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Fundamentals HTML & CSS

Goal of the Submodule

The goal of this submodule is to cover the basics of how the Internet and HTML works. By the end of this submodule, the learners should be able to understand fundamentals of:

- Communication over the Internet
- URLs
- Basic website concepts
    - HTML
    - CSS

Topics

Introduction on how the internet works (TCP / IP)

Basic Anatomy of an URL

- DNS (domain name / IP)
- Protocol
- Resource path
- Parameters

HTML & CSS Basic concepts

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Glossary

Term	Definition
TCP/IP	Transmission Control Protocol / Internet Protocol; "Internet protocol suite". Set of communications protocols used in the Internet.
HTML	HyperText Markup Language; standardized markup language for displaying documents in web browsers
CSS	Cascading Style Sheets; standardized language for visually styling HTML documents
DNS	Domain Name System; standardized hierarchical and decentralized naming and addressing system for the Internet
URL	Universal Resource Locator; a specific kind of address used a lot on the Internet.

How the Internet works

The Internet is a network of servers
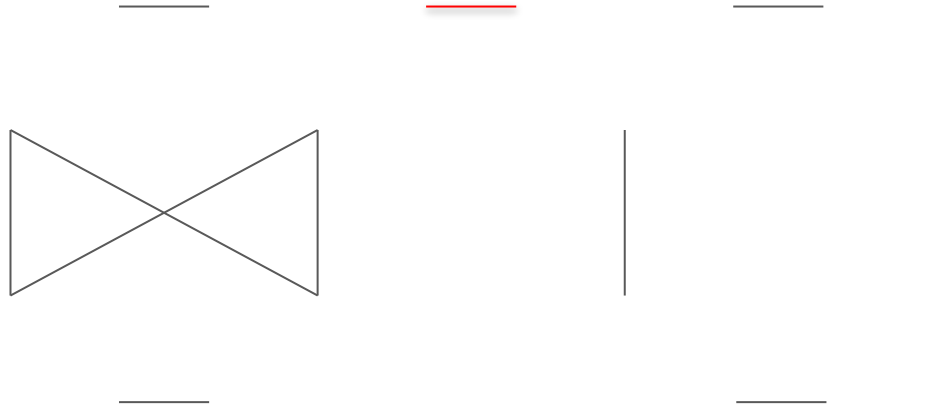
The Internet is basically a bunch of servers connected to each other like a web.

Servers are just computers, either physical or virtual.

These servers exchange information using standardized communication protocols.

Many kinds of specialized servers, providing many services.

Data / Information flow online

Users and servers both are connected to the Internet via an Internet Service Provider

Information flows from one machine to another over the network of computers, sometimes passing many different nodes.

| Browser | ← → | User ISP | ← → | Internet | ← → | Server ISP | ← → | Web Server |

TCP/IP
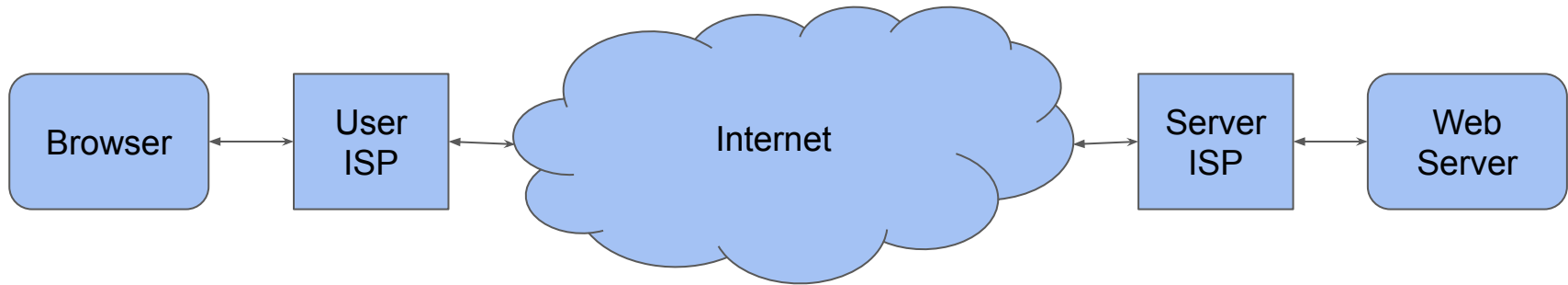
To enable computers to communicate, a shared protocol exists.

