Web Technology

By

Dr. Vandana Bhatia

Prerequisites

- Interested in the learning of Course/web designing.
- Interested in Programming
  - Basic Idea of Programming is required (Depends on tool).
- Fascinated to think and solve real life problem that need a web based solution.
- Curious to build new/reliable design and solution to help the society.

Unit I
Introduction , Web Browser , Web 2.0

Contents

- Introduction ,
- W3C,
- Web 2.0 ,
- Personal, Distributed and Client/Server Computing ,
- Browser Portability ,
- Software Technologies ,
- Web Resources,
- Customizing Browser Setting ,
- Searching the Internet,
- Keeping Track of Your Favourite Sites,
- File Transfer Protocol (FTP),
- Online Help,
- Web Resources, Web 2.0?,
- Search,
- Content Networks ,
- User-Generated Content,
- Blogging,
- Social Networking,
- Social Media,
- Tagging ,
- Social Bookmarking ,
- Software Development ,
- Rich Internet Applications (RIAs),
- Web Services,
- Mashups, Widgets and Gadgets,
- Location-Based Services,
- XML, RSS, Atom,
- JOSN and VolP,
- Web 2.0 Monetization Models,
- Web 2.0 Business Models,
- Future of the Web ,
- Where to GO for more Web 2.0 Information

Evaluation Components

Components of Course Evaluation		Marks	Possible Ways
Theory	CA	15	Quizzes + Continuous Lab
	MS	15	Viva + Assignment
	ES	40	Viva + Exam + Attendance
Practical	CA	15	Project Evaluation (Team)
	ES	15	Project Evaluation (Team)

Desired Outcome

A PROJECT BASED ON WEB DESIGN (FRONT+ BACK).

EVERY TEAM MEMBER SHOULD HAVE INDIVIDUAL RESPONSIBILITY IN PROJECT.

A VIDEO OF PROJECT (5-10 MINUTES).

Reference Books

- Deitel and Deitel: Internet and Worldwide Web programming, Pearson
- Frank Barbier: Reactive Internet programming, ACM Books
- Tara Calishain: Google hacks, O'Reilly Media
- Sergei Dunaev Advanced Internet Programming, IT Master

Web Browser

- A web browser is application software for accessing the World Wide Web.
- When a user requests a web page from a particular website, the web browser retrieves the necessary content from a web server and then displays the page on the user's device.
- Each individual web page, image, and video is identified by a distinct Uniform Resource Locator (URL) enabling browsers to retrieve these resources from a web server and display them on a user’s device.
- Example:
  - Google Chrome
  - Firefox
  - Opera
  - Safari

W3C

- The World Wide Web Consortium(W3C) is the main international standards organization for the World Wide Web.
- Founded in 1994
- Currently led by Tim Berners-Lee
- The consortium is made up of member organizations that maintain full-time staff working together in the development of standards for the World Wide Web.

Web 2.0

- Web 2.0 is the term used to describe a variety of web sites and applications that allow anyone to create and share online information or material they have created.
- There are number of different types of web 2.0 applications including wikis, blogs, social networking, folksonomies, podcasting & content hosting services.
- It emphasize on following features for end-users
  - user-generated content
  - ease of use
  - participatory culture
  - interoperability (i.e., compatible with other products, systems, and devices)

Key Features: Web 2.0

- **Folksonomy**

– free classification of information; allows users to collectively classify and find information (e.g. "tagging" of websites, images, videos or links)

- **Rich user experience**

– dynamic content that is responsive to user input (e.g., a user can "click" on an image to enlarge it or find out more information)

- **User participation**

– information flows two ways between the site owner and site users by means of evaluation, review, and online commenting. Site users also typically create user-generated content for others to see (e.g., Wikipedia, an online encyclopedia that anyone can write articles for or edit)

- **Software as a service (SaaS)**

– Web 2.0 sites developed APIs to allow automated usage, such as by a Web "app" (software application) or a mashup

- **Mass participation**

– near-universal web access leads to differentiation of concerns, from the traditional Internet user base (who tended to be hackers and computer hobbyists) to a wider variety of users

Centralized Architectures

- Run on a single computer system and do not interact with other computer systems.
- General-purpose computer system: one to a few CPUs and a number of device controllers that are connected through a common bus that provides access to shared memory.
- Single-user system (e.g., personal computer or workstation): desk-top unit, single user, usually has only one CPU and one or two hard disks; the OS may support only one user.
- Multi-user system: more disks, more memory, multiple CPUs, and a multi-user OS. Serve a large number of users who are connected to the system vie terminals. Often called server systems.

Personalized Computing

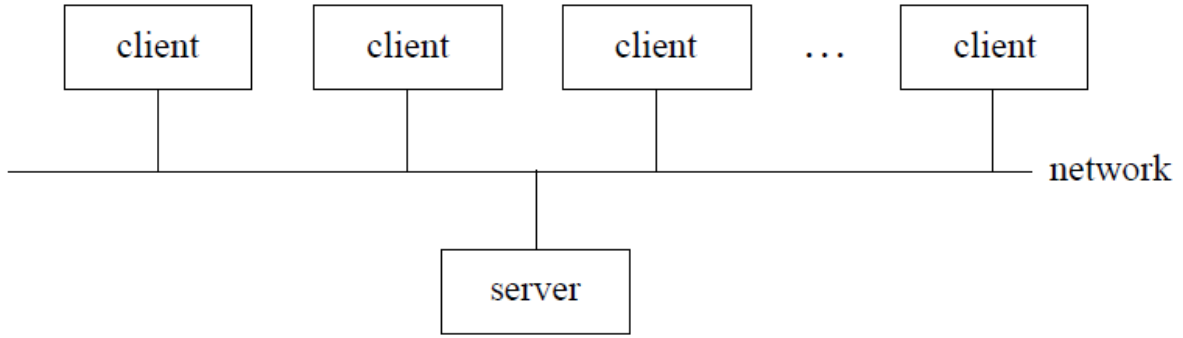
Using desktop and laptop computers for personal use.

Distributed Computing

- A distributed system allows resource sharing
- Includes software by systems connected to the networl
- Examples of distributed computing
  - Intranets,
  - Internet,
  - WWW,
  - email.
  - Telecommunication networks: Telephone networks and Cellular networks.

