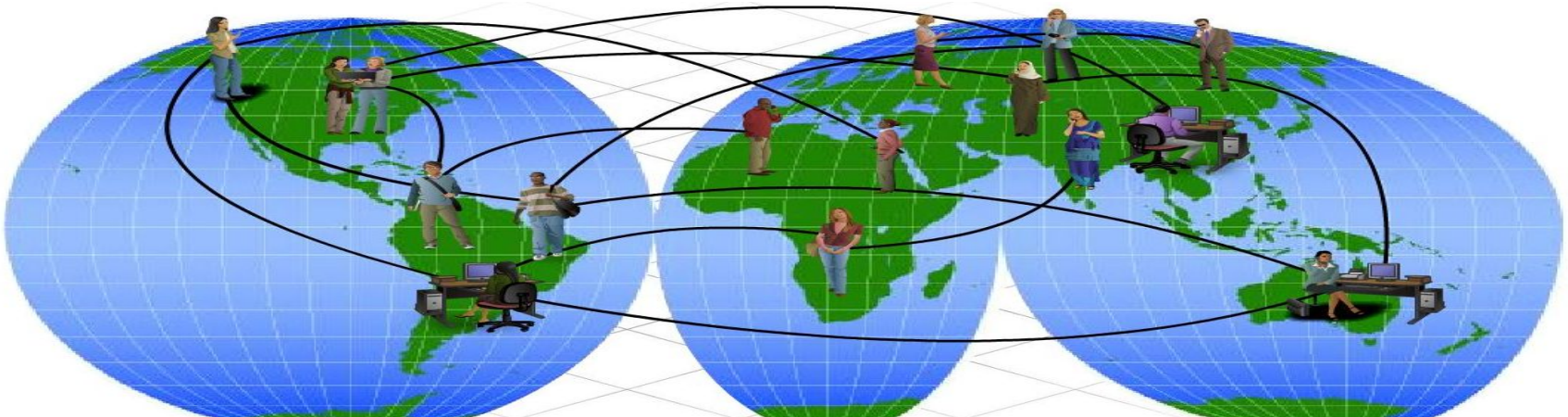
Chapter 1

Introduction

What is the Internet

- Most people today have had exposure to the Internet at school, in their homes, at their jobs, or at their local library.
- The **Internet** is a worldwide collection of computers and computer networks that links billions of computers used by businesses, government, educational institutions, organizations, and individuals using modems, phone lines, television cables, satellite links, fiber-optic connections, and other communications devices and media
- There are, however, several major **International organizations** that help manage the Internet so that everyone uses the same rules.



Internet

- In **business**, large networks can be used to advertise and sell products, order supplies, and communicate with customers.
- Communication over a network is usually more efficient and less expensive than traditional forms of communication, such as regular mail or long distance phone calls.
- The **Internet** is considered a "**network of networks**" because it is literally made up of millions of networks that are connected to each other.

Here are other uses of a network and the Internet:

- Sharing music and video files
- Research and on-line learning
- Chatting with friends
- Planning vacations
- Purchasing gifts and supplies

World Wide Web

- The **World Wide Web**, also called the **Web**, is the part of the Internet that supports multimedia and consists of a collection of linked documents.
- WWW, is a system of interlinked, hypertext documents accessed through the Internet.
- The web provides a communication platform for users to retrieve and exchange information over the internet.
- To support multimedia, the Web relies on the **Hypertext Transfer Protocol** (**HTTP**), which is a set of rules for exchanging text, graphic, sound, video, and other multimedia files**.**

Brief History of WWW

- In 1993, a team at the University of Illinois' National Center for Supercomputing Applications released **Mosaic**, the first Web browser to become popular with the general public.
- The Web began to enter everyday use in 1993-4, when websites for general use started to become available
- In 1994, Tim BL founded the **World Wide Web Consortium (W3C)**, an organization that brings together representatives from many different technology companies to work together on the creation of web technology specifications. The aim was to standardize and develop the Web further.
- By the end of 1994, the Web had 10,000 servers - of which 2000 were commercial - and 10 million users
- The next few years saw the launch of websites such as Yahoo (1994), Amazon (1995), eBay (1995) and Google (1998).

