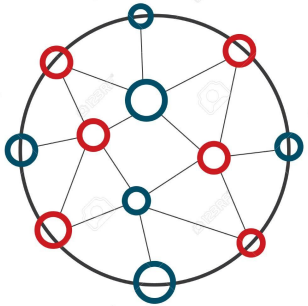

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Network | Main course

# Session 2 & 3

- Review
- Port
- Client-Server
- HTTP protocol
- Firewall

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www.maktabsharif.ir

# Review

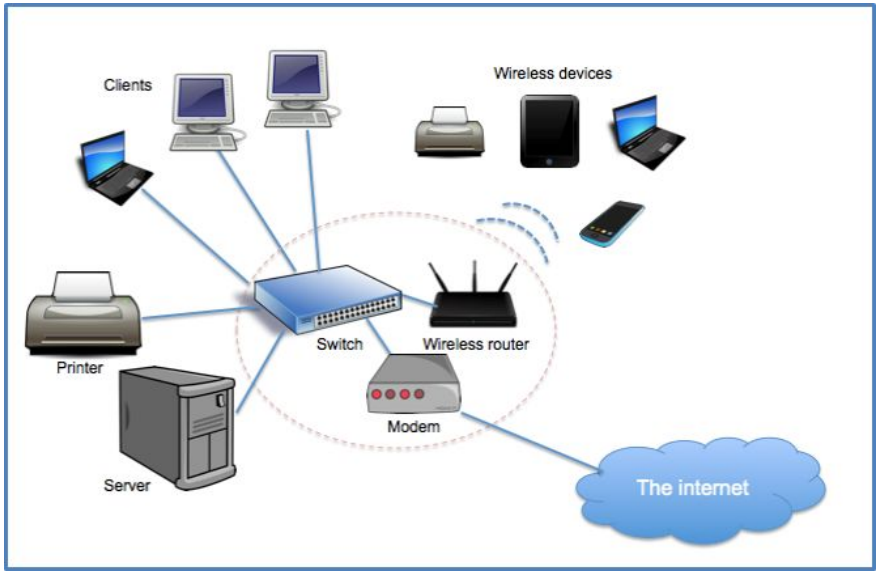
# Port

# Intro



## Port

In computer networking, a port is a communication endpoint.
At the software level, within an operating system, a port is a logical construct that identifies a specific process or a type of network service. A port is identified for each transport protocol and address combination by a 16-bit unsigned number, known as the port number.



# Port number



## Port Number

A port number is a 16-bit unsigned integer, **thus ranging from 0 to 65535.**

example

`192.168.1.1:8000`

| Number | Assignment |
|---|---|
| 20 | File Transfer Protocol (FTP) Data Transfer |
| 21 | File Transfer Protocol (FTP) Command Control |
| 22 | Secure Shell (SSH) Secure Login |
| 23 | Telnet remote login service, unencrypted text messages |
| 25 | Simple Mail Transfer Protocol (SMTP) E-mail routing |
| 53 | Domain Name System (DNS) service |
| 67, 68 | Dynamic Host Configuration Protocol (DHCP) |
| 80 | Hypertext Transfer Protocol (HTTP) used in the World Wide Web |
| 110 | Post Office Protocol (POP3) |
| 119 | Network News Transfer Protocol (NNTP) |
| 123 | Network Time Protocol (NTP) |
| 143 | Internet Message Access Protocol (IMAP) Management of digital mail |
| 161 | Simple Network Management Protocol (SNMP) |
| 194 | Internet Relay Chat (IRC) |
| 443 | HTTP Secure (HTTPS) HTTP over TLS/SSL |

# Scan open ports



## Netstate

Run this command:

**`netstat -lnut`**

## Nmap

Install nmap and scan your ports:

**`nmap localhost`**

Also, you can scan other websites or hosts:

**`nmap google.com`**

```
m-tehrani@MohammadAmin:~$ netstat -lnut
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp        3      0 0.0.0.0:8000            0.0.0.0:*               LISTEN
tcp        3      0 0.0.0.0:1234            0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN
tcp6       0      0 ::1:631                 :::*                    LISTEN
tcp6       0      0 127.0.0.1:9614          :::*                    LISTEN
tcp6       0      0 :::80                   :::*                    LISTEN
```

```
m-tehrani@MohammadAmin:/var/www/html$ nmap localhost
Starting Nmap 7.80 ( https://nmap.org ) at 2021-05-07 00:08 +0430
Nmap scan report for localhost (127.0.0.1)
Host is up (0.000063s latency).
Not shown: 996 closed ports
PORT     STATE SERVICE
80/tcp   open  http
631/tcp  open  ipp
1234/tcp open  hotline
8000/tcp open  http-alt

Nmap done: 1 IP address (1 host up) scanned in 0.06 seconds
```

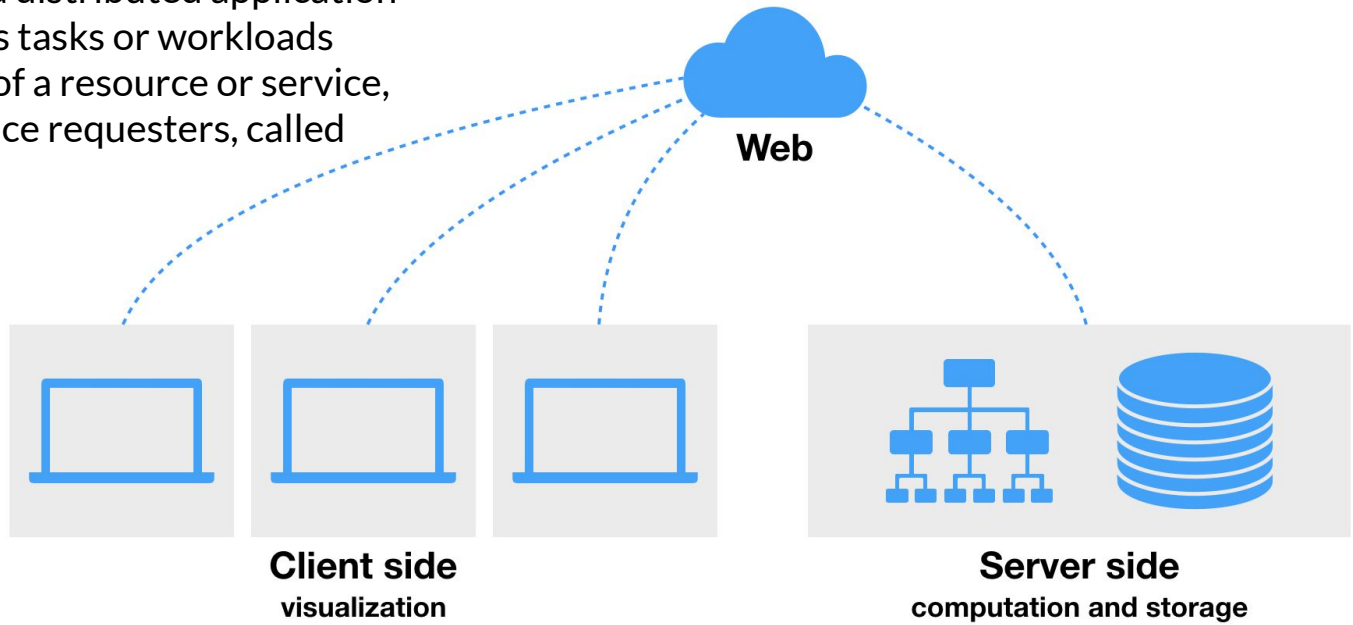
# Client-Server


# Intro



## Client-Server model

Client–server model is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients.



# Client & Server

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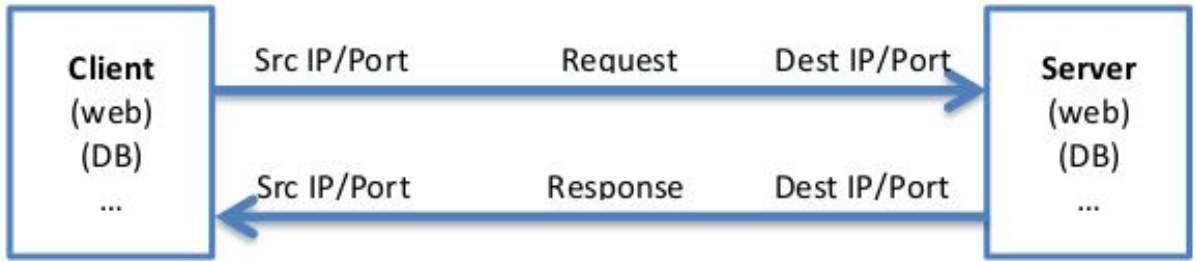
## Client

The **client** side (user side) of the Web. A Web client typically refers to the Web browser in the user's machine or mobile device.