This protocol defines the standards that ensure that computers understand each other globally.

The set of protocols that powers the Internet is called the Internet protocol suite.

It is also commonly known as TCP/IP.

The protocol defines exactly how sent data looks like.

TCP/IP

- **Transmission Control Protocol**
- **Internet Protocol**

Based on research by DARPA in the 1960s

TCP - 1974
TCP/IP - 1978

TCP/IP

TCP / IP

Data is sent as small packets using two different kinds communication:

TCP Connected
- like a telephone 📞
  - a connection is created and information sent
  - possible to confirm information was received
  - in case of error, information resent / retried
- used when all data is needed, no error tolerance
- transfer of web pages and pictures

UDP Connectionless
- like radio transmissions 📧
  - no connection made
  - messages sent and *hopefully* received
  - no error checking
- faster and simpler
- voice and video streaming

Topics

To send data using TCP/IP, computers & smartphones need an address! **An IP address!**

IPv4 ➡️ **192.168.1.1**

This one *127.0.0.1* points to your local device

0.0.0.0 - 255.255.255.255 = ~3400 million addresses

We are running out of IPv4 addresses! 😨 But things like IPv6 are helping!

They can change OR be static (you can buy static IP addresses)
Some are Public (used on the internet) addresses
Some are Private (used in local networks) addresses

IPv6 ➡️ **2001:db8::8a2e:370:1123** (0:0:0:0:0:0:0:1 or ::1 for your local device)

These are *slowly* becoming popular. They are static, nearly endless and ❤️𝒞𝑜𝑜𝓁❤️. Also complex.

Help me DNS, you are my only hope

The Internet sure would be terrible if we had to remember the IP address of every website…

Tell me, was Facebook
2a03:2880:f10c:83:face:b00c:0:25de

Or was it
2a03:2880:f10c:83:face:b00c:0:25df

?

🤦

Thankfully, we have nicer addresses for websites.

They look like this: **https://www.reddit.com/r/ProgrammerHumor/**

That's better. That's an URL.

Universal Resource Locator

The web (maybe you have heard of it?) uses URLs instead of IP addresses to make addresses easy to remember and recognize.

URLS are made up of multiple different parts ....

The anatomy of an URL

Protocol   **Port**   **Query string**

https://**test.example.org**:**80**/**dogs/poodle**?**color=white&puppy=false****#first**

             Domain   **Resource**   **Hash**
        (subdomain: test)   **path**
      (domain name: example)
   (TLD / top level domain: org)

Common ports
      80 - normal web traffic (http)   22 - SSH access
      443 - encrypted web traffic (https)   21 - FTP File transfer protocol

DNS

DNS (Domain Name System) is the phone book of the internet, translating IP addresses to Domains and pointing Domains to IP addresses.

When you type in an address, your computer does a DNS query to find the IP to connect to.

DNS is a layered system, where you have different kinds of DNS servers
　　　DNS Root servers know where TLD domains (.com, .de) are stored
　　　DNS TLD Servers know where specific domains are stored
　　　DNS Authoritative servers know which domain points to which IP address

...by the way, web sites can work without domains http://216.58.192.78/

Topics

Anyone can set up a custom domain using **DNS**.

When you register a domain name, your request is handled by a registrar, like Google Domains.

Registrars are accredited by ICANN - a nonprofit organization responsible for the organization of several databases related to the Internet.

The DNS record is maintained by a registry operator, like Verisign, who stores the DNS.

Changes to DNS records can take some time to take into effect

The DNS can actually store many types of information...