Client-Server Computing

- A distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients.
- Clients and servers communicate over a computer network on separate hardware, but both may reside in the same system also.

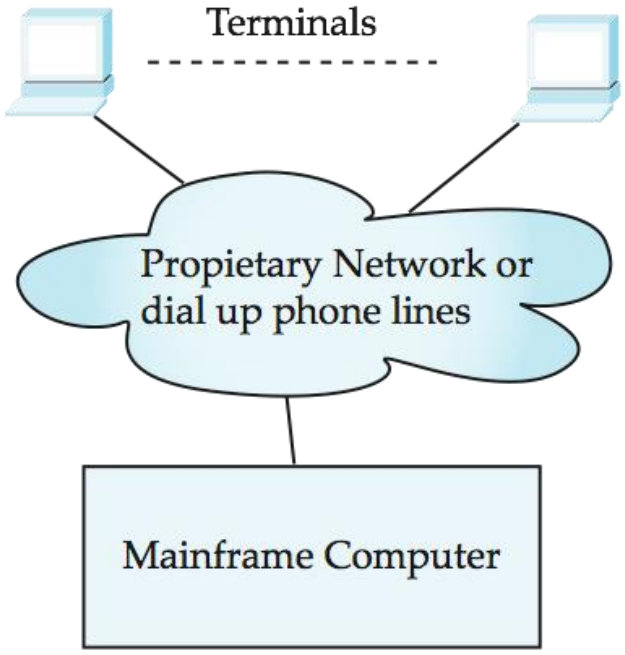


Client-Server Architectures

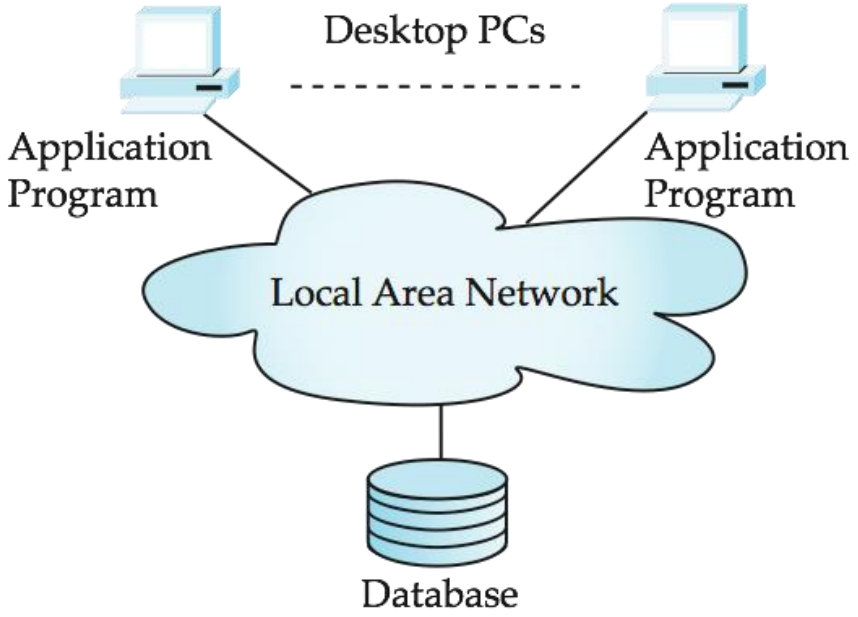
- Advantages of replacing mainframes with networks of workstations or personal computers connected to back-end server machines:
  - better functionality for the cost
  - flexibility in locating resources and expanding facilities
  - better user interfaces
  - easier maintenance
- Server systems can be broadly categorized into two kinds:
  - **transaction servers** which are widely used in relational database systems, and
  - **data servers**, used in object-oriented database systems

Application Architecture Evolution

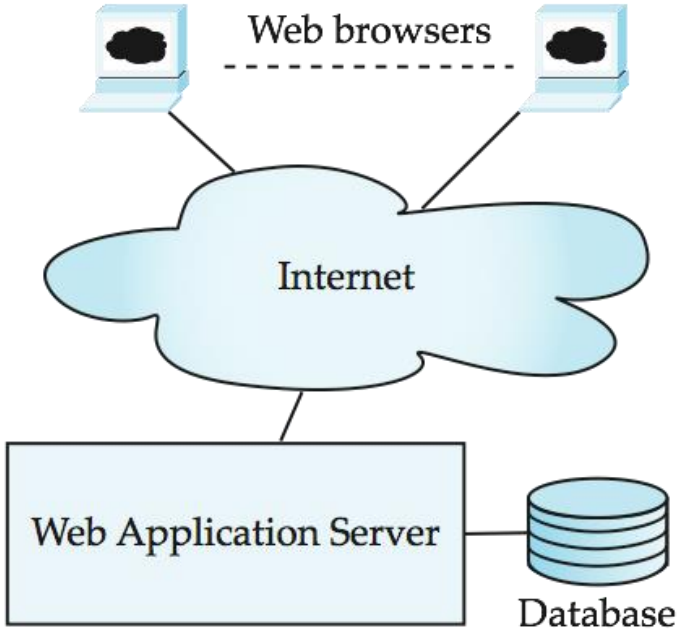
- Three distinct era's of application architecture
  - mainframe (1960's and 70's)
  - personal computer era (1980's)
  - Web era (1990's onwards)



