

<https://www.halvorsen.blog>



Web Programming



Hans-Petter Halvorsen



Contents

- Introduction
 - Web, Internet, Web Technologies, etc.
- HTML
- CSS
- JavaScript
- Web Development Frameworks
- JavaScript Frameworks

<https://www.halvorsen.blog>

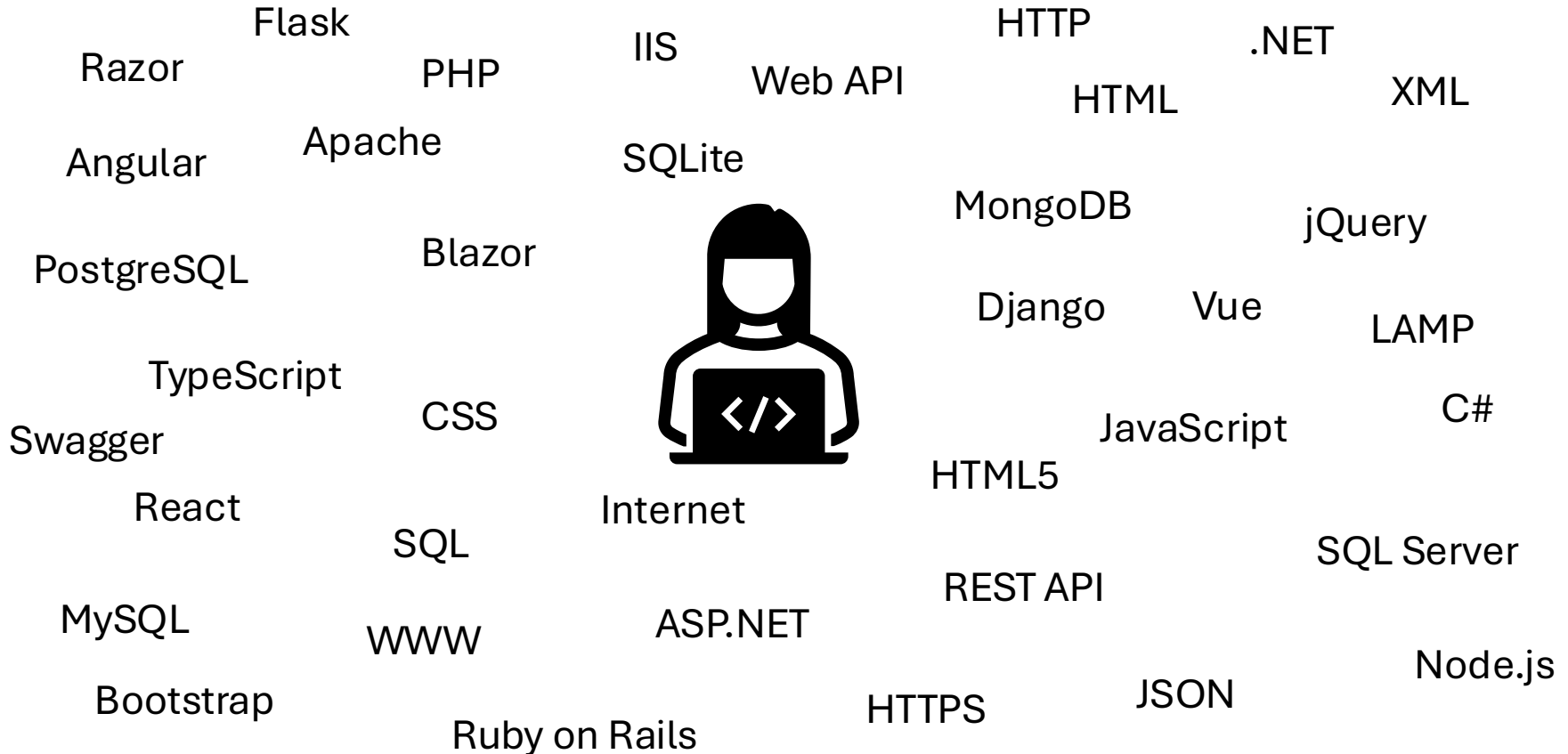
Introduction



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Hans-Petter Halvorsen

Web and Web Technology



History of Internet and Web

- Internet (1960s)
- The first PC: 1981 (IBM Personal Computer)
- World Wide Web - WWW (1990)
- The first Web Browser - Netscape, 1994
- Google, 1998
- Facebook, 2004
- Smartphones (iPhone), 2007
- Tablets (iPad), 2010
- AI and ChatGPT, 2022

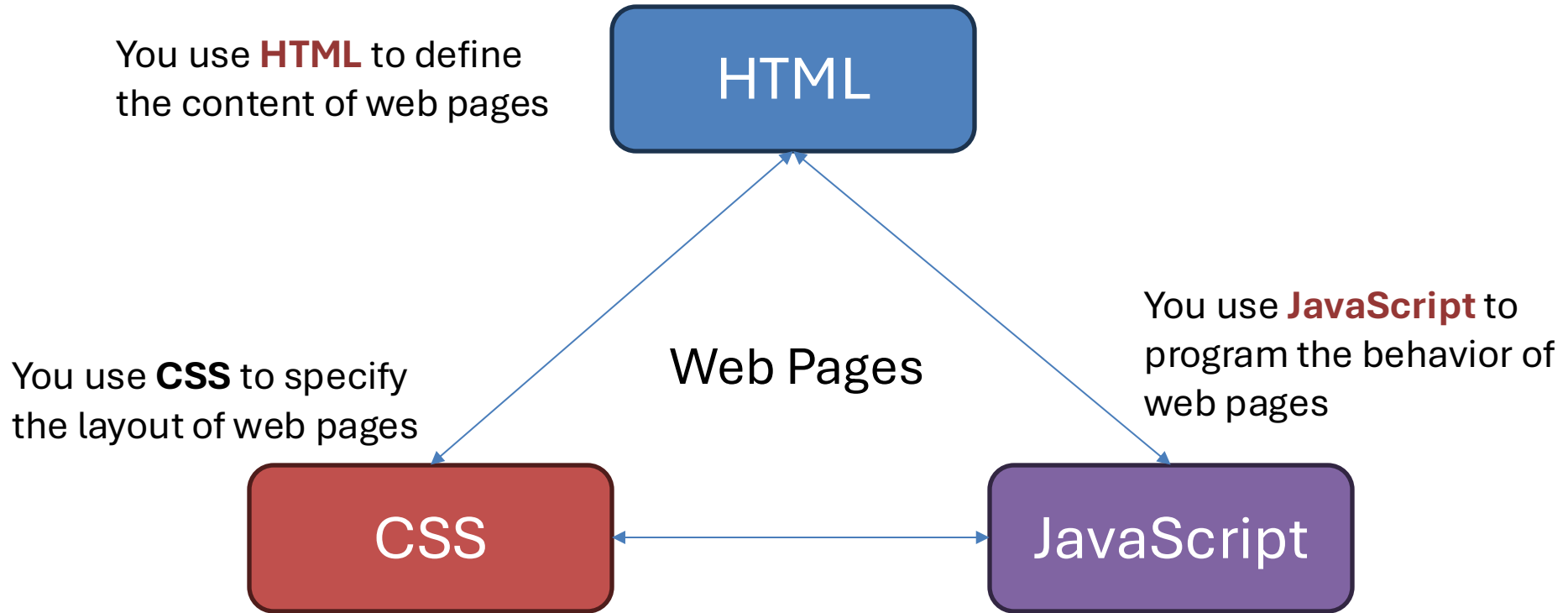
History of Internet and Web

- Internet (1960s)
 - Made it possible to connect computers all over the world
- The first PC: 1981 (IBM Personal Computer)
 - Everyone could afford it and do it from home
- World Wide Web - WWW (1990)
 - The foundation for today's web pages with hyperlinks
- The first Web Browser - Netscape, 1994
- Google, 1998
 - Made it possible to search through all web pages and find information
- Facebook, 2004
 - A totally new way of using Internet and communicate with others
- Smartphones (iPhone), 2007
 - Internet and browse web pages in your pocket
- Tablets (iPad), 2010
 - A new way of surfing and read information on Internet from your sofa
- AI and ChatGPT, 2022
 - Revolutionized the way of finding and creating information

