# M2. Application Layer

In the Internet Protocol Stack, What does the Application Layer do? Explain any two of the following protocols, HTTP, FTP, SMTP/POP3/IMAP, and DNS

## Application layer in the Internet Protocol Stack

The application layer is the first layer in the Internet Protocol Stack, this is where the network applications and their application layer protocols are.

* HTTP (Web documentation request and transfer)
* SMTP (transfer of e-mail messages)
* FTP (Transfer of files between two end system)
* DNS (domain name service)

Application-layer protocol is distributed over multiple end systems, with the application in one end system using the protocol to exchange packets of information with the application in another end system. We refer to this packet of information at the application layer as a message.

## FTP

File Transfer Protocol is used to transfer files between a user (at local host) and a remote host. The user must be identifies by the server using username and password (FTP can be public).

FTP uses TCP, like HTTP. FTP uses two TCP connections, a control connection and a data connection. Control is used for identifying the user, and for sending other control commands, like changing directory, and put/get. The data connection is used for moving the actual files – it is non-persistent, a new TCP connection is opened for every file.

Since FTP uses dual connections it is said that it sends control information out-of-band. Hence HTTP sends control information in-band.

## DNS

Two ways of identifying a host by either a hostname or an IP address. Humans prefer hostnames because they are easier to remember, than a number, while routers prefer fixed-length IP addresses.  
DNS translates hostnames to IP addresses, example [*www.someschool.edu*](http://www.someschool.edu)*/index.html*

1. User machine runs the client side of the DNS application
2. Browser extracts the hostname [*www.someschool.edu*](http://www.someschool.edu) from the URL, and sends it to the DNS client application.
3. DNS client sends a query with the hostname to the DNS server.
   1. DNS server searches for the hostname *someschool*  at the world wide web, on the topdomain *edu*
4. DNS server returns a package including the IP address to the hostname.
5. The browser can now establish a TCP connection to the HTTP server process located at port 80 at the IP address.