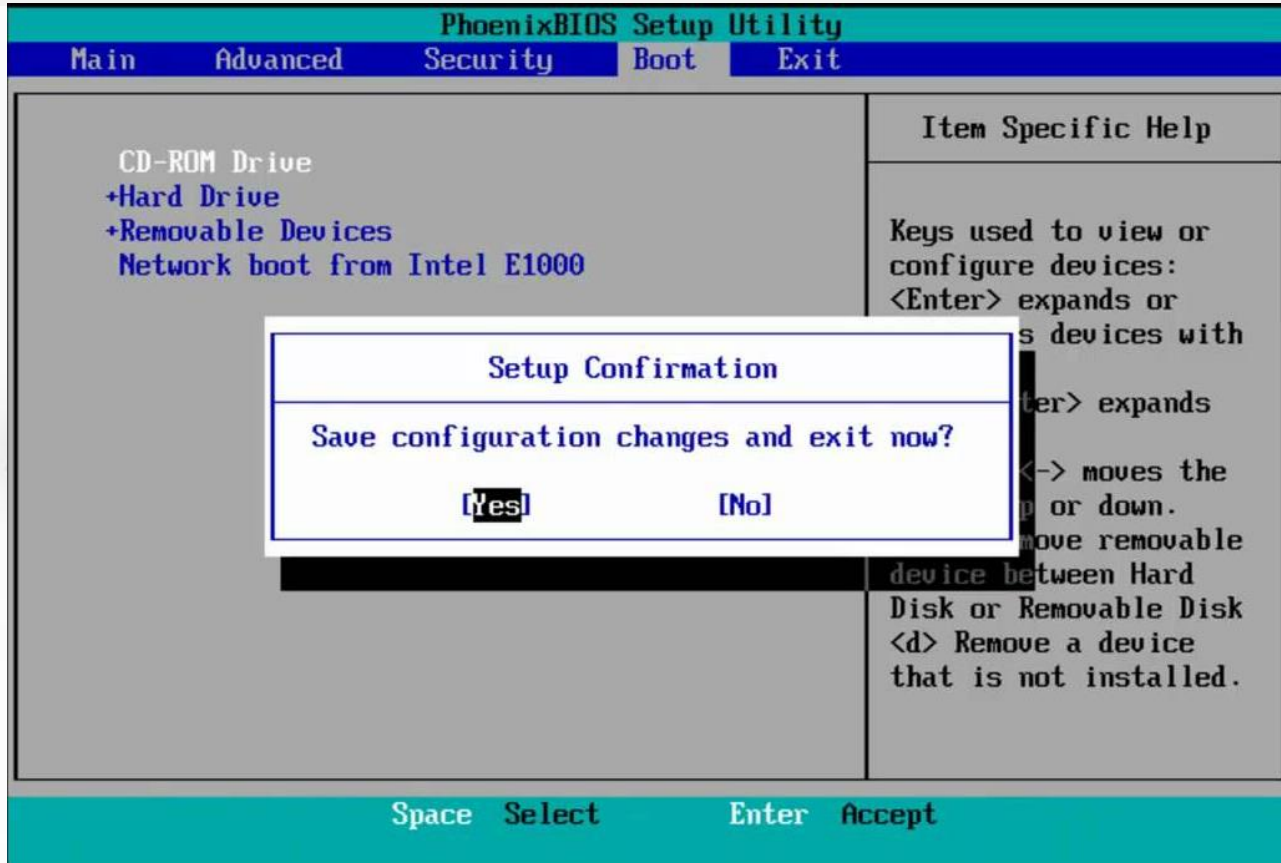
- Introduction
- Microsoft file sharing
- Netware file sharing
- FTP Overview



1. Introduction

- In order to **put the site “live”**, the Web page files need to be sent to a Web server.
- The uploading process is done through a file transfer protocol (FTP).
- **FTP** is the most common cross-platform file transfer mechanism between computers over the Internet.
- FTP software is freely available for all major operating systems: Windows, Linux,...
- FTP supersedes an older protocol known as trivial file transfer protocol (TFTP).

1. Introduction



2. Microsoft file sharing

Common Internet File (CIF) system

- An extension of the earlier **server message block** (SMB) protocol.
- Provides for the network drive functionality and print sharing.
- More secure than FTP and faster.
- The protocol is largely proprietary.

2. Microsoft file sharing

Common Internet File (CIF) system

- Most commonplace within office networks
 - share a printer
 - a central repository for files
- From a programmer's perspective, it is an ideal technology where all of the system users would be on the same internal network

2. Microsoft file sharing

Common Internet File (CIF) system

- NETBIOS and NETBEUI are the more correct names.
- NBT, a favor of NetBIOS, runs over IP.
- All other forms use NETBIOS hostname which may query a WINS Server