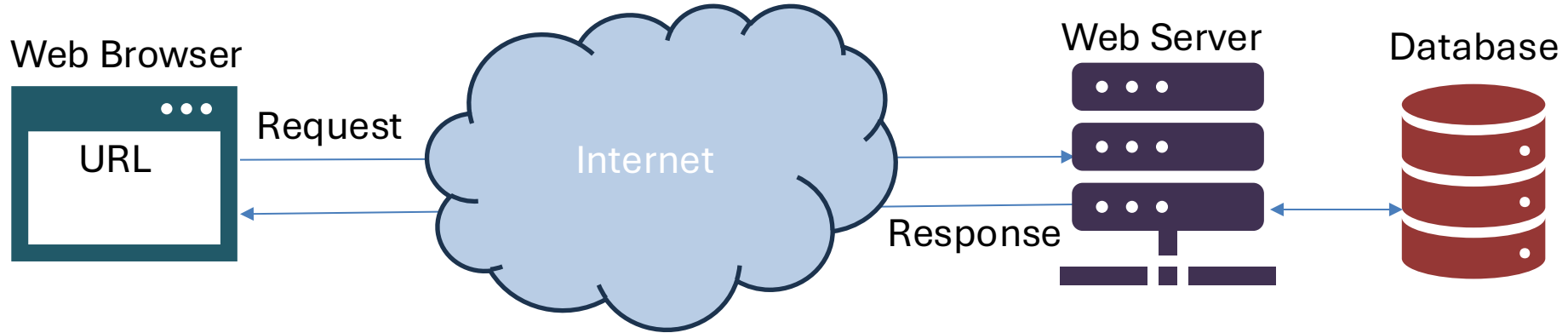
Internet and WWW

- The Internet and the World Wide Web (WWW) are the foundation of today's websites and web applications.
- The Internet and the WWW (often just called the web) are often used interchangeably, but they are different: **the Internet is the infrastructure**, while the **WWW is a service that runs on this infrastructure**.
- The internet is a global network that connects billions of devices, including computers, smartphones, and other digital devices. The Internet was founded in the 60s. The internet uses the **TCP/IP** protocol to send data between these devices.
- The **WWW** is a service that uses the internet to view and surf between web pages. The WWW was invented around 1990 by Tim Berners-Lee and made it possible to navigate between web pages using so-called **hyperlinks**.
- The WWW mainly uses the Hypertext Transfer Protocol (**HTTP**) to transfer information between clients (such as web browsers) and servers (so-called web servers).
- The first **web browsers** also came in the 90s. The first commercial browser was Netscape Navigator, which was launched in December 1994. This browser played an important role in popularizing the internet and making it accessible to a wider audience. Internet Explorer from Microsoft came along with Windows 95. Internet Explorer quickly became one of the most widely used browsers in the 1990s and early 2000s.
- **HTML** is the "language" used in connection with web pages. HTML is used to structure the content of web pages.
- **CSS** (Cascading Style sheet) is used to format and present (layout) the web pages.

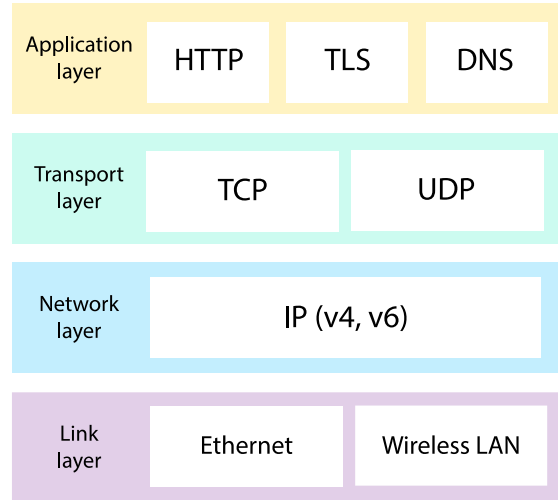
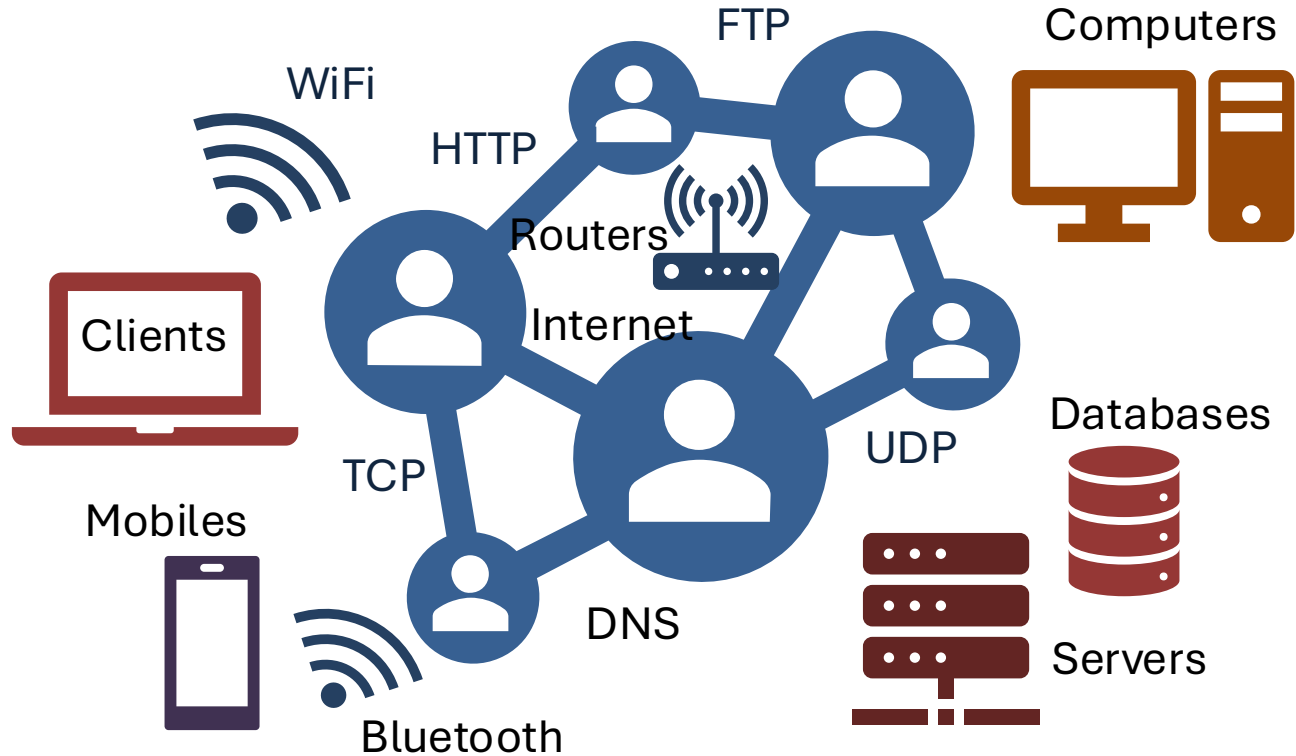
Web Programming Triangle



