Lesson 1 Introduction to Web

September 8, 2020

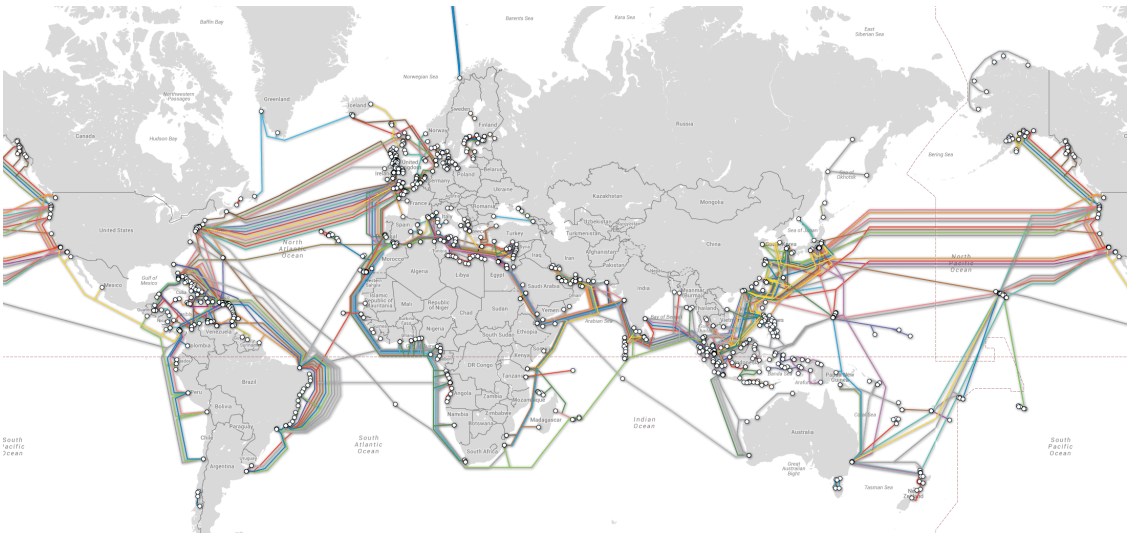
1 Introduction to Web

1.1 Agenda

- Internet and TCP/IP Protocol Suite
- IP Addresses
- The World Wide Web
- Client-Server Architecture
- Protocols: DNS, HTTP
- Web Browser
- Developer Tools

1.2 Internet and TCP/IP Protocol Suite

Internet = a global network of computers that enables them to send one another small packets of digital data



