

# Introduction to Web Programming

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# About the course

- Mondays 13:30-16:15
- **Online for now**
  - When switched to in-class lectures, we'll use **D3**.
- Online lectures will be held on TEAMS:
  - Teams code: **1lgw02m**
- Grading:
  - Midterm - 35%
  - Final - 40%
  - Project - 25%

About the course

# Web Programming

About the course

# Web Programming



You have already  
learned about the  
“programming” part in  
many core courses

About the course

# Web Programming



What about this?

# What is Web?

- Web is short for World Wide Web:
  - WWW is an information system enabling documents and other web resources to be accessed over the Internet.<sup>1</sup>
    - "The World Wide Web (WWW, or simply Web) is an information space in which the items of interest, referred to as resources, are identified by global identifiers called Uniform Resource Identifiers (URI)."

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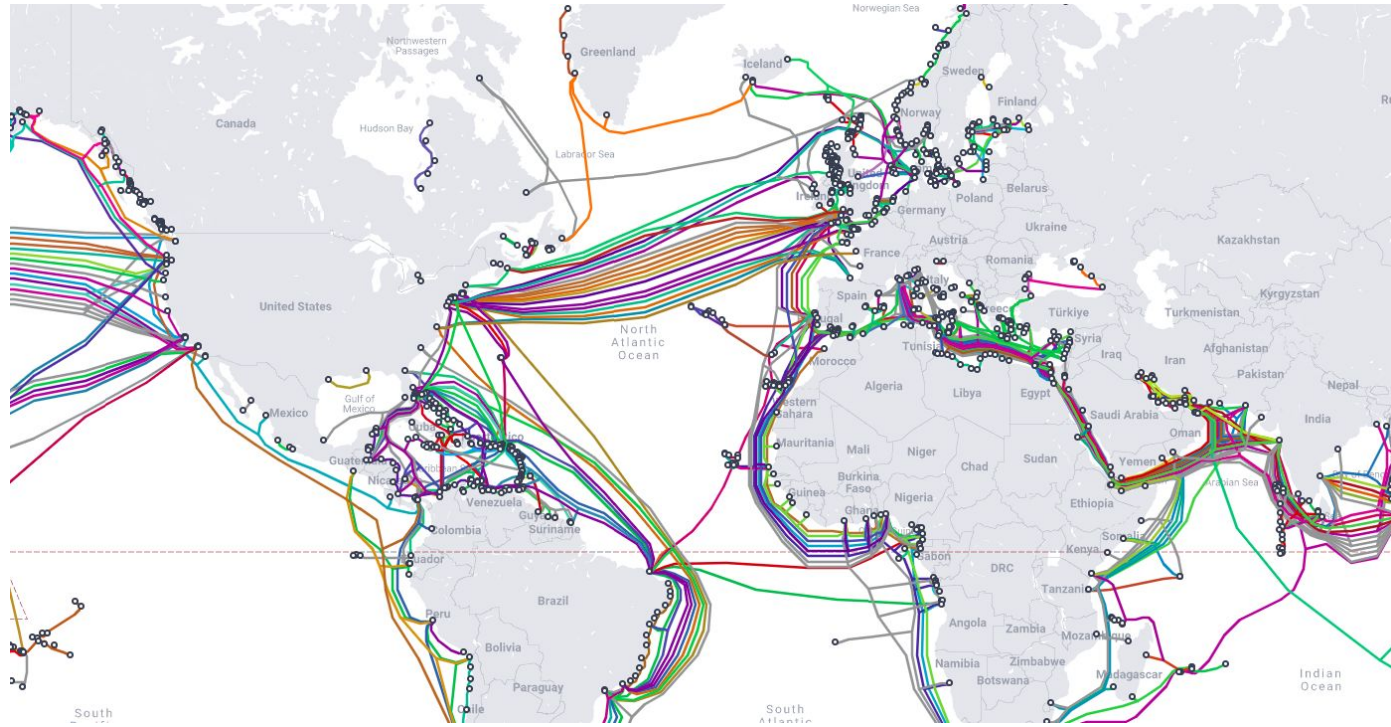
# Internet

- The Internet (or internet) is a global system of interconnected computer networks that uses the Internet protocol suite (TCP/IP) to communicate between networks and devices.<sup>1</sup>
  - Each device can connect with any other device as long as both are connected to the internet using a valid IP address.
  - Web is only one of the ways information is shared on the internet (others include email, File Transfer Protocol (FTP), and instant messaging services)