## Server

A **server** is a computer that provides data to other computers. It may serve data to systems on a local area network (LAN) or a wide area network (WAN) over the Internet.




A Machine (Device) can be a server and a client simultaneously.

# Request & Response

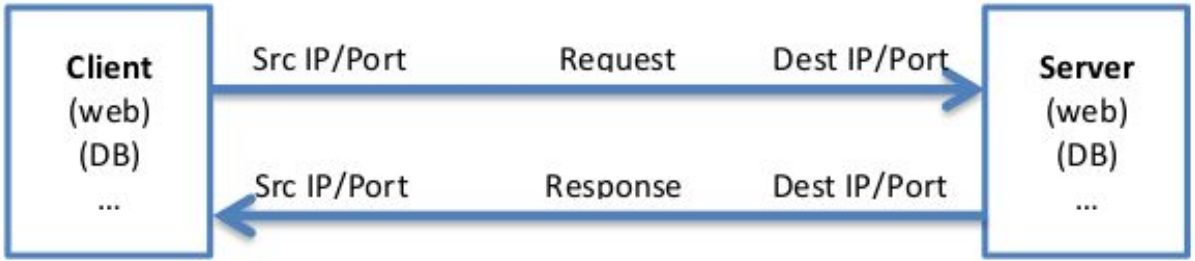


## Request

A client is the **requesting** program or user in a client/server relationship. For example, the user of a Web browser is effectively making client requests for pages from servers all over the Web. ... The computer handling the request and sending back the HTML file is a server.

## Response

A Server handling the request and sending back a **Response.**

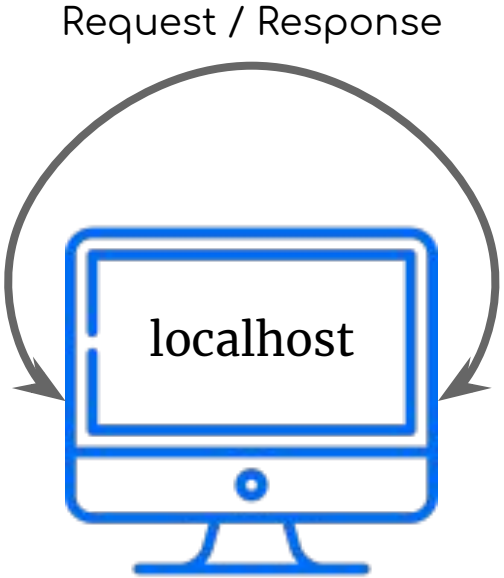


# Localhost



## Localhost

When you send a request to **localhost,** you are actually requesting your self, then you get a response from yourself. So **you are both the client and the server.**



# Web servers



## Web server

A web server is computer software and underlying hardware that accepts requests via HTTP, the network protocol created to distribute web pages, or its secure variant HTTPS.

## Web server software

A web server is software that uses HTTP (Hypertext Transfer Protocol) and other protocols to respond to client requests made over the World Wide Web.  Web servers are used in web hosting, or the hosting of data for websites and web-based applications.