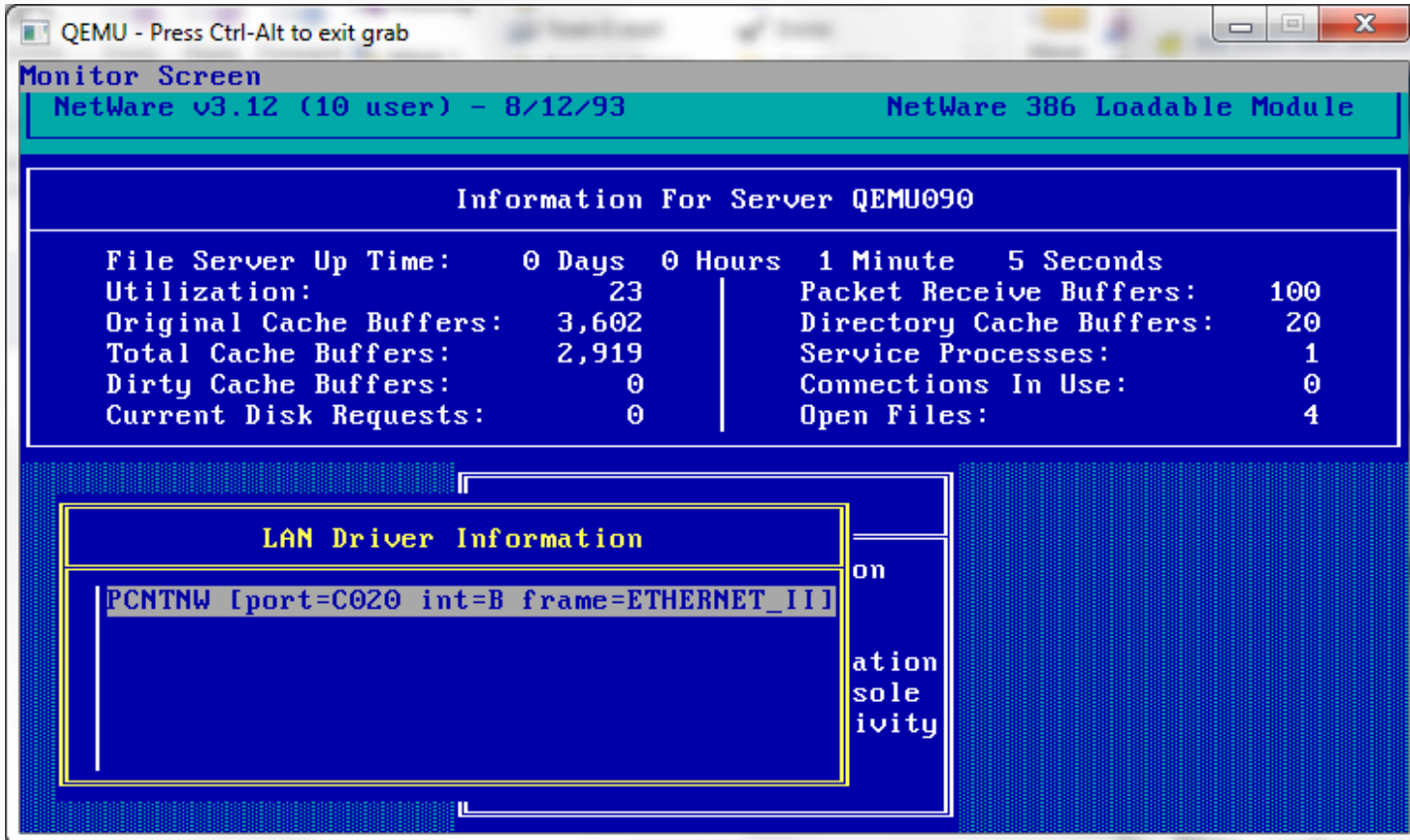
3. Netware file sharing

- Appeared for decades
- One of the fastest file transfer protocols over internal networks
- Built on top of the Internetworking packet exchange / Sequenced Packet Exchange (IPX/SPX) protocols → non-routable

3. Netware file sharing

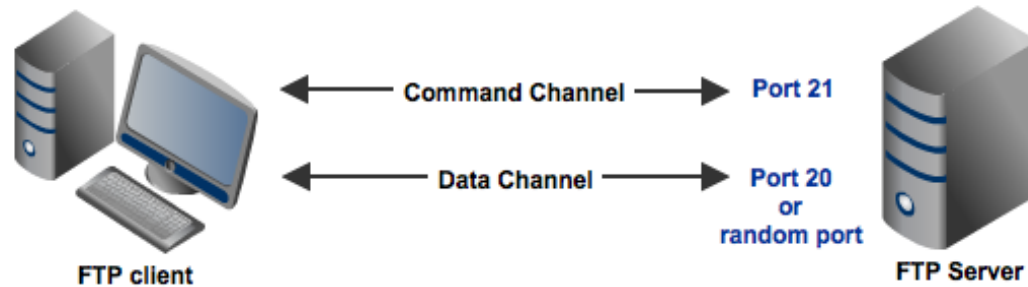
- Novell clients are available for almost any platform: DOS, Windows, Macintosh, UNIX
- The clients locate the server by using the Novell core protocol (NCP)
- When a remote file server is found, it is mapped to a local drive on the client's machine

3. Netware file sharing



4. An overview of FTP

- FTP operates on two ports:
 - 21, the control socket: send and receive commands and responses
 - 20 or some other, high port: a data socket



- The commands between client and server are quite human readable and are broken up into lines

4. An overview of FTP

- The **FTP utility** is a DOS-based program with a command-line interface → not the best-practice means
- The **FTP protocol** facilitates more than uploading and downloading
It also be able to accommodate all manner of file-manipulation tasks: deleting, renaming, navigating through folders

