

# Web Development 101

## Level 1: Introduction to Web

### What is the Internet?

The origin of the Internet dates back to the 1960s, with it starting out as a way to connect computers across the United States. Today, billions of devices are interconnected over the Internet.

In the following video, Vint Cerf, one of the *fathers of the internet* explains the history of the net and how no one person or organization is really in charge of it.

<https://youtu.be/Dxcc6ycZ73M>

### Client & Server

When you're browsing the Internet, you usually start by typing in an address into the browser's address bar, or by initiating a search.

This means that information needs to flow from a machine (somewhere in the world) connected to the Internet, to your computer, which is also connected to the Internet.

- The machine that requests some info (your PC, for example) is called the client.
- The machine that stores the information is called the server.

For example, if you want to know the current weather in your city today, you might start by opening up a web browser. Next, you type in the web address that provides weather. `https://weather.com`, for example, and press *Enter*.

In that moment your computer starts talking to another computer over Internet, called a server, usually thousands of miles away. And in milliseconds your computer asks that server for a web document (in our case, `weather.com`) and the server starts to talk back to your computer using a couple of different language, the most important of which is HTML - Hyper Text Markup Language - which is used to tell a web browser how a page looks.

All of a web document's contents are transferred over the Internet using a set of rules called [HTTP \(HyperText Transfer Protocol\)](#). Such rules are often called *protocols*, and there are a few different kinds used in the Internet. HTTP is the most common one.

## Hops

If you've watched the earlier video about how the Internet works, then you probably noticed that machines connected to the Internet don't talk to each other directly. Instead, *packets* of information sent across the internet might *hop* across many machines on their journey from the *client* to the *server*. This makes the Internet resilient to failures. Even if one path from a client to a server fails, another can still be taken by the packets that are sent out.

However, this introduces a big problem. Every machine that a packet *hops through* gets to keep that *packet* for a short time, during which it can be *read*.

## Security

You might have noticed that web addresses often start with `https://`. The `HTTPS` is the *Secure* version of the HyperText Transfer Protocol, and is used by almost all websites and web applications - the protocol guarantees that only the client and the server can understand the information that is sent from one side to the other.

Watch the following video to learn more about how the Internet is used to send information securely from you to the server and back.

<https://youtu.be/kBXQZMmiA4s>

## IP Address

Just as every house is assigned a specific and unique postal address, all computers connected to the Internet are also assigned an *IP Address*. IP stands for Internet Protocol.

There are two kinds of IP addresses: *IPv4* and *IPv6*.

An example of an IPV4 address looks like a combination of 4 numbers:

216.58.193.68

IPv4 is the older version which allows for a maximum of around 4.3 billion IP addresses. While that might sound like a lot of addresses, it isn't anywhere near enough to satisfy today's numbers of devices connected to the internet. To satisfy the need for *addressing* the ever-growing number internet users and devices, a new IPv6 version was created that can provide *many more* addresses.

An example of a *full* IPv6 IP address would be:

2001:0db8:0000:0000:0000:ff00:0042:8329

Notice how the IPv6 address is much longer than IPv4? It greatly increases the available address space.

How much more?

340,282,366,920,938,463,463,374,607,431,768,211,456 addresses

That's approximately  $3.4 \times 10^{38}$ . That's a lot - we're not going to need another version of IP addresses for a long while (if ever).

Do you want to know what your IP address is?

The simplest way to discover your current IP address is by typing "What is my IP" in Google search. Google will display your IP address at the top of the search results page.

## Domain Names

Since IP addresses are unique, they are useful for computers to connect with each other, but we humans have a difficult time reading them, or remembering them.

Domains associate an IP address like 216.58.193.68 with a string of text like google.com. Thanks to the [Domain Name System](#) (DNS), both are interchangeable. You can go to <http://216.58.193.68> or <http://google.com> and end up on the exact same website.

When you type in a domain name into your browser's address bar, your browser contacts the DNS to figure out its IP address, and then uses *that* to actually contact the server that belongs to the domain.

In short, a domain name is a unique, easy-to-remember address used to access websites.

## What's a URL?

URL stands for *Uniform Resource Locator*, it's simply a web address that uniquely identifies a specific resource in the computer network or the Internet.

For example, the current page's URL is

`https://www.pupilfirst.school/targets/12078`, and it can be divided in 3 parts:

- `https://` is the protocol.
- `www.pupilfirst.school` is the domain.
- `/targets/12078` is the path to a *resource*.

Watch the video below to learn more about how networks talk to each other, and how the Internet works.

<https://youtu.be/5o8CwafCxnU>

## The Web

The World Wide Web is commonly shortened to *WWW*, or simply called *the Web*.

A broader definition comes from the organization that Web inventor Tim Berners-Lee helped found, the [World Wide Web Consortium \(W3C\)](#).

The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge.

**In simple terms, the World Wide Web is a network of public webpages connected to one another so that information is exchanged between computers on the Internet.**

Note: The *Internet* and the *Web* are different things: The *Web* uses the *Internet* to pass through information.

## **Webpage**

**A *webpage* is a document on the World Wide Web, created using HTML, that can be viewed in a web browser.**

**To access a webpage you can either:**

- **Type its URL, like `http://google.com` in your Web browser...**
- **...or click on a link, like [this one](#).**

What's a website?

**A *webpage* is a single HTML document. A collection of such documents, usually linked to each other under the same domain is called a *website*.**

## **Web browser**

A web browser, or simply *browser* is an application used to access websites. Popular web browsers include Microsoft Edge, Google Chrome and Mozilla Firefox.

## Why Linux, why not Windows?

You can develop perfectly fine on any operating system. However, many developers choose Linux or OSX (Mac) as their development environment because a lot of developer *tools* are built for Unix systems *first*. This makes it typically (much) easier to set up on Unix systems. It is also generally accepted that the Unix command line is superior to the Windows command line. In this course, we're assuming that you have access to a Linux development environment because it makes it easier to build and maintain the course content when it targets just one environment.

## Using WSL

Follow the official Windows instructions for installing WSL on your computer running Windows 10.

<https://docs.microsoft.com/en-us/windows/wsl/install-win10#manual-installation-steps>

### Notes

1. You'll need administrative permissions on your computer to be able to set up WSL.
2. Most of you will want to follow the [manual installation steps](https://docs.microsoft.com/en-us/windows/wsl/install-win10#manual-installation-steps). As of March 2021, the *Simplified Installation* feature of WSL is only available to users of *Windows Insiders*.

The manual installation steps are quite easy to follow, so we recommend following those steps instead of joining the *Windows Insiders* program.

3. When you reach [Step 6 - Install your Linux distribution of choice](#), search for and install *Ubuntu 20.04 LTS* - this is the latest version of Ubuntu available via the Windows Store.
4. There are two versions of WSL; version 1 is older and is not recommended. When you install Ubuntu, it should default to using the newer version 2 of WSL

If your computer is running Windows older than *Windows 10*, then you're not going to be able to use the WSL feature that we documented in the last target.

Instead, the easiest method to run Ubuntu inside an older version of Windows is to use virtual machine software.

We have documented how to use two such software to install and run Ubuntu. You can find these in the *Appendix* of the course. Here are quick links to the two available options:

1. **Recommended:** [Install Ubuntu using VMware Workstation Player](#)
2. [Install Ubuntu using Virtualbox](#)