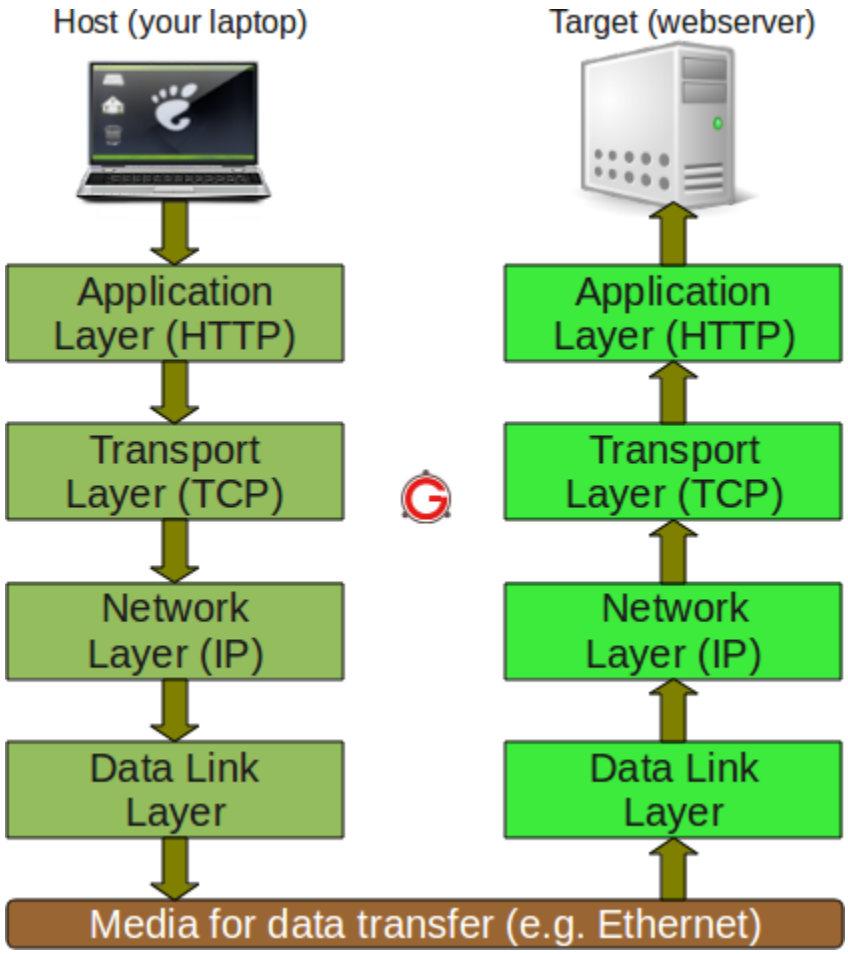
Only submarine cables

Originated from ARPAnet in the 1960s

Can send various types of data, like web pages, email messages, and large files that might be digital videos, music files or computer programs.

Uses the TCP/IP protocol suite to enable communication

Protocol suites have a layered architecture. Each layer depicts some functionality which can be carried out by a protocol. TCP / IP is the most widely known and used protocol suite. It has four layers



Application Layer Includes applications or processes that use transport layer protocols to deliver the data to destination computers

Protocols:

- HTTP (HyperText TransferProtocol) & HTTPS (HTTP Secure)
- FTP (File Transfer Protocol)
- SMTP (Simple Mail Transfer Protocol)

Transport Layer Provides backbone to data flow between two hosts

Protocols:

- TCP = Transmission Control Protocol. TCP is responsible for breaking data down into small packets before they can be sent over a network, and for assembling the packets again
- UDP = User Datagram Protocol

Network Layer Also called Internet Layer. Handles the movement/routing of data on network.

Protocols:

- IP = Internet Protocol

  IP is responsible for addressing, sending and receiving the data packets over the Internet

All computers connected to internet have an IP address.

- How to finde it?
- How dose it look like?

Data Link Layer Also called Network Interface Layer

Normally consists of **device drivers in the OS** and the **network interface card** attached to the system

Protocols

- ARP (Address Resolution Protocol)
- PPP (Point to Point Protocol)

1.3 IP Addresses

A unique string of numbers separated by full stops/colons that identifies each computer using the Internet Protocol to communicate over a network

- IPv4

  4 numbers from 0-255 separated by full stops

  Example: 192.168.56.17

- IPv6

  8 groups of 4 hexadecimal digits (numbers from 0 - 221241855) separated by colons

  Example: 2a04:2413:8100:8080:d4d2:c098:514d:e7b2

1.4 The World Wide Web

Video: TED - What is the world wide web? - Twila Camp

World Wide Web is an information system on the Internet which allows documents to be connected to other documents by hypertext links, enabling the user to search for information by moving from one document to another.

`WWW` is based on 3 main technologies:

- HTML: HyperText Markup Language
- URI: Uniform Resource Identifier
  - URL & ISBN
- HTTP: Hypertext Transfer Protocol

Uniform Resource Locator (URL) The URL is a specialised URI that also indicates how to acces a specific resource

A reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it

1. https is the scheme
2. semicolon and two slashes (://) separate the scheme from the machine/domain name
3. scoalainformala.ro is the machine/domain name.
4. single slash (/) separates the name from the path
5. oras/cluj-napoca/ is the path
6. question mark (?) separates the path from query