How Web Works



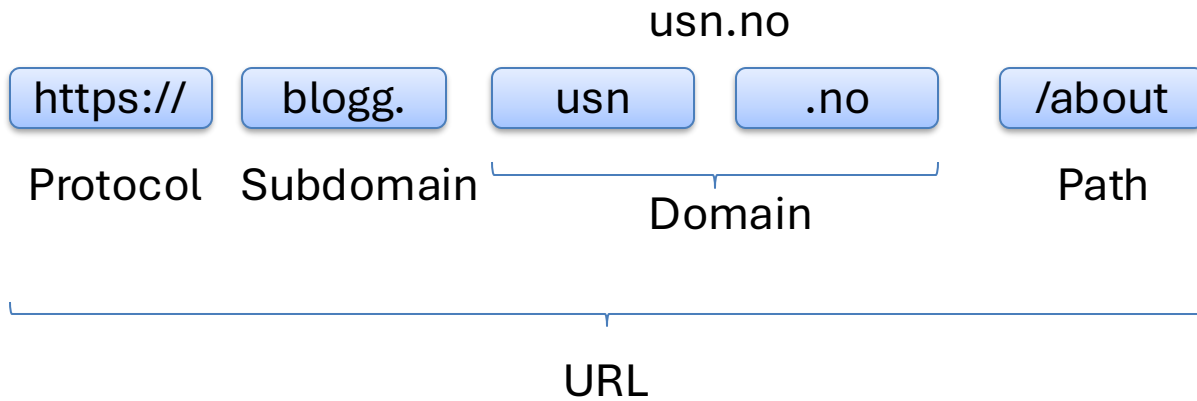
Computers and Network



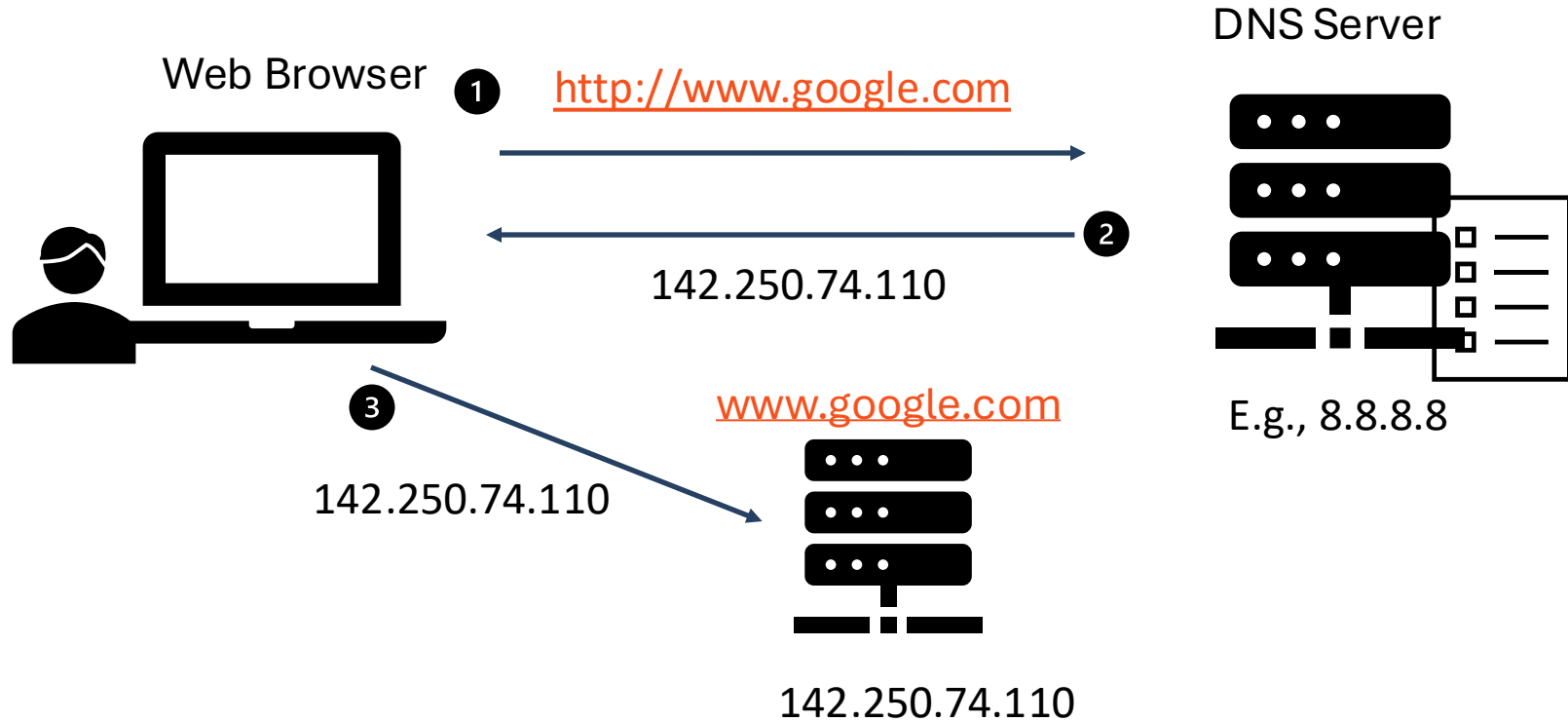
The OSI model and the Internet Stack

URL

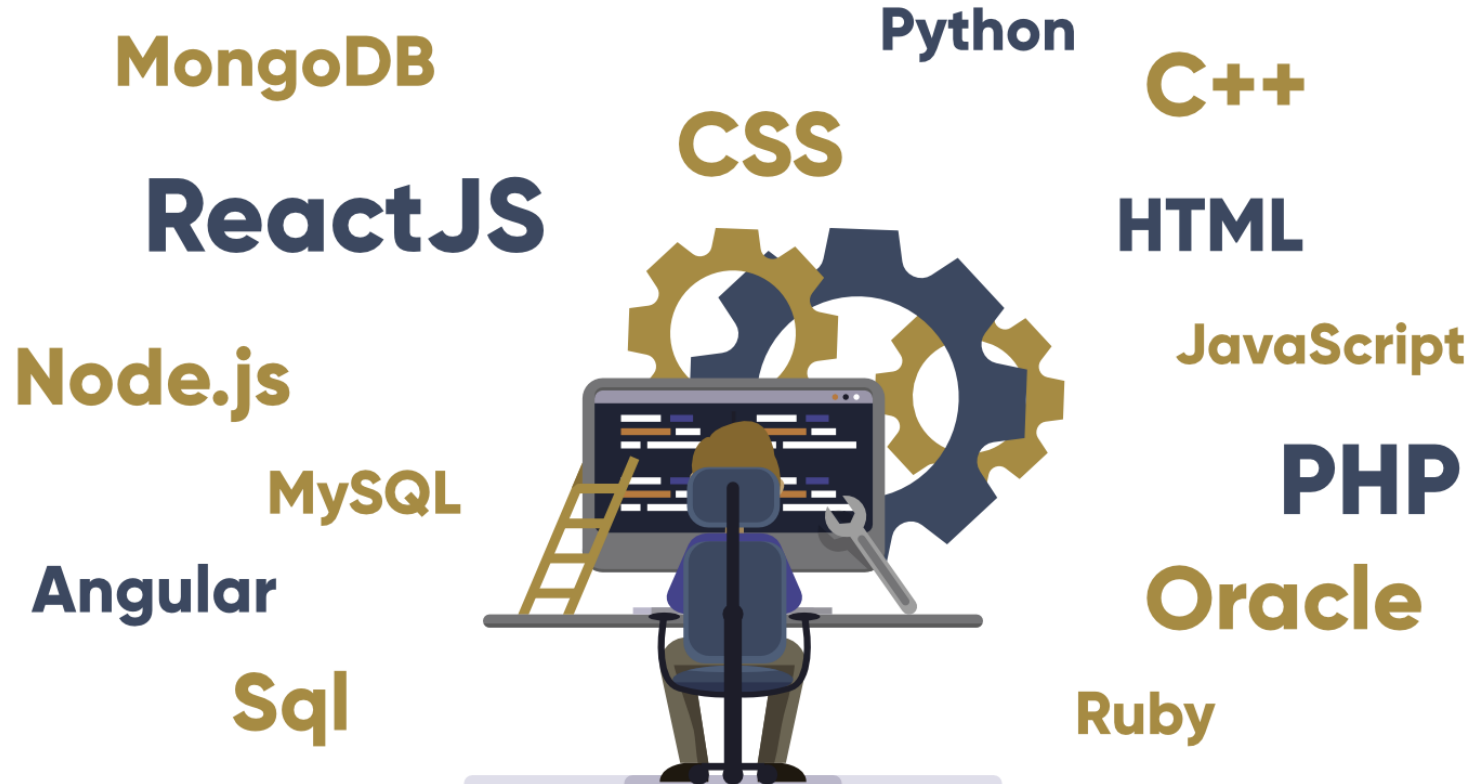
<https://blogg.usn.no/about/>



DNS



Full stack Web Developers



Front-end Technologies

Front-end “Programming Languages”:

- HTML
- CSS
- JavaScript

These 3 are the main building blocks for all
Web Development

Front-end Technologies

Front-end “Libraries and Frameworks”:

- Angular
- React
- Bootstrap
- jQuery
- Vue

Back-end Technologies

- PHP
- ASP.NET (C#)
- Django (Python)
- Node.js (JavaScript)

Databases (Back-end)

- SQL Server
- MongoDB
- ..

References

- HTML Tutorial:

<https://www.w3schools.com/html>

- CSS Tutorial:

<https://www.w3schools.com/css>

- JavaScript Tutorial:

<https://www.w3schools.com/js>

<https://www.halvorsen.blog>

HTML

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HTML

- HTML is the main "language" used in connection with web pages.
- HTML is used to structure the content of web pages.
- HTML stands for Hyper Text Markup Language
- HTML elements tell the browser how to display the content

HTML

```
<!DOCTYPE html>
```

```
<html>
```

```
  <head>
```

```
    <title>Hello World</title>
```

```
  </head>
```

```
  <body>
```

```
    <h1>Welcome</h1>
```

```
    <p>Here you will learn about HTML.</p>
```

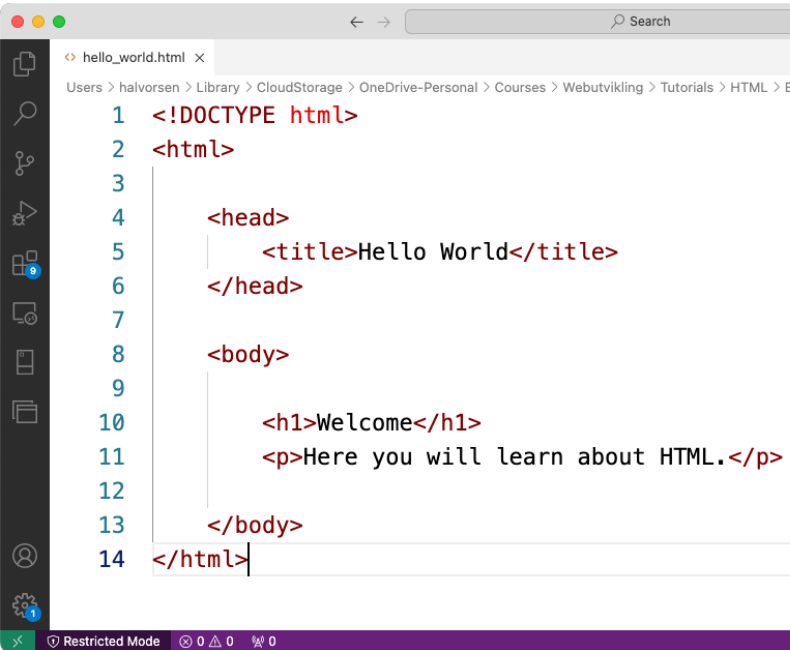
```
  </body>
```

```
</html>
```

Here you see the main structure of an HTML file.