(a) Mainframe Era



(b) Personal Computer Era



(c) Web era

Web Programming

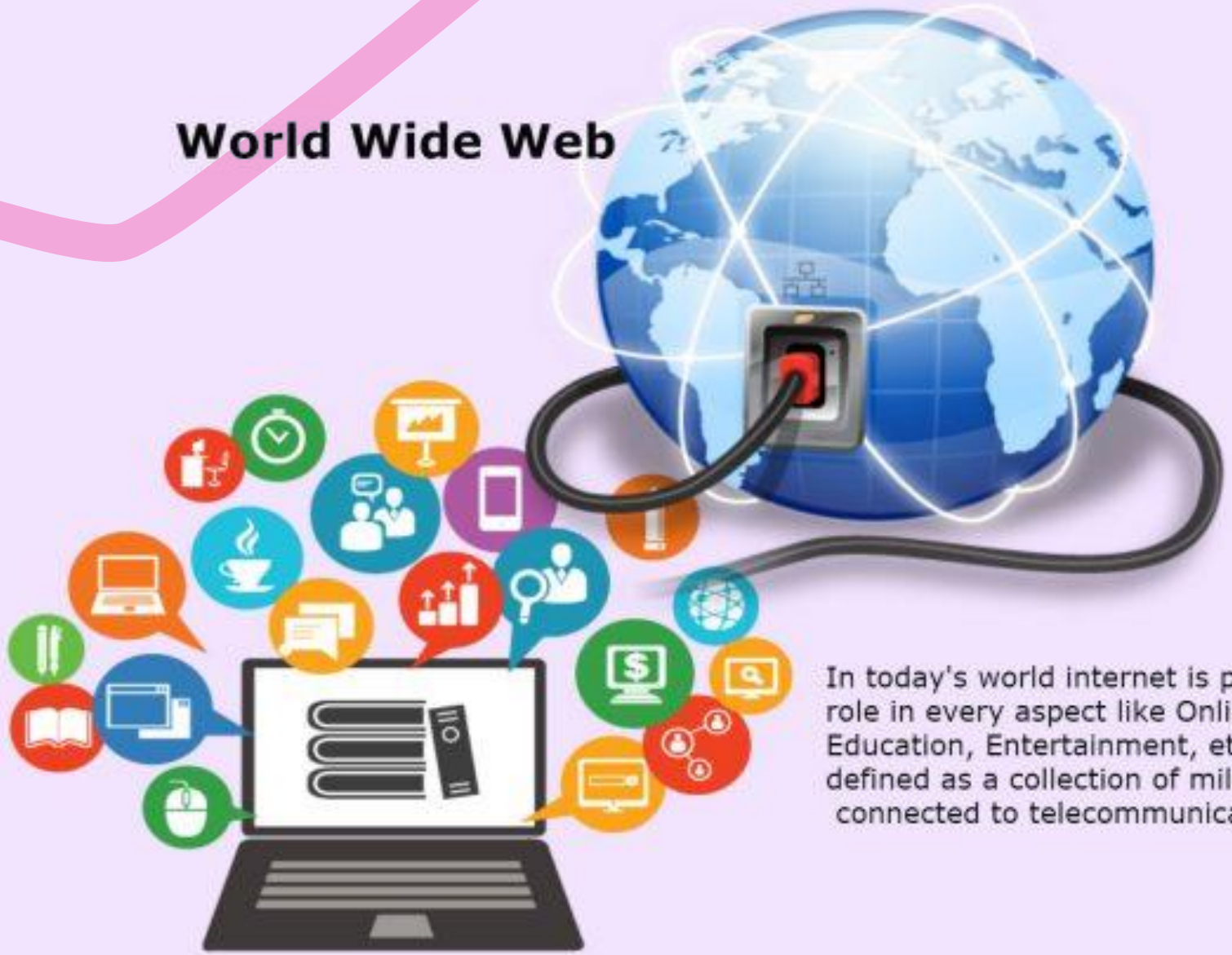
Client-side programming technologies are used to build web pages and applications that are run on the client(i.e., in the browser on the user's device).

Server-side programming—the applications that respond to requests from client-side web browsers, such as searching the Internet, checking your bank-account balance, ordering a book from Amazon, bidding on an eBay auction and ordering concert tickets.

Moore’s Law

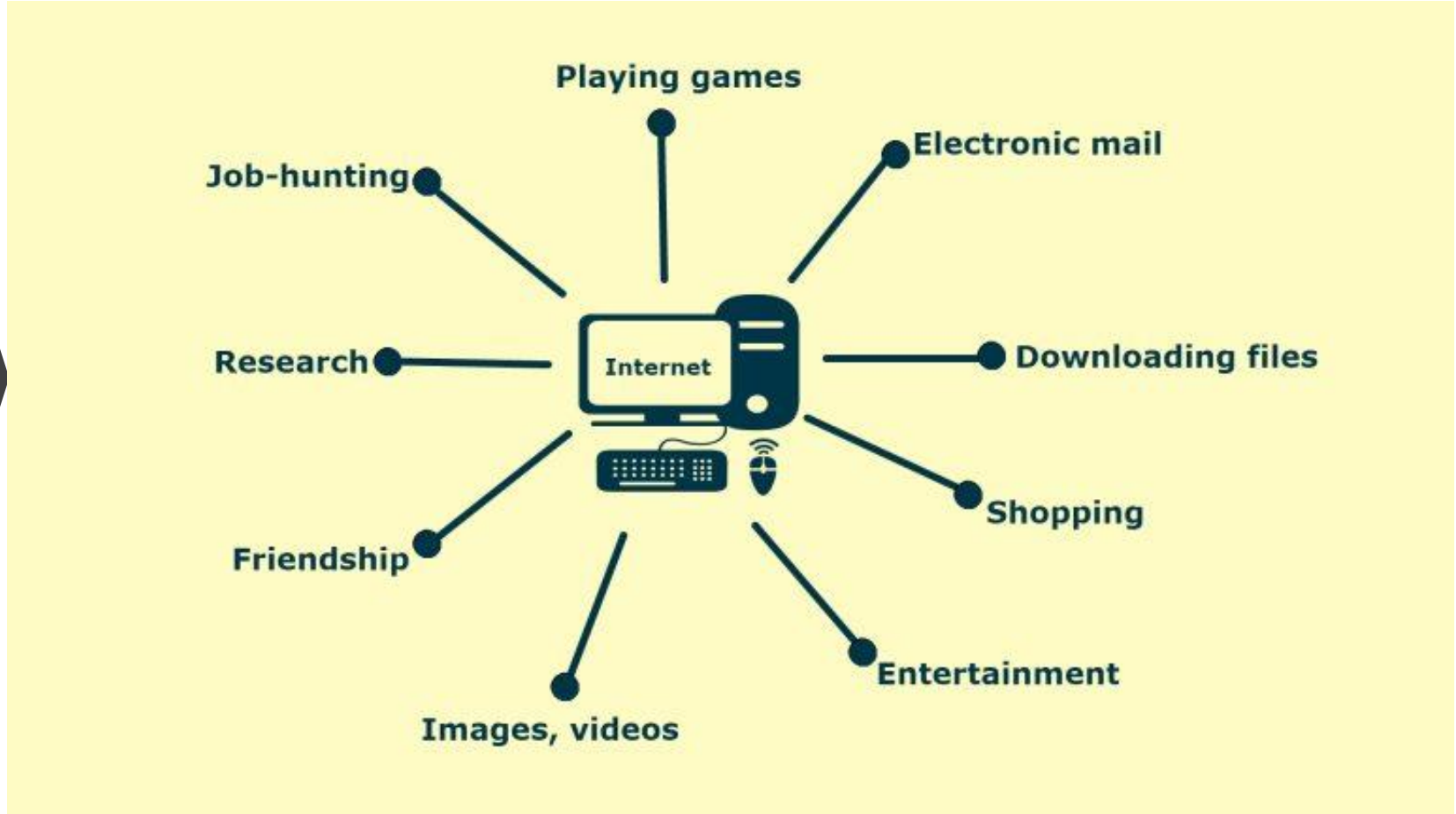
- Every year or two, the capacities of computers have approximately doubled inexpensively.
- This remarkable trend often is called Moore’s Law.
- Moore’s Law and related observations apply especially to the amount of memory that computers have for programs, the amount of secondary storage (such as disk storage) they have to hold programs and data over longer periods of time, and their processor speeds—the speeds at which computers execute their programs (i.e., do their work).
- Similar growth has occurred in the communications field, in which costs have plummeted as enormous demand for communications bandwidth (i.e., information-carrying capacity) has attracted intense competition.