4. An overview of FTP

FTP utility

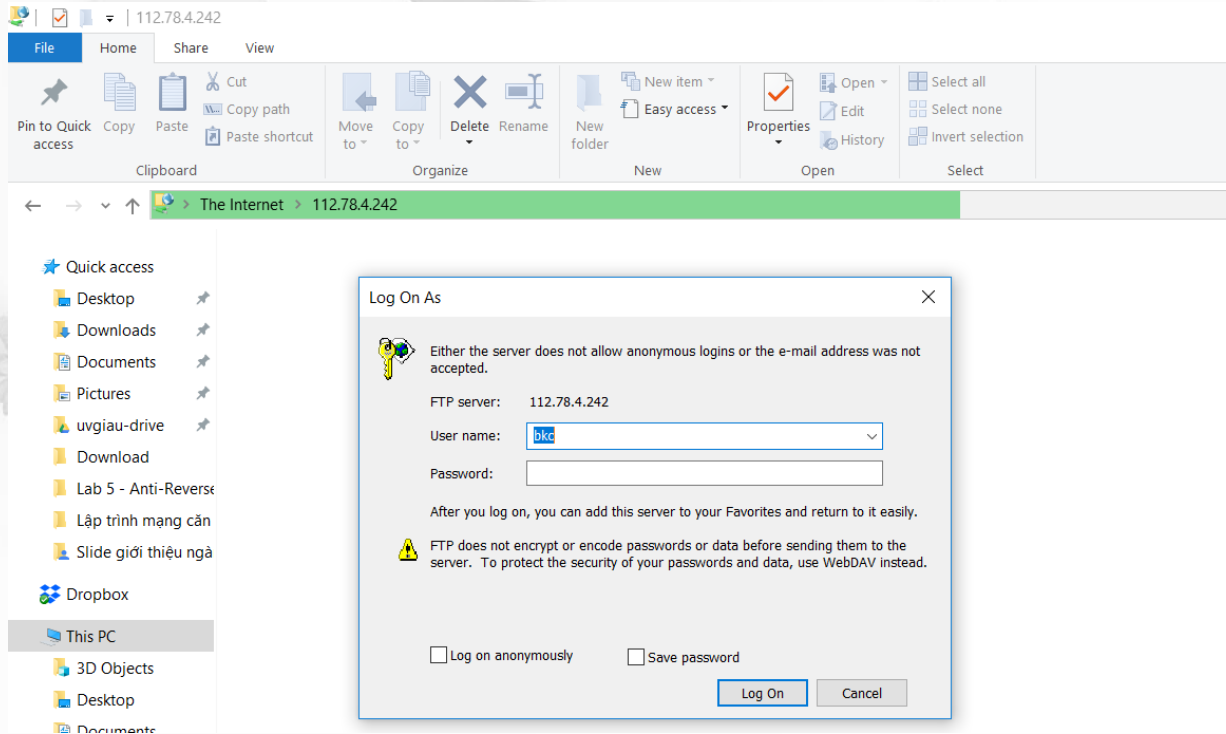
- FTP accepts script files as a parameter to run autonomously
- Example:
 - Create a script file (script.ftp)

```
open www.eej.ulst.ac.uk
anonymous
me@myemail.com
cd lib
get libtermcap.so.2.0.8
quit
```
 - Run the script: `ftp -s: script.ftp`