Hello World

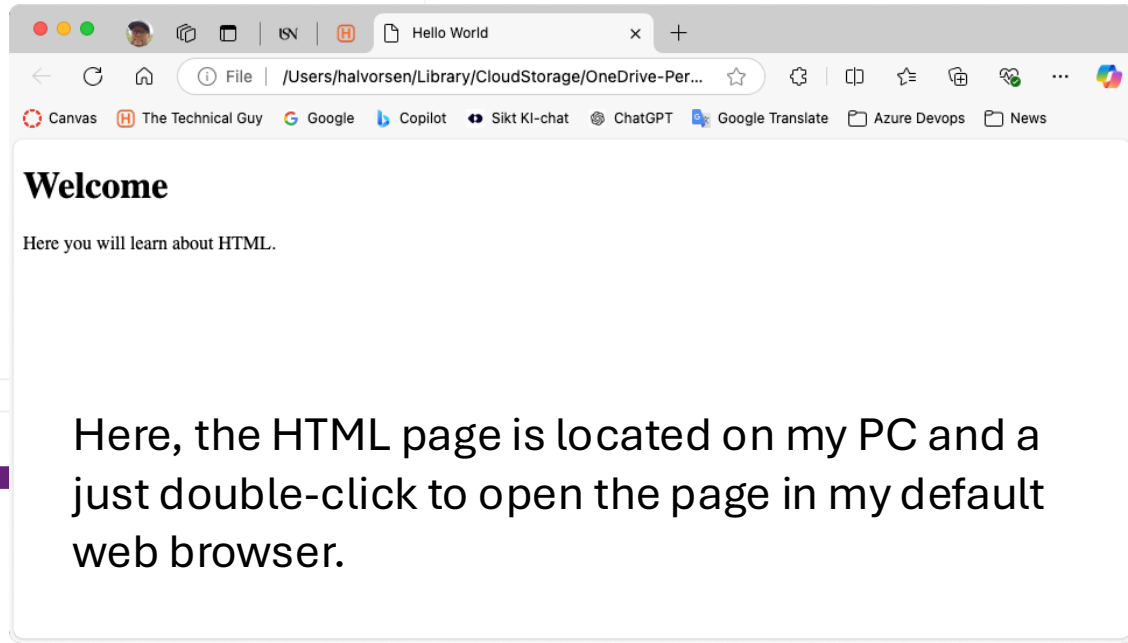
The HTML code created in Visual Studio Code:



```
1 <!DOCTYPE html>
2 <html>
3
4   <head>
5     <title>Hello World</title>
6   </head>
7
8   <body>
9
10    <h1>Welcome</h1>
11    <p>Here you will learn about HTML.</p>
12
13  </body>
14 </html>
```

You can use any type of text editor since HTML is pure text.

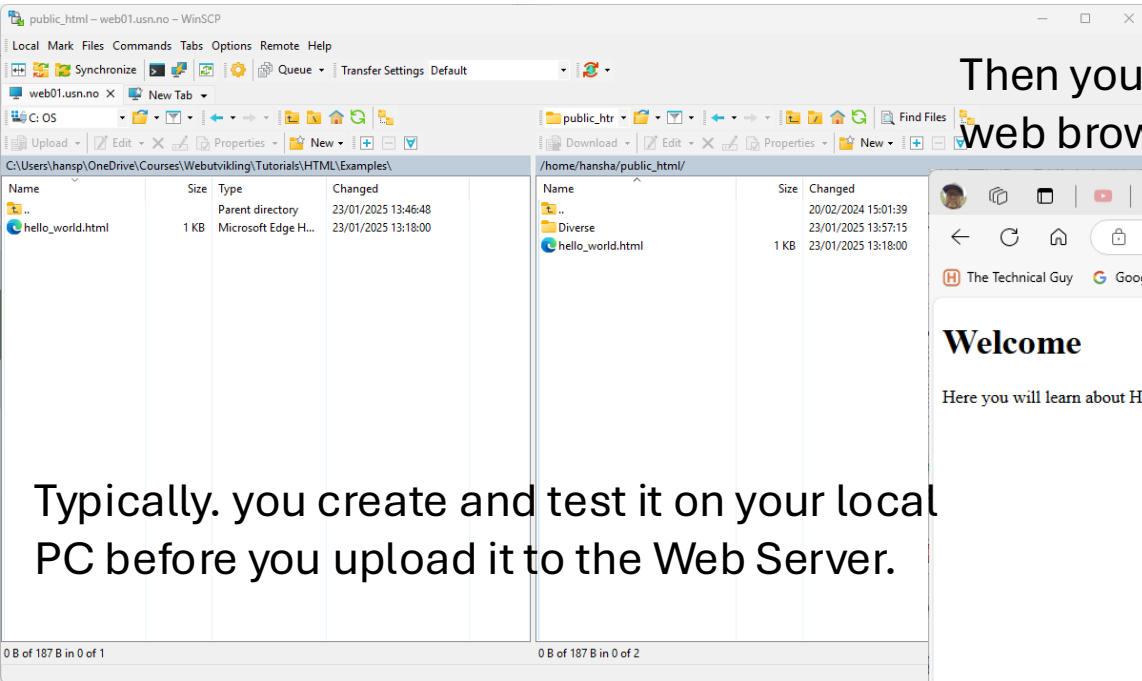
The HTML page open in my local web browser:



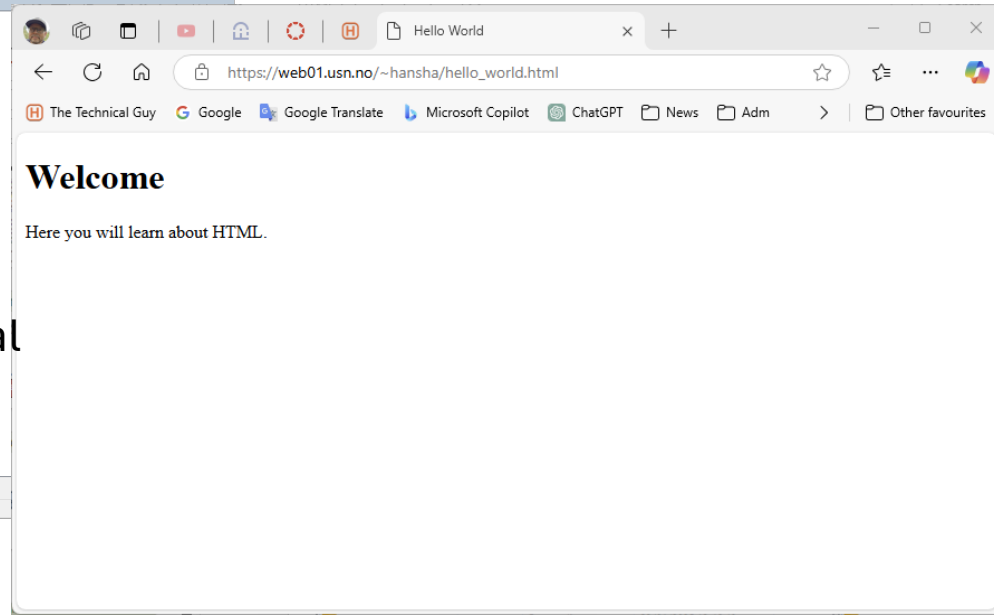
Here, the HTML page is located on my PC and a just double-click to open the page in my default web browser.

Upload File to Web Server

You typically need to upload the HTML file to a Web Server using an FTP program:



Then you enter the URL to the Web page in my web browser in order to open the HTML file:



Typically, you create and test it on your local PC before you upload it to the Web Server.