Evolution of WEB

Web 1.0

- The first version of web **Web 1.0** also referred as Syntactic web or **read only web** is the era (1990–2000) where the role of a user is limited with consuming information provided by the content producers.
- There is no option given for user or consumer to communicate back the information to the content producers.
- During this early phase of web development, web pages were mostly **static documents** read from a server and displayed on a client, with no options for users to contribute content, or for content to be tailored to a user's specific demands.

Evolution of WEB

Web 2.0

- The **Web 2.0** also referred as **Social Web** or **read-write** web is the era (2000–2010 and continues even now) which facilitates interaction between web users and sites.
- Previously a consumer of content provided by others, the web user has now become a prosumer, capable of adding information to a web page, and in this way communicating not only with the server, but through the server with other clients (users) as well.
- These Web 2.0 technologies have made possible a wide range of social web sites now familiar to everyone, including chat rooms, blogs, wikis, product reviews and e-markets.
- Some of the famous **Web 2.0 applications** are ***Facebook, Youtube, Flickr, Twitter*** etc.,

Evolution of WEB

Web 2.5

- The Web 2.5 is the concept to address the practical and real evolution which we are currently seeing in our era 2010–2020 between Web 2.0 and 3.0.
- Web 2.5 is majorly focusing on mobile computing and evolution in mobile technologies.
- Some of the technologies which got introduced in this era are Progressive Web Apps(PWA), Accelerated Mobile Pages(AMP) etc.
- To make in conceptually clear we can call Web 2.5 as the convergence between Social and Semantic web.

Evolution of WEB

Web 3.0

- The **Web 3.0** also referred as **Semantic Web** or **read-write-execute** is the era (2010 and above) which refers to the future of web.
- In this era computers can interpret information like humans via Artificial Intelligence and Machine Learning. Which help to intelligently generate and distribute useful content tailored to a particular need of a user.

What if computers can understand meaning behind information and what if they can learn "what we are interested in" ???

  - They can help us find what we want
  - They can recognize People, Place, Events, Companies, Product, Movies etc.,
  - They can understand the relationship between things
- Some of the examples of web 3.0 are **Apple's Siri, Googles Cloud API, Wolfram Alpha**.

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Elements of a WWW

- ✔ Sever and Client
- ✔ Web browser
- ✔ Webpage/ website
- ✔ URL
- ✔ DNS

Web Browsers

- People access websites using software called a **web browser**. Popular examples include Firefox, Internet Explorer, Safari, Chrome, and Opera.
- A **Web browser**, also called a **browser**, is a program that interprets and displays Web pages and enables you to view and interact with a Web page.
- To locate a Web page using a browser, you type the Web page's Uniform Resource Locator (URL) in the browser's Address or Location bar.

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Web Server

- The term web server can also refer to the computer or virtual machine running the program.
- A web server is a computer programs that delivers (serves) content, such as web pages, using Hypertext Transfer Protocol (HTTP), over the World Wide Web. You know when you are using HTTP because the website URL begins with http:// (for example, "http://www.google.com").
- Examples of the most popular web servers are,

✔ Apache HTTP Server (also referred to as simply "Apache"),

✔ Microsoft Internet Information Services (IIS),

✔ Sun Java System Web Server.

- Web pages are stored on a **Web server**, or **host**, which is a computer that stores and sends (serves) requested Web pages and other files.
- Any computer that has Web server software installed and is connected to the Internet can act as a Web server.
- Every Web site is stored on, and runs from, one or more Web servers.
- A large Web site may be spread over several servers in different geographic locations.
- In order to make the Web pages that you have developed available to your audience, you have to publish those pages.

- **Publishing** is copying the Web pages and associated files such as graphics and audio to a Web server
- Once a Web page is published, anyone who has access to the Internet can view it, regardless of where the Web server is located.
- Once a Web page is published, it can be read by almost any computer: whether you use the Mac, Windows, or Linux operating system, with a variety of computer hardware, you have access to billions of published Web pages