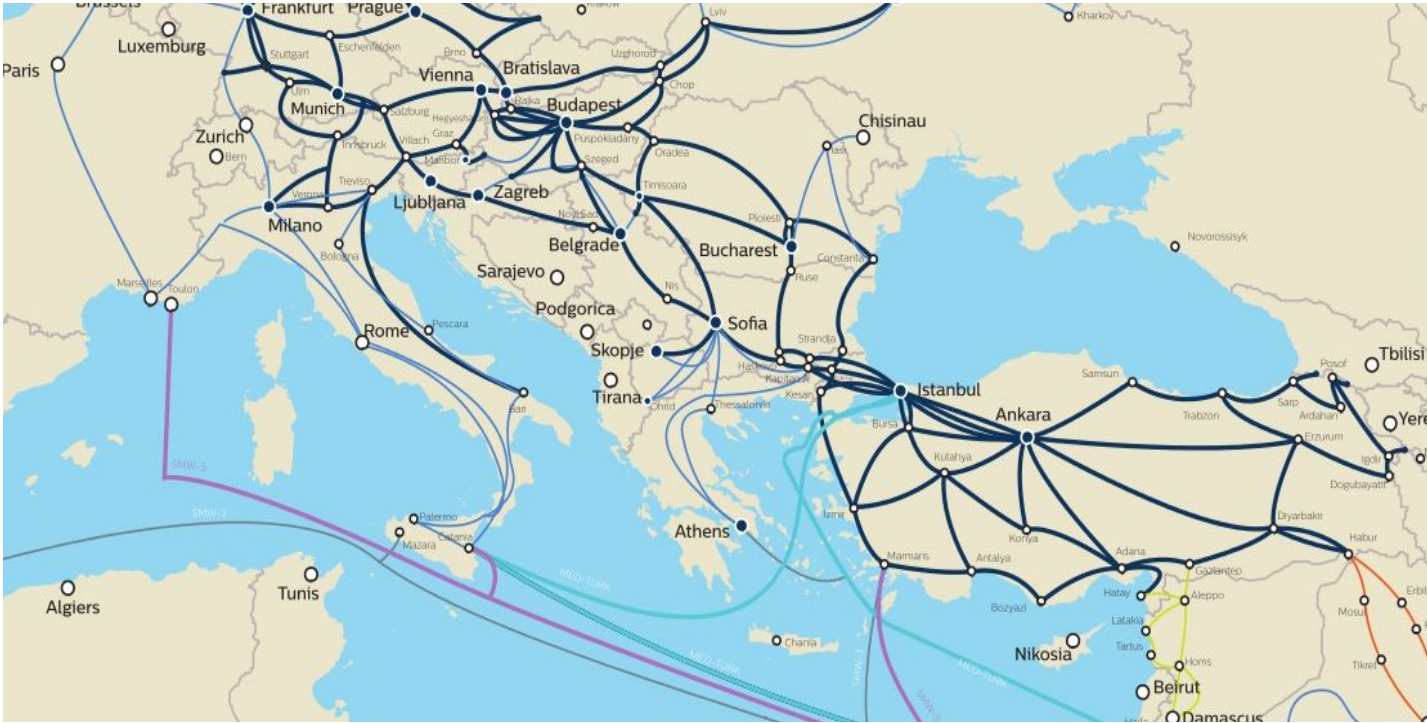
<sup>1</sup><https://en.wikipedia.org/wiki/Internet>



