Web Programming Introduction
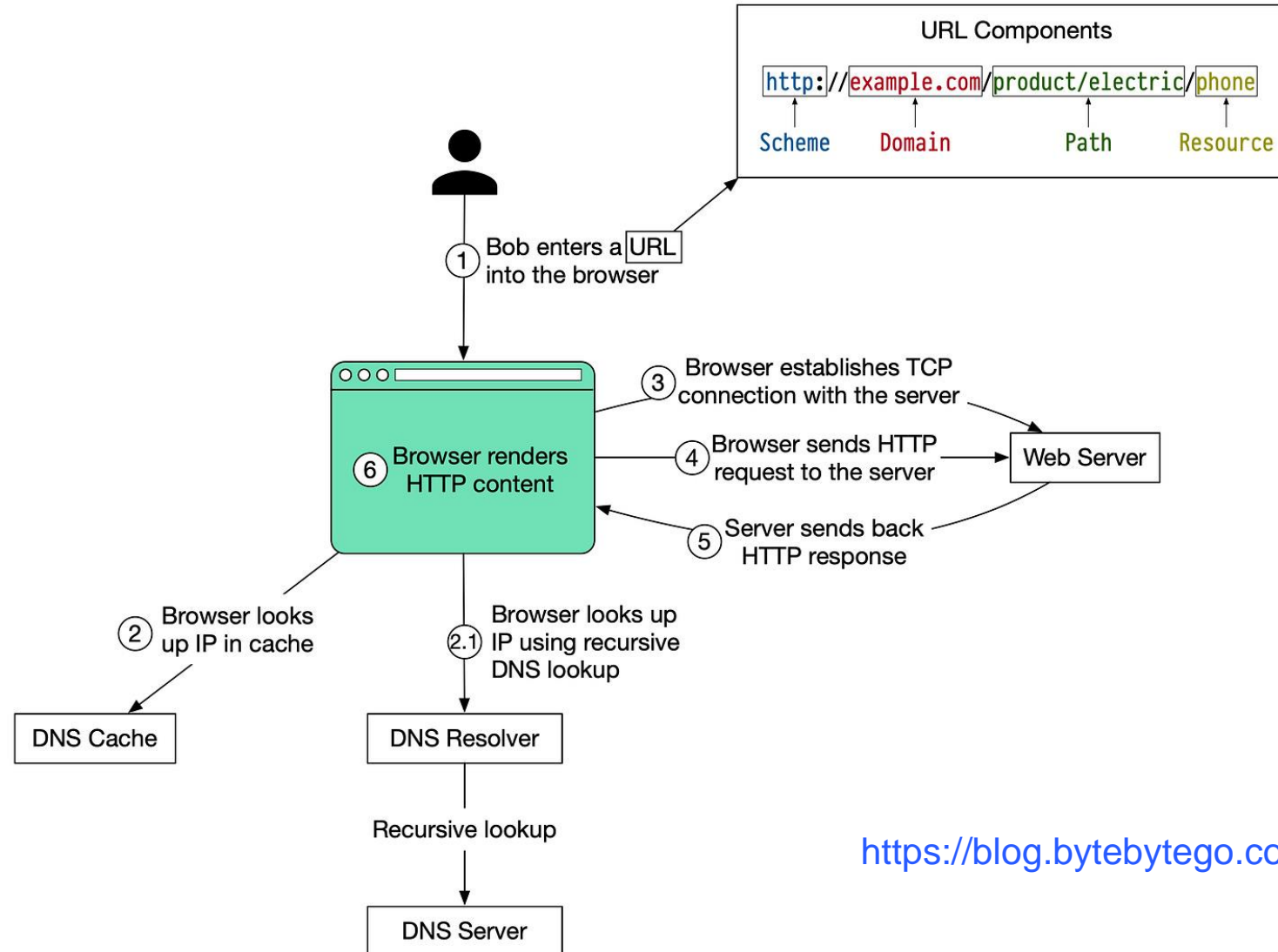
海大資工 馬尚彬

2024

World Wide Web (WWW)

- 由Tim Berners-Lee創立: https://zh.wikipedia.org/zh-tw/蒂姆·伯纳斯-李
- 一個Internet上用來存取鏈結文件(linked documents)的一個架構
- 最一開始創立的目標以文件分享為主，再配合超連結的觀念
- 從靜態的內容，到動態的內容與多媒體

Browser and Web Server

| What happens when you type a URL into your browser?