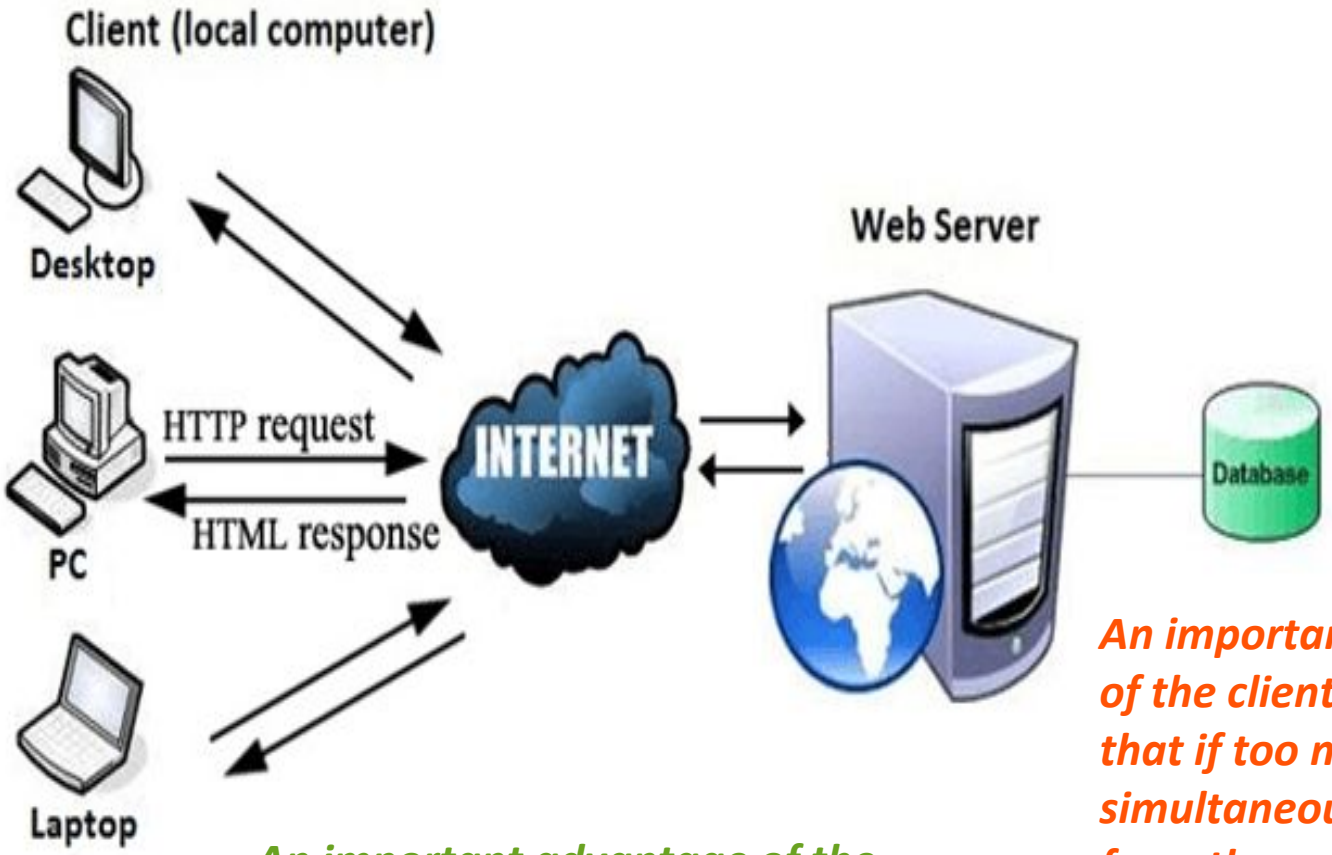
WWW, Cont…

- A communications *protocol* is simply a set of rules that computers use to communicate over a network
  - The **H**yper**t**ext **T**ransfer **P**rotocol (HTTP) is a protocol that computers use to communicate on the WWW.
  - HTTPS is the **s**ecure version of HTTP, which is used when sensitive information such as bank details are being exchanged.

How WWW Works?

- The web works on a **"client-server model".**
- Client-server architecture is an architecture of a computer network in which many clients (remote processors) request and receive service from a centralized server (host computer)
- Clients are the typical web user's internet-connected devices and web-accessing software available on those devices.
- Client is capable of receiving information or using a particular service from the service providers (Servers).
- Server is a remote computer which provides information (data) or access to particular services. It stores webpages, sites, or apps.

How WWW Works?



An important advantage of the client-server model is that its centralized architecture helps make it easier to protect data with access controls that are enforced by security policies.

