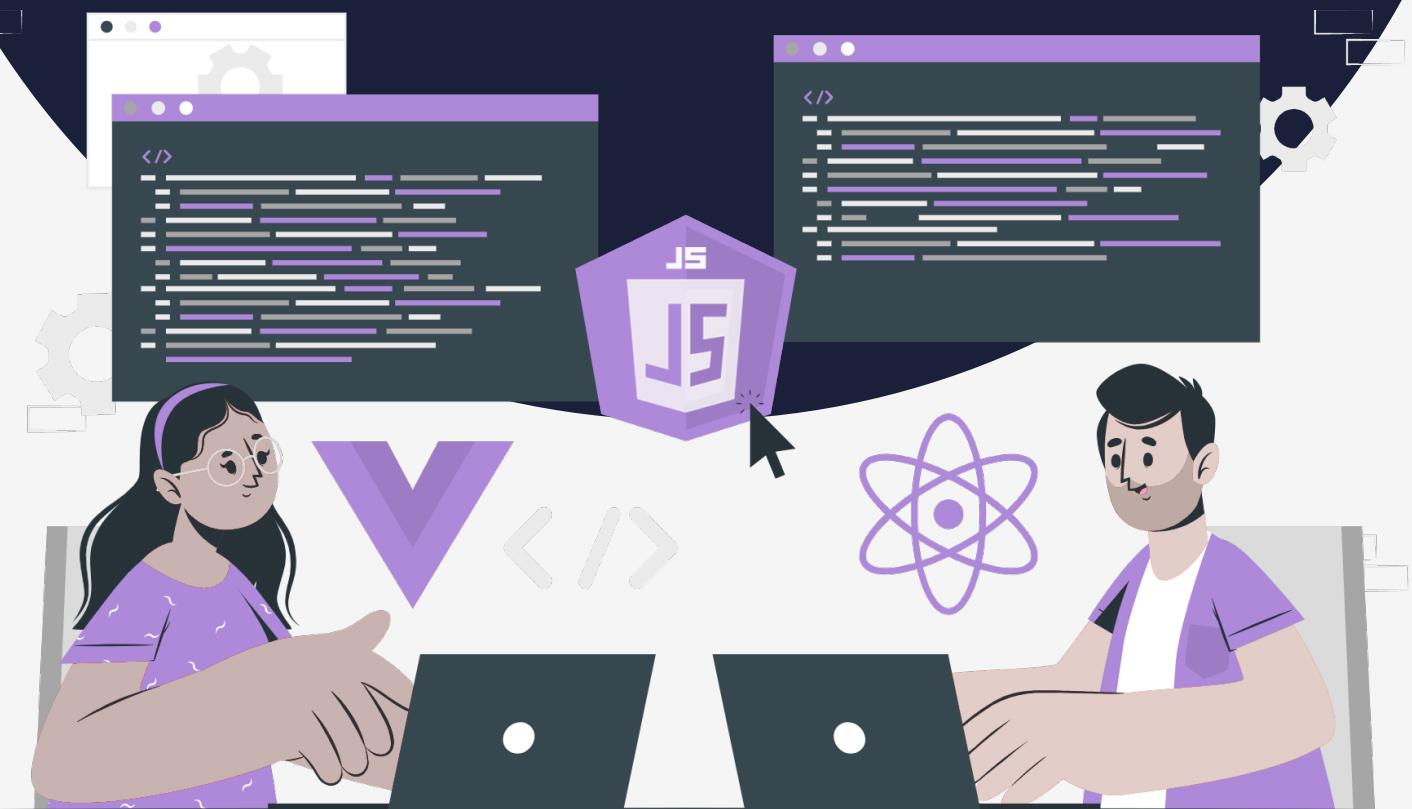


Lesson:

Network



Topics Covered

1. Introduction.
2. Network.
3. WWW.
4. IP Address.
5. PORT numbers.
6. DNS.
7. Cache.
8. The flow of how users get webpages.