World Wide Web



In today's world internet is playing important role in every aspect like Online transactions, Education, Entertainment, etc. The internet is defined as a collection of millions of computers connected to telecommunication links.

Usage of the Internet



Application Programs and User Interfaces

- Most database users do *not* use a query language like SQL
- An application program acts as the intermediary between users and the database
  - Applications split into
    - front-end
    - middle layer
    - backend
- Front-end: user interface
  - Forms
  - Graphical user interfaces (GUI)
  - Many interfaces are Web-based

Web Interface

- Web browsers have become the de-facto standard user interface to databases
  - Enable large numbers of users to access databases from anywhere
  - Avoid the need for downloading/installing specialized code, while providing a good graphical user interface
    - Javascript, Flash and other scripting languages run in browser, but are downloaded transparently
  - Examples: banks, airline and rental car reservations, university course registration and grading, and so on.

The World Wide Web

- The Web is a distributed information system based on hypertext.
- Most Web documents are hypertext documents formatted via the HyperText Markup Language (HTML)
- HTML documents contain
  - text along with font specifications, and other formatting instructions
  - hypertext links to other documents, which can be associated with regions of the text.
  - forms, enabling users to enter data which can then be sent back to the Web server

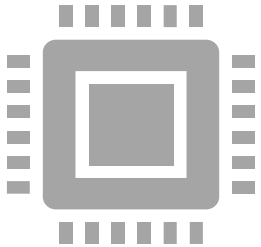
Programming the Web

Client-Side Programming

JavaScript

Dynamic HTML

.Net controls



Server-Side Programming

ASP script

Server components

C# code-behind

ADO

Web controls used on ASPX pages

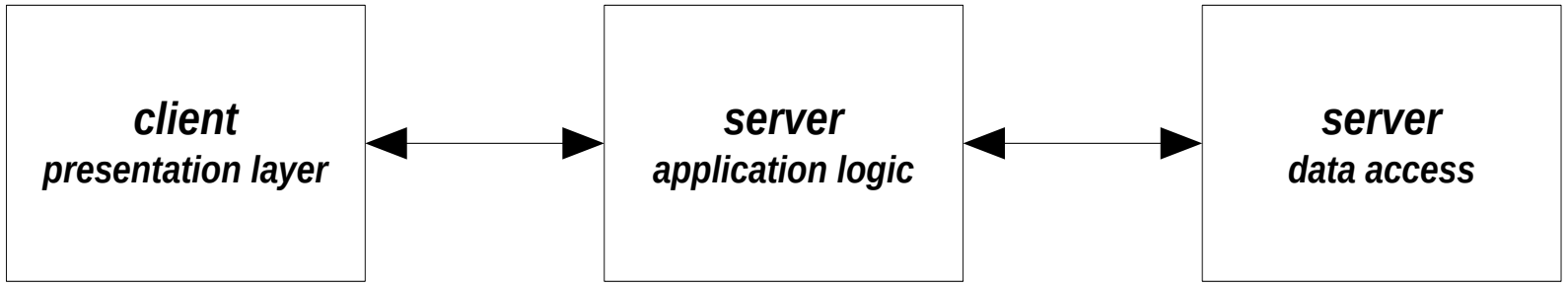
Web services

Web Processing Models

- ***HyperText Transfer Protocol (HTTP)***
  - Universal access
  - HTTP is a "request-response" protocol specifying that a client will open a connection to server then send request using a very specific format. Server will respond and then close connection.
- ***HyperText Markup Language (HTML)***
  - Web of linked documents
  - Unlimited scope of information content
- ***Graphical Browser Client***
  - Sophisticated rendering makes authoring simpler
- ***HTML File Server***
  - Using HTTP, Interprets request, provides appropriate response, usually a file in HTML format
- ***Three-Tier Model***
  - Presentation, application logic, data access

Three Tier Architecture

- **Client Tier**
  - Presentation layer
  - Client UI, client-side scripts, client specific application logic
- **Server Tier**
  - Application logic, server-side scripts, form handling, data requests
- **Data Tier**
  - Data storage and access



Programming the Web : Client-Side Code

- **What is client-side code?**
  - Software that is downloaded from Web server to browser and then executes on the browser client

- **Why client-side code?**
  - Better scalability: less work done on server
  - Better performance/user experience
  - Create UI constructs not inherent in HTML
    - Drop-down and pull-out menus
    - Tabbed dialogs
  - Cool effects, e.g. animation
  - Data validation

