

# Web Design & Programming

**History and Concepts**

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# History of the World Wide Web

- Created
  - by Tim Berners-Lee
  - at CERN (Centre Européen pour la Recherche sur le Nucléaire)
  - in Switzerland
  - in 1989 (officially announced in 1991)
- The goal was to easily share documents between computers.
- T. Berners-Lee moved to MIT and founded the World Wide Web Consortium (W3C) in 1994; he is still director of the organization.

# What about the Internet?

- The World Wide Web is not the Internet, it is build on top of it.
- The Internet is older (1974), using technologies created by various other people (Vint Cerf, Bob Kahn, Jon Postel, ...).
- The Internet was not really “visible” to the general public before the World Wide Web.

# Arpanet

- Advanced Research Projects Agency Network
- Founded by ARPA for the Department of Defense in 1969.
- Using packet switching, and later implementing TCP/IP.
- It has been expanded to academic and research organizations, spitted from the military network, and then became the Internet.

# Opening Internet to the General Public

- During the 1990s more services appeared on the web, more applications became available and more people got connected.
- At the end of the 1990s and beginning of 2000 the “dot-com bubble” burst, many companies and organizations changed their online strategy.

# Internet US Milestones

- High Performance Computing and Communication Act – 1991 – Al Gore
- The first web server outside Europe was installed at Stanford University in 1992.
- NCSA Mosaic, the first popular web browser in 1993, developed by the National Center for Supercomputing Applications at the University of Illinois.
- The White House web site was launched in 1994.

# Few other dates

- 1994: Amazon, Yahoo
- 1995: Altavista, eBay
- 1998: Google, MSN Search, Pets.com
- 2001: Wikipedia
- 2004: Facebook
- 2005: YouTube
- 2006: Twitter



# Web 2.0

- Term invented in 1999 by Darcy DiNucci, then popularized in the early 2000s.
- Marks a difference between static web content and dynamic web content, including some generated by the end-users.
- Shows more cooperation and interaction between service providers and end-users.

# Responsive Web Design

- Term defined by Ethan Marcotte in 2010.
- To “*embed standards-based technologies into our designs to make them not only more flexible, but more adaptive to the media that renders them*”.
- The same HTML and CSS code should be used to render a web page on devices with various screen sizes.

Source:

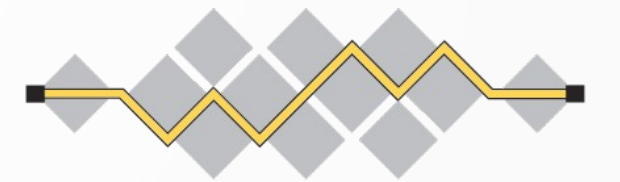
<https://alistapart.com/article/responsive-web-design/>

# The Internet as of today...

- E-business, e-administration, e-learning, ...
- Social networks, User Generated Content (UGC)
- Entertainment
- Political content and activities; censorship
- Industrial control, Internet of Things (IoT)
- Mobile access (Wi-Fi, 4G/5G, ...)
- ...