Networking concepts are an essential aspect of web development. Understanding how networks, the internet, and various protocols work is crucial for web developers to create reliable and secure websites. As a web developer, it's important to understand how the internet works. This includes concepts like networks, the internet, the World Wide Web (WWW), DNS, IP addresses, and port numbers.

A network is a group of devices that are connected to each other. The internet is a huge network that connects devices all around the world. The WWW is a collection of documents and resources that can be accessed through the internet using web browsers like Chrome or Firefox.

DNS is a system that translates human-readable web addresses (like google.com) into computer-readable IP addresses. IP addresses are unique numbers that help computers communicate with each other across networks. Port numbers are like addresses for specific applications or services running on a device, which help ensure data is sent to the correct destination. Understanding these concepts can help web developers build better, more reliable websites.

In this lecture, we will be exploring some of the important networking concepts which help us build websites that are accessible to users around the world and can provide a seamless browsing experience.

Network.

In the world of web development, a network refers to a group of interconnected devices that can communicate with each other to share resources, data, and information. Networks can vary in size from a small-scale local network in a home or office to a large-scale global network like the internet.

As a web developer, having an understanding of how networks work is crucial for building reliable and secure websites. When designing a website, web developers need to consider factors such as network speed, bandwidth, and latency to ensure that their site loads quickly and is easily accessible to users.

Network speed is the rate at which data is transmitted over a network. In the context of web development, it refers to how quickly website data is downloaded by visitors to the site. Faster network speeds mean faster website loading times, which can lead to a better user experience and increased engagement with the site.

Bandwidth, on the other hand, refers to the amount of data that can be transmitted over a network in a given time period. Web developers need to consider the available bandwidth when designing and building websites, as large files like images and videos can use a lot of bandwidth and slow down website loading times. Optimizing images and videos for web use can help reduce the amount of bandwidth they use, resulting in faster website loading times.

Latency, or network delay, is the time it takes for data to travel from the server to the client and back. High latency can result in slow website loading times and poor user experience. Web developers can improve website performance by reducing latency through strategies like using content delivery networks (CDNs) and optimizing server and client configurations. We will be looking at this in more detail in upcoming lectures.

Internet.

Internet refers to a global network of interconnected computer networks that use standardized communication protocols to exchange data and information. The internet provides access to a vast array of resources, including websites, email, online applications, and digital media.

The Internet is a critical component of the technology stack used to build and maintain websites. Web developers use internet protocols like HTTP (Hypertext Transfer Protocol) and HTTPS (Hypertext Transfer Protocol Secure) to communicate between servers and clients, and DNS (Domain Name System) to translate human-readable domain names into IP addresses used by computers to connect to each other. We will be looking at protocols like HTTP, and HTTPS in further lectures.

The internet also provides a platform for hosting and serving websites to users around the world. Web developers can use various hosting services to deploy their websites on internet-connected servers, which can then be accessed by users using web browsers.

WWW.

The World Wide Web (WWW or simply the Web) refers to a system of interconnected web pages and resources accessed through the internet. The Web is built on top of the internet and provides a way for users to access and share information and resources using standard protocols.

The Web is a platform for creating, publishing, and consuming digital content, including websites, web applications, multimedia, and more. Web developers use a variety of tools and technologies to create websites and web applications that can be accessed and used by users around the world.

The Web is often described as a distributed system, meaning that web pages and resources are hosted on servers located all around the world. This allows users to access information and resources from anywhere with an internet connection, making the Web an essential platform for global communication and collaboration.

IP Address.

IP address (Internet Protocol address) is a unique numerical identifier assigned to each device connected to the internet. IP addresses are used to identify and communicate with devices on a network and are an essential component of the internet infrastructure.

IP addresses come in two main types: IPv4 and IPv6. IPv4 addresses are the most common type and consist of four sets of numbers between 0 and 255, separated by dots (for example, 192.168.1.1). IPv6 addresses are longer and consist of eight sets of four hexadecimal digits, separated by colons (for example, 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

IP addresses are used to identify servers that host websites and web applications. When a user types a domain name (such as www.pwskills.com) into their web browser, the browser uses a DNS server to translate the domain name into the IP address of the server that hosts the website. The browser then sends a request to the server using the IP address, asking for the web page or resource requested by the user.