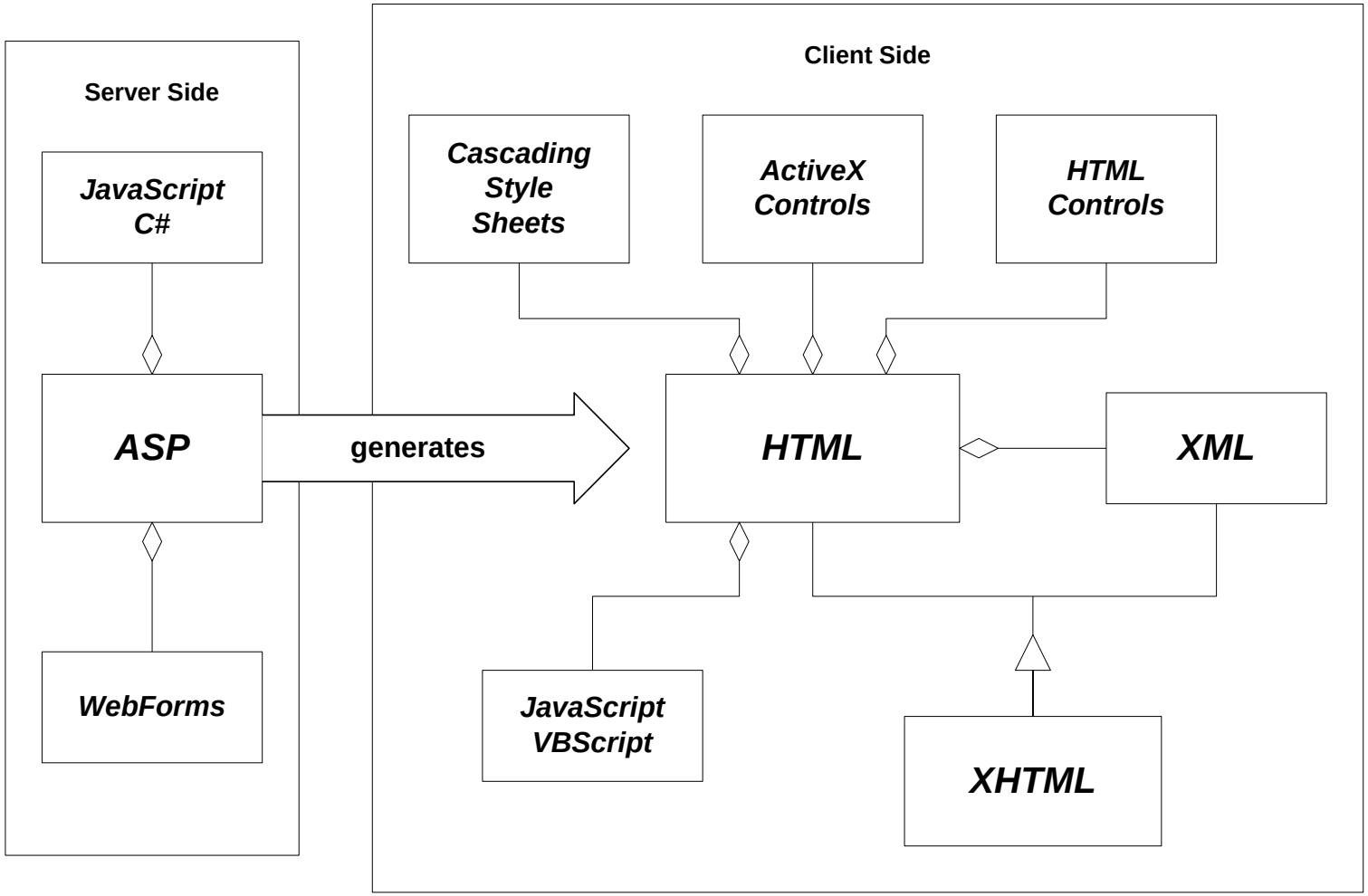
Programming the Web: Server-Side Code

- **What is server-side code?**
  - Software that runs on the server, not the client
  - Receives input from
    - URL parameters
    - HTML form data
    - Cookies
    - HTTP headers
  - Can access server-side databases, e-mail servers, files, mainframes, etc.
  - Dynamically builds a custom HTML response for a client