HTML Tags Examples

Hyperlink:

Here you see some of the most used HTML Tags

```
<a href="http://www.google.com">This is a link to Google</a>
```

Bold Text:

```
<b>This is my Text</b>
```

Paragraph:

```
<p>My first paragraph.</p>
```

Headers:

```
<h1>This is my Header</h1>
```

```
<h2>This is my Header</h2>
```

```
<h3>This is my Header</h3>
```

Line Break:

```
This is my Text
```

```
<br>
```

```
This is also my Text
```

Title:

```
<title>This is my Title</title>
```

Comments:

```
<!-- Write your comments here -->
```

Image:

```

```


Learn HTML

- HTML Tutorial:

<https://www.w3schools.com/html>

- HTML Fundamentals Videos (w3school):

https://www.youtube.com/playlist?list=PLP9IO4UYNF0VdAajP_5pYG-jG2JRrG72s

<https://www.halvorsen.blog>

CSS

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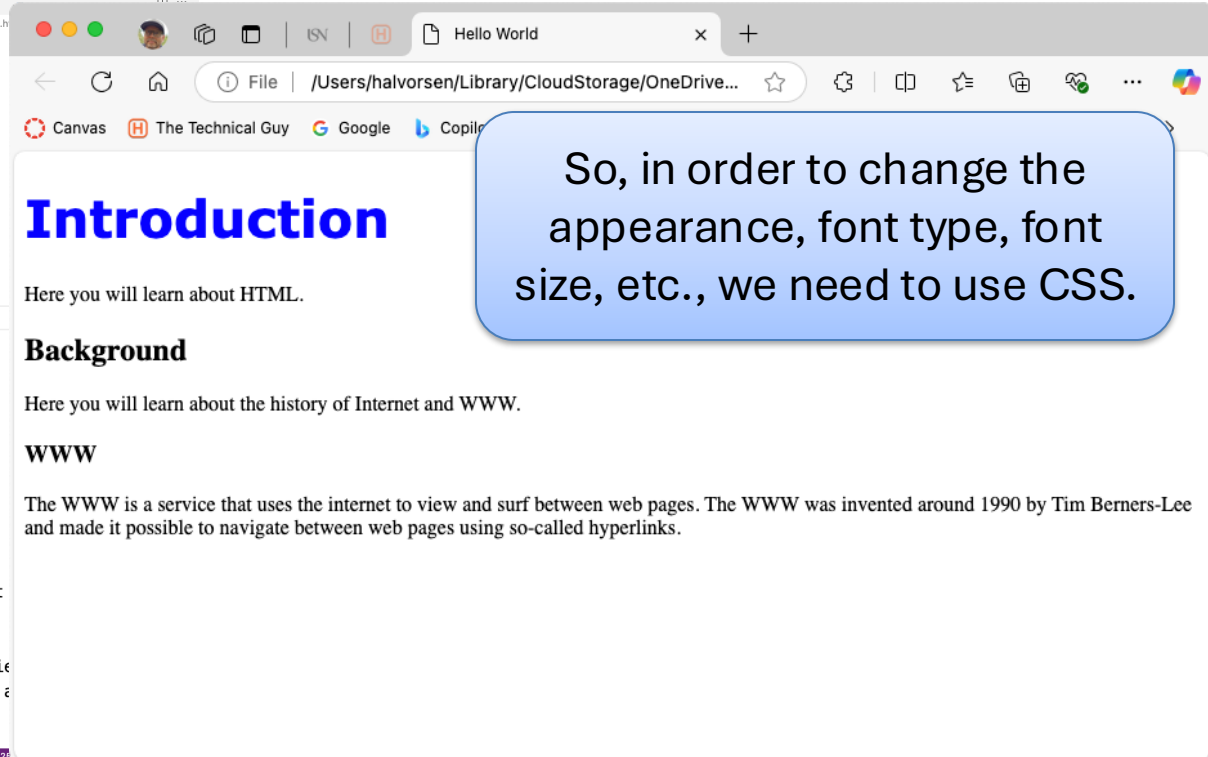
Hans-Petter Halvorsen



CSS

CSS (Cascading Style sheet) is used to format and present (layout) the web pages.

```
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5   <title>Hello World</title>
6 </head>
7
8 <style>
9   h1 {
10    font-family: Verdana;
11    font-size: 40px;
12    color: blue;
13    text-align: left;
14  }
15 </style>
16
17 <body>
18
19 <h1>Introduction</h1>
20 <p>Here you will learn about HTML.</p>
21
22 <h2>Background</h2>
23 <p>Here you will learn about the history of Internet
24
25 <h3>WWW</h3>
26 <p>The WWW is a service that uses the internet to view
27 The WWW was invented around 1990 by Tim Berners-Lee and
28 between web pages using so-called hyperlinks.</p>
29
```



Three Ways to Insert CSS

There are three ways of inserting a style sheet:

- **External style sheet** (Recommended!!)
 - An external style sheet is ideal when the style is applied to many pages. With an external style sheet, you can change the look of an entire Web site by changing just one file.
 - An external style sheet can be written in any text editor. The file should not contain any html tags.
 - The style sheet file must be saved with a .css extension.
- **Internal style sheet**
 - An internal style sheet should be used when a single document has a unique style.
 - You define internal styles in the head section of an HTML page, inside the <style> tag.
- **Inline style**
 - An inline style loses many of the advantages of a style sheet (by mixing content with presentation). Use this method sparingly!

Inline CSS

For Inline CSS we use the style attribute for a single HTML tag. Examples:

```
<h1 style="color: chocolate;">Welcome</h1>
```



Property
Name



Property
Value

```
<p style="color: red;">Welcome</p>
```



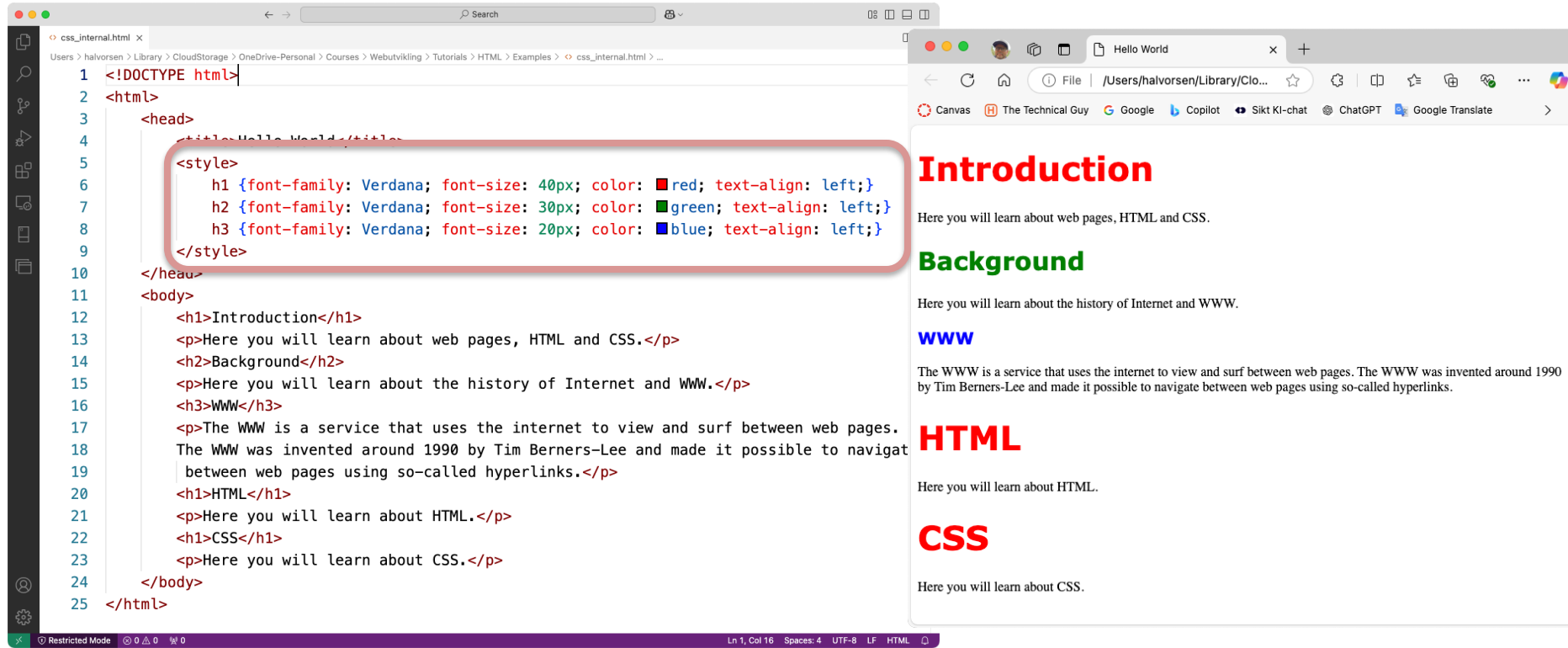
Property
Name



Property
Value

Internal CSS

Internal CSS is used to set the style for the entire HTML page. We then use the `<style>` element inside the `<head>` section. See Example:



The image shows a side-by-side comparison of a code editor and a web browser. The code editor on the left displays the HTML source code for a file named 'css_internal.html'. The code includes a `<style>` block within the `<head>` section that defines styles for `h1`, `h2`, and `h3` tags. The styles specify font-family (Verdana), font-size, color, and text-align. The browser on the right shows the rendered output of this code. The page content is styled according to the internal CSS: the main heading is red, the background section is green, and the HTML section is blue. The browser's address bar shows the file path: `/Users/halvorsen/Library/Clo...`.