4. An overview of FTP

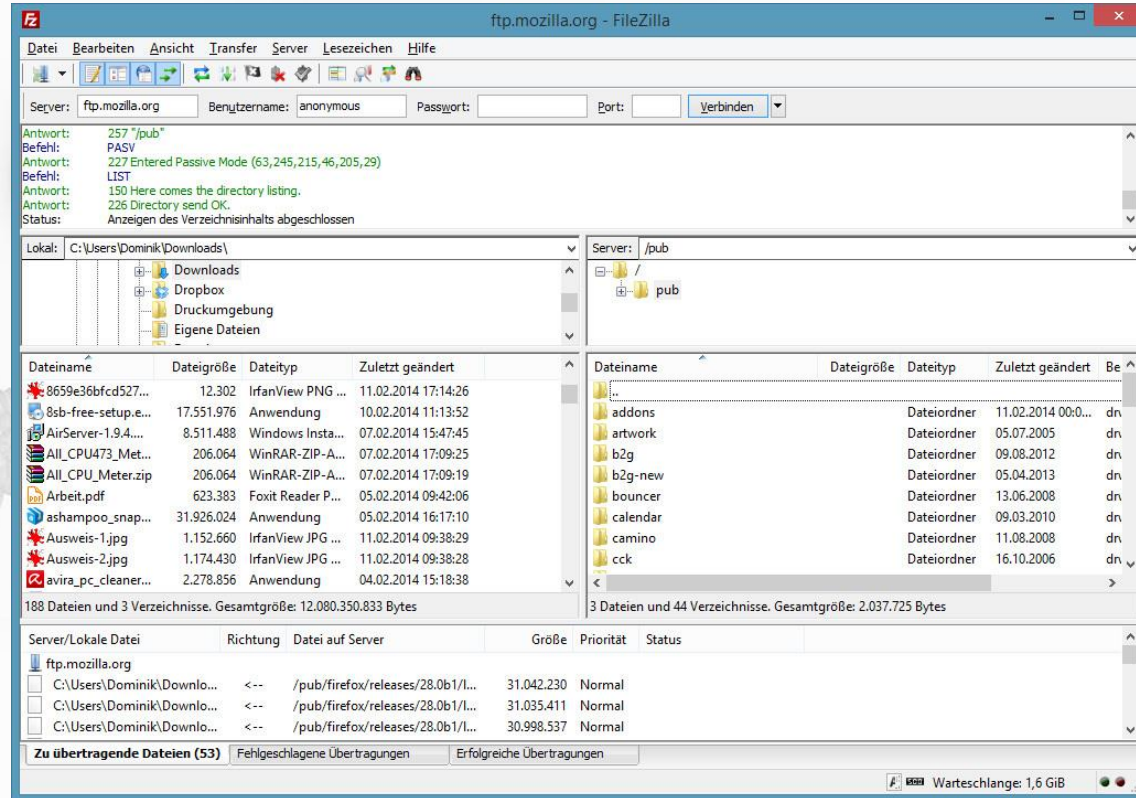
FTP client app

Windows Explorer



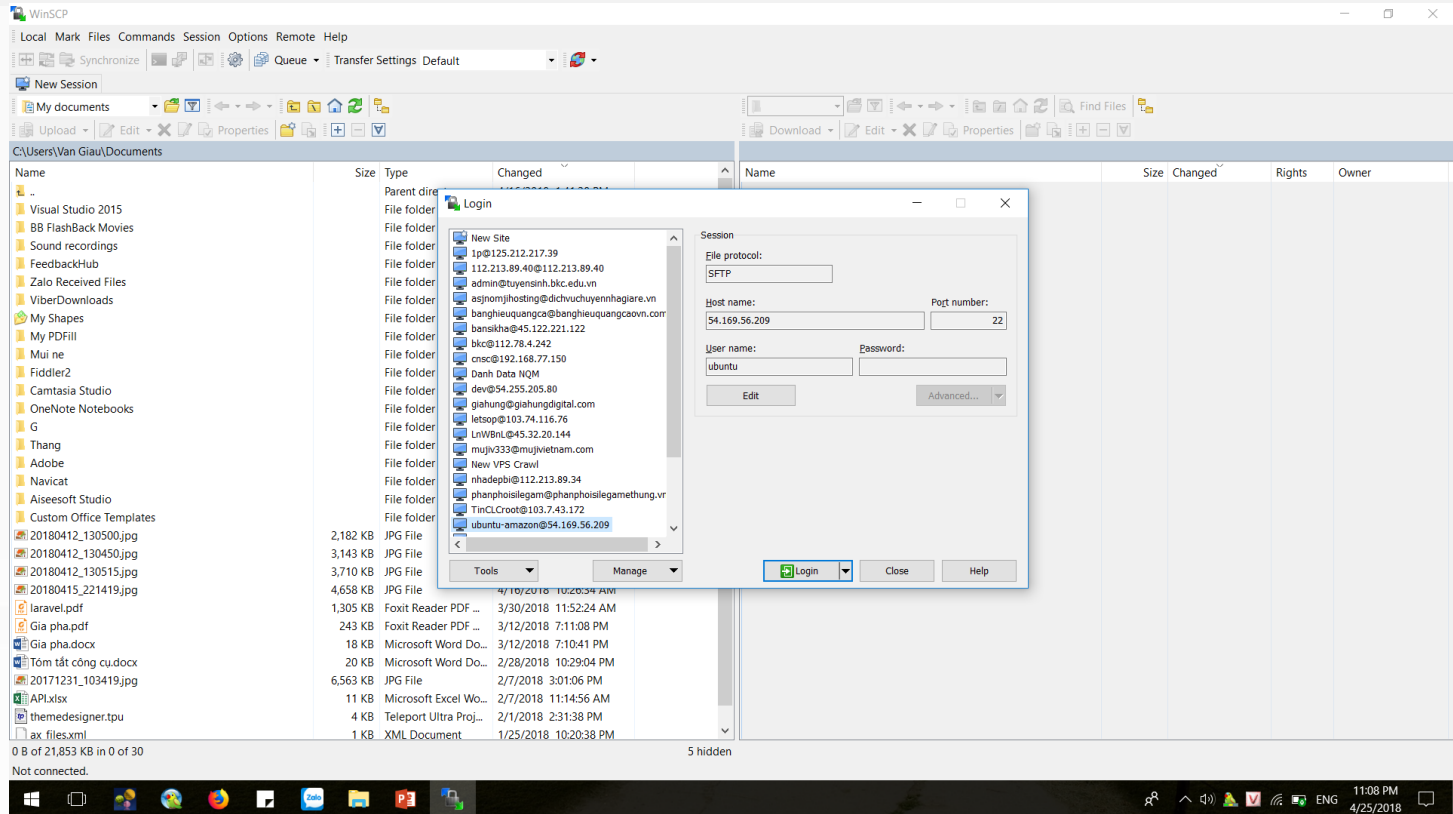
4. An overview of FTP

FTP client app



4. An overview of FTP

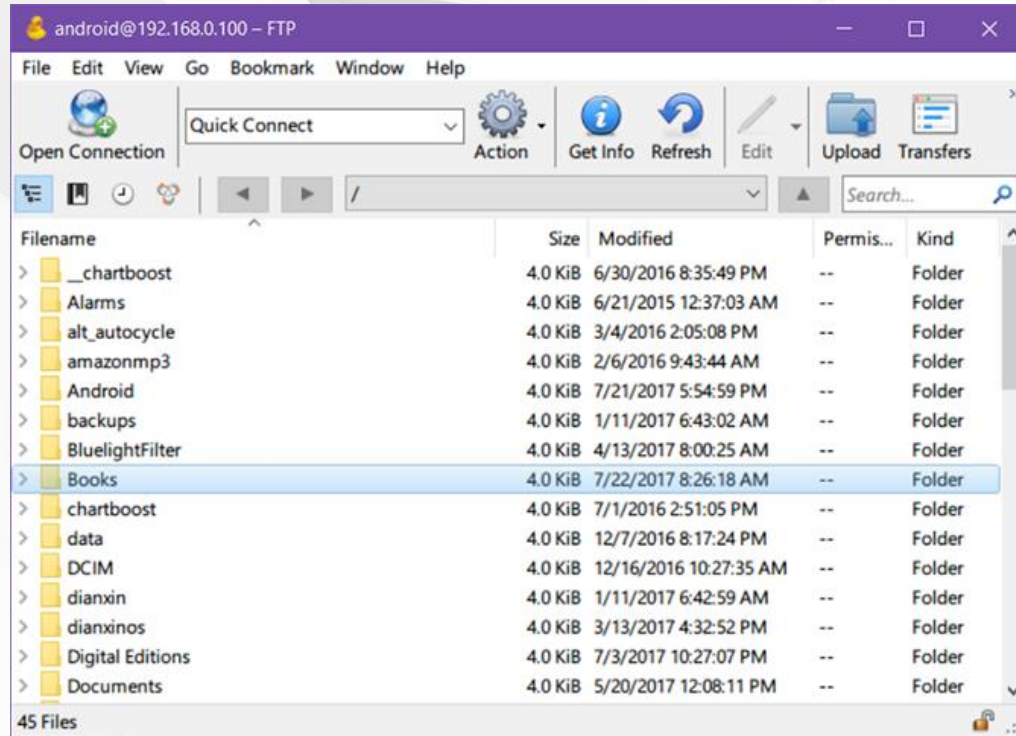
FTP client app



4. An overview of FTP

FTP client app

Cyberduck



4. An overview of FTP

- Commands issued from client to server take the form:

`<keyword> <parameter> <enter>`

- Commands from server to client take the form:

`<status code> <message> <enter>`

4. An overview of FTP

- FTP status codes

Code range	Meaning
1xx	The command has begun on the server.
2xx	The command has been completed successfully.
3xx	The command has been accepted, but no action has been taken.
4xx	The command has been denied, but can be reissued later
5xx	The command has been denied and should not be reissued.