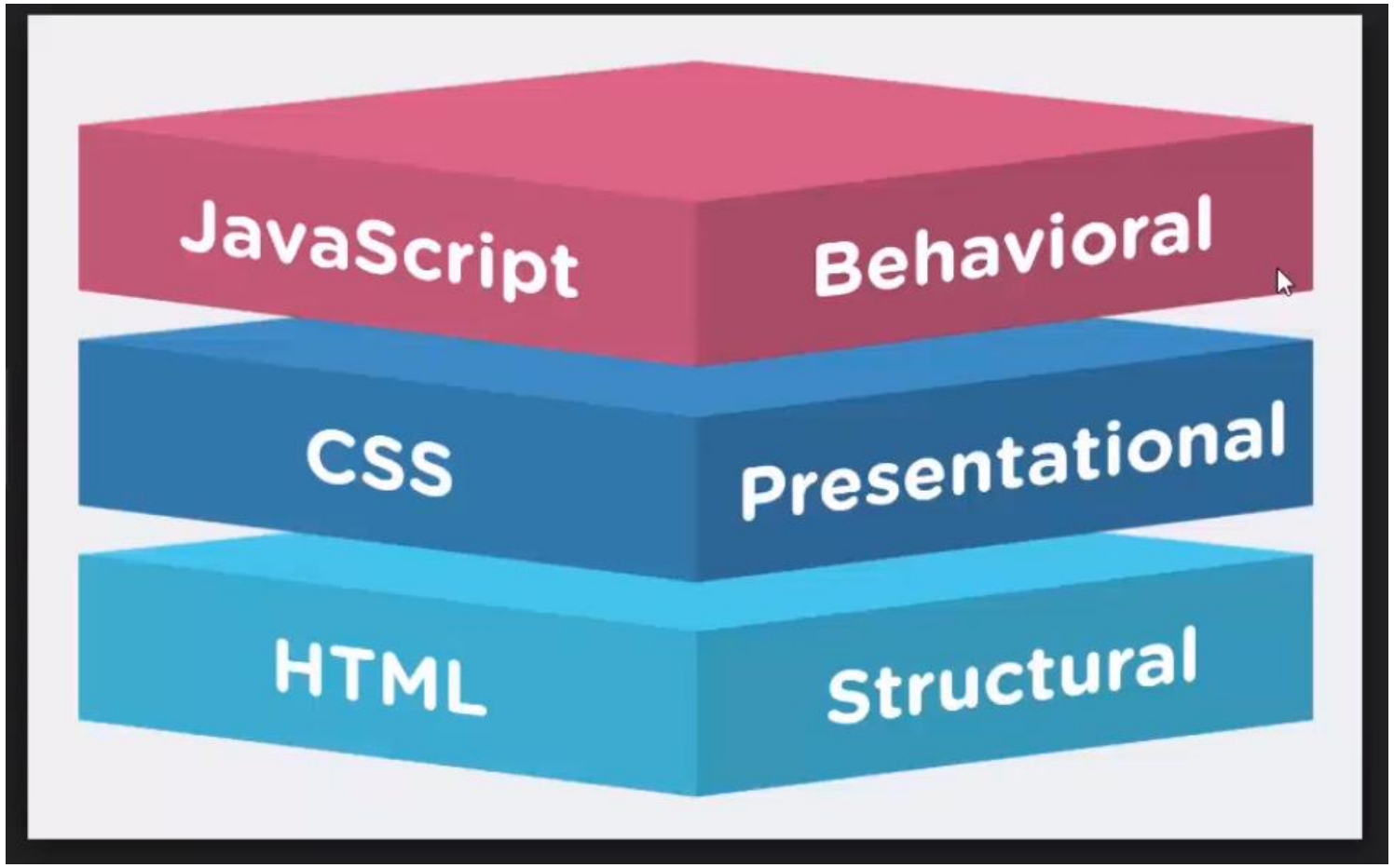
Programming the Web
Server-Side Code

- **Why server-side code?**
  - **Accessibility**
    - You can reach the Internet from any browser, any device, any time, anywhere
  - **Manageability**
    - Does not require distribution of application code
    - Easy to change code
  - **Security**
    - Source code is not exposed
    - Once user is authenticated, can only allow certain actions
  - **Scalability**
    - Web-based 3-tier architecture can scale out

Web Programming – Language Model



A simple Web application



HTML5

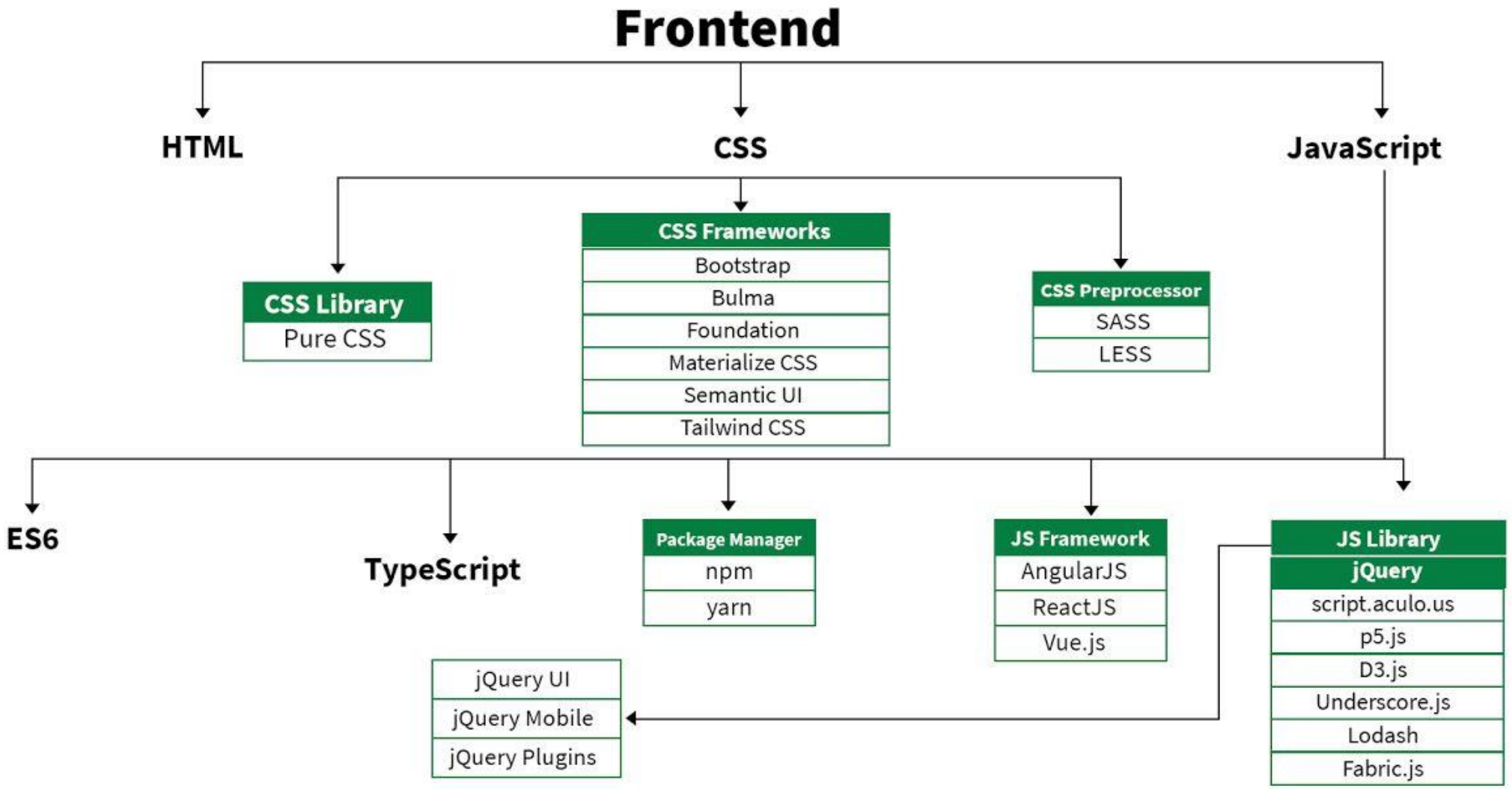
- HTML (Hyper Text Markup Language) is a special type of computer language called a markup language designed to specify the content and structure of web pages (also called documents) in a portable manner.
- HTML5, now under development, is the emerging version of HTML.
- HTML enables you to create content that will render appropriately across the extraordinary range of devices connected to the Internet—including
  - smartphones,
  - tablet computers,
  - notebook computers,
  - desktop computers,
  - special-purpose devices such as large-screen displays at concert arenas and sports stadiums
- A “stricter” version of HTML called XHTML (Extensible HyperText Markup Language), which is based on XML (eXtensible Markup Language), is still used frequently today.