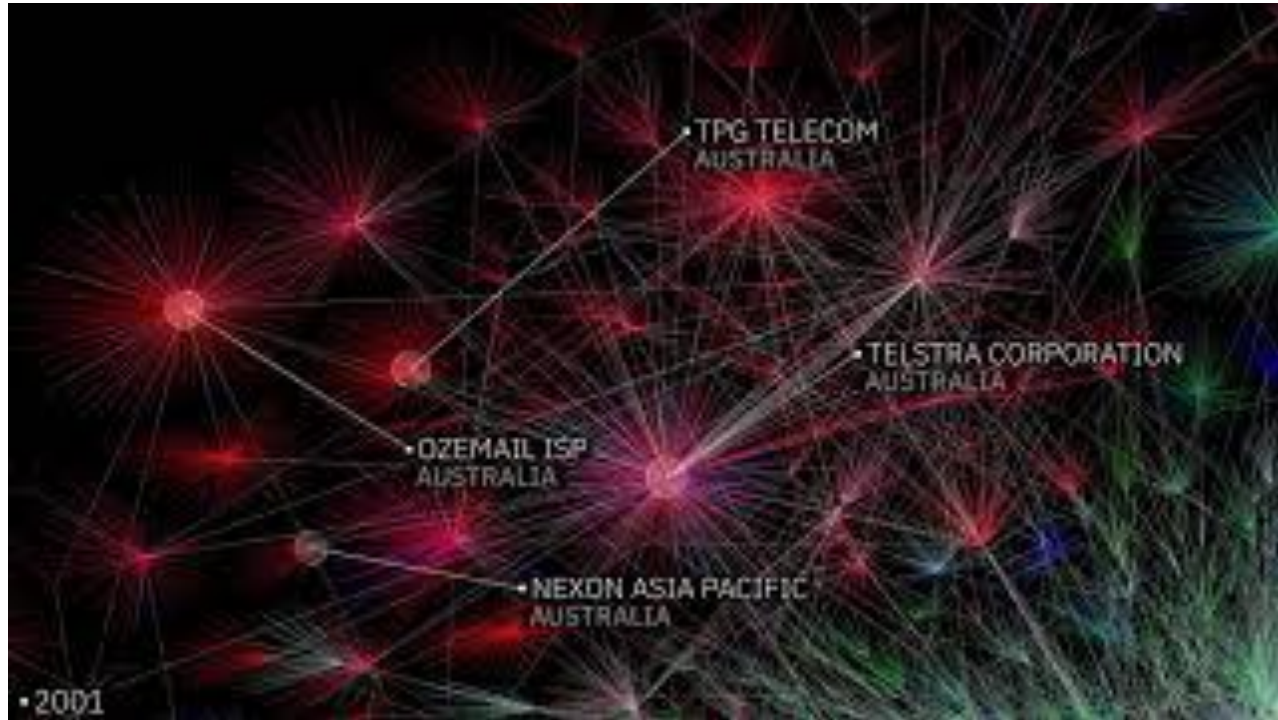
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# Information System

- An information system (IS) is a formal, sociotechnical, organizational system designed to collect, process, store, and distribute information.<sup>1</sup>
- It requires 6 components:
  - Hardware
  - Software
  - Data
  - Procedures
  - People
  - Internet\*

<sup>1</sup>[https://en.wikipedia.org/wiki/Information\\_system](https://en.wikipedia.org/wiki/Information_system)

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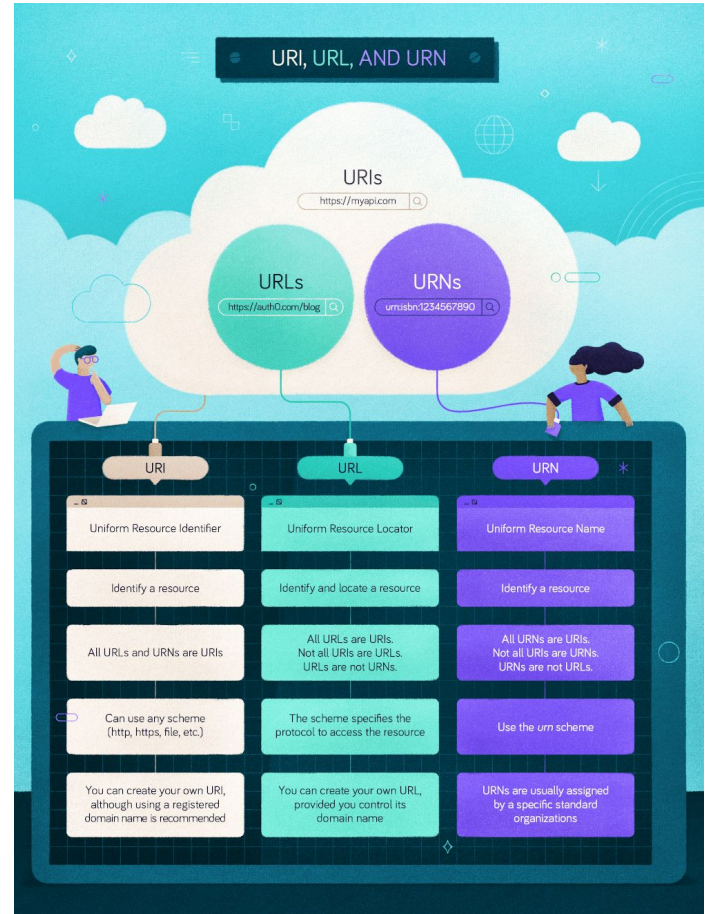
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- The first three specifications for Web technologies defined **URLs**, **HTTP**, and **HTML**. (Tim Berners-Lee, 1989)