4. An overview of FTP

FTP status codes

- Example:

220 Serv-U FTP-Server v2.5k for WinSock ready...

USER secret

331 User name okay, need password.

PASS (hidden)

230 User logged in, proceed.

PWD

257 "/" is current directory.

TYPE A

200 Type set to A.

PASV

227 Entering Passive Mode (212,17,38,3,11,144)

LIST -aL

150 Opening ASCII mode data connection for /bin/ls.

226 Transfer complete.

4. An overview of FTP

FTP command

Command	Meaning
?	display the FTP Help information
ascii	set the file transfer mode to ASCII
binary	set the file transfer mode to BINARY
bye	exit the FTP environment (same as quit)
cd	change directory on the remote system
close	terminate a session with another system
close brubeck	closes the current FTP connection, but still leaves you within the FTP environment
delete	delete (remove) a file in the current remote directory (same as rm in UNIX)
get	copy one file from the remote machine to the local machine
get ABC DEF	copy file ABC in the current remote directory to (or on top of) a file named DEF in your current local directory (overwrite)

4. An overview of FTP

FTP command

Command	Meaning
help	request a list of all available FTP commands
lcd	change directory on your local machine
ls	list the names of the files in the current remote directory
mkdir	make a new directory within the current remote directory
mget	copy multiple files from the remote machine to the local machine; you are prompted for a y/n answer before transferring each file mget. To stop this command from prompting for multiple files, type: prompt off
mget *	copy all the files in the current remote directory to your current local directory, using the same filenames. Notice the use of the wild card character, *
mput	copy multiple files from the local machine to the remote machine; you are prompted for a y/n answer before transferring each file
open	open a connection with another computer

4. An overview of FTP

FTP command

Command	Meaning
open brubeck	Open a new FTP connection with brubeck; you must enter a username and password for a brubeck account (unless it is to be an anonymous connection)
put	copy a file (using BINARY mode) from the local system to the remote system
pwd	display the current directory on the remote machine
quit	exit the FTP environment
rmdir	remove (delete) a directory in the current remote directory

4. An overview of FTP

How FTP uses ports

- In the email protocols, data could be suffixed with <enter>.<enter> to mark the end. If the email body contains it, it could be removed.
- In the FTP, the removal could cause the file to corrupt.
- To avoid the problem:
 - Port 21 is used to send and receive commands and responses, each terminated by an <enter>
 - When data is sent, a temporary connection is opened on port 20, the data is transferred

4. An overview of FTP

How FTP uses ports

- The most FTP client should do all the requesting and the server should do all the serving.
- **Passive-mode FTP** is where the **client** instructs the server to listen on a port other than the default data port

4. An overview of FTP

How FTP uses ports

- The response to the PASV command will always include six numbers separated by commas:
 - The first 4 digits represent the IP address of the server
 - The final 2 digits represent the port the server is listening on for its data connection
- Example: 212,17,38,3,11,144
 - IP: 212.17.38.3
 - Port: $2960 = 11 \times 256 + 144$

4. An overview of FTP

How FTP uses ports

- The server will **begin listening** on the port as soon as it receives the PASV command.
- It will **return a 227** message to indicate that it has begun listening on this port.
- Once the **client connects** to this port, the **server will return a 150** message.

4. An overview of FTP

How FTP uses ports

- If the **client does not connect** to the port in a timely fashion (a few seconds), the server will **issue** a **425 timeout** message
- The server will **send the requested data** on that port and close the connection once all of the data is sent, and then **issue** a **226** message

4. An overview of FTP

How FTP uses ports

- The same process happens in reverse when **uploading** to the server
- The PASV command is issued, and the **client connects to the port specified** by the server
- The **client** then **places the contents** on the new socket and closes the connection once the file is sent

4. An overview of FTP

The FTP handshake

- FTP uses a basic authentication mechanism.
It accepts a username and password in plain text.
- FTP over **SSL (SFTP)** is recommended when a Web site carries information of substantial value.
- An FTP server may allow anonymous access
 - Username: **anonymous**
 - Password: can be anything