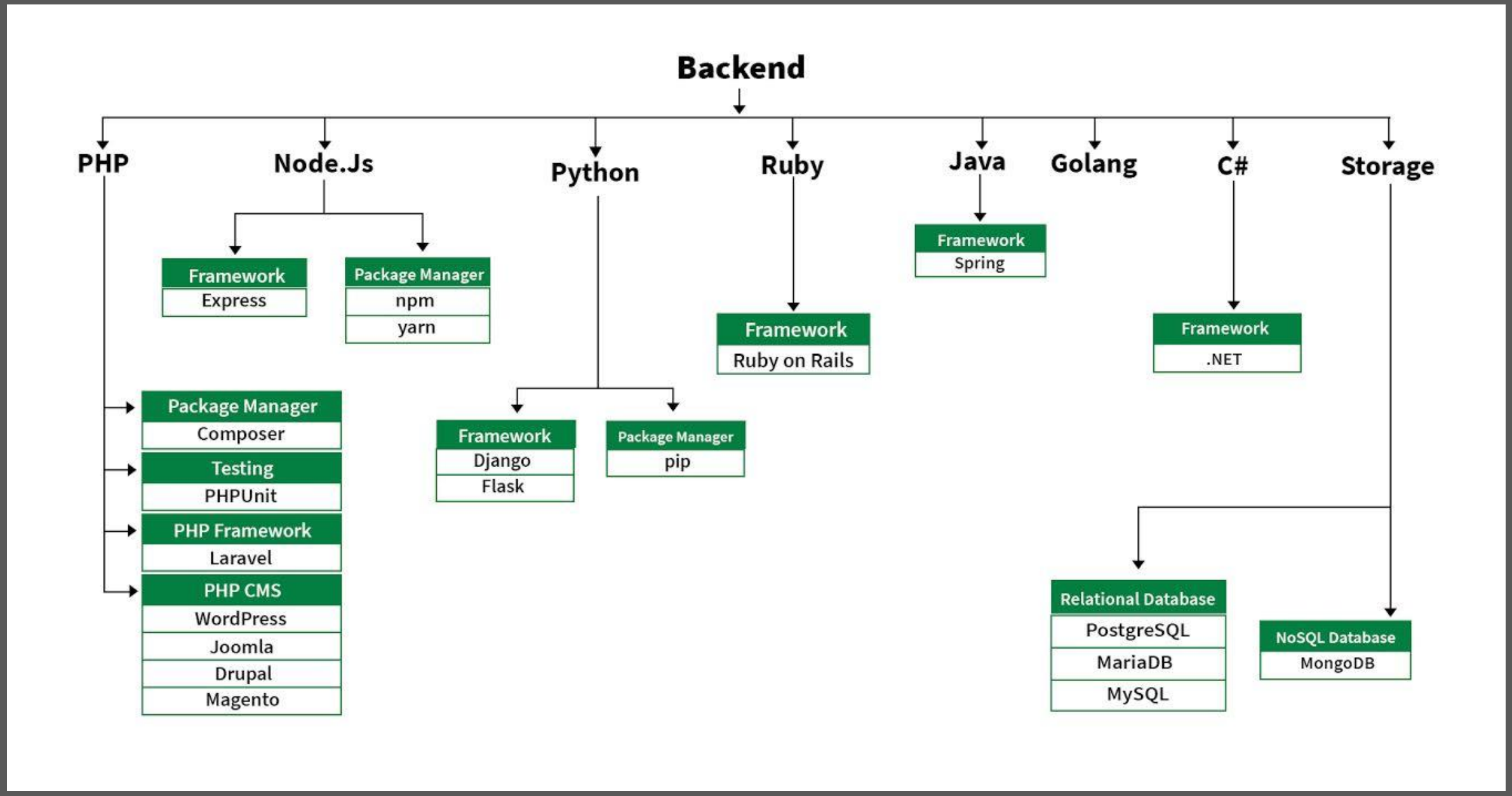
Cascading Style Sheets (CSS)

- Although HTML5 provides some capabilities for controlling a document's presentation, it's better not to mix presentation with content.
- Cascading Style Sheets(CSS) are used to specify the presentation, or styling, of elements on a web page (e.g., fonts, spacing, sizes, colors, positioning).
- CSS was designed to style portable web pages independently of their content and structure.
- By separating page styling from page content and structure, you can easily change the look and feel of the pages on an entire website, or a portion of a website, simply by swapping out one style sheet for another.
- CSS3 is the current version of CSS under development.

JavaScript

- JavaScript helps you build dynamic web pages (i.e., pages that can be modified “on the fly” in response to events, such as user input, time changes and more) and computer applications.
- It enables you to do the client-side programming of web applications.
- JavaScript was created by Netscape.
- Both Netscape and Microsoft have been instrumental in the standardization of JavaScript by ECMA International (formerly the European Computer Manufacturers Association) as ECMAScript.
- ECMAScript5, the latest version of the standard, corresponds to the version of JavaScript.
- JavaScript is a portable scripting language. Programs written in JavaScript can run in web browsers across a wide range of devices.


Frontend
HTML
CSS
JavaScript
CSS Library
Pure CSS
CSS Frameworks
Bootstrap
Bulma
Foundation
Materialize CSS
Semantic UI
Tailwind CSS
CSS Preprocessor
SASS
LESS
ES6
TypeScript
Package Manager
npm
yarn
JS Framework
AngularJS
ReactJS
Vue.js
JS Library
jQuery
script.aculo.us
p5.js
D3.js
Underscore.js
Lodash
Fabric.js
jQuery UI
jQuery Mobile
jQuery Plugins


Backend
PHP
Node.Js
Python
Ruby
Java
Golang
C#
Storage
Framework
Express
Package Manager
npm
yarn
Framework
Spring
Framework
Ruby on Rails
Framework
.NET
Package Manager
Composer
Testing
PHPUnit
PHP Framework
Laravel
PHP CMS
WordPress
Joomla
Drupal
Magento
Framework
Django
Flask
Package Manager
pip
Relational Database
PostgreSQL
MariaDB
MySQL
NoSQL Database
MongoDB

Web Browsers and Web-Browser Portability

- Ensuring a consistent look and feel on client-side browsers is one of the great challenges of developing web-based applications.
- Currently, a standard does not exist to which software vendors must adhere when creating web browsers.
- Although browsers share a common set of features, each browser might render pages differently.