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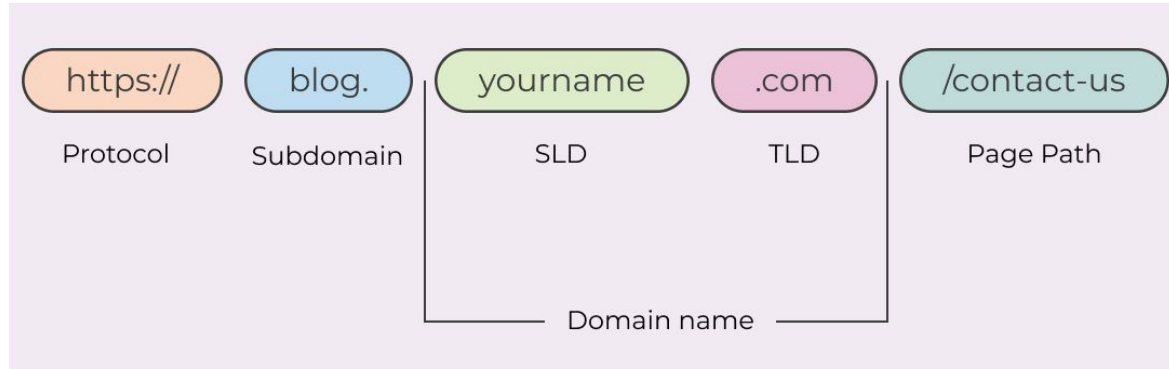
# URI / URL / URN

- URI: Uniform Resource Identifier
- URL: Uniform Resource Locator
- URN: Uniform Resource Name



# URL

- A URL, colloquially termed as a web address, is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.<sup>1</sup>
  - URL is not a link.



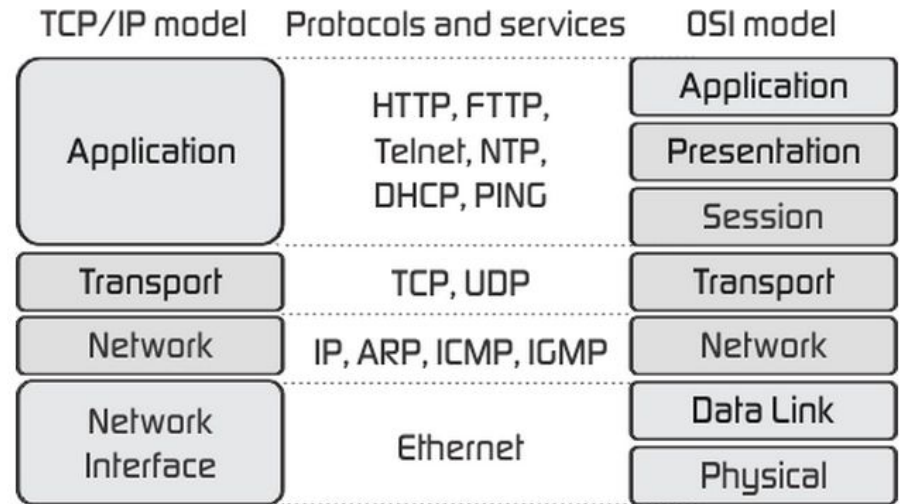
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# Internet Protocols

- Internet Protocols are a set of rules that governs the communication and exchange of data over the internet. Both the sender and receiver should follow the same protocols in order to communicate the data.

# Internet Protocols

- HTTP(S) (HyperText Transfer Protocol (Secure))
- SMTP(Simple Mail Transfer Protocol)
- FTP (File Transfer Protocol)
- TCP (Transmission Control Protocol)
- IP (Internet Protocol)
- ...



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# HTTP

- The Hypertext Transfer Protocol (HTTP) is an application layer protocol in the Internet protocol suite model for distributed, collaborative, hypermedia information systems.

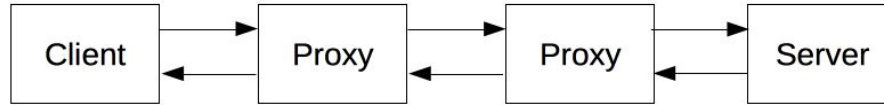
HTTP is the foundation of data communication for the World Wide Web, where hypertext documents include hyperlinks to other resources that the user can easily access, for example by a mouse click or by tapping the screen in a web browser.<sup>1</sup>

<sup>1</sup><https://en.wikipedia.org/wiki/HTTP>

# HTTP

- HTTP is designed for communication between clients (such as web browsers) and web servers (but it can also be used for other purposes).
  - A typical flow over HTTP involves a client machine making a request to a server, which then sends a response message.