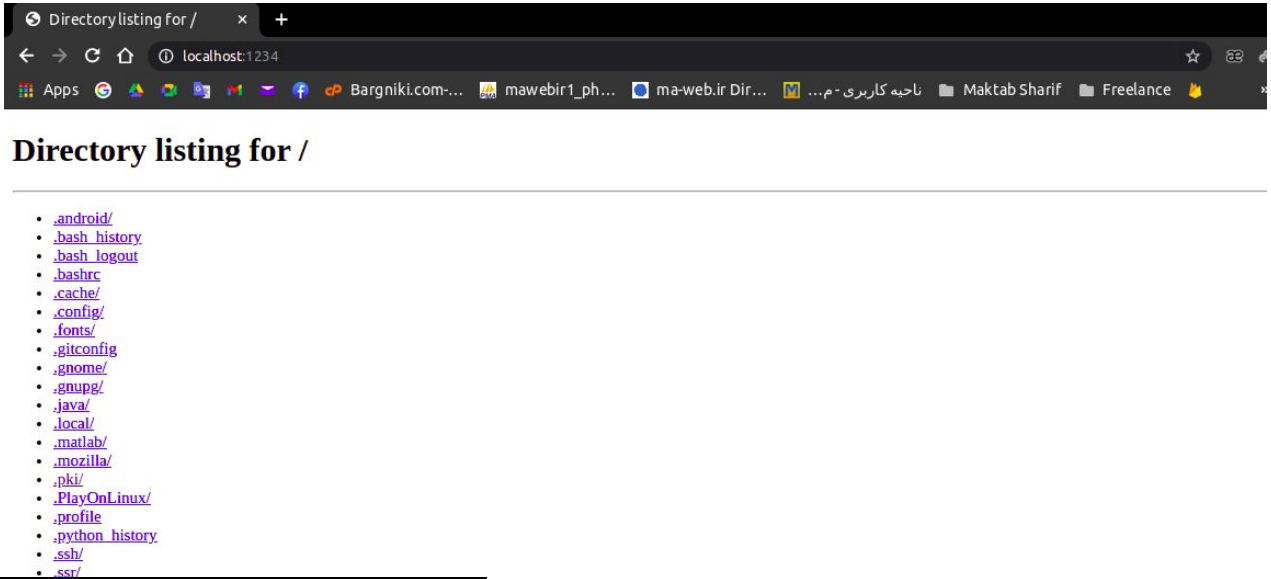
- Apache
- Nginx
- IIS
- CherryPy
- ...

# Run a server on localhost using python



## Python http server

```
python -m http.server
```




```
m-tehrani@MohammadAmin:~$ python3 -m http.server 1234
Serving HTTP on 0.0.0.0 port 1234 (http://0.0.0.0:1234/) ...
```

# Wireshark utility

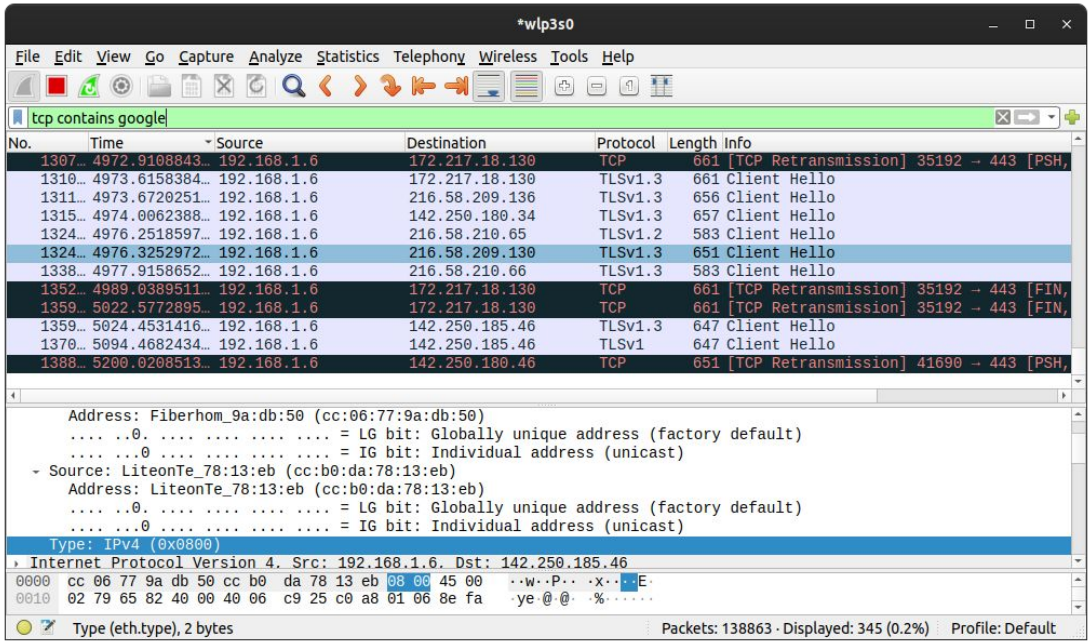


## Python http server

**Wireshark** is a free and open-source packet analyzer. It is used for network troubleshooting, analysis, software and communications protocol development, and education. Originally named Ethereal, the project was renamed Wireshark in May 2006 due to trademark issues.