PORT numbers.

The port number is a numeric identifier used to identify specific services running on a server. Port numbers are used to help route data to the correct destination on a network and are an essential component of internet communication protocols.

For example, a web server might use port 80 to serve HTTP traffic and port 443 to serve HTTPS traffic. Web developers may also use different port numbers to identify different web applications running on the same server.

Users typically do not see the port number in their browser's address bar unless it is a non-standard port. By default, web traffic uses port 80 for HTTP and port 443 for HTTPS, so users do not need to specify a port number when accessing most websites.

If a website is hosted on a non-standard port, users may need to include the port number in the URL to access the site. For example, if a website is hosted on port 8080, users would need to enter the port number in the URL like this: <http://website.com:8080/>.

Considering VS Code's Live Server extension, port numbers are used to identify the local web server that is serving the website or web application. By default, Live Server uses port number 5500 to serve web content, but users can specify a different port number if needed.

DNS

DNS, or Domain Name System, is a system used in web development to translate domain names, such as "pwskills.com," into IP addresses that computers can understand. DNS servers maintain a database of domain names and their corresponding IP addresses, allowing web browsers and other applications to access websites by their domain names instead of their IP addresses.

For example, when a user types "pwskills.com" into their web browser, the browser sends a DNS request to a DNS server, asking for the IP address associated with the domain name "pwskills.com." The DNS server then responds with the IP address of the web server hosting the website. The browser can then use this IP address to request the web page from the server.

DNS can also be used to set up subdomains, such as "jobs.pwskills.com/" or "affiliate.pwskills.com/", which can be used to host different sections of a website or different applications on the same domain.

Having a domain name provides several advantages over using an IP address in web development. First and foremost, domain names are easier to remember than IP addresses, which are typically long strings of numbers. This makes it easier for users to access websites without having to remember complex IP addresses.

Domain names can be used to create subdomains, which can be used to host different sections of a website or different applications on the same domain. This makes it easier for website owners to organize their content and applications, while still maintaining a consistent branding and domain name.

Having a domain name can help establish credibility and trust with users. A domain name is a unique identifier that can be associated with a brand or business, helping to build brand recognition and reputation over time.

Majorly there are two types of DNS servers: local DNS servers, which are provided by your Internet Service Provider (ISP) and help your computer find websites quickly, and authoritative DNS servers, which manage domain name records for specific websites. Together, local and authoritative DNS servers work together to make sure you can access the websites you want to visit easily and quickly.

Cache.

Cache refers to a mechanism for storing frequently accessed data in a temporary storage location to reduce the time it takes to access the data in the future. Caching is used to improve the performance and speed of web applications by reducing the number of requests made to the server and minimizing the amount of data that needs to be transmitted over the network.

One example of caching in web development is browser caching. When a user visits a website, their browser stores certain resources such as images, stylesheets, and JavaScript files in its cache. The next time the user visits the same website, the browser can retrieve these resources from its cache instead of requesting them from the server again, resulting in faster page load times and reduced bandwidth usage.

The flow of how users get web pages.

When a user types a domain name into their web browser, the following flow occurs to bring the website to the user's web browser:

1. The web browser sends a request for the website to the user's local DNS resolver.
2. The local DNS resolver checks its cache to see if it already has the IP address for the domain name. If it does, it sends the IP address back to the web browser. If it does not, it forwards the request to the DNS server.
3. The local DNS resolver then sends a request to the DNS server for the IP address of the domain name.
4. The local DNS resolver sends the IP address back to the web browser.
5. The web browser sends a request for the website to the web server using the IP address.
6. The web server sends the website content back to the web browser.
7. The web browser renders the website content and displays it to the user.

In summary, when a user types a domain name into their web browser, DNS servers are used to translate the domain name into an IP address that can be used to locate the web server hosting the website. The web server then sends the website content back to the web browser, which renders and displays it to the user. This process involves multiple steps and multiple DNS servers, but it is largely transparent to the user, who only sees the final website in their web browser.