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The internet

Birth of the internet

Tim Berners-Lee, a British scientist, invented the World Wide Web (WWW) in **1989**, while working at **CERN**. The web was originally conceived and developed to meet the demand for automated information-sharing between scientists in universities and institutes around the world.

On 30 April 1993, CERN put the World Wide Web software in the public domain. Later, CERN made a release available with an open licence, a more reliable way to maximise its dissemination. These decisions allowed the web to flourish.

Interface of the Internet

With the creation of the web, there was also the need for a way to consult the files and resources made accessible. Sir Tim Berners-Lee therefore created a specific software, called the **WorldWideWeb browser**.

WorldWideWeb


first browser

Screen capture of the first browser developed by Sir Tim Berners-Lee

The concept of **hypertext** preceded the World Wide Web by decades. But nearly all hypertext systems worked on local files. Tim Berners-Lee wanted to create a system that would work across networks so that people could link from a file on one machine to another file on another machine.

WorldWideWeb wasn't just a programme for browsing files. It was a browser and editor. The introductory text reads:

> HyperMedia Browser/Editor, An excercise in global information availability by Tim Berners-Lee

At its heart, WorldWideWeb is a word processor... but with hyperlinks. And just as you can use a word processor purely for reading documents, the real fun comes when you write your own. Especially when you throw hyperlinks into the mix !

There was one major downside to the WorldWideWeb browser: it could only be used on a NeXT computer... Almost nobody had a NeXT machine.

Line Mode browser

To make the Web more widely accessible, a second browser project was developed at CERN: the Line Mode browser. The Line Mode browser was first released in 1991 and was compatible with most unix / linux systems. Thereby instantly bring the Web to commonly used, much lower powered devices, such as the "line mode" terminals that were used to access mini computers, still common at the time.

 first browser

Screen capture of the Line Mode browser

Language of the Internet

HyperText Markup Language

HTML (**H**ypertext **M**arkup **L**anguage) is the code that is used to structure a web page and its content. For example, content could be structured within a set of paragraphs, a list of bulleted points, or using images and data tables.

