Université Constantine 2
جامعة قسنطينة 2

Network Management

– Course 1 –

Chapter 5: TCP/IP services oriented Users (1/1)

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Concerned Students :

Faculty	Department	Level	Speciality
NTIC	TLSI	License 3	G.L.

Objectives:

The objective of this course is to present some network services that an administrator is supposed to be able to manage, such as:

- FTP service,
- HTTP service,
- and Messaging (eMail) service.

Introduction

User services are services that are **explicitly requested** by users. They are characterized by their role in:

- **information,**
- **communication**,
- **sharing**.

FTP: File transfer Protocol

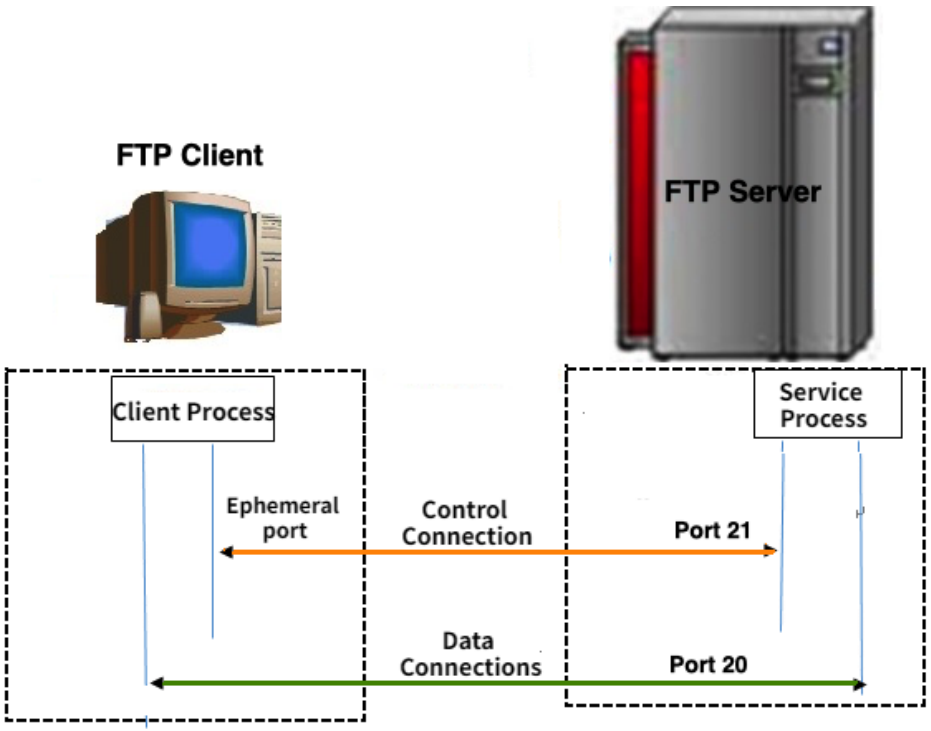
- **FTP** operates within a client-server model.
- Its implementation dates back to 1971,
- It defines how data should be transferred over a TCP/IP network.
- The objectives of FTP are to:
  - Enable **sharing** of files between remote machines,
  - Provide **independence** from the file systems of the client and server machines,
  - Enable **efficient** data transfer.

FTP Transfer

During an FTP connection, two transmission channels are opened:

- One channel for commands (control channel: TCP port *21*)
- One channel for data (TCP port *20*).

Protocol operation principle:



FTP Commands

- FTP allows file transfers in several formats that are typically system-dependent.
- The **GET** command transfers a file from the remote machine to the current directory of the local machine:

  get "my-file"
- For the reverse transfer (being authorized to write to its file system), the following command is used:

  put "my-file"
- To transfer or put all files with a given extension, the following commands are used:

  mget *.ext or **mput *.ext**

Anonymous FTP servers

- There are **anonymous FTP servers,** which means that on such servers, it is possible to connect under the username *anonymous* and download files.
- The internet is full of such servers, generally provided by universities and government institutions.
- All members of the Internet network can access these sites by giving "anonymous" as the user code and their email address as the password.