An important disadvantage of the client-server model is that if too many clients simultaneously request data from the server, it may get overloaded. In addition to causing network congestion, too many requests may result in a denial of service.

Some common Internet protocols

- HTTP (HyperText transfer Protocol): used on the World Wide Web (WWW) for transferring web pages and files contained in web pages such as images.
- FTP (File Transfer protocol): employed for transferring files from one machine to the other.
- SMTP (Simple Mail Transport Protocol): used for email.
- Telnet Protocol: Used to open telnet sessions.
- The web employs a **connection-less protocol**, which means that after every client-server interaction the connection between the two is lost

HTTP

- is protocol between Web servers and browsers
- HTTP has the following duties:
  - To establish a connection between the browser (the client) and the server
  - To negotiate settings and establish parameters for the session
  - To provide for the orderly transfer of HTML content
  - To close the connection with the server

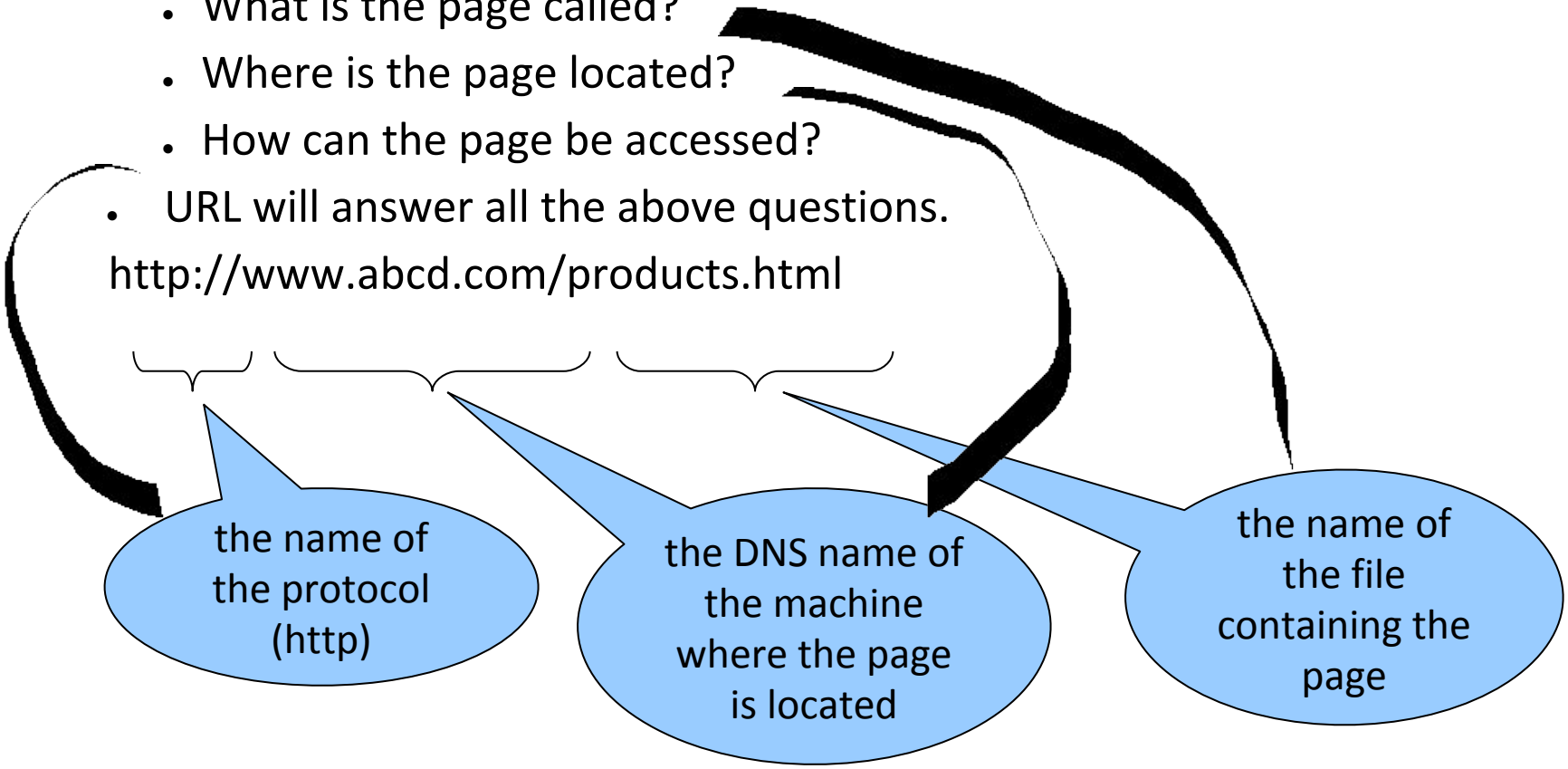
URI

- Each web server resource has a name which is called a **uniform resource identifier (URI)**
- **URI -** uniquely identify and locate information resources around the world.
- Eg. URI for an image resource on Joe's Hardware store's web server:
  - http://www.joes-hardware.com/specials/saw-blade.gif
- URIs come in two flavors, called
  - URLs and
  - URNs.

URL (Uniform Resource Locator)

- Three questions had to be answered before a selected page could be displayed:
  - What is the page called?
  - Where is the page located?
  - How can the page be accessed?
- URL will answer all the above questions.

http://www.abcd.com/products.html



Front End & Back End Development

How website looks..

How website works..

- The main difference between front and back end development is the particular area of focus.
- The front end is concerned with a website's appearance, look and feel;
- while the back end focuses on functionality on a website's server-side, including all communications between the browser and the database.
- To build a website, a front end developer takes care of the theme, including the presentation, images and style.
- The back end developer takes care of the database, security, site performance and users.
- Each side needs to communicate and operate effectively with the other as a single unit to improve the website's functionality.

Front End Development

- The part of a website that user interacts with directly is termed as **front end**.
- It is also referred to as the **'client side'** of the application.
- It includes everything that users experience directly:
  - ✔ colors and styles,
  - ✔ images,
  - ✔ graphs and tables,
  - ✔ buttons,
  - ✔ navigation menu and etc.

Front End Development

- The structure, design, behavior, and content of everything seen on browser screen when websites, web applications, or mobile apps are opened up, is implemented by front end developers.
- ***Responsiveness*** and ***performance*** are two main objectives of the front end.
- The developer must ensure that the site is responsive i.e. it appears correctly on devices of all sizes no part of the website should behave abnormally irrespective of the size of the screen.

Front End Development

Front End Languages

- HTML
- CSS
- JavaScript
- VBScript

Front End Frameworks and Libraries

- AngularJS
- React.js
- Bootstrap
- jQuery
- SASS

Front End Development

Languages

HTML

- HTML stands for Hyper Text Markup Language.
- It is used for creating websites and web applications for World Wide Web.
- HTML5 is the latest and most enhanced version of HTML.
- HTML5 is a standard language for structuring and presenting content on the WWW.
- Any page made in HTML5 is compatible with both computers and mobile devices. In other words, you can set the mobile specification from the HTML document itself.
- All the latest versions of web browsers including the mobile web browsers that come pre-installed on iPhones, iPads, and Android phones have excellent support for HTML5.

Front End Development

Languages

CSS (Cascading Style Sheets)

- **CSS** is a simply designed language intended to simplify the process of making web pages presentable.
- CSS is a language that that lets you describe how the elements defined in your HTML should be styled, allowing changes in font, color, layout, simple animations, and other superficial elements.
- It is used for defining the look and feel of a webpage
- More importantly, CSS enables you to do this independent of the HTML that makes up each web page.
- CSS3 is the most widely used version, though CSS4 has been released

Front End Development

Languages

JavaScript

- Developed by Netscape, it is good for network-centric web applications.
- It is a famous scripting language used to create the magic on the sites to make the site interactive for the user.
- It is used to enhancing the functionality of a website by running cool games and displaying timely content updates, interactive maps, animated 2D/3D graphics, scrolling video jukeboxes, etc.
- JavaScript can **calculate**, **manipulate** and **validate** data.
- With the breakthroughs of Node.js and AngularJS, JavaScript became the undisputed frontrunner in-browser programming today

Most web developers use JavaScript for client-side scripting in order to be sure their website works in all browsers.