Download page

Debian-based package install:
**sudo apt install wireshark**



# HTTP protocol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# Intro

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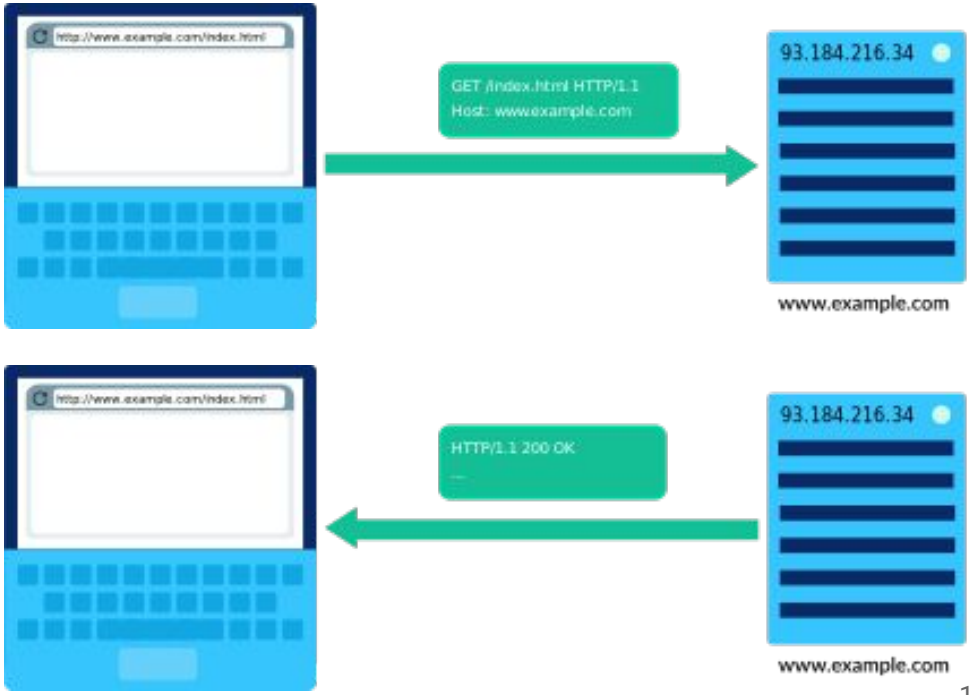
## HTTP stands for

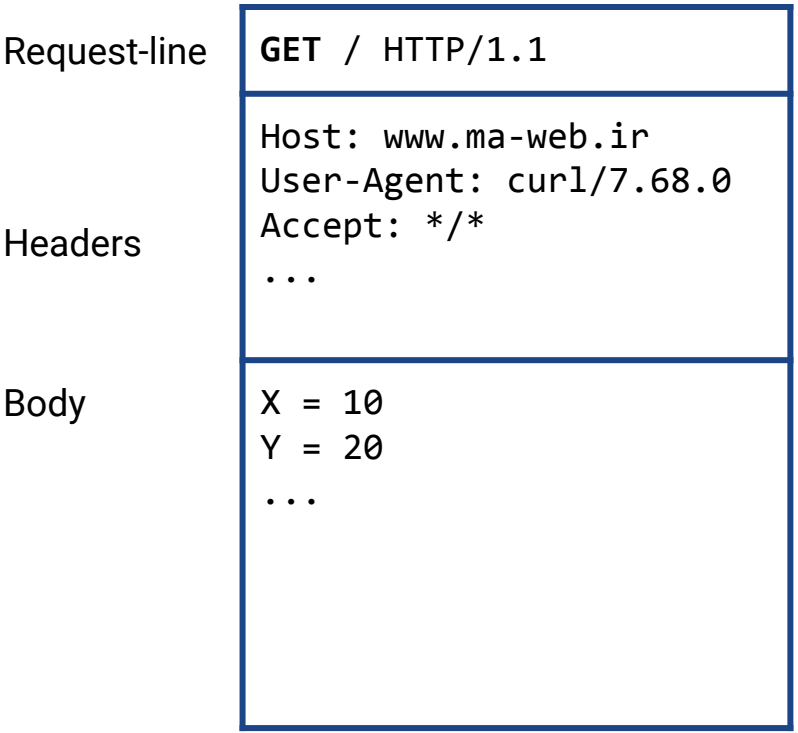
The **HyperText Transfer Protocol (HTTP)** is an application layer protocol for distributed, collaborative, hypermedia information systems.