Installation of an FTP server

- The FTP server configuration file is usually located in */etc/vsftpd.conf*
- List of files involved in server configuration:
  - /etc/xinetd.d./ftp
  - /etc/vsftpd.banned_emails
  - /etc/vsftpd.chroot_list
  - /etc/vsftpd/vsftpd.conf
  - /etc/services

Example of a vsftpd.conf file

```
# This directive enables listening on IPv6 sockets.
listen_ipv6=YES
# Allow anonymous FTP (Disabled by default).
anonymous_enable=NO
# Uncomment this to allow local users to log in.
local enable=YES
# It lincomment this to enable any form of FTP write command.
write enable=YES
# Default umask for local users is 077. You may wish to change this to 022,
# if your users expect that (022 is used by most other ftpd's)
local unask=022
# You may restrict local users to their home directories.
chroot_local_user=YES
# Maximum number of possible connections from the same IP address
per_source = 5
# Prohibition to connect to the ftp from the address
no_access = 192.168.1.3
# Uncomment this to allow the anonymous FTP user to upload files. This only
# has an effect if the above global write enable is activated. Also, you will
obviously need to create a directory writable by the FTP user.
Anon_upload_enable=NO
```

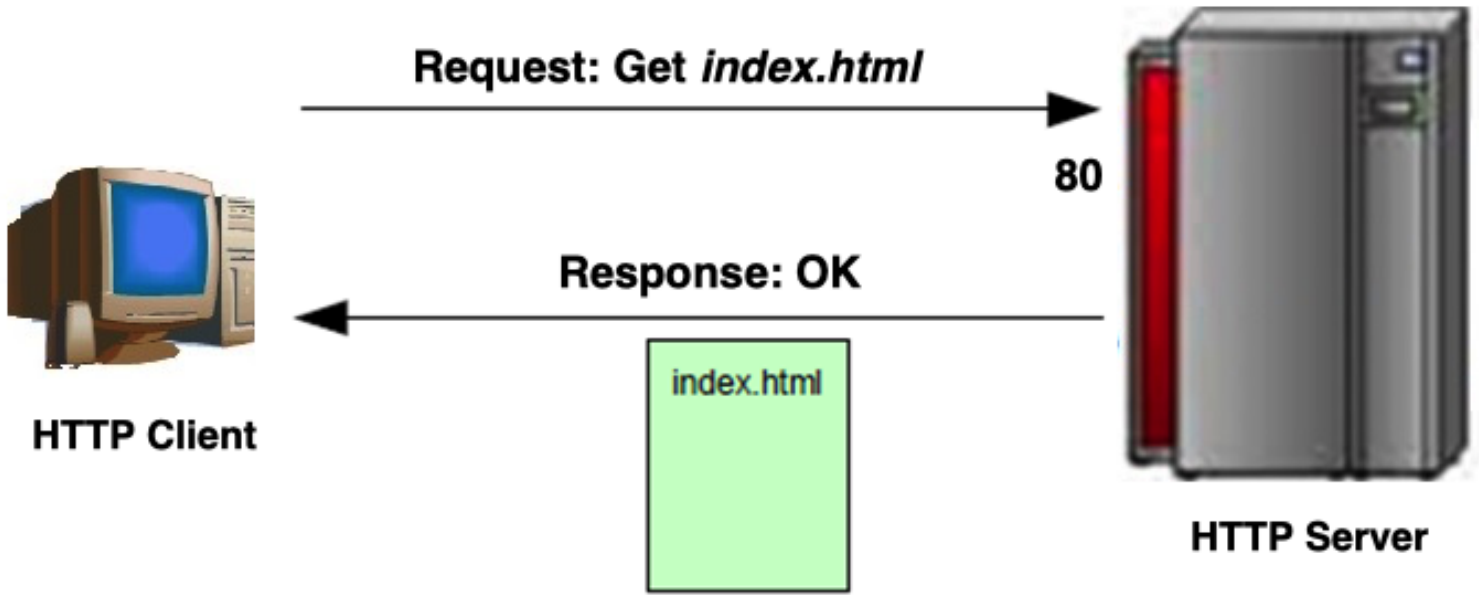
HTTP

- Created at *CERN* in the early 1990s, **HTTP** (HyperText Transfer Protocol) is a simple transfer protocol.
- It allows accessing HTML files located on a network.
- **HTTP** is a:
  - document *retrieval* protocol,
  - form *submission* protocol.
- It is notably used for the *World Wide Web*.
- It is a connectionless protocol, and each *request/response* pair is independent.