DNS Records

The Domain Name System has many types of records, most importantly:

Type	Purpose	Example
A	Maps domain names to IP Addresses	A Example.org 192.168.0.1
CNAME	Canonical name; maps a domain to another domain	CNAME www.example.org example.org
TXT	Contains arbitrary text data; for example can prove ownership of domain	TXT Definitely not a scam website.

When you type in a website address

1. Your computer gets the website server IP address from DNS
2. Your computer connects to the target server and requests a website
3. The server responds and sends the data for the website
4. The data transmitted to you can travel through many servers on the internet
5. And all the communicating happens using the TCP/IP protocols

The Internet is awesome.

At the core of the lesson

Computers use standardized communication protocols

Computers have IP addresses for communication

IP Addresses are mapped to human readable domain addresses with DNS

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HTML & CSS Basic concepts

Basic. Website. Concepts.

First things first.

When you open a website, you are receiving an HTML document.

HTML is the basic language of web pages.

It's not really a programming language, but a *Markup* language.

It's the ✨ **HyperText Markup Language** ✨

HyperText Markup Language

- HTML is a text format (so, not a binary format)
- HTML is not a programming language

    Rather, it is a language that identifies the meaning and structure of text in a document.

- HTML is based on SGML

    Developed by Tim Berners-Lee and released in 1991

- HTML is somewhat similar to XML, but it is *not* compatible with XML 💔
- HTML is continuously developed

    We are on HTML version 5, but HTML is a living standard, constantly evolving

- HTML is made up of different elements

    Elements represent things like Paragraphs or Images

What does one do with an HTML?

When your web browser receives an HTML document, the browser parses and interprets it. There is some error tolerance here. Then the browser draws the elements defined in the document as visual elements on your screen.

In other words, text based HTML is rendered by the browser.
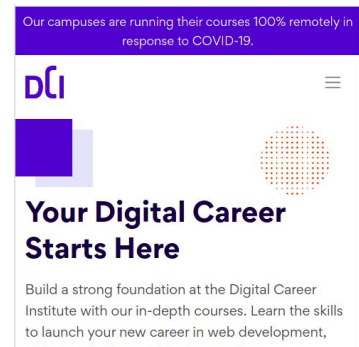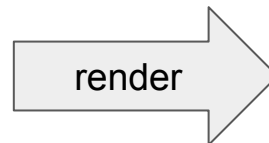
Sadly, browsers can have slight disagreements how to render each thing, causing occasional differences how a website looks between browsers.

What does one do with an HTML?

Commonly HTML pages are generated

➡️ probably no single person wrote that HTML document you are loading.

More likely it was manufactured dynamically either on server the by some backend programming language - or increasingly commonly generated in the fronted (the browser) itself by. Both generation methods often use templates and data for generation.

Vising a website, eh?
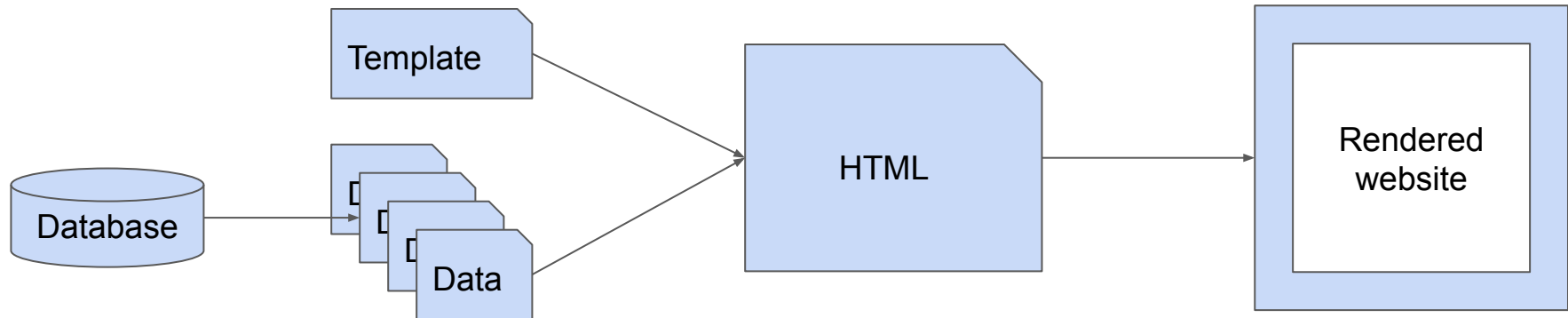
So visiting a website downloads HTML right?