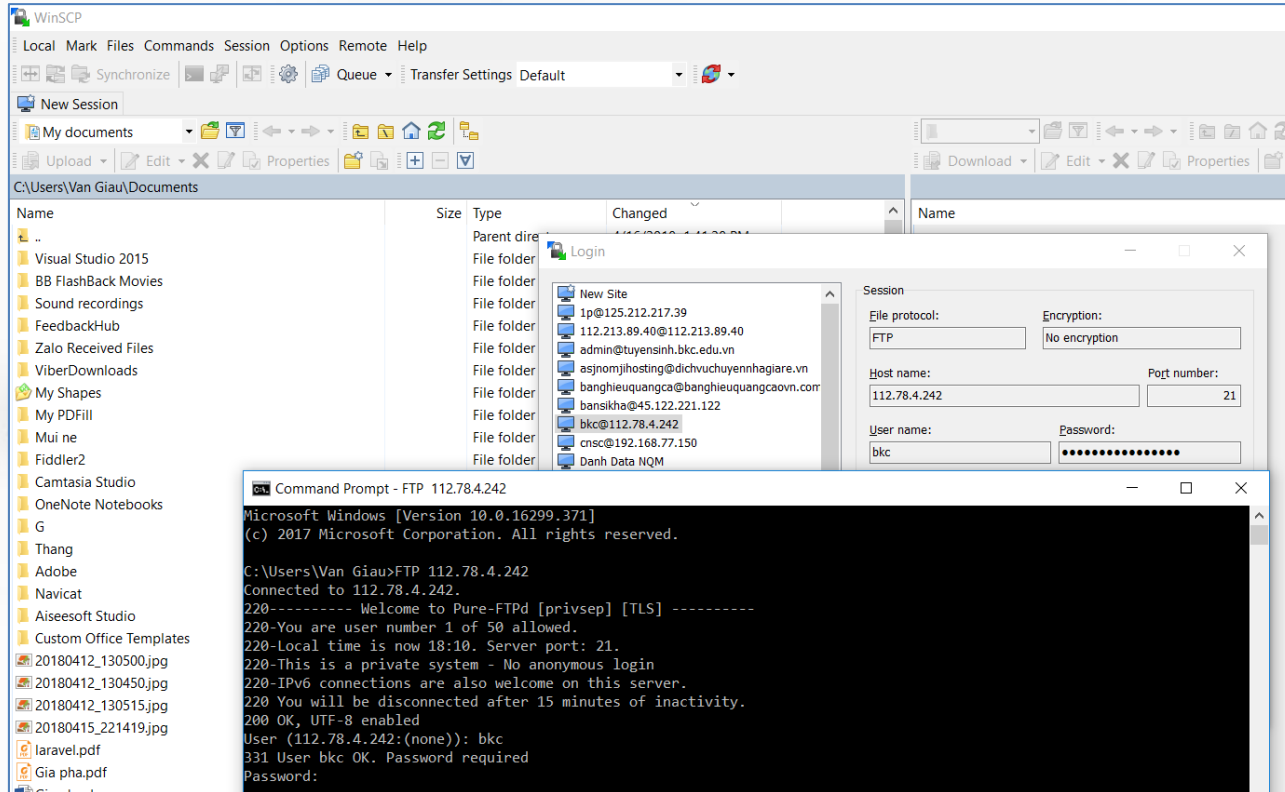
4. An overview of FTP

The FTP handshake

- Open CMD
- Type: FTP <server IP>
- After the connection is established, the server requires authentication:
 - USER <Enter username>
 - PASS <Enter password>
- Then, you can type commands in need

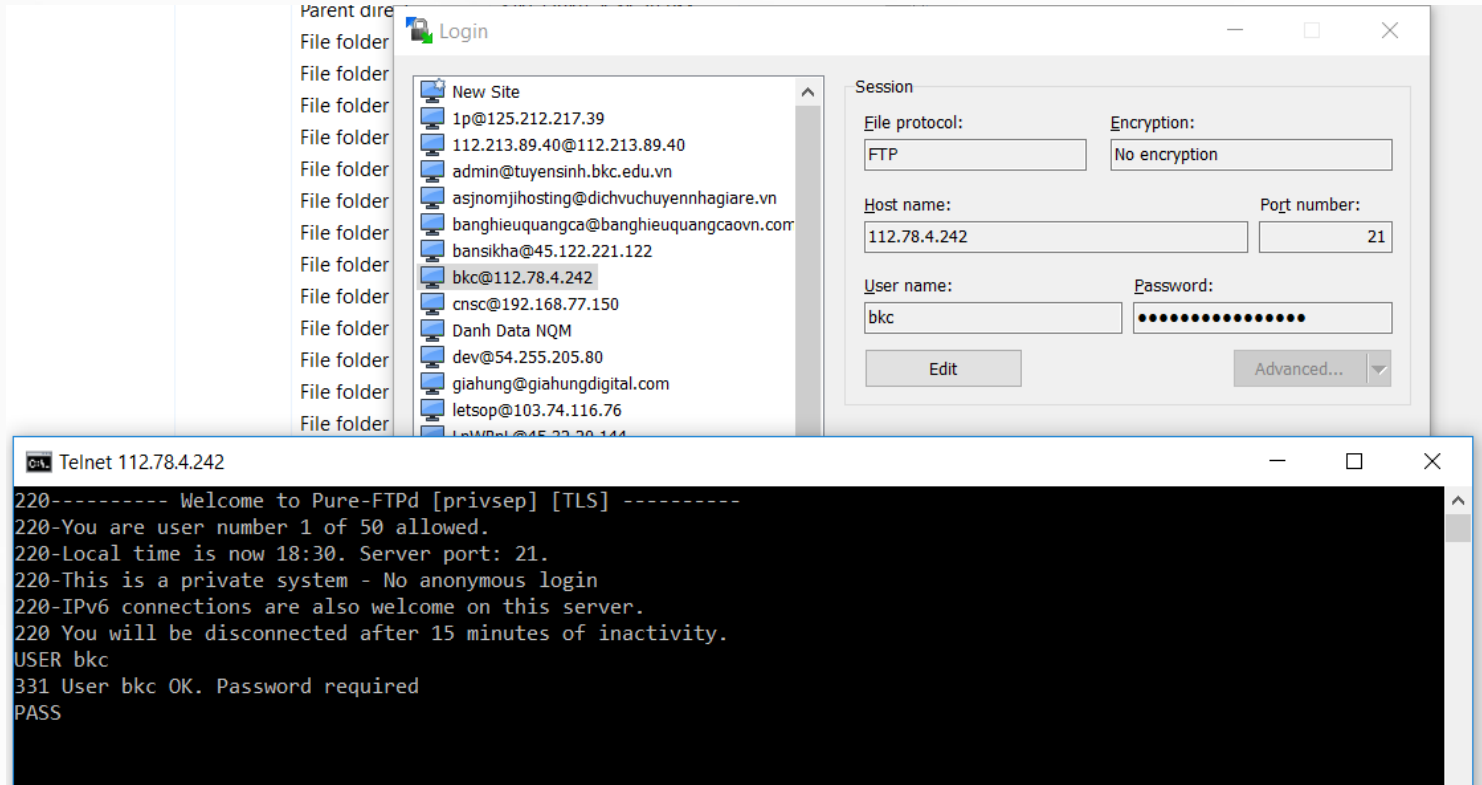
4. An overview of FTP

Example - Use FTP



4. An overview of FTP

Example - Use Telnet



4. An overview of FTP

Library

FtpWebRequest Class

- Namespace: System.Net
- Implements a File Transfer Protocol (FTP) client.
- Don't recommend

FtpWebResponse Class

- Namespace: System.Net
- Encapsulates a File Transfer Protocol (FTP) server's response to a request.