HTTP Operation

Operation of HTTP (very simple):

- Connection (port **80**),
- Request (GET) for a document,
- Return of the requested document or an error,
- Disconnection.



HTTP URL

- A **URI** (Uniform Resource Identifier) is a structured string of characters used to uniquely identify a resource.
- A resource can be identified either by a **URN** (Uniform Resource Name) or by a **URL** (Uniform Resource Locator).
- *URN* and *URL* are subsets of *URI*.

Example of URN: isbn:0-4995-76842-2

Example of URL: http://www.university2.edu/index.html

HTTP Methods

- **GET**: request to obtain information and a data zone about the *URI*,
- **HEAD**: request to only obtain information about the *URI* (by a proxy),
- **POST**: send data located in the body (form content) to the server,
- **PUT**: records the body of the request to the indicated *URI* (Site Management),
- **DELETE**: delete data designated by the *URI*.
- **OPTIONS**: request for available communication options,
- **TRACE**: returns the intact body of the request (debugging)

HTTP Response Codes

- HTTP response codes are 3-digit codes sent by an HTTP server in response to a request from an HTTP client.
- Response codes are categorized into five categories:
  - **1xx**: Informational
  - **2xx**: Success
  - **3xx**: Redirection
  - **4xx**: Client Error
  - **5xx**: Server Error
- The most commonly used response codes include:
  - **200 OK**: The request has been successfully processed.
  - **301 Moved Permanently**: The requested resource has been permanently moved to another URI.
  - **404 Not Found**: The requested resource was not found on the server.
  - **500 Internal Server Error**: An internal server error prevented the request from being processed successfully.

HTTP Configuration

- All configuration files for the httpd daemon are located in the directory:

  /etc/httpd/conf/

- The main configuration file is:

  httpd.conf

Web Servers

Web Servers

- HTTP is used to access websites.
- A website can provide any type of content (text files, HTML, Flash, media, zip...).
- Several Web servers that use HTTP are available, such as:
  - *Apache*
  - *Tomcat* (Apache J2EE)
  - *Sun Java Server*
  - *MS IIS* (Internet Information Server).

Apache Web Server

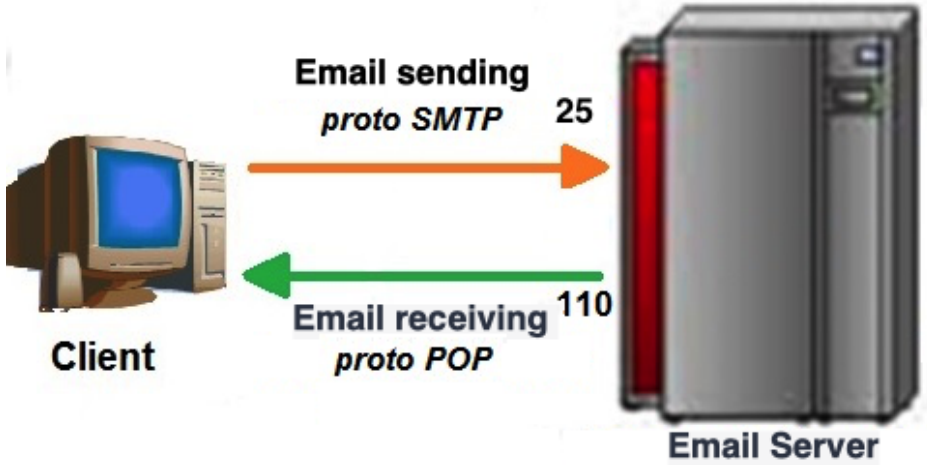
- **Apache** is a **free** HTTP server and is the most widely used.
- Apache is derived from the **httpd** daemon.
- It allows a machine to become a web server (also called WWW).

Advantages:

- Available on many Unix and Windows platforms.
- Extensible by third-party modules.

Email

- **Email** or Electronic mail is one of the most commonly used services on the internet, allowing a sender to send a message to one or more recipients.
- Also known as *Messaging Service* or *Mailing*.
- Email was invented by **Ray Tomlinson** in 1972.