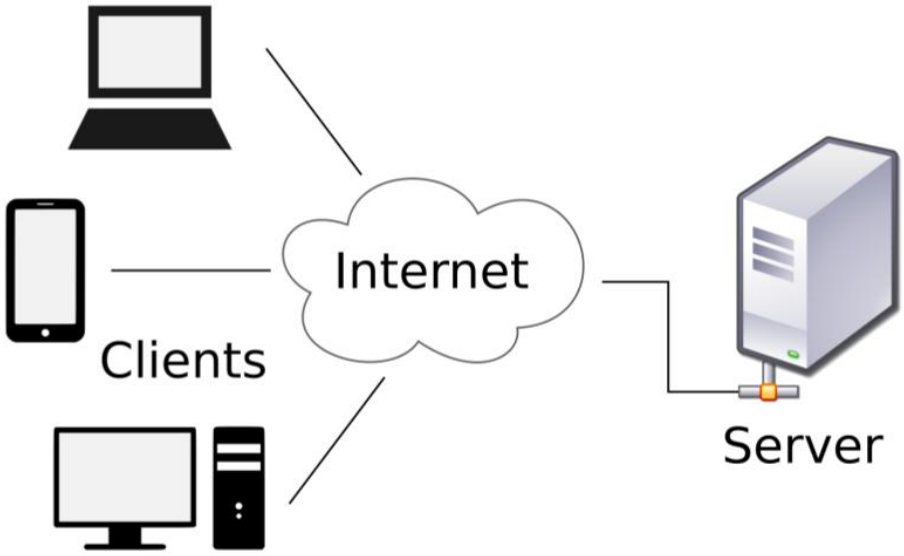
7. nivel=specializare is the query (which are key-value pairs separated by &. Ex: key1=value1&key2=value2)
8. hashtag (#) separates the query from fragment
9. not_from_here is the fragment

1.5 Client-Server Architecture

1. A client is making a request to a server
2. The server processes the request, and sends a response back to the client

Examples:

- Desktop application to database server communication
- Browser to web server communication
- Mobile to server communication



1.5.1 Multy Layer Architecture

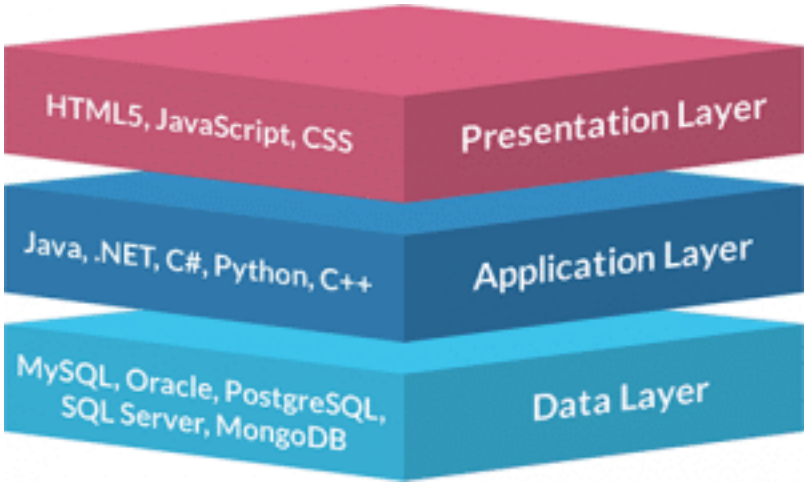
3-layer architecture:

- Presentation / GUI
- Business Logic / Application
- Data

E.g.: web and mobile apps

- Presentation = Application topmost level which users can access directly. Display information from other layers and communicates with business layer

- Business / Application = Controls application functionality by performing detailed processing between the two surrounding layers
- Data = Provides data persistence (store and retrieve) mechanisms to database servers. Information is sent to business logic layer for processing and eventually back to the user.