Front End Development

Languages

JavaScript

- The merits of using JavaScript are:
- **Less server interaction** − You can validate user input before sending the page off to the server. This saves server traffic, which means less load on your server.
- **Immediate feedback to the visitors** − They don't have to wait for a page reload to see if they have forgotten to enter something.
- **Increased interactivity** − You can create interfaces that react to user-initiated events such as button clicks, link navigation.
- **Richer interfaces** − You can use JavaScript to include such items as drag-and-drop components and sliders to give a Rich Interface to your site visitors.

Front End Development

Languages

VBScript

- **"Microsoft Visual Basic Scripting Edition"**
- It is developed and maintained by Microsoft for the purpose of developing dynamic web applications.
- It is a lightweight active scripting language modeled on Visual basic.
- The syntax of VBScript is very similar to that of Visual Basic.
- It gives different functionalities to the web pages and designs the user interaction in a different manner.
- VBScript only worked in Internet Explorer while JavaScript was a cross-browser solution that also worked in other browsers.
- It is not supported by their competitors' browsers such as Firefox and Opera.
- Unfortunately, ***VBScript is now disabled by default in Internet Explorer on all supported versions of Windows after a recent Windows update.***
- ***That's a big reason why JavaScript won!***

Back End Development

- Backend is the server side of the website.
- It is the part of the website that you cannot see and directly interact with.
- The parts and characteristics developed by backend designers are indirectly accessed by users through a front-end application.
- It stores and arranges data, and also makes sure everything on the client-side of the website works fine.
- Activities, like writing APIs, creating libraries, and working with system components without user interfaces or even systems of scientific programming, are also included in the backend.

Back End Development

Server-side programming must deal with dynamic content. Most web pages are not static since they deal with searching databases.

Server-side Uses

- It processes the user input
- Displays the requested pages
- Interaction with servers/storages
- Interaction with databases
- Querying the database
- Encoding of data into HTML
- Operations over databases like delete, update.

Back End Development

Languages & Frameworks

PHP

- It is an open source, server-side scripting language designed specifically for web development.
- Since PHP code executed on the server side so it is called ***server-side scripting language***.
- It has been used to create web applications for over 35 years, with multiple frameworks being available for the developers.
- **Wordpress** runs on it and powers 25% of the websites today, including most popular blogs and news websites.
- It finds applications mainly in the fields of *server-side and standalone web application development along with the development of CMS systems*.
    - Notable websites built on PHP: ***Facebook, Wikipedia, Wordpress.***

```
<!DOCTYPE html>
<html>
<head>
<title> PHP Time</title>
</head>
<body>
<h1>Welcome</h1>
<?php $t = date("H");
if ($t < 12) { echo
'<p>Good
morning!</p>'; } else {
echo '<p>Good
day!</p>'; } ?>
</body>
</html>
```

Back End Development

Languages & Frameworks

ASP.NET

- **ASP.NET** is an open-source, server-side web-application framework designed for web development to produce dynamic web pages.
- It was developed by Microsoft to allow programmers to build dynamic web sites, applications and services.
- Prior to ASP.NET, Microsoft had developed another server-side scripting language with the name ASP (Active Server Pages) which was used widely on the web. However, other than the name, ASP and ASP.NET are very different technologies.
- ***.NET is a developer platform made up of tools, programming languages, and libraries for building many different types of applications.***
- ***The base platform provides components that apply to all different types of apps. Additional frameworks, such as ASP.NET, extend .NET with components for building specific types of apps.***

Back End Development

Languages & Frameworks

Python

- Python is an interpreted, high-level and general-purpose programming language.
- It was designed to be simple and easy to learn. Hence reducing the overall development time of the project code.
- Lets you work quickly and integrate systems more efficiently.
- Its ease of coding, and support from the open-source community has led to the exponential growth of Python
- Used by both beginners and as well as experienced programmers
- It has a set of different libraries and APIs that support data analysis, data visualization, and data manipulation.

Back End Development

Languages & Frameworks

Java

- Java was developed in an effort to create a simple, object-oriented interpreted programming language.
- It was released in 1995 and quickly became the hottest new programming language due in part to its promise of ***"write once, run anywhere"***.
- It was to act as an alternative to C++ which was widely used in business applications of the 90s.
- But over time, Java far surpassed C++ in terms of popularity due to its lower learning barrier and the highly distributable nature of Java code.
- It is powerful in terms of scalability and it's components are easily available.
- Java, with the help of the Java Virtual Machine, is a language that is independent of platforms. This makes it the most popular programming language for enterprises.