How Email Works

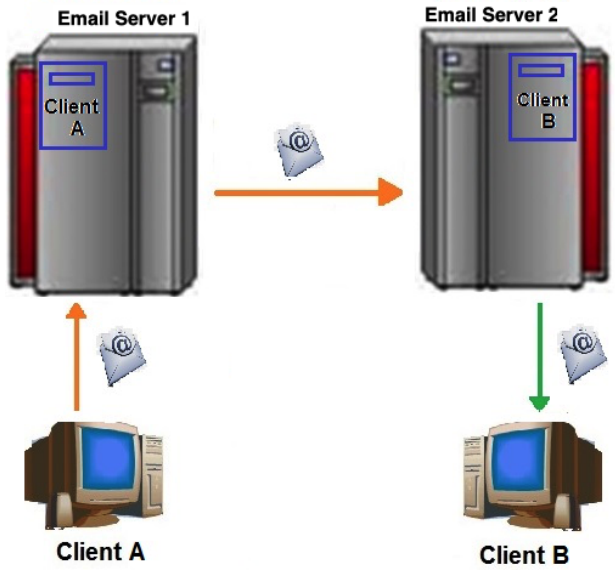
- **Email** uses the **Simple Mail Transfer Protocol** (SMTP) for sending messages and the **Post Office Protocol** (POP) or **Internet Message Access Protocol** (IMAP) for receiving messages.
- Messages are sent through a network of mail servers (SMTP) until they reach the recipient's mail server.
- The mail server stores the messages until the recipient retrieves them using a mail client (Outlook, Thunderbird, Gmail, etc.) that uses POP or IMAP.
- Email also uses Domain Name Systems (DNS) to resolve domain names into IP addresses for message routing.

Notion of messaging service

- At its core, it is a service for exchanging short texts (an electronic transfer of ASCII character files).
- *Extension* to transfers of any kind of files (in structure and content), often with a limitation on the *file size*.
- **Asynchronous** transmission: the sender and the receiver do not have to be connected at the same time.
- **Terminology:** email, electronic mail, e-mail, message, etc.

Operation

- The operation of email is based on the use of an **email mailbox**.
- When sending an email, the message is routed from server to server until it reaches the recipient's mail server.
- For security, mailbox access is protected by a *username* and *password*.