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Hello World</title>
5     <style>
6       h1 {font-family: Verdana; font-size: 40px; color: red; text-align: left;}
7       h2 {font-family: Verdana; font-size: 30px; color: green; text-align: left;}
8       h3 {font-family: Verdana; font-size: 20px; color: blue; text-align: left;}
9     </style>
10  </head>
11  <body>
12    <h1>Introduction</h1>
13    <p>Here you will learn about web pages, HTML and CSS.</p>
14    <h2>Background</h2>
15    <p>Here you will learn about the history of Internet and WWW.</p>
16    <h3>WWW</h3>
17    <p>The WWW is a service that uses the internet to view and surf between web pages.
18    The WWW was invented around 1990 by Tim Berners-Lee and made it possible to navigat
19    between web pages using so-called hyperlinks.</p>
20    <h1>HTML</h1>
21    <p>Here you will learn about HTML.</p>
22    <h1>CSS</h1>
23    <p>Here you will learn about CSS.</p>
24  </body>
25 </html>
```

Introduction

Here you will learn about web pages, HTML and CSS.

Background

Here you will learn about the history of Internet and WWW.

WWW

The WWW is a service that uses the internet to view and surf between web pages. The WWW was invented around 1990 by Tim Berners-Lee and made it possible to navigate between web pages using so-called hyperlinks.

HTML

Here you will learn about HTML.

CSS

Here you will learn about CSS.

External CSS

stylesheet.css:

A recommended way to use CSS is to put all CSS styling and formatting into separate file and then link that document into the different HTML files. In that way you have all CSS in one place, and you can easily change the CSS for all your HTML files by only change it one place.

```
body {  
    background-color: #d0e4fe;  
}  
  
h1 {  
    color: orange;  
    text-align: center;  
}  
  
p {  
    font-family: "Times New Roman";  
    font-size: 20px;  
}
```

myfile.htm:

```
...  
<head  
...  
    <link rel="stylesheet" type="text/css" href="stylesheet.css" />  
...  
</head>  
...
```

Learn CSS

- CSS Tutorial:

<https://www.w3schools.com/css>

- CSS Fundamentals Videos (w3school):

<https://www.youtube.com/playlist?list=PLP9IO4UYNF0UCaUSF3XNZ1U9f01E5h5PM>

<https://www.halvorsen.blog>

JavaScript



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JavaScript

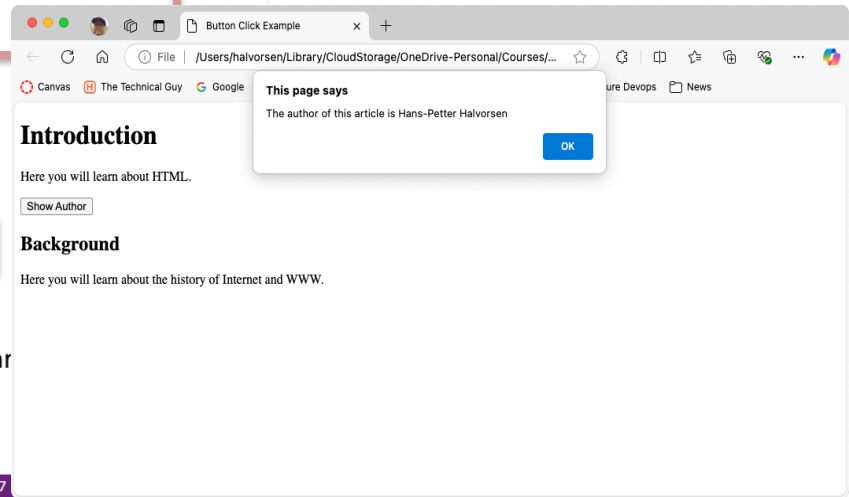
- JavaScript is the programming language of the Web.
- All modern HTML pages are using JavaScript.
- JavaScript is the default scripting language in all modern browsers, and in HTML5.
- JavaScript is probably the most popular programming language in the world.
- It is the language for HTML, for the Web, for computers, servers, laptops, tablets, smart phones, and more.
- JavaScript can change HTML Elements! – which makes it very powerful!

JavaScript

- You use JavaScript to program the behavior of web pages.
- You can use JavaScript to make your web pages more dynamic, e.g.,:
 - you can specify what happens when a user clicks on a button, etc.
 - You can update contents on the HTML web page.
 - You can create and use functions, create variables, if – else, etc. – just like other programming languages.
- You use the `<script>` tag to define JavaScript code within your HTML files.

Button Click Example

```
button_click_ex.html x
Users > halvorsen > Library > CloudStorage > OneDrive-Personal > Courses > Webutvikling > Tutorials > HTML > Examples > button_click_ex.html > html
1 <!DOCTYPE html>
2 <html>
3 <head>
4   <title>Button Click Example</title>
5   <script>
6     function ButtonClick() {
7       alert("The author of this article is Hans-Petter Halvorsen");
8     }
9   </script>
10 </head>
11 <body>
12   <h1>Introduction</h1>
13   <p>Here you will learn about HTML.</p>
14   <button onclick="ButtonClick()">Show Author</button>
15   <h2>Background</h2>
16   <p>Here you will learn about the history of Internet and WWW.</p>
17 </body>
18 </html>
```



Update Web contents

The image shows a browser window with a tab titled "Button Click Example". The address bar shows the file path: `/Users/halvorsen/Library/CloudStorage/OneDrive-Personal/Courses/Webutvi...`. The browser's search bar contains "evops" and "News". The page content includes a search bar with "Write your Name" and a "Write Name" button. A dialog box titled "This page says" is open, with the text "Write your Name" and a text input field containing "Hans-Petter". The dialog has "Cancel" and "OK" buttons. A blue arrow points from the "Write your Name" text in the page to the dialog box. Another blue arrow points from the "OK" button in the dialog to a larger, outlined box on the right. This larger box shows the page after the dialog is closed: the search bar now contains "Hans-Petter" and the "Write Name" button is still present. The page content is updated to show "Introduction" and "Background" sections.

Introduction

Here you will learn about HTML.

Write your Name

Write Name

Background

Here you will learn about the history of Internet and WWW.

Here we use JavaScript to update the contents of a “textbox” based on user input.

Introduction

Here you will learn about HTML.

Hans-Petter

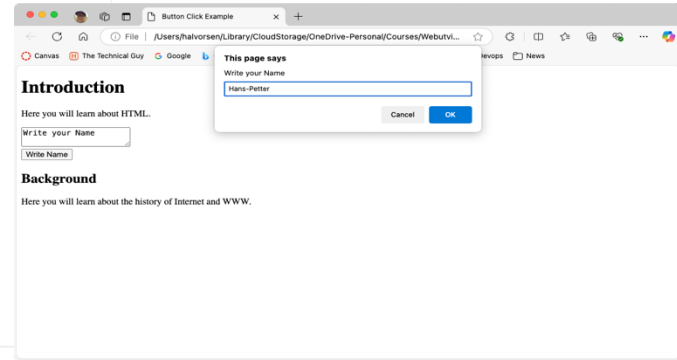
Write Name

Background

Here you will learn about the history of Internet and WWW.

Update Web contents