# HTTP

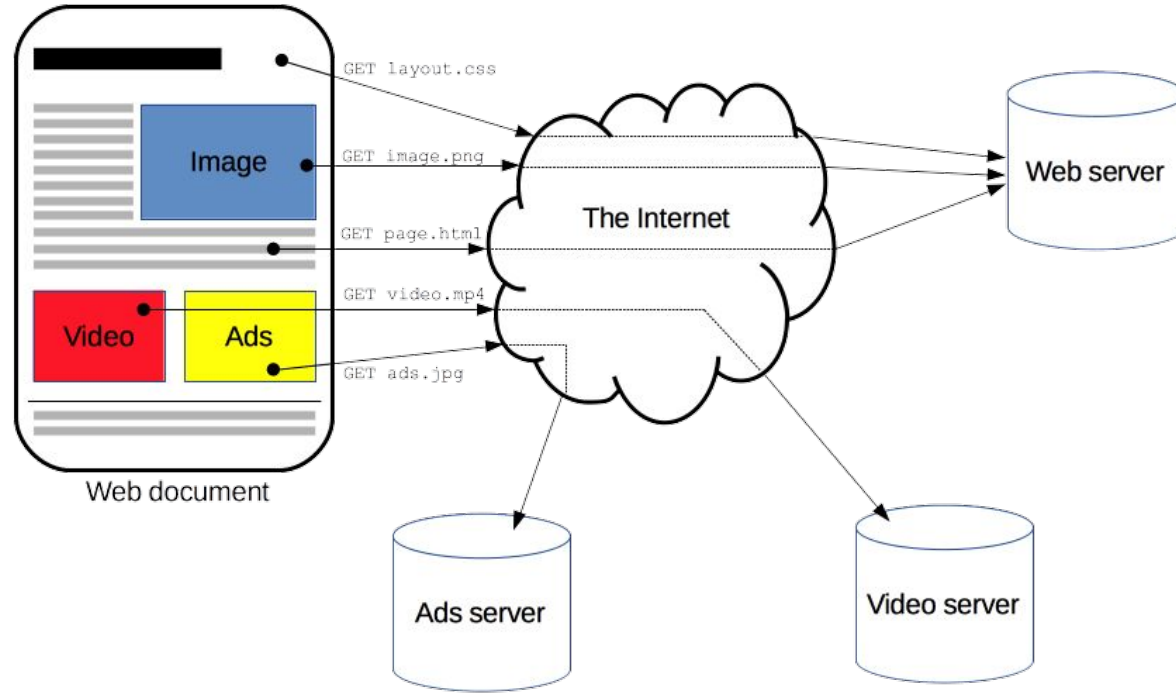


- Client: the user-agent
  - The user-agent is any tool that acts on behalf of the user. This role is primarily performed by the Web browser, but it may also be performed by programs used by engineers and Web developers to debug their applications.
- The Web server
  - On the opposite side of the communication channel is the server, which serves the document as requested by the client.

<sup>1</sup><https://developer.mozilla.org/en-US/docs/Web/HTTP/Overview>



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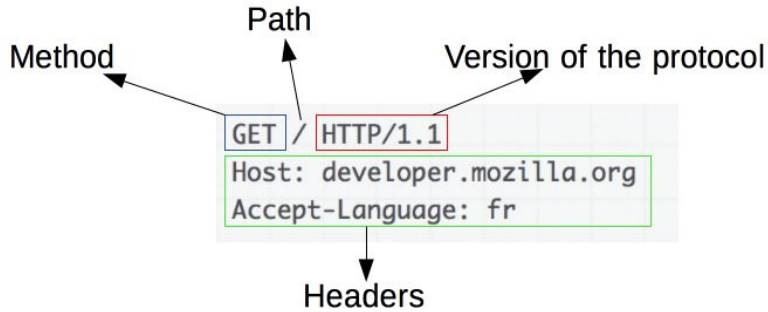
# HTTP

- Simple
- Extensible
- Stateless, but not sessionless
  - There is no link between two requests being successively carried out on the same connection.
  - HTTP cookies allow the use of stateful sessions.
- Relies on the TCP standard (not UDP)