When your browser loads and parses an HTML document, there are often **many** external resources defined in the HTML document.

Common resources loaded by an HTML document:
 - style sheets
 - images
 - scripts
 - fonts
 - video / audio
 - data from external sources (Weather info, Currency conversion data, Product lists...)
        - You might program one of these external service providers in the future 🤔

These are mostly loaded by the browser with separate requests.
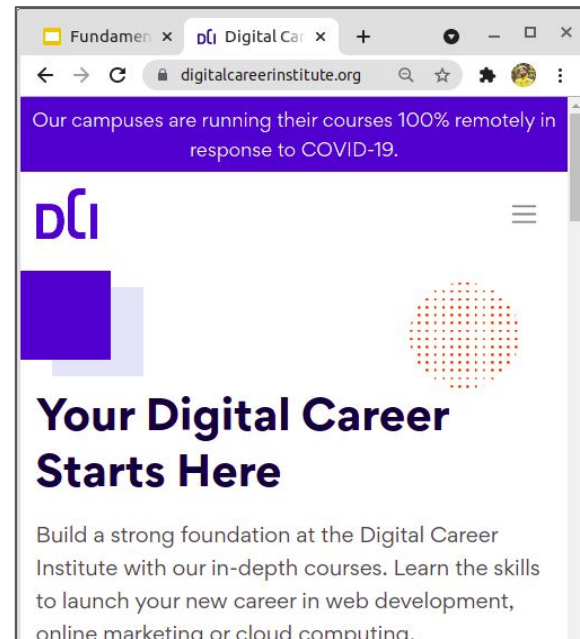Let's examine the *style sheets* slightly more.

HTML... and what?

HTML by itself forms the structure of a website and is visually very limited
HTML is almost always combined with CSS - Cascading Style Sheets (not a programming language)

HTML - content and structure
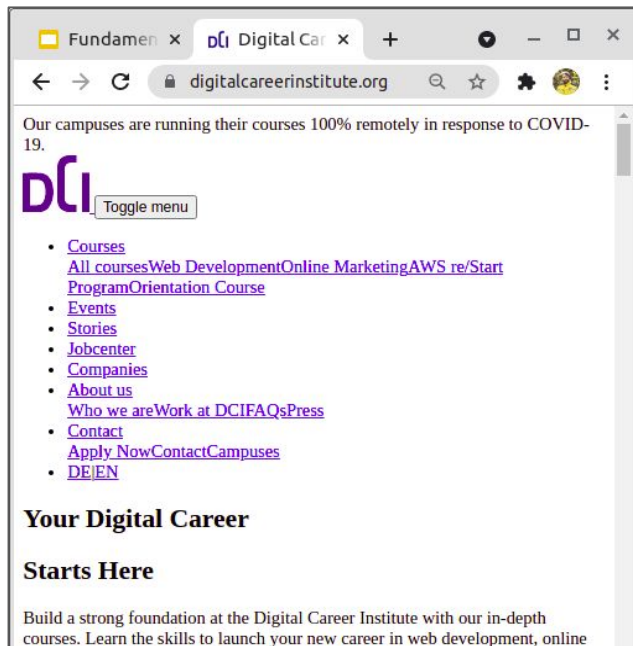
CSS - design and visual aspects

Add CSS

At the core of the lesson

Websites are based on HTML

Browsers render the text-based HTML to visual elements

Web developers can use CSS to make their websites look nice

The web and its technologies are constantly evolving

Self Study

Documentation

THANK YOU

Contact Details
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