Sofascore Frontend Academy Lecture 01,
February, 2024

Frontend. Browser. HTML. CSS.

Alen Murtić

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About Sofascore academy and your teachers

Sofascore academy

- Sofascore started student education relatively early
  - Some of the first employees were students
  - Student courses with 3-4 lessons from late 2015 to 2017
  - Summer internships in 2018 and 2019
  - Sofascore academy in this format from 2020 (this is 5th edition)
    - Great for sharing knowledge, expanding community and potentially expanding Sofascore team

Your Academy Manager - Alen Murtić

- Started student job at Sofascore in 2017
    - Backend developer with potential switch to data analytics (did not switch :D)
- Lead Symfony portion of Sofascore backend academy in 2020 & 2021
- Switched teams to frontend in 1/2021, attended 2021 frontend academy
- Lead 2022, 2023 and 2024 frontend academy

Teachers - Darjan Baričević and Petar Ćorluka

- Frontend devs working at Sofascore since 2022
- Did not attend academy (losers)
- Reviewers for the most homeworks
- Each of them will cover 50% of the lessons

Assistant - Tvrtko Babić

- Former academy graduate (2022), now working full-time at Sofascore
- Reviewer for couple of homeworks

Planned curriculum

1. Frontend. Browser. HTML. CSS. ||| Hw: Init git repo and solve CSS quiz.
2. Responsive web. JavaScript. ||| Hw: Solve various JS tests.
3. Typescript. Promises. Fetching data. Event propagation. ||| Hw: Simple web app || I-O script
4. React.js ||| Hw: Some kind of simple React app.
5. CSS in JS (Panda CSS). Next.js basics. ||| Hw: Review previous homework.
6. More of Next.js. Zeplin/Figma. ||| Hw: Init final project, one project page
7. Context. Router. More hooks. ||| Hw: Review previous homework.
8. SWR. Client vs server. Routing. ||| Hw: complete final project with one checkpoint.
9. RSC and App router in Next.js
10. Redux

Curriculum changes from last year

- CSS-in-JS: no more Kuma UI, we will use Panda CSS now
- Next.js: Pages router is a thing of past, we will cover App router now

02

Web applications and browser

Web application

- Wikipedia: link
    - "A web application (or web app) is application software that runs on a web server"
    - "Web applications are accessed by the user through a web browser with an active network connection"
    - "These applications are programmed using a client–server modeled structure"
- Simply: it consists of **Frontend (client)** and **Backend (server)**

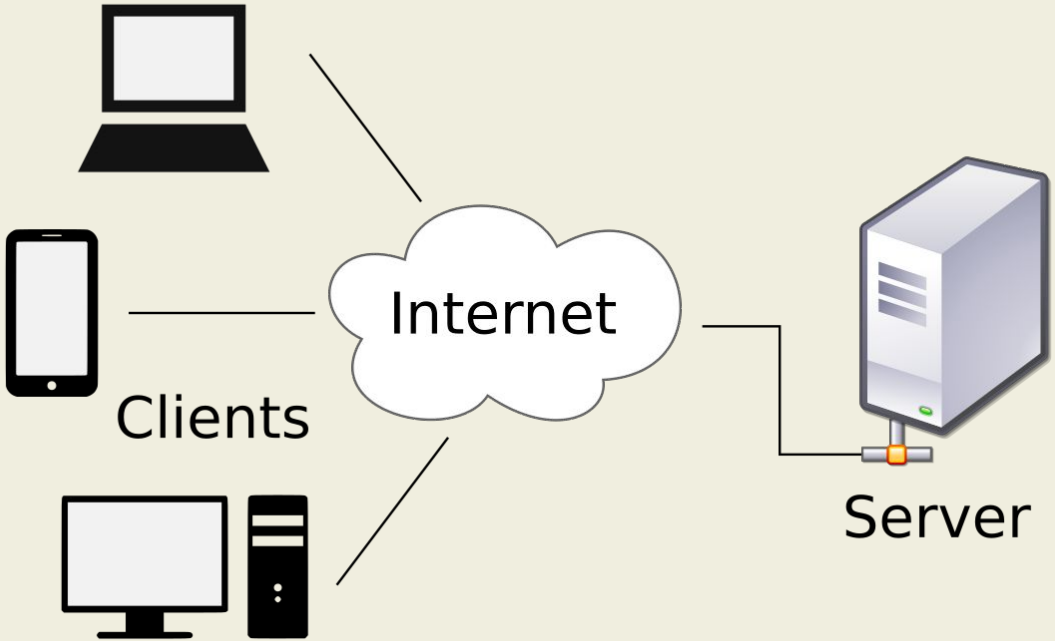
Client - Server Architecture

- Core principle of web communication
    - Client asks the server for a resource, server responds
    - Resource: HTML document, formatted data, image, video,...