Cont’d

- A **library** performs specific, well-defined operations
- A **framework** is a skeleton where the application defines the "meat" of the operation by filling out the skeleton. The skeleton still has code to link up the parts but the most important work is done by the application.
- A **language** is syntax, grammar, semantics (and perhaps a core library) that implementers are required to support.
- A **framework** is a *cohesive* set of library code that together simplifies programming in any given language.

Front End Development

Frameworks and Libraries

AngularJS

- AngularJs is a JavaScript open source front-end framework that is mainly used to develop single page web applications (SPAs).
- It is a continuously growing and expanding framework which provides better ways for developing web applications.
- It changes the static HTML to dynamic HTML. It is an open source project which can be freely .
- It extends HTML attributes with Directives.

Front End Development

Frameworks and Libraries

React.js

- React is a declarative, efficient, and flexible JavaScript library for building user interfaces.
- ReactJS is an open-source, component-based front end library responsible only for the view layer of the application.

Bootstrap

- Bootstrap is a free and open-source tool collection for creating responsive websites and web applications.
- It is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile-first web sites.

Front End Development

Frameworks and Libraries

jQuery

- jQuery is an open source JavaScript library that simplifies the interactions between an HTML/CSS document, or more precisely the Document Object Model (DOM), and JavaScript.
- Jquery is a javascript toolkit that simplifies writing code and enables rapid web development.
- The claim of the developers is that jquery runs exactly the same across all brow
- Elaborating the terms, jQuery simplifies HTML document traversing and manipulation, browser event handling, DOM animations, Ajax interactions, and cross-browser JavaScript development.

SAS

- It is the most reliable, mature and robust CSS extension language.
- It is used to extend the functionality of an existing CSS of a site including

Web tools

- A web design program is a computer program used to create, edit, and update web pages and websites.
- What you see is what you get (WYSIWYG) is the content (text and graphics) displayed onscreen during editing appears in a form closely corresponding to its appearance when the web page displayed
- WYSIWYG is editing tools in their third and fourth generations, and have become very sophisticated applications
- Common WYSIWYG web design tools now are
  - Macromedia Dreamweaver
  - Adobe Edge tools
  - Ms web matrix
  - Ms Expression
  - Eclipse
  - Net beans
  - Fireworks and many other
- There are plenty of high level applications aimed at the more experienced users, who like to be able to focus on the HTML, CSS or Scripting code

Other Important Concepts in Web Development

Cross-browser Compatibility

- It is the practice of trying to make sure your webpage works across as many devices as possible.
- This includes using technologies that all the browsers support, delivering better experiences to browsers that can handle them (progressive enhancement), and/or writing code so that it falls back to a simpler but still usable experience in older browsers.
- It also involves a lot of testing to see if anything fails in certain browsers, and then more work to fix those failures.

Responsive Web Design

- Responsive web design is the practice of making your website functionality and layouts flexible so they can automatically adapt to different browsers.
- An obvious example is a website that is laid out one way in a widescreen browser on the desktop, but displays as a more compact, single-column layout on mobile phone browsers.

Other Important Concepts in Web Development

Performance

- It means getting web sites to load as quickly as possible, but also making them intuitive and easy to use so that users don't get frustrated and go somewhere else.

Accessibility

- It means making your websites usable by as many different kinds of people as possible (related concepts are diversity and inclusion, and inclusive design).
- This includes people with visual impairments, hearing impairments, cognitive disabilities, or physical disabilities.
- It also goes beyond people with disabilities — how about young or old people, people from different cultures, people using mobile devices, or people with unreliable or slow network connections?

Other Important Concepts in Web development

Internationalization

- making websites usable by people from different cultures, who speak different languages to your own.
- There are technical considerations here (such as altering your layout so that it still works OK for right-to-left, or even vertical languages), and human ones

Privacy & Security

- Privacy refers to allowing people to go about their business privately and not spying on them or collecting more of their data than you absolutely need to.
- Security refers to constructing your website in a secure way so that malicious users cannot steal information contained on it from you or your users.