4. An overview of FTP

Library

WebRequestMethods.Ftp Class

- Namespace: System.Net
- Represents the types of FTP protocol methods that can be used with an FTP request.

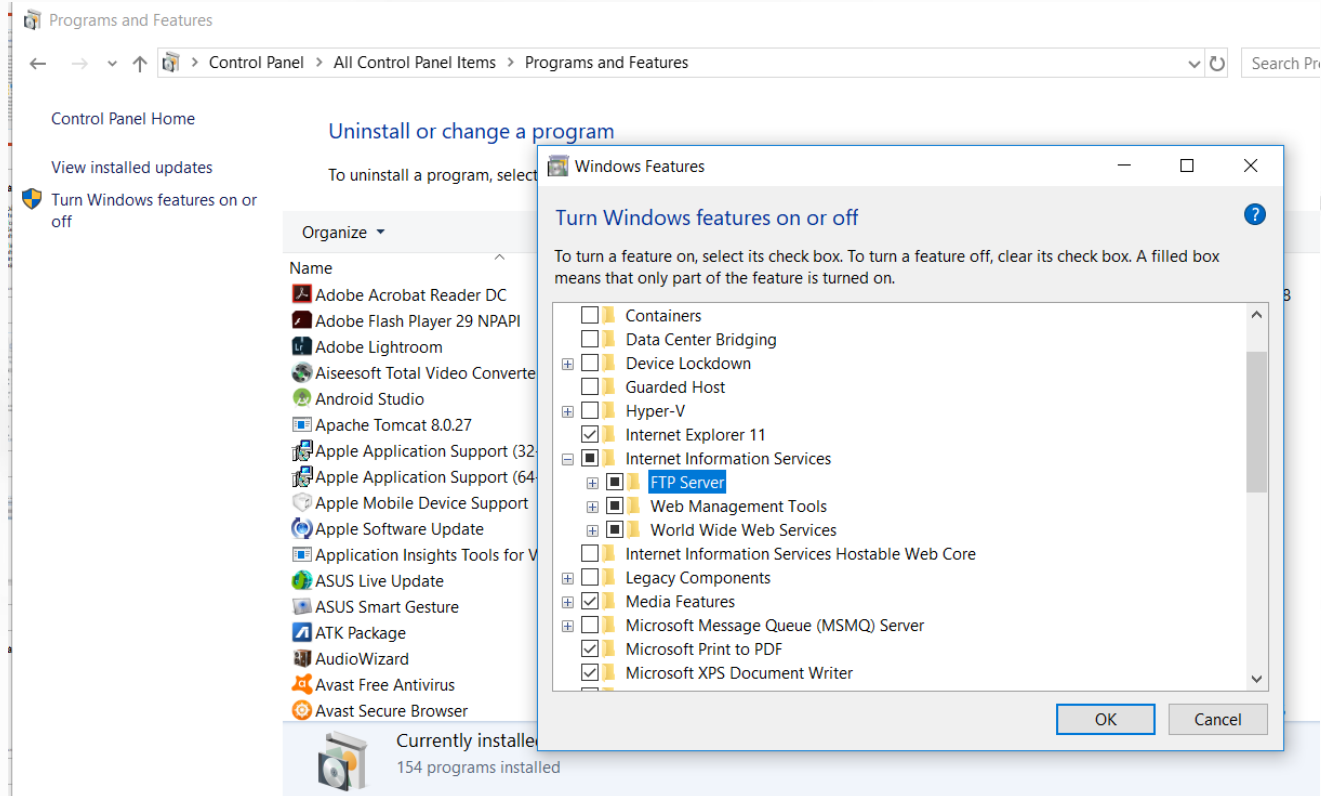
This class cannot be inherited.

Enable FTP server on Windows

Control Panel → Add/Remove Programs → Add or Remove Windows Components → Internet Information Services → Check FTP Server