HTML consists of a **series of elements**, which you use to enclose, or wrap, different parts of the content to make it appear a certain way, or act a certain way. The enclosing tags can make a word or image hyperlink to somewhere else, can italicize words, can make the font bigger or smaller, and so on.

```
<p>This is a paragraph, because it is enclosed in a "p" html tag.</p>
<p>This is another paragraph, also enclosed in a "p" html tag.</p>
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General Intro to the Course

Hello World!

Since the computers and the Internet appeared, they have changed deeply how we play, how we communicate, how we work, how we live. Because of these deep changes in our Society, there are many jobs available for people who have learned to code and solve problems by coding websites and web applications.

Perhaps you think you need a University degree in Mathematics and nuclear engineering to be able to code? Not at all! Coding is easy once you "get it" : even kids can learn programming... Because it actually is a lot of fun! If you ask programmers what they do every day, they will say things like: "it's like playing with Lego Bricks" or "It's like cooking, writing recipes...".

What you can expect

The objectives of this training is to allow you to have a try at programming and logical thinking, to see if you too find it fun and something you would like to pursue once you get out of jail.

This course will have you learn the basics of website making and programming using the 3 main languages of the web: HTML, CSS, and JavaScript. By the end of the training, you will be more than ready to join a coding bootcamp that will help you reach a level in which you can get a real job as a programmer !

Learn by doing

The best way to learn coding, is just like cooking... By doing it! This is why the course is organized as a series of exercises that you need to succeed in order to move on to the next step. Don't worry about being fast, it's not like school! The system remembers your progress so you don't have to start over from one session to the next.

... It doesn't work! I suck at this!!

No, you don't. Coding is about trying until it works. So we all start by failing! Get used to it, failure is part of the learning process. Just keep trying, you will make it!

A final word from the team

Ready ? Let's go!

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How does the internet work

In short

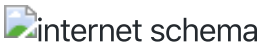
The Internet is the backbone of the Web, the technical infrastructure that makes the Web possible. At its most basic, the Internet is a large network of computers which communicate all together.

The history of the Internet is somewhat obscure (you can read more about it here (Background.md)). It began in the 1960s as a US-army-funded research project, then evolved into a public infrastructure in the 1980s with the support of many public universities and private companies. The various technologies that support the Internet have evolved over time, but the way it works hasn't changed that much: Internet is a way to connect computers all together and ensure that, whatever happens, they find a way to stay connected.

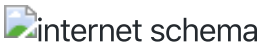
Deeper Dive

A simple network

When two computers need to communicate, you have to link them, either physically (usually with an Ethernet cable) or wirelessly (for example with WiFi or Bluetooth systems). All modern computers can sustain any of those connections.

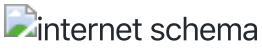


Such a network is not limited to two computers. You can connect as many computers as you wish. But it gets complicated quickly. If you're trying to connect, say, ten computers, you need 45 cables, with nine plugs per computer!



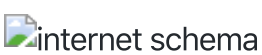
To solve this problem, each computer on a network is connected to a special tiny computer called a router. This router has only one job: like a signaler at a railway station, it makes sure that a message sent from a given computer arrives at the right destination computer. To send a message to computer B, computer A must send the message to the router, which in turn forwards the message to computer B and makes sure the message is not delivered to computer C.

Once we add a router to the system, our network of 10 computers only requires 10 cables: a single plug for each computer and a router with 10 plugs.

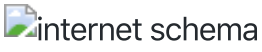


A network of networks

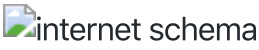
So far so good. But what about connecting hundreds, thousands, billions of computers? Of course a single router can't scale that far, but, if you read carefully, we said that a router is a computer like any other, so what keeps us from connecting two routers together? Nothing, so let's do that.



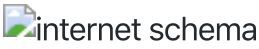
By connecting computers to routers, then routers to routers, we are able to scale infinitely.



Such a network comes very close to what we call the Internet, but we're missing something. We built that network for our own purposes. There are other networks out there: your friends, your neighbors, anyone can have their own network of computers. But it's not really possible to set cables up between your house and the rest of the world, so how can you handle this? Well, there are already cables linked to your house, for example, electric power and telephone. The telephone infrastructure already connects your house with anyone in the world so it is the perfect wire we need. To connect our network to the telephone infrastructure, we need a special piece of equipment called a modem. This modem turns the information from our network into information manageable by the telephone infrastructure and vice versa.



So we are connected to the telephone infrastructure. The next step is to send the messages from our network to the network we want to reach. To do that, we will connect our network to an Internet Service Provider (ISP). An ISP is a company that manages some special routers that are all linked together and can also access other ISPs' routers. So the message from our network is carried through the network of ISP networks to the destination network. The Internet consists of this whole infrastructure of networks.



Finding computers