ByteByteGo

URL Components

```
http://example.com/product/electric/phone
```

Scheme   Domain   Path   Resource

① Bob enters a URL into the browser

③ Browser establishes TCP connection with the server

④ Browser sends HTTP request to the server

⑥ Browser renders HTTP content

⑤ Server sends back HTTP response

Web Server

② Browser looks up IP in cache

DNS Cache

2.1 Browser looks up IP using recursive DNS lookup

DNS Resolver

Recursive lookup

DNS Server

https://blog.bytebytego.com/p/what-happens-when-you-type-a-url

Web Communication Protocols

- A Web page is identified by a unique address called the URL.
- Hypertext Transfer Protocol (HTTP) manages the hypertext links that are used to navigate the Web
  - HTTP是Browser與Web Server溝通的語言
- HTTP 1.1 was standardized in RFC 2616 in 1999.
- HTTP/2 was published as Proposed Standard on Feb 17, 2015.
  - HTTP/2 is used by 35.1% of all the websites.
    - https://w3techs.com/technologies/details/ce-http2

HTML Documents

- Web pages are created using Hypertext Markup Language (**HTML**)
- Web pages are commonly referred to as **HTML pages** or **documents**
- A **markup language** is a set of characters or symbols that define a document's logical structure
- **HTML** has evolved into a language that defines how elements should appear in a Web browser

- 你是否曾經「檢視原始檔」?

Well-Formed Web Pages

- HTML became an Internet standard in 1993 with the release of version 1.0.
- HTML5
  - As of October 2014 this is the final and complete fifth revision of the HTML standard of the World Wide Web Consortium (W3C).
  - \<video\>, \<audio\>, and \<canvas\> elements
    - include and handle multimedia and graphical content on the web without having to resort to proprietary plugins and APIs.
  - \<section\>, \<article\>, \<header\>, and \<nav\>
    - enrich the semantic content of documents.

Cascading Style Sheets

- A single piece of CSS formatting information, such as text alignment, is referred to as a style
- The term cascading refers to the ability for Web pages to use CSS information from more than one source
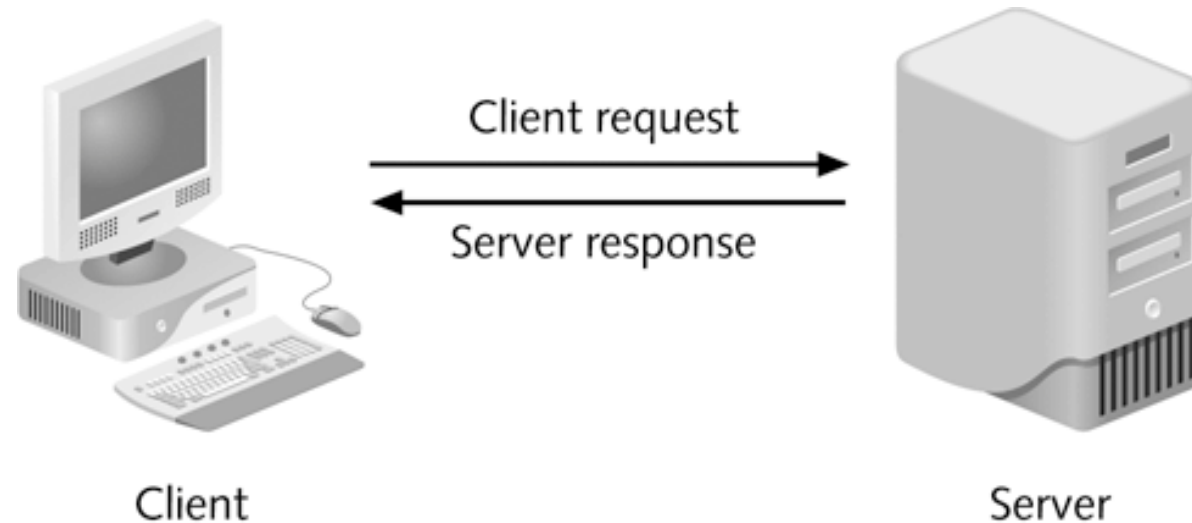
HTML只管文件內容，CSS負責呈現！
(有質感的Website都靠好的CSS!)

WEBSITE

with HTML & CSS

with HTML only

https://www.reddit.com/r/ProgrammerHumor/comments/68x8bm/with_css_vs_without_css/

Client/Server Architecture[1]

- Server ("backend"):
  - Fulfills a request for information by managing the request or serving the requested information to the client.
  - Responsible for data storage and management.
- A system consisting of a client and a server is known as a **two-tier system.**

Client/Server Architecture$_2$

- Client ("front-end"):
  - Presents an interface to the user
  - Gathers information from the user, submits it to a server, then receives, formats, and presents the results returned from the server

Client request

Server response

Client

Server

Client-Side Scripting

- Client-side scripting is a language that runs on a local browser (on the client tier) instead of on a Web server (on the processing tier).
  - Libraries: jQuery, d3.js (c3.js), Leaflet, babylon.js, etc.
  - Frameworks: reactJS, AngularJS, Vue.js, etc.

JavaScript

- JavaScript is a client-side scripting language that allows Web page authors to develop interactive Web pages and sites
    - Used in most Web browsers including Chrome, Edge, Firefox and Safari.
- JavaScript allows you to:
    - Turn static Web pages into applications such as games or calculators.
    - Change the contents of a Web page after a browser has rendered it.
    - Create visual effects such as animation.

要讓前端網頁能動，大部分靠JavaScript!