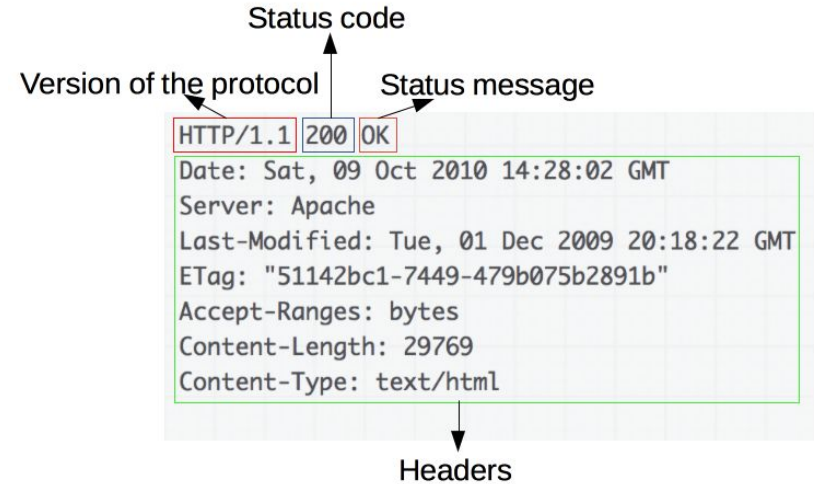
# HTTP Flow

1. Open a TCP connection.
  - The TCP connection is used to send a request, or several, and receive an answer. The client may open a new connection, reuse an existing connection, or open several TCP connections to the servers.
2. Send an HTTP message.
3. Read the response sent by the server.
4. Close or reuse the connection for further requests.

# HTTP Request / Response



**Optionally**, a body, for some methods like POST, similar to those in responses, which contain the resource sent.



**Optionally**, a body containing the fetched resource.

<sup>1</sup><https://developer.mozilla.org/en-US/docs/Web/HTTP/Overview>

# What to send over http and how?

- Users can serve any type of content over HTTP such as HTML, sound, images, video, etc.
- An application programming interface (API) is a set of tools, definitions, and protocols for integrating application software and services.
  - It's the stuff that lets your products and services communicate with other products and services without having to constantly build new connectivity infrastructure.

<sup>1</sup><https://www.redhat.com/en/topics/api>

# APIs

- SOAP (Simple Object Access Protocol)
  - It is a standard protocol that was first designed so that applications built with different languages and on different platforms could communicate.
  - APIs designed with SOAP use XML for their message format.
- REST (Representational State Transfer)
  - It is a set of architectural principles attuned to the needs of lightweight web services and mobile applications.
  - APIs designed for REST can return messages in a variety of formats: HTML, XML, plain text, and JSON.

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# HTML

- The HyperText Markup Language or **HTML** is the standard markup language for documents designed to be displayed in a web browser.
- It is often assisted by technologies such as Cascading Style Sheets (**CSS**) and scripting languages such as **JavaScript**.
- Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages.<sup>1</sup>

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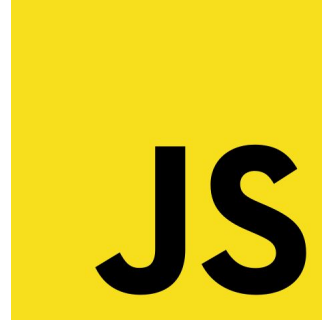
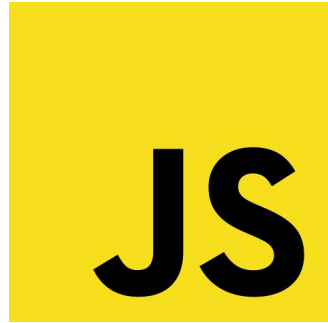


# HTML

- It is the most basic building block of the Web.
- It defines the meaning and structure of web content.
- It uses "markup" to annotate text, images, and other content for display in a Web browser.

```
<!DOCTYPE html>
<html>
  <body>
    <h2> HTML Links </h2>
    <p> HTML links are defined with the a tag: </p>
    <a href="https://www.w3schools.com">This is a link</a>
    <h3 id="demo" onclick="myFunction()">Click me to change my color.</h3>
    <script>
      function myFunction() {
        document.getElementById("demo").style.color = "red";
      }
    </script>
  </body>
</html>
```

# Summary



# Tools



Visual Studio Code



**ESLint**



Prettier



**docker**