If you want to send a message to a computer, you have to specify which one. Thus any computer linked to a network has a unique address that identifies it, called an "IP address" (where IP stands for Internet Protocol). It's an address made of a series of four numbers separated by dots, for example: 192.168.2.10.

That's perfectly fine for computers, but we human beings have a hard time remembering that sort of address. To make things easier, we can alias an IP address with a human readable name called a domain name. For example (at the time of writing; IP addresses can change) google.com is the domain name used on top of the IP address 173.194.121.32. So using the domain name is the easiest way for us to reach a computer over the Internet.

Internet and the web

As you might notice, when we browse the Web with a Web browser, we usually use the domain name to reach a website. Does that mean the Internet and the Web are the same thing? It's not that simple. As we saw, the Internet is a technical infrastructure which allows billions of computers to be connected all together. Among those computers, some computers (called Web servers) can send messages intelligible to web browsers. The Internet is an infrastructure, whereas the Web is a service built on top of the infrastructure. It is worth noting there are several other services built on top of the Internet, such as email and IRC.

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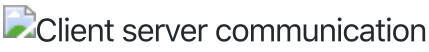
How the Web works

How the web works provides a simplified view of what happens when you view a webpage in a web browser on your computer or phone.

This theory is not essential to writing web code in the short term, but before long you'll really start to benefit from understanding what's happening in the background.

Clients and servers

Computers connected to the web are called **clients** and **servers**. A simplified diagram of how they interact might look like this:

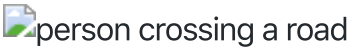


- Clients are the typical web user's internet-connected devices (for example, your computer connected to your Wi-Fi, or your phone connected to your mobile network) and web-accessing software available on those devices (usually a web browser like Firefox or Chrome).
- Servers are computers that store webpages, sites, or apps. When a client device wants to access a webpage, a copy of the webpage is downloaded from the server onto the client machine to be displayed in the user's web browser.

Other parts of the toolbox

The client and server we've described above don't tell the whole story. There are many other parts involved, and we'll describe them below.

For now, let's imagine that the web is a road. On one end of the road is the client, which is like your house. On the other end of the road is the server, which is a shop you want to buy something from.



In addition to the client and the server, we also need to say hello to:

- Your internet connection: Allows you to send and receive data on the web. It's basically like the street between your house and the shop.
- TCP/IP: Transmission Control Protocol and Internet Protocol are communication protocols that define how data should travel across the web. This is like the transport mechanisms that let you place an order, go to the shop, and buy your goods. In our example, this is like a car or a bike (or however else you might get around).
- DNS: Domain Name Servers are like an address book for websites. When you type a web address in your browser, the browser looks at the DNS to find the website's real address before

it can retrieve the website. The browser needs to find out which server the website lives on, so it can send HTTP messages to the right place (see below). This is like looking up the address of the shop so you can access it.

- HTTP: Hypertext Transfer Protocol is an application protocol that defines a language for clients and servers to speak to each other. This is like the language you use to order your goods.
- Component files: A website is made up of many different files, which are like the different parts of the goods you buy from the shop. These files come in two main types:
  - Code files: Websites are built primarily from HTML, CSS, and JavaScript, though you'll meet other technologies a bit later.
  - Assets: This is a collective name for all the other stuff that makes up a website, such as images, music, video, Word documents, and PDFs.

So what happens, exactly?

When you type a web address into your browser (for our analogy that's like walking to the shop):

1. The browser goes to the DNS server, and finds the real address of the server that the website lives on (you find the address of the shop).
2. The browser sends an HTTP request message to the server, asking it to send a copy of the website to the client (you go to the shop and order your goods). This message, and all other data sent between the client and the server, is sent across your internet connection using TCP/IP.
3. If the server approves the client's request, the server sends the client a "200 OK" message, which means "Of course you can look at that website! Here it is", and then starts sending the website's files to the browser as a series of small chunks called data packets (the shop gives you your goods, and you bring them back to your house).
4. The browser assembles the small chunks into a complete website and displays it to you (the goods arrive at your door — new shiny stuff, awesome!).

DNS explained

Real web addresses aren't the nice, memorable strings you type into your address bar to find your favorite websites. They are special numbers that look like this: 63.245.215.20.

This is called an IP address, and it represents a unique location on the web. However, it's not very easy to remember, is it? That's why Domain Name Servers were invented. These are special servers that match up a web address you type into your browser (like "mozilla.org") to the website's real (IP) address.

Websites can be reached directly via their IP addresses. You can find the IP address of a website by typing its domain into a tool like IP Checker.

Packets explained

Earlier we used the term "packets" to describe the format in which the data is sent from server to client. What do we mean here? Basically, when data is sent across the web, it is sent as thousands of small chunks, so that many different web users can download the same website at the same time. If websites were sent as single big chunks, only one user could download one at a time, which obviously would make the web very inefficient and not much fun to use.