```
1 <!DOCTYPE html>
2 <html>
3 <head>
4   <title>Button Click Example</title>
5   <script>
6     function ButtonWriteNameClick() {
7       let myname;
8       myname = prompt("Write your Name");
9
10      if (myname != null && myname != "")
11        document.getElementById("myname").innerHTML = myname
12    }
13  </script>
14 </head>
15 <body>
16   <h1>Introduction</h1>
17   <p>Here you will learn about HTML.</p>
18
19   <textarea id="myname">Write your Name</textarea>
20   <br>
21   <button onclick="ButtonWriteNameClick()">Write Name</button>
22
23   <h2>Background</h2>
24   <p>Here you will learn about the history of Internet and WWW.</p>
25 </body>
26 </html>
```



Learn JavaScript

- JavaScript Tutorial:

<https://www.w3schools.com/js>

- JavaScript Fundamentals Videos (w3school):

<https://www.youtube.com/playlist?list=PLP9IO4UYNF0WWmZpE3W33vVPRL2GvjEqz>

<https://www.halvorsen.blog>

Web Development Frameworks



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Web Development Frameworks

Some of the most used server-side (backend) Web Development Frameworks:

- **PHP** (Scripting language for Web development)
- **ASP.NET** (Microsoft, Visual Studio, C#)
- **Ruby on Rails** (Ruby)
- **Django** (Python)

Web Development Frameworks

What is a server-side Web Development Framework?

- It is used to generate dynamic web page content before the page is sent to the user's web browser.
- With dynamic we typically mean that the web page/application is dynamically changes based on data in a Database.

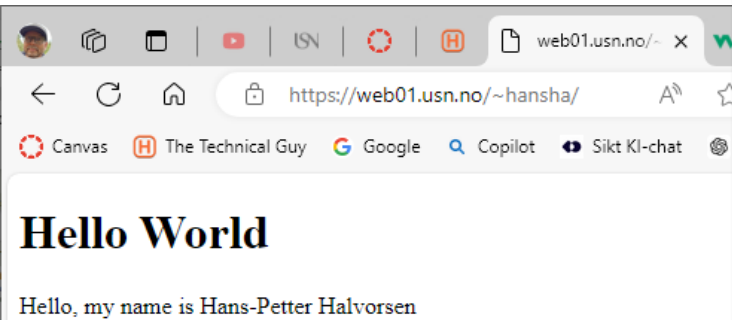
PHP



- PHP is a **server scripting language** for making dynamic and interactive web pages.
- PHP scripts are executed on the server/webserver.
- PHP files have extension ".php" and are typically a mix of PHP, HTML, CSS and JavaScript
- PHP is free and open-source.
- With PHP you can easily typically. communicate with a Database, and especially MySQL.
- LAMP: Linux, Apache, MySQL and PHP.
- PHP is widely used and still by far the most used/popular language for web development.
- PHP is easy to learn (but still very powerful) – which cannot be said on many other web technologies and programming languages.
- Homepage: <https://www.php.net>
- PHP Tutorial: <https://www.w3schools.com/php>

PHP Example

Typically, you include PHP code in between your HTML code. Here is a basic example:



```
<!DOCTYPE html>
<html>
  <body>
    <h1>Hello World</h1>
    <?php
      $name = "Hans-Petter Halvorsen";
      echo "Hello, my name is $name";
    ?>
  </body>
</html>
```

PHP Code is put inside `<?php ... ?>` and it is executed on the server-side before it is sent to the web browser on the client side.

ASP.NET

- ASP.NET is a framework for web development.
- ASP.NET is based on .NET and C#.
- What is the difference between ASP.NET and .NET frameworks?
 - ASP.NET is specifically designed for web development, while the .NET framework covers a broader range of application types, including Windows desktop, mobile, and web applications.
- In ASP.NET code and layout are separated into 2 files; The layout file has the extension “. cshtml”, and the code-behind file has the extension “. cshtml.cs” (where “cs” is short for C#).
- The layout file “. cshtml” use something called **Razor** syntax and are mixed with HTML.
- Homepage: <https://dotnet.microsoft.com/en-us/apps/aspnet>

ASP.NET with Razor

- Razor is a markup syntax for embedding server-based code into ASP.NET Core webpages.
- The Razor syntax consists of Razor markup, C#, and HTML.
- Files containing Razor generally have a .cshtml file extension.
- The default Razor language is HTML.
- Rendering HTML from Razor markup is no different than rendering HTML from an HTML file.
- HTML markup in .cshtml Razor files is rendered by the server unchanged.

PHP vs ASP.NET

- PHP is open-source and free to use.
- With ASP.NET you are locked and forced into Microsoft technology and tools.
- PHP works on various platforms and supports most web servers.
- ASP.NET can have a steeper learning curve for beginners.
- PHP is embedded within the HTML code, making web development easier.
- Hosting is very easy with PHP with lots of providers.
- ASP.NET is based on C#, .NET and Visual Studio, so if you already know these tools, then you are well on your way.

ASP.NET YouTube

- **Back-end** Web Development with .NET for Beginners:
<https://www.youtube.com/playlist?list=PLdo4fOcmZ0oWunQnm3WnZxJrseIw2zSAk>
- **Front-end** Web Development with .NET for Beginners:
<https://www.youtube.com/playlist?list=PLdo4fOcmZ0oXNZX1Q8rB-5xgTSKR8qA5k>

Python

Python has become very popular the last 10 years and can also be used for Web development.

Python Frameworks for web development:

- Django
- Flask

Django (Python)

- Django is a back-end (server-side) web development framework.
- Django is free, open source and written in Python.
- Django is using a Model View Template (MVT) pattern.
- Homepage: <https://www.djangoproject.com>
- Django Tutorial: <https://www.w3schools.com/django>

Flask (Python)

- Flask is a “micro“ web framework written in Python.
- Flask can be used to build lightweight web applications, you can run it on, e.g., Raspberry Pi.
- Wikipedia:
[https://en.wikipedia.org/wiki/Flask_\(web_framework\)](https://en.wikipedia.org/wiki/Flask_(web_framework))
- Homepage: <https://flask.palletsprojects.com>
- Flask Tutorial: <https://www.geeksforgeeks.org/flask-tutorial/>

<https://www.halvorsen.blog>

Javascript Frameworks



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JavaScript Frameworks

- Node.js
- TypeScript (Microsoft)
- Angular (Google)
- React (Facebook)
- jQuery
- Vue

Node.js



- Node.js allows you to run JavaScript on the **server** (server-side, backend).
- Node.js is a free, open-source and cross-platform
- **npm** is a package manager for Node.js packages/modules
- Homepage: <https://nodejs.org>
- Node.js Tutorial: <https://www.w3schools.com/nodejs>

npm

- npm is the world's largest Software Library.
 - Homepage: <https://www.npmjs.com>
- npm is also a software Package Manager and Installer.
- npm is free to use.
- npm includes a CLI (Command Line Client) that can be used to download and install software:
 - `C:\>npm install <package>`
- The name npm (Node Package Manager) comes from Node.js since it was originally created as a package manager for Node.js.
- For most of the JavaScript packages you need to use NPM to install them.
- npm is installed with Node.js
 - This means that you must install Node.js to get npm installed on your computer.
 - Download: <https://nodejs.org>

Node.js in Visual Studio

The image shows two overlapping windows from Visual Studio. The background window is the 'Visual Studio Installer' in the 'Workloads' tab, showing the 'Node.js development' workload selected with a red box. The foreground window is the 'Create a new project' dialog, showing the 'Blank Node.js Web Application' template selected with a red box.

Visual Studio Installer - Workloads

- Web & Cloud (4)
 - ASP.NET and web development
 - Python development
 - Node.js development** (highlighted)
 - Azure development
- Desktop & Mobile (5)
 - .NET Multi-platform App UI development
 - Desktop development with C++
 - .NET desktop development
 - Windows application development

Create a new project - Recent project templates

Search for templates (Alt+S)

All languages | All platforms | All project types

- Blank Node.js Console Application (New)
- Blank Node.js Web Application (New)** (highlighted)
- Blank Node.js Console Application (New)
- Blank Node.js Web Application (New)
- Basic Node.js Express 4 Application (New)
- Basic Node.js Express 4 Application (New)

<https://visualstudio.microsoft.com/vs/features/node-js/>

Node.js in Visual Studio

File Edit View Project Build Debug Test Analyze Tools Extensions Window Help Search - NodejsWebApp

Debu Any CPU Web Server (Microsoft Edge) GitHub Copilot

Toolbox

Search Toolbox

General

There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

server.js