Role of Browser

- A primary task of any browser is to make HTTP requests on behalf of the browser user.
- A browser must perform the following tasks:

1. Reformat the URL entered as a valid HTTP request message.

2. If the server is specified using a host name (rather than an IP address), use DNS to convert this name to the appropriate IP address.

3. Establish a TCP connection using the IP address of the specified web server.

4. Send the HTTP request over the TCP connection and wait for the server's response.

5. Display the document contained in the response. If the document is not a plain-text document but instead is written in a language such as HTML, this involves *rendering* the document: positioning text and graphics appropriately within the browser window, creating table borders, using appropriate fonts and colors, etc.

Evolution of Internet and World Wide Web, HTML, HTTP

- The World Wide Web allows computer users to execute web-based applications and to locate and view multimedia-based documents on almost any subject over the Internet.
- In 1989, Tim Berners-Lee of CERN (the European Organization for Nuclear Research) began to develop a technology for sharing information via hyperlinked text documents.
- Berners-Lee called his invention the Hyper Text Markup Language(HTML).
- He also wrote communication protocols to form the backbone of his new information system, which he called the World Wide Web.
- In particular, he wrote the Hypertext Transfer Protocol(HTTP)—a communications protocol used to send information over the web.
- The URL(Uniform Resource Locator)specifies the address (i.e., location) of the web page displayed in the browser window.
- Each web page on the Internet is associated with a unique URL.
- URLs usually begin with http://.

HTTP cookies

- Also called web cookies, Internet cookies, browser cookies, or simply cookies
- HTTP cookies are small blocks of data created by a web server while a user is browsing a website and placed on the user's computer or other device by the user’s web browser.
- Cookies are placed on the device used to access a website, and more than one cookie may be placed on a user’s device during a session.
- Cookies serve useful and sometimes essential functions on the web.
- They enable web servers to store stateful information (such as items added in the shopping cart in an online store) on the user’s device or to track the user's browsing activity (including clicking particular buttons, logging in, or recording which pages were visited in the past).
- They can also be used to save for subsequent use information that the user previously entered into form fields, such as names, addresses, passwords, and payment card numbers.

Set-Cookie

Set-Cookies:<cookie-name>=<cookie values>

HTTP cookies: Types

- **Authentication cookies** are commonly used by web servers to authenticate that a user is logged in, and with which account they are logged in. Without the cookie, users would need to authenticate themselves by logging in on each page containing sensitive information that they wish to access. The security of an authentication cookie generally depends on the security of the issuing website and the user's web browser, and on whether the cookie data is encrypted.
- Security vulnerabilities may allow a cookie's data to be read by an attacker, used to gain access to user data, or used to gain access (with the user's credentials) to the website to which the cookie belongs (see cross-site scripting and cross-site request forgery for examples).
- **Tracking cookies**, and especially third-party tracking cookies, are commonly used as ways to compile long-term records of individuals' browsing histories — a potential privacy concern that prompted European[3] and U.S. lawmakers to take action in 2011. European law requires that all websites targeting European Union member states gain "informed consent" from users before storing non-essential cookies on their device.

Customizing your Web Browser

- Set the default search engine
- Set the homepage
- Customizing toolbars
- Browser apps, add-ons, plug-ins, and extensions
- Themes

Web Resources

- Web resource is any identifiable resource (digital, physical, or abstract) present on or connected to the World Wide Web.
- A Web resource is any one of the resources that are created during the development of a Web application, for example, Web projects, HTML pages, JSP files, servlets, custom tag libraries, and archive files.
- Resources are identified using Uniform Resource Identifiers.
- Examples:
  - Web pages
  - E-mail
  - Information from databases
  - Web services

XML

Example

```
<note>
  <date>2021-09-01</date>
  <hour>08:30</hour>
  <to>John</to>
  <from>Jani</from>
  <body>Hello. How are you</body>
</note>
```

XML stands for eXtensible Markup Language

XML is a markup language much like HTML

XML was designed to store and transport data

XML was designed to be self-descriptive

XML is a W3C Recommendation

XML vs HTML

XML and HTML were designed with different goals:

XML was designed to carry data - with focus on what data is

HTML was designed to display data - with focus on how data looks

XML tags are not predefined like HTML tags are

XML

- XML Simplifies Things
  - It simplifies data sharing
  - It simplifies data transport
  - It simplifies platform changes
  - It simplifies data availability
- Many computer systems contain data in incompatible formats. Exchanging data between incompatible systems (or upgraded systems) is a time-consuming task for web developers. Large amounts of data must be converted, and incompatible data is often lost.
- XML stores data in plain text format. This provides a software- and hardware-independent way of storing, transporting, and sharing data.
- XML also makes it easier to expand or upgrade to new operating systems, new applications, or new browsers, without losing data.
- With XML, data can be available to all kinds of "reading machines" like people, computers, voice machines, news feeds, etc.

JSON

JSON stands for **J**ava**S**cript **O**bject **N**otation

JSON is a lightweight data-interchange format

JSON is plain text written in JavaScript object notation

JSON is used to send data between computers

JSON is language independent *

JSON

- **JSON** (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language Standard ECMA-262 3rd Edition - December 1999. JSON is a text format that is completely language independent but uses conventions that are familiar to programmers of the C-family of languages, including C, C++, C#, Java, JavaScript, Perl, Python, and many others. These properties make JSON an ideal data-interchange language.
- JSON is built on two structures:
- A collection of name/value pairs. In various languages, this is realized as an *object*, record, struct, dictionary, hash table, keyed list, or associative array.
- An ordered list of values. In most languages, this is realized as an *array*, vector, list, or sequence.