Operation

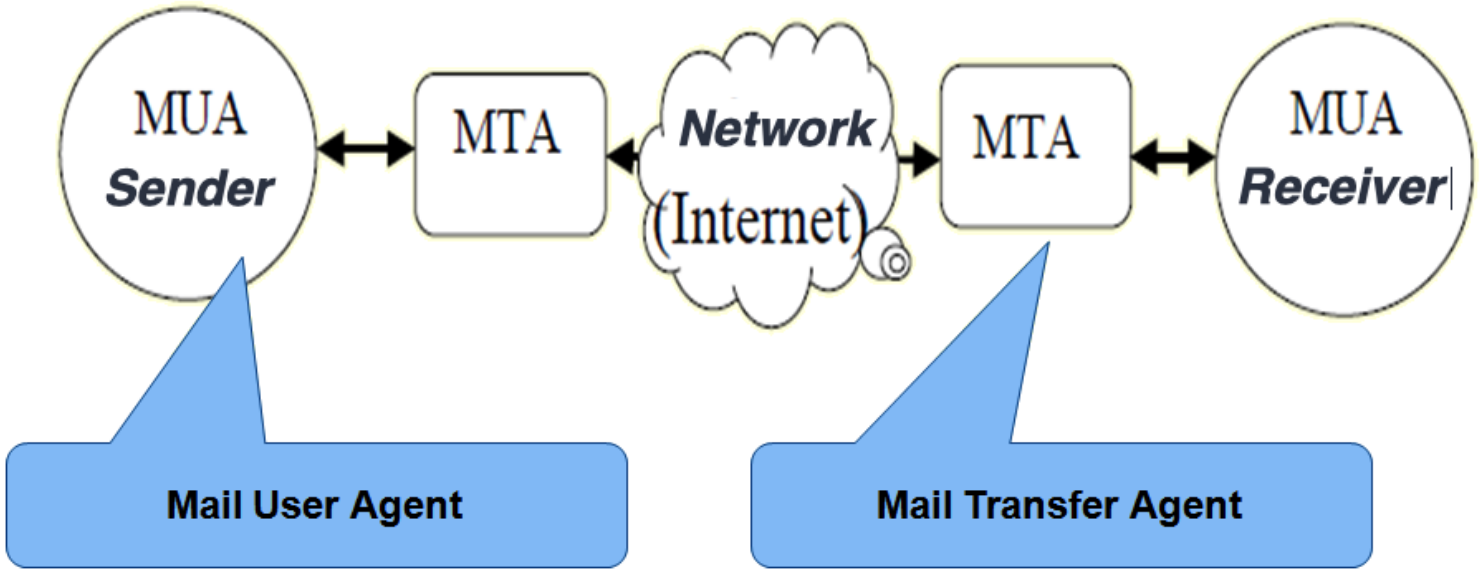
Functions

The functions of an email service are:

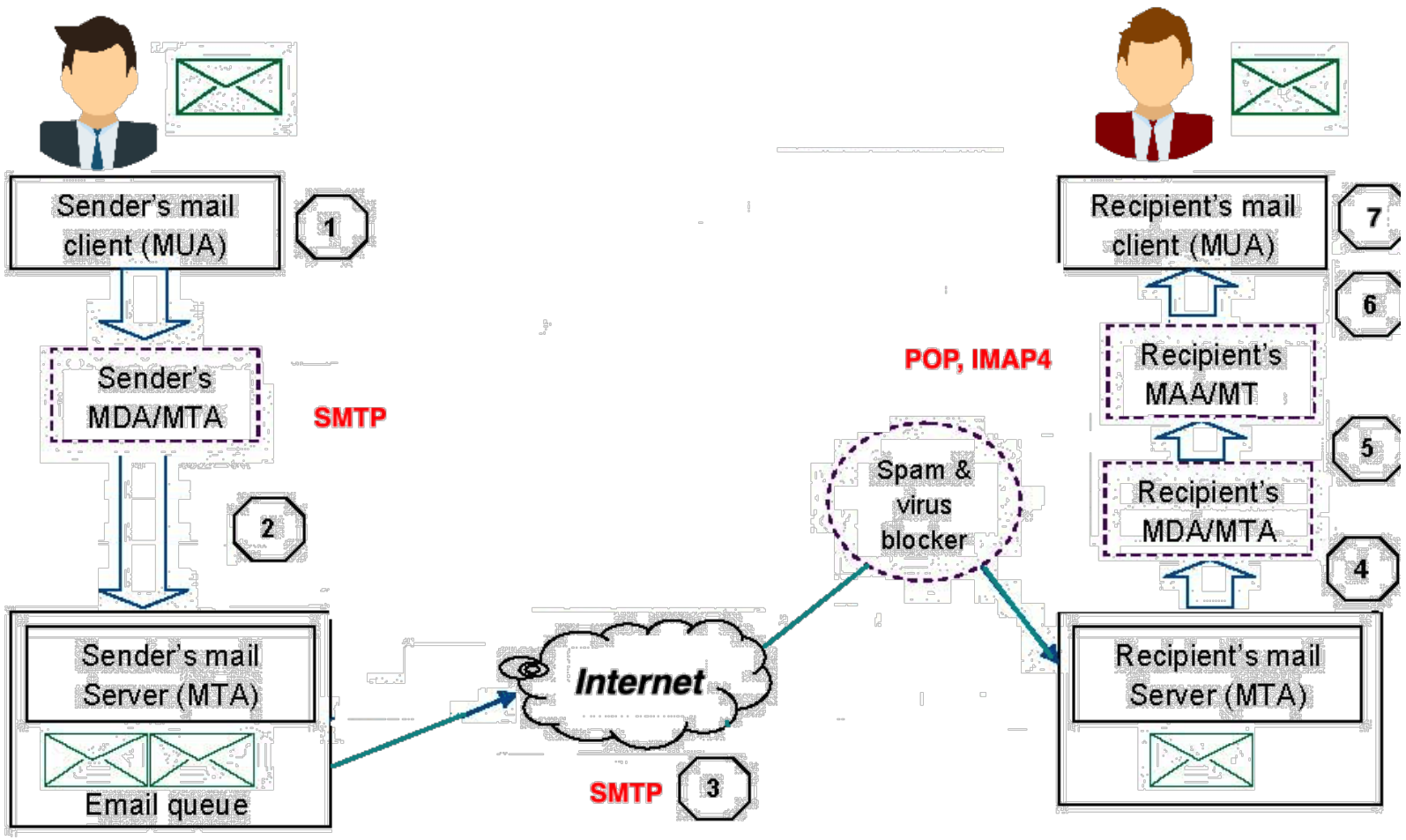
- *Designation*: defining an addressing system, sending to a recipient or a group of recipients.
- *Composing* the email.
- *Sending* the email.
- *Reading* the email: mailbox concept.
- *Managing archives* of emails.