HTTP is the foundation of data communication for the World Wide Web, where hypertext documents include hyperlinks to other resources that the user can easily access, for example by a mouse click or by tapping the screen in a web browser.



# HTTP Requests & Responses






Http Request example:

```
> GET / HTTP/1.1
> Host: www.ma-web.ir
> User-Agent: curl/7.68.0
> Accept: */*
```

Http Response example:

```
< HTTP/1.1 200 OK
< Connection: Keep-Alive
< Content-Type: text/html
< Last-Modified: Thu, 06 May 2021 19:15:27 GMT
< Etag: "48-6094404f-cc13dc659683674a;;;"
< Accept-Ranges: bytes
< Content-Length: 72
< Date: Fri, 07 May 2021 04:23:04 GMT
< Vary: User-Agent
<
* Connection #0 to host www.ma-web.ir left intact
A <snap style="color:blue">HTTP</snap> Test Page for maktab 52
students!
```

# Method



## GET

The GET method requests a representation of the specified resource. Requests using GET should only retrieve data.

## POST

The POST method is used to submit an entity to the specified resource, often causing a change in state or side effects on the server.

## Other http methods:

- PUT
- PATCH
- DELETE
- OPTION
- CONNECT
- HEAD

# cURL



## cURL

**cURL** is a computer software project providing a library and command-line tool for transferring data using various network protocols. The name stands for "Client URL", which was first released in 1997.

Commands:

- curl -h
- curl (your_url)
- curl -v (your_url)
- curl --request (method) (your_url)

```
m-tehrani@MohammadAmin:~$ curl ma-web.ir
A <snap style="color:blue">HTTP</snap> Test Page for
maktab 52 students!
```

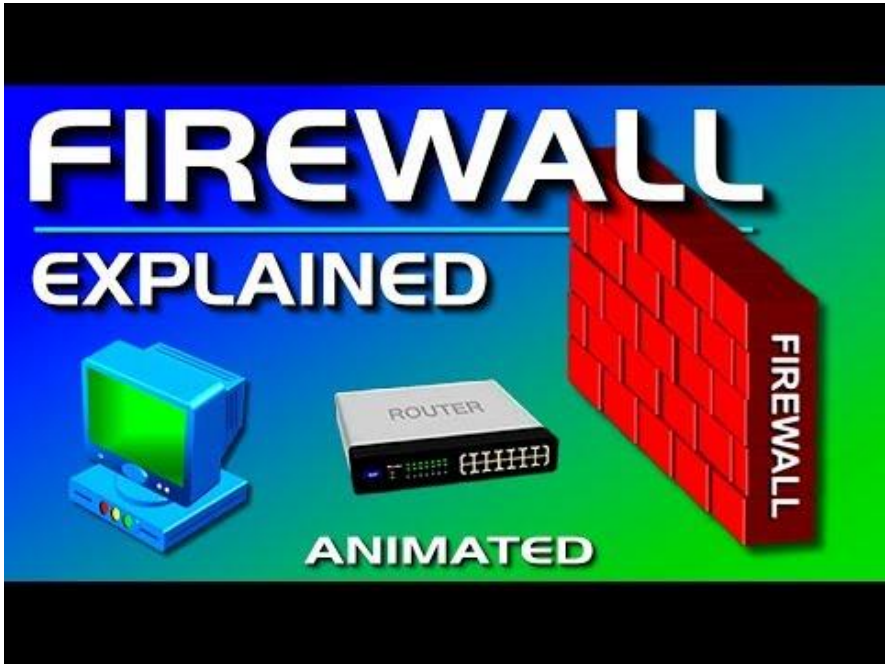
```
m-tehrani@MohammadAmin:~$ curl -v ma-web.ir
*   Trying 185.94.96.2:80...
* TCP_NODELAY set
* Connected to ma-web.ir (185.94.96.2) port 80 (#0)
> GET / HTTP/1.1
> Host: ma-web.ir
> User-Agent: curl/7.68.0
> Accept: */*

< HTTP/1.1 200 OK
< Connection: Keep-Alive
< Content-Type: text/html
...
```