Why Backend?[1]

- Data Management
  - Connect and interact with databases
  - Ensure data integrity and security
- System Integration
  - Bridge modern web apps with legacy systems
  - Facilitate API connections with third-party services
- User Interaction
  - Enable real-time communication between users
  - Manage user authentication and authorization

Why Backend?$_2$

- Business Logic
  - Implement and protect core application functionality
  - Centralize critical operations for consistency and maintainability
- Asynchronous Processing
  - Handle background tasks and scheduled jobs
  - Push notifications and updates to users
- Scalability and Performance
  - Optimize server-side operations for improved response times
  - Manage server resources to handle increasing loads

Server-Side Scripting

- **Server-side scripting** refers to a scripting language that is executed from a Web server
- Common server-side scripting technology:
  - Java: Spring/Spring Boot
  - C#: ASP.Net
  - Python: Flask, FastAPI, Django
  - PHP: Laravel, Lumen, Codeigniter
  - **node.js (JavaScript)**: Express.js, Koa.js, Socket.io

PHP

- **Hypertext Preprocessor (PHP)** is a server-side scripting language that is used to develop interactive Web sites.
  - Is easy to learn.
  - Includes object-oriented programming capabilities.
  - Supports many types of databases (MySQL/MariaDB, Oracle, MongoDB, etc.).
  - Well-Known frameworks: Laravel, Lumen, Codeigniter

Node.js

- **Node.js** is an open-source, cross-platform JavaScript run-time environment for executing JavaScript code server-side.
  - Enables JavaScript to be used for server-side scripting, and runs scripts server-side to produce dynamic web page content before the page is sent to the user's web browser.
  - Has an event-driven architecture capable of non-blocking, asynchronous I/O.
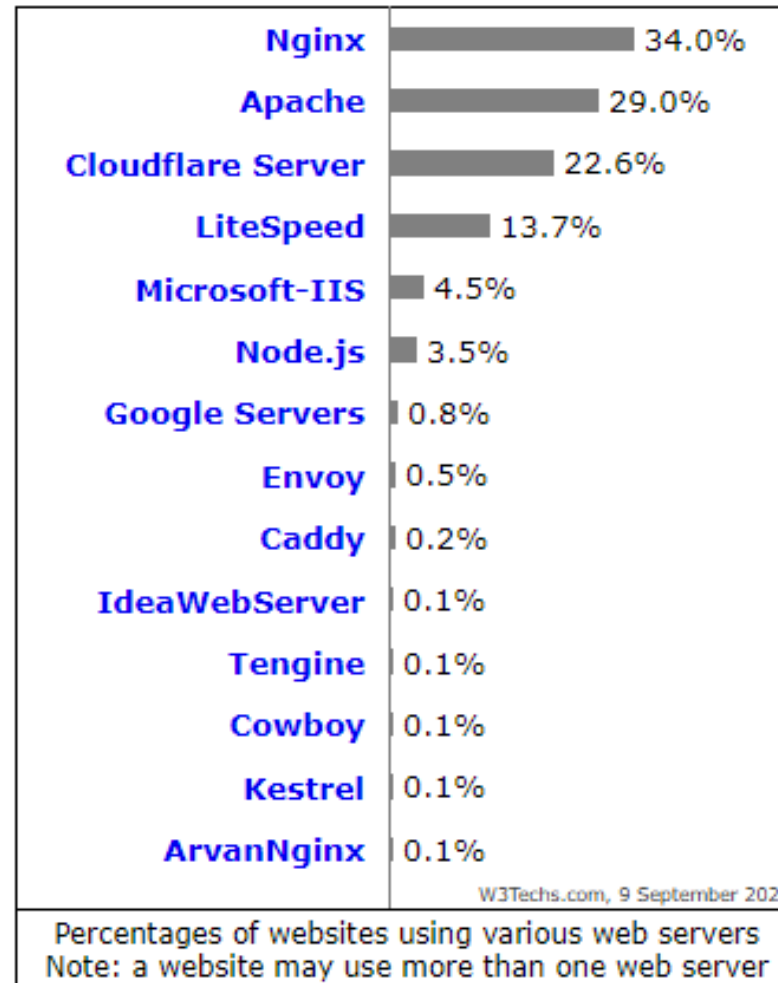 - Well-Known frameworks: Express.js, Koa.js, Socket.io

Browser Market Share

2024		Chrome	Edge	Firefox	Safari	Opera
March		77.6 %	10.7 %	4.6 %	3.7 %	2.2 %
February		77.5 %	10.5 %	4.6 %	3.6 %	2.0 %
January		78.1 %	10.4 %	4.7 %	3.8 %	2.1 %
2023		Chrome	Edge	Firefox	Safari	Opera
December		78.2 %	10.0 %	4.6 %	3.7 %	2.1 %
November		77.4 %	10.6 %	4.9 %	3.9 %	2.4 %
October		78.0 %	10.3 %	4.8 %	3.9 %	2.3 %

https://www.w3schools.com/browsers/default.asp

Percentages of Websites using Various Web Servers

Percentages of websites using various web servers
Note: a website may use more than one web server

https://w3techs.com/technologies/overview/web_server/all

課前問卷

- http://tiny.cc/2024-ntou-web-survey