Enable FTP server on Windows

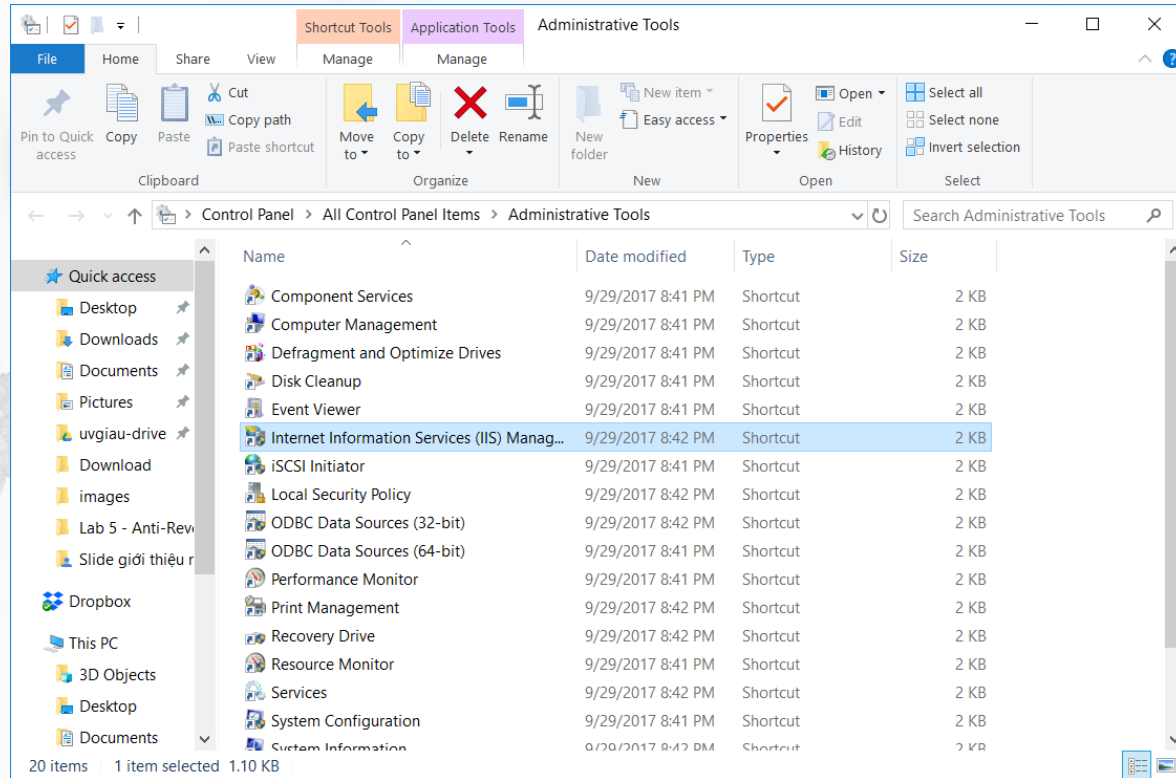


Setup FTP server on Windows

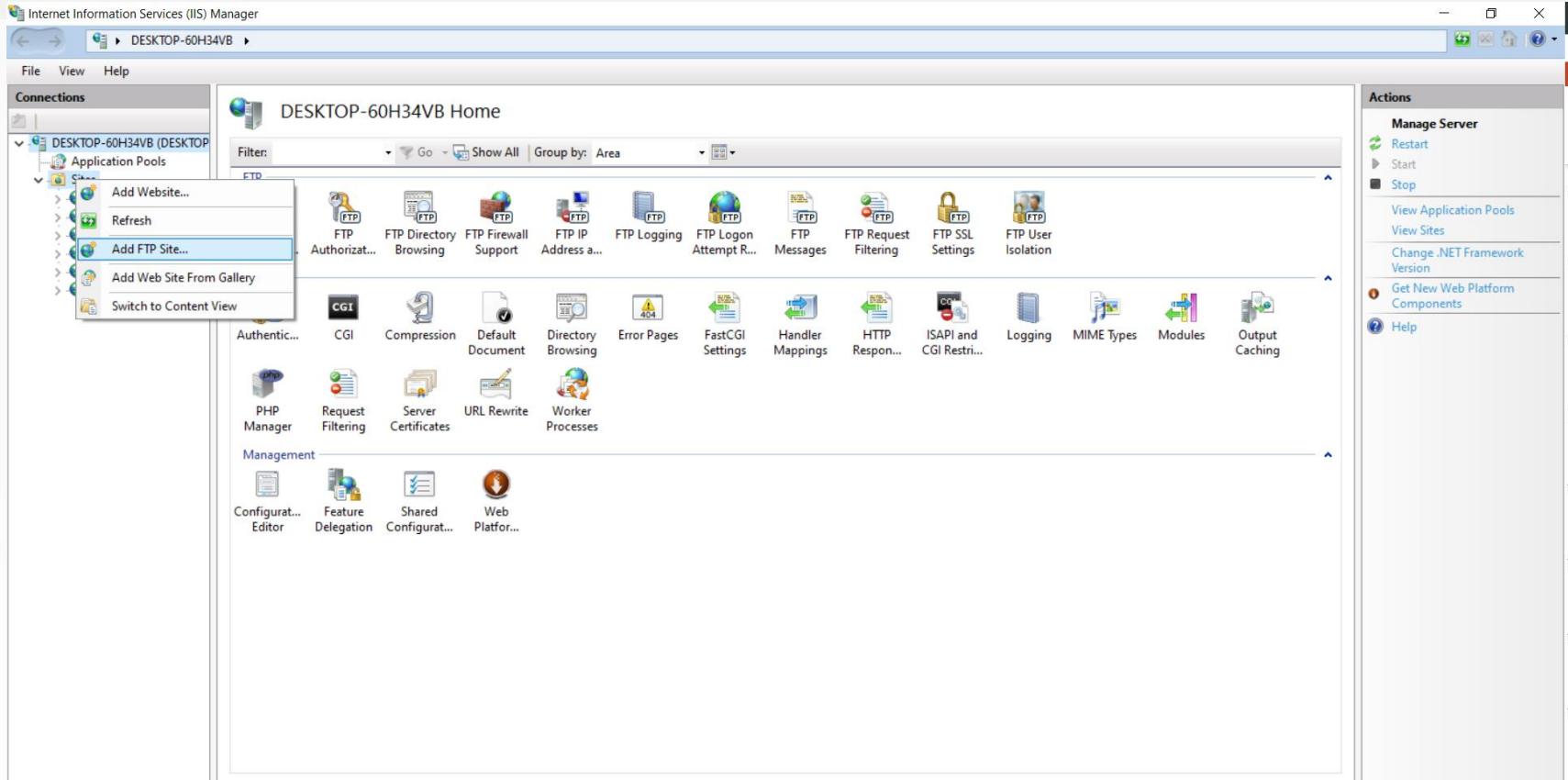
To manage and configure FTP server: Control Panel → Administrative Tools → Internet Information Services → FTP



Setup FTP server on Windows



Setup FTP server on Windows



Setup FTP server on Windows

The screenshot displays the IIS Manager console for the site `ftp.tranbanhiem.com`. The left pane shows the tree structure: `NHIEM-LENOVO (NHIEM-LENOVO) > Sites > ftp.tranbanhiem.com`. The right pane shows the site's home page with various FTP-related icons. The `FTP Authentication` icon is circled in red.

An inset window titled `FTP Authentication` provides a detailed view of the authentication settings. It includes a 'Group by' dropdown set to 'No Grouping' and a table with the following data:

Mode	Status	Type
Anonymous Authentication	Enabled	Built-In
Basic Authentication	Enabled	Built-In

Exercise

- Setup FTP server
- Use telnet or ftp to check the FTP service
- Create a FTP connection and do some basic commands





Q&A