Email Architecture

The email service provided by a server (*MTA: Mail Transfer Agent*) directly forwards a message between a sender and a recipient (*MUA*).



Email Architecture



Email Architecture

- 1: A user composes a message with the help of his email client (**MUA**: Mail User Agent).
- 2: The message is transmitted to the user's **MTA** (Mail Transfer Agent) (his mail server).
- 3: The message is forwarded to the recipient's mail server.
- 4: The server forwards the message to an **MDA** (Mail Delivery Agent).

Email Architecture

- 5: The **MDA** stores the mail in the recipient's mailbox.
- 6: On a request from the recipient, the messages are extracted from the mailbox by an **MAA** (Mail Access Agent) and forwarded to the recipient's email client. They are also stored in the client's mailbox.
- 7: The recipient views his messages using his email client (**MUA**).

Messaging Protocols

- **Simple Mail Transfer Protocol** (SMTP): The protocol based on *text* message format that defines exchanges between mail servers.
- **Post Office Protocol** (POP) : Basic *retrieval* protocol for dialogue between an MUA email client and a mail server in its *MAA* (Mail Access Agent) component.
- **Internet Message Access Protocol** (IMAP): Another retrieval protocol that offers *broader capabilities* than POP (management of email archives, limitation of exchanged data volumes...)

Email Address

- In the email service (senders or recipients), addresses are made up of two parts:

- The Domain Name System (DNS) is used to determine the mail servers for a domain (MX record).
- The names used for mailboxes can be arbitrary (size less than *64* bytes).

Free Mail Servers (MTA)

- **Sendmail** (since 1980), main author *Eric Allman*, latest version 8.14.7 (April 21, 2013), *40%* (may be less) usage, security and configuration issues.
- **Postfix** (since 2001) main author *Vietse Venema*, IBM Vmailer project, *5%* usage, fairly simple configuration.
- **Qmail** (since 1997) author *Dan Bernstein*, *8%* usage.

Proprietary Mail Servers

- Enterprise email software most often integrated into office suites or web servers.
- **Exchange/Internet Information Service** (Microsoft's common MTA for Exchange email and IIS web server) *20%*,
- Lotus **Notes/Domino** (IBM) *2%*,
- **IMAIL** (Ipswitch) *7%*.

Email Software: MUA

- When the **MUA** is software installed on the user's system, it is called a **mail client** such as Microsoft *Outlook*, *Eudora Mail*,...
- When it is a web interface that interfaces with the incoming mail server, it is called a webmail (Gmail, Hotmail, Yahoo mail...).
- For web interfaces, you need to **be connected** to compose or read messages + storage space constraints.

Conclusion

- The goal of this course was to introduce some network services that are often used by network users.
- **HTTP** (Web) and **Mail** services are the most used, but **FTP** service is still considered an efficient and reliable transfer service, and it is still configured for applications that require the transfer of large files.

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- M. Buck, P. Koetter, R. Hilderbandt, A. McDonald, D. Rusenko, C. Taylor, "Monter son serveur de mails sous Linux", Édition Eyrolles, 2006, ISBN10 : 2212119313.

Some useful links:

- La documentation officielle de vsftpd est disponible sur le site: http://vsftpd.beasts.org/
- http://www.commentcamarche.net
- www.developpez.com.