```
1 'use strict';
2 var http = require('http');
3 var port = process.env.PORT || 1337;
4
5 http.createServer(function (req, res) {
6   res.writeHead(200, { 'Content-Type': 'text/plain' });
7   res.end('Hello World\n');
8 }).listen(port);
9
```

package.json

Solution Explorer

Search Solution Explorer (Ctrl+)

Solution 'NodejsWebApp' (1 of 1 project)

- NodejsWebApp
 - node_modules
 - dev
 - package.json
 - README.md
 - server.js

Properties

server.js File Properties

Build Action	Content
File Name	server.js
Full Path	C:\Users\hansha\OneD
Publish	False
TestFramework	

Build Action

How the file relates to the build and depl...

Error List

Entire Solution 0 Errors 0 Warnings 0 Messages Build + IntelliSense

Search Error List

Code	Description	Project	File	L...
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100 % No issues found Ln: 6 Ch: 58 SPC CRLF

Ready Add to Source Control

TypeScript

- TypeScript is a strongly typed programming language that builds on JavaScript.
 - For example, TypeScript will report an error when passing a string into a function that expects a number. JavaScript will not.
- TypeScript is a superset of JavaScript and adds syntax on top of JavaScript.
- Homepage: <https://www.typescriptlang.org>
- TypeScript Tutorial: <https://www.w3schools.com/typescript>

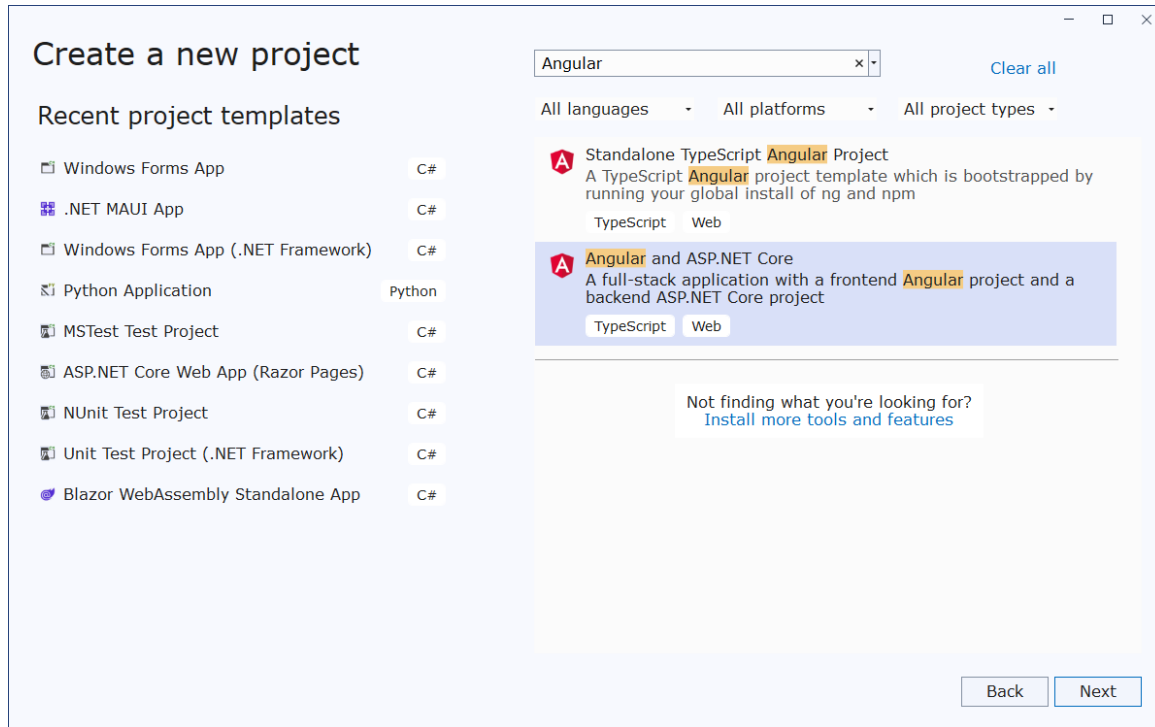
Angular



- Developed and maintained by Google
- Framework for building single-page client applications using HTML and TypeScript.
- Open-source TypeScript framework for client-side applications.
- Angular is based on the Model-View-Controller (MVC) architecture
- Has changed name several times, AngularJS, Angular2, now just known as Angular.
- Homepage: <https://angular.dev>
- Angular Tutorial: <https://www.w3schools.com/angular>
- Angular Tutorial: <https://www.geeksforgeeks.org/angular-tutorial/>

Angular and ASP.NET

With Visual Studio you can use Angular as frontend and ASP.NET Core As backend



<https://learn.microsoft.com/en-us/visualstudio/javascript/tutorial-asp-net-core-with-angular>

React



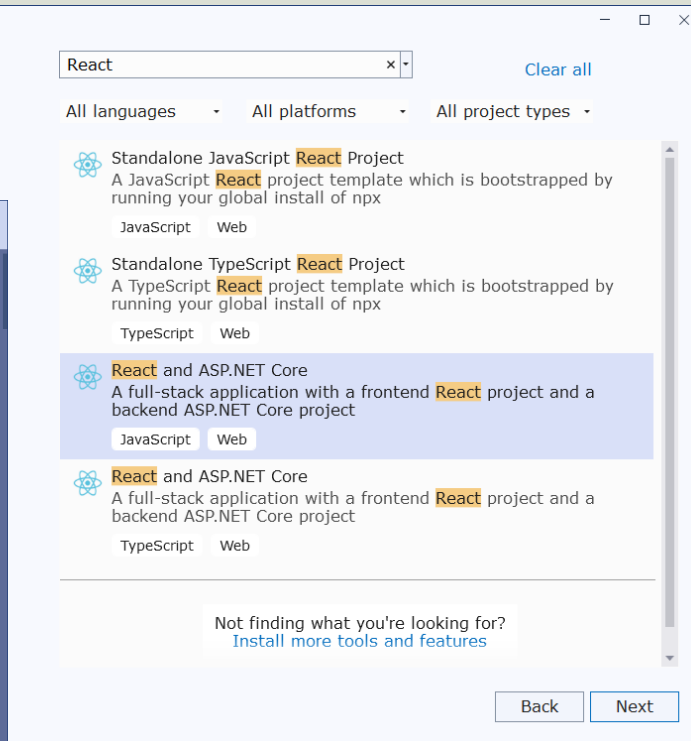
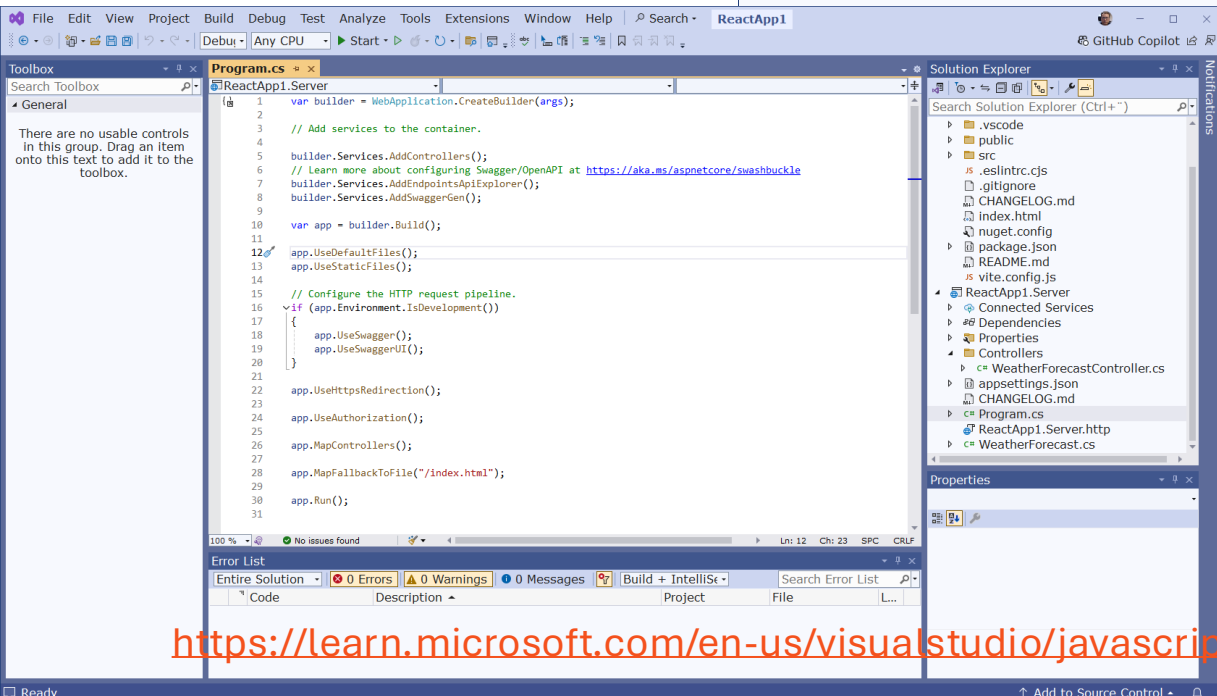
- React is a **front-end JavaScript library** for building user interfaces in Web Applications.
- React is also known as “React.js” or “ReactJS”.
- Developed by **Facebook** in 2011. React is now free and open source.
- React mainly focus on the user interface and rendering components to the DOM.
- **Note!** React is a front-end Library and not a Framework.
 - So, you typically need a Framework like Next.js or ASP.NET Core.
- Homepage: <https://react.dev>.
- React Tutorial: <https://www.w3schools.com/react/>.
- Tutorial: Create an ASP.NET Core app with React in Visual Studio: <https://learn.microsoft.com/en-us/visualstudio/javascript/tutorial-asp-net-core-with-react>.

React in Visual Studio

Create a new project

Recent project templates

Blank Node.js Web Application JavaScript



<https://learn.microsoft.com/en-us/visualstudio/javascript/tutorial-asp-net-core-with-react>

ASP.NET Blazor

- ASP.NET Blazor is an alternative to miscellaneous frontend JavaScript frameworks.
- ASP.NET Blazor is not a frontend JavaScript framework.
- But it is Microsoft's alternative for a frontend web development framework.
- It uses **Razor** and C# instead of JavaScript.
- So, if you are already familiar with Visual Studio and C# this is a good alternative.
- And you can use tools from Microsoft for Full stack development.

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