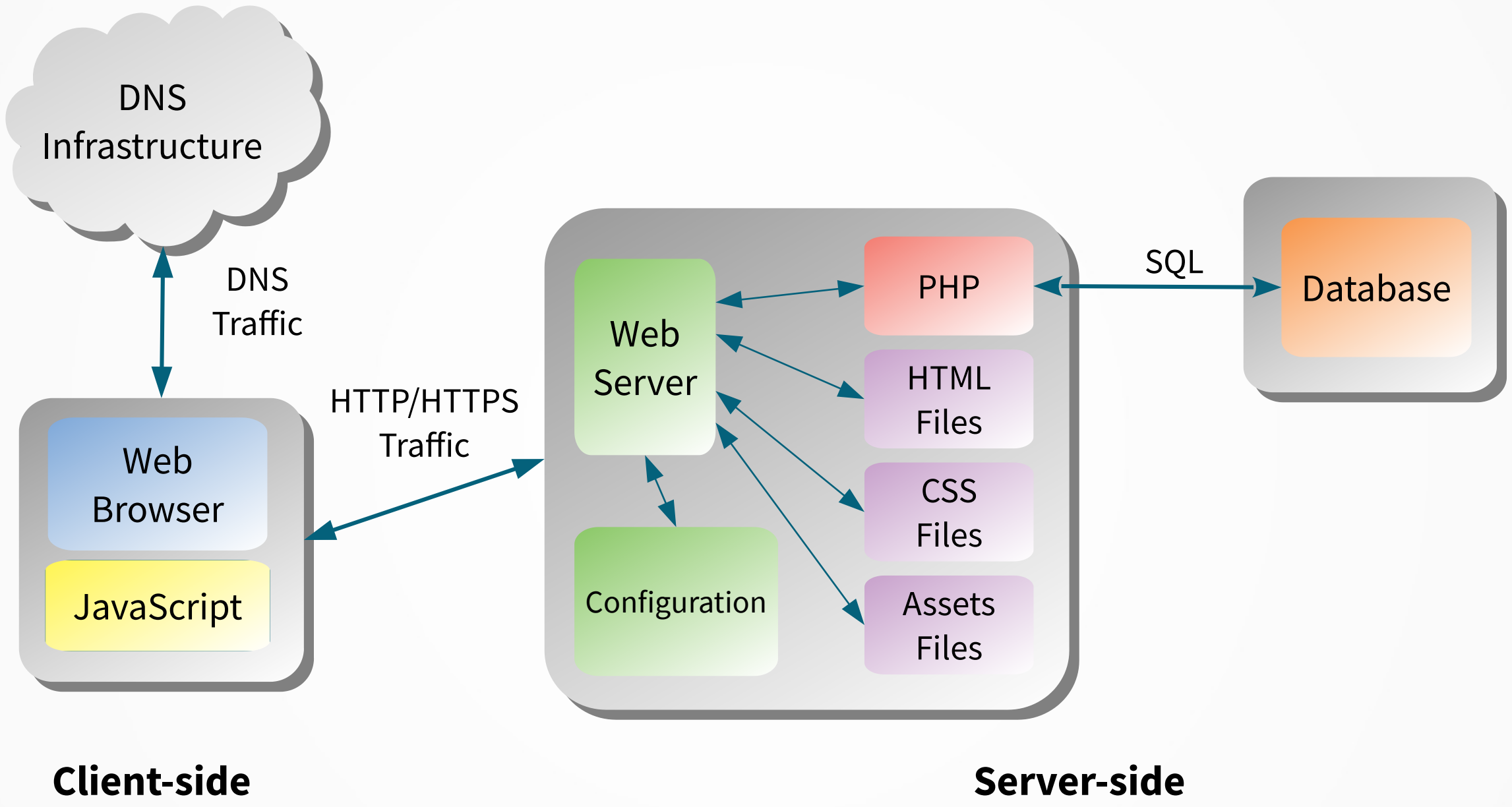
# Organizations

- **RFC: Request For Comments.** Documentation (mostly technical) about the protocols used on the Internet, some becoming official standards
- **IETF: Internet Engineering Task Force.** Volunteers organized in Working Groups, writing RFCs.
- **W3C: World Wide Web Consortium.** Standard organization focused on web technologies.



**I E T F**<sup>®</sup>

**W3C**<sup>®</sup>



**Client-side**

**Server-side**

# Clients

- Graphical desktop browsers (Google Chrome, Mozilla Firefox, Apple Safari, Microsoft Edge, ...)
- Graphical mobile/specialized browsers (Amazon Silk, Samsung Internet, ...)
- Text-based browsers (Lynx, ...)
- Specialized browsers (Braille, text-to-speech)
- HTTP utilities (curl, wget, ...) and scripting languages
- Search engines (crawler, spider)
- Various applications (HTTP being used as “generic protocol”)

# Rendering Engine

- The rendering engine is the core of the web browser, that will display the HTML and CSS code.
- Few engines are in use:
  - Apple WebKit (forked from KHTML from the KDE project)
  - Google Blink
  - Mozilla Gecko
  - Microsoft Trident and EdgeHTML

# JavaScript Engine

- The JavaScript Engine will execute the JavaScript code present in a page.
- Most important engines in use:
  - Apple JavaScriptCore
  - Google V8
  - Mozilla SpiderMonkey
  - Microsoft Chakra



# Web Browser Features

- Memory cache, browsing history
- User-Agent String
- Automatic updates (“evergreen browser”)
- Web technologies support
- Identity and privacy support

# URL

- Uniform Resource Locator
- An URL is a specific type of URI (Uniform Resource Identifier)
- An URL is needed for an absolute link; it can point to a non-web resource (email address or phone number for instance)
- An URL can be using international characters
- Special characters can be encoded using percent encoding method (%25 for the ‘%’ character for instance)

# URL Details

<https://user:password@server.example.com:8080/directory/index.php?q=token&s=individual#reference>

<b>Scheme</b>	https
<b>Credential</b>	user:password
<b>Subdomain</b>	server
<b>Domain</b>	example.com
<b>Host</b>	server.example.com
<b>Port</b>	8080
<b>Resource path</b>	directory/index.php
<b>Query string</b>	?q=token&s=individual
<b>Fragment</b>	#reference

# HTTP

- Hyper Text Transfer Protocol
- Text-oriented protocol
- Stateless protocol
- Requests from the client, responses from the server
- Request methods
- Responses headers



# HTTP Specifications

- First version was “HTTP 0.9”
- HTTP/1.0: first official RFC (RFC 1945 -May 1996)
- All RFC related to HTTP were updated in June 2022 (RFC 9110, 9112, 9113 and 9114).
- HTTP over TLS (HTTPS): RFC 2818 (May 2000); RFC 8446 (August 2018) for TLS 1.3

# Network Ports

- HTTP: TCP/80
- HTTPS: TCP/443
- Common Alternative ports: TCP/8008, TCP/8080

# HTTP Status Codes

- Informational: 1xx
- Success: 2xx
  - 200: OK
- Redirection: 3xx
  - 301 Moved Permanently
- Client Error: 4xx
  - 401 Unauthorized
  - 403 Forbidden
  - 404 Not Found
- Server Error: 5xx
  - 500 Internal Server Error
  - 503 Service Unavailable

Full list available at:

<https://www.iana.org/assignments/http-status-codes/http-status-codes.xhtml>

# HTTP Requests Methods

- GET: used to retrieve data
- POST: used to send data (typically with forms)
- HEAD: similar to GET, without the data body
- and others, less common



# robots.txt

- The robots.txt is a text file that be set at the root of a website, with instructions to block search engines from browsing and referencing some specific pages or directories.
- This will not block requests to the pages or directories, this file does not provide any enforcable security mechanism.
- See <https://www.robotstxt.org/> for more details.

# Cookies

- Cookies are additional pieces of data (not part of a web page) sent by the server to the client where it is stored.
- Cookies are used to work around the fact of HTTP being stateless, information can be kept between visits.
- Cookies are usually used for session management, customization and tracking.

# HTTP Compression

- If a client announces that it support compression the server can then send compressed content to save bandwidth.
- Filtering can be set to compress only files of a certain type (usually text files, not images).

- **IETF Logo: Wikimedia Commons**

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