Frontend code is concerned with the first layer (Presentation) and the backend code is concerned with the second and third layer (Application and Data)

1.6 Protocols: DNS, HTTP

DNS is the Internet's equivalent of a phone book

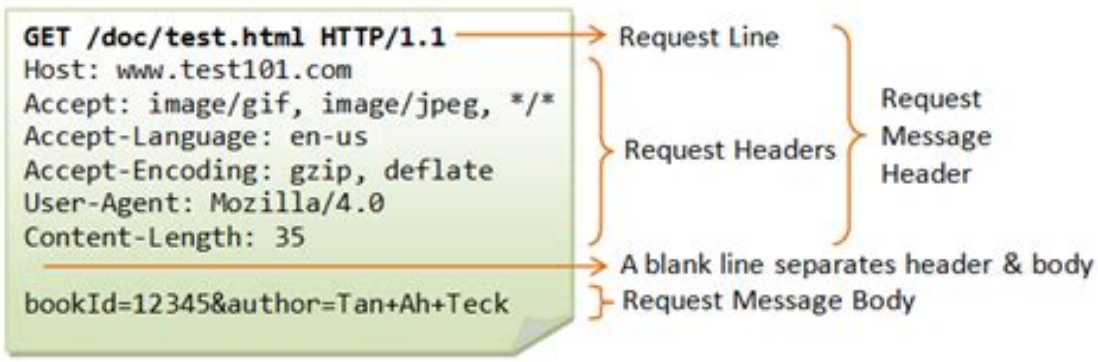
- Domain Name Servers maintain a directory of domain names and translate them to Internet Protocol (IP) addresses

HTTP Requests

A request message sent by a client consists of:

- Request line – request method, resource URI, and protocol version
- Request headers – additional parameters
- Body – optional data

E.g. posted form data, files, etc



A set of HTTP request methods indicate the desired action to be performed for a given resource. These request methods are sometimes referred to as HTTP verbs

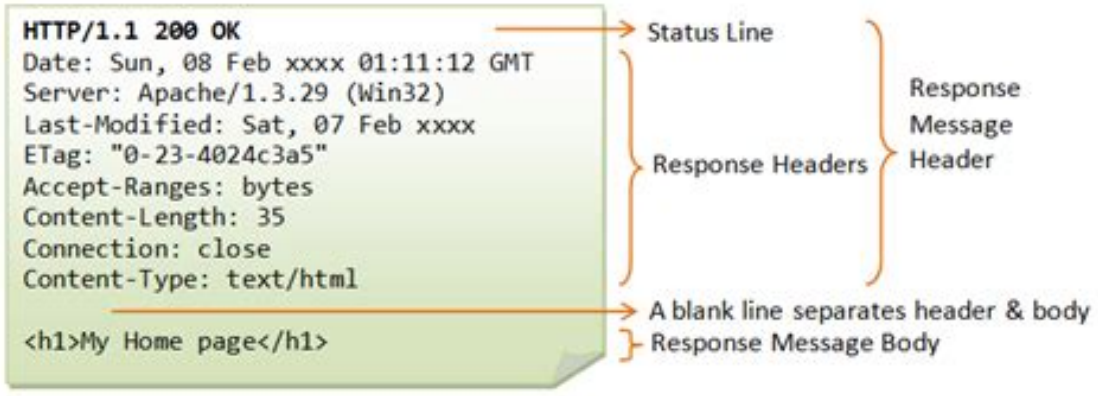
The most common request methods are mapped on CRUD:

- Create - HTTP POST
- Read - HTTP GET
- Update - HTTP PUT
- Delete - HTTP DELETE

HTTP Response

A response message sent by a server consists of

- Status line – protocol version, status code, status phrase
- Request headers – metadata
- Body – the contents of the response (the requested resource)



HTTP response status codes indicate whether a specific HTTP request has been successfully completed. They are grouped in five classes:

- Informational - 1xx (100 Continue)
- Successful - 2xx (200 Success, 201 Created, 204 No Content)
- Redirects - 3xx (302 Found, 304 Not Modified)
- Client errors - 4xx (400 Bad Request, 401 Unauthorized, 404 Not Found)

- Server errors - 5xx (500 Internal Server Error, 503 Service Unavailable)

1.7 Web Browser

A web browser is a client-side software application for retrieving, presenting and traversing information resources on the WWW. Most popular browsers are:

- Google Chrome
- Mozilla Firefox
- Microsoft Internet Explorer
- Microsoft Edge
- Apple Safari
- Opera

1.8 Developer Tools Demo