# Firewall


# Intro



A firewall is a system designed to prevent unauthorized access to or from a private network. You can implement a firewall in either hardware or software form, or a combination of both. Firewalls prevent unauthorized internet users from accessing private networks connected to the internet, especially intranets.



# Windows firewall

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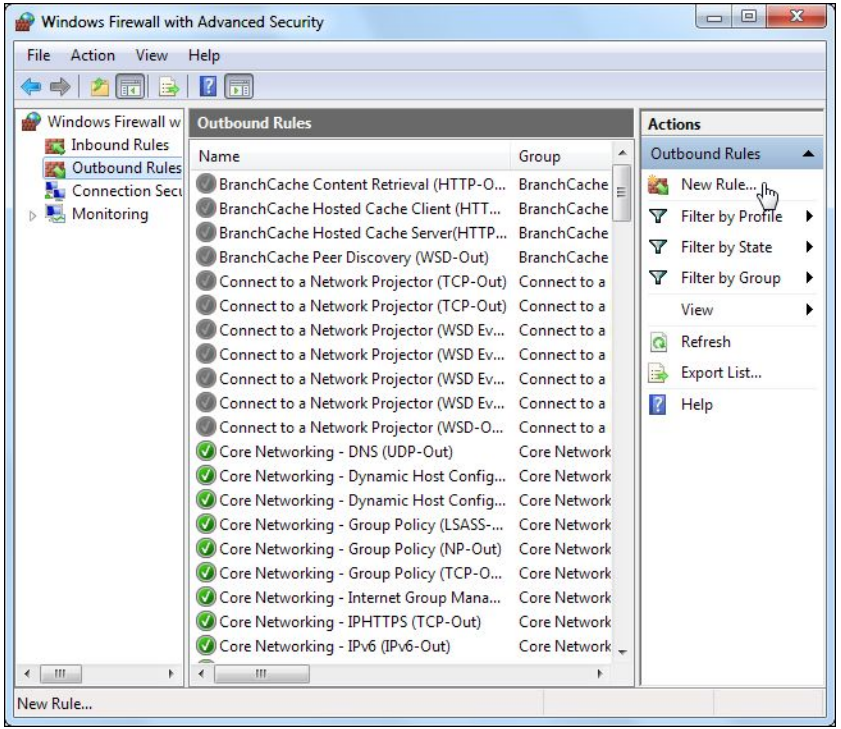
Windows Firewall, is a firewall component of Microsoft Windows. It was first included in Windows XP and Windows Server 2003. Prior to the release of Windows XP Service Pack 2 in 2004, it was known as Internet Connection Firewall.



# Uncomplicated Firewall



Uncomplicated Firewall is a program for managing a netfilter firewall designed to be easy to use. It uses a command-line interface consisting of a small number of simple commands, and uses iptables for configuration.

```
m-tehrani@MohammadAmin:~$ ufw help

Usage: ufw COMMAND

Commands:
 enable                          enables the firewall
 disable                         disables the firewall
 default ARG                     set default policy
 logging LEVEL                   set logging to LEVEL
 allow ARGS                      add allow rule
 deny ARGS                       add deny rule
 reject ARGS                     add reject rule
 limit ARGS                      add limit rule
 delete RULE|NUM                 delete RULE
 insert NUM RULE                 insert RULE at NUM
 route RULE                      add route RULE
 route delete RULE|NUM           delete route RULE
 route insert NUM RULE           insert route RULE at NUM
 reload                          reload firewall
 reset                           reset firewall
 ...
```

# Pre-reading

Search about:

1. * Port
2. Client-Server model
3. Run server on Linux (Apache)