  E.g. What is the score in a match? Give me team logo...
- THE protocol: **HTTP** (Hypertext Transfer Protocol)
    - What is HTTP (Cloudflare)?
    - Later created: Websockets - to improve efficiency

Client - Server architecture

- Basically: clients pull data from server or push it to server via Internet
- Communication protocol: HTTP



Frontend

- Interface with which a user (person or a script) interacts (sees, clicks, ...)
  - "Visible" part of the web application
  - In a general meaning - any client which has UI - Android, iOS, KaiOS apps
  - We use the term "Frontend" as a shorthand for **web frontend**

Web frontend

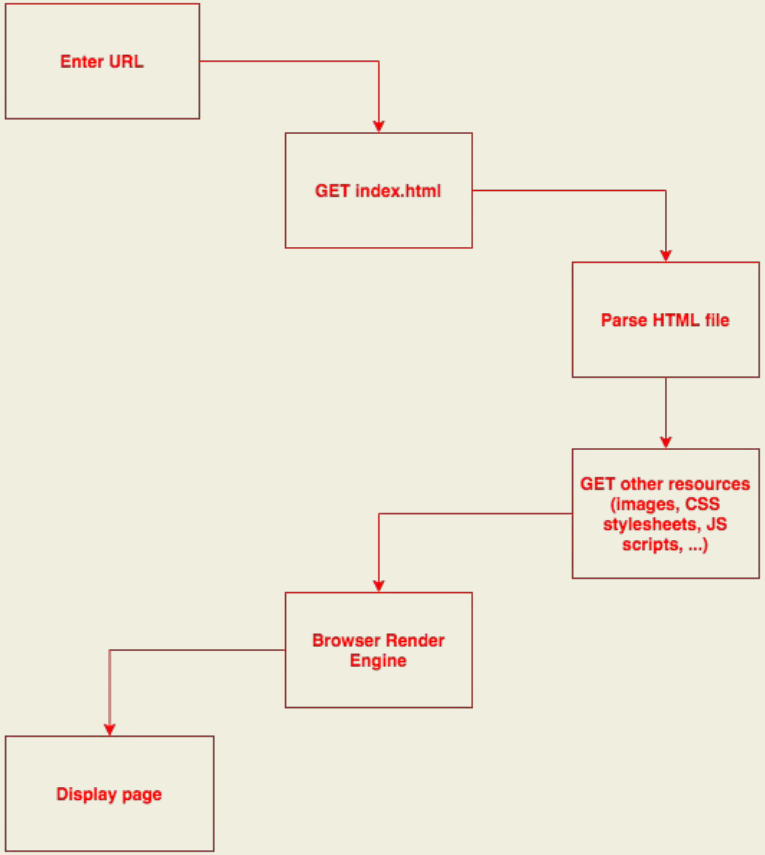
- Visual application that is displayed by web browser
- Source written in HTML, CSS, JavaScript
- Source can be in WebAssembly 😱 - Binary (compiled) [mostly JavaScript] for higher performance
    - Writing WebAssembly By Hand
    - Personal opinion: not a fan of writing code directly in WASM

Browser

- A tool to navigate the web, display web applications and provide interactivity
- Core component: render engine
  - MSHTML, EdgeHTML - deprecated, used by Internet Explorer and early Edge
  - Gecko - Firefox
  - WebKit - Safari and early Chrome
  - Blink - Chromium project, fork of WebKit
  - Chrome, current Edge, Brave, Opera, Vivaldi, Samsung Internet, ...
- 2023: For desktop I would recommend Firefox -> reason: Manifest V3
  - Link 1 and link 2 why, Vivaldi and Brave try to fight it, Edge doesn't
- For mobile it's a little bit murkier, but the Android Firefox is getting better, on iOS everything is repackaged Safari (for now)

Browser flow

- Example of client - server architecture
- Browser (+user) = client
- Detailed description: how browsers work



Browser differences

- Different engines -> differences in how everything works
  - Most of things are standardized via W3C, but some browsers don't support some features
  - Can I use "navigator.share"?
  - Browsers depend on the OS for features like graphics APIs, threads, processes, ...
- Browsers work on CPU, but do mostly graphics tasks
  - Hardware acceleration -> doing some tasks on GPU (or special CPU cores)
  - Problem with HA: now your browser depends on your GPU & its driver

Reporting bugs cheatsheet

- Always report: browser, OS
- Can make a difference: ad-blocker, tracking protection, private (incognito) or normal mode
    - Also if 3rd party cookies are enabled or not
- Nice caveat: hardware acceleration
    - e.g. Chromium browsers and image scaling with hardware acceleration in versions 80-sth

03

HTML

HTML

- **H**yper**T**ext **M**arkup **L**anguage
  - HyperText -> text with references to other pages (links)
  - Markup -> standardized set of notations (tags and attributes)
    - e.g. XML, markdown (.md), TeX/LaTeX
  - Idea: How to display content
  - NOT A PROGRAMMING LANGUAGE!!!! MARKUP LANGUAGE!!!

HTML

- Created by Tim Berners-Lee to enable document sharing (text based -> links, headings, paragraphs)
  - Standardized by W3C
  - Latest and greatest: HTML5 - late 2000s, big improvements
    - Made proprietary things such as Flash obsolete
- HTML6 is coming - 4 years old article 😂
- HTML is forwards-compatible
  - Designed to treat all tags in the same way (as inert, unstyled inline elements) unless their appearance or behavior is overridden
  - i.e. 2007 browser can display 2023 plain-HTML page decently

HTML structure

- **HTML Element: Tag + Attribute(s) + Content**
- Tag: identifies element (html, body, b, div, span)
  - opening: e.g.
  - closing:
  - self closing: <img/>
- Attribute: specifies properties of an element (e.g. styling, source for an image, ...)
- Content: between opening and closing tag
  - any text, HTML element, ...
  - self closing tags don't have content
- Each HTML document has **html**, **body**, **head** tags.

HTML

HTML elements examples

- `<b>This is bold text</b>`
- `<div id="atribute_example">Text and/or other element(s)</div>`
- `<img src="path_to_image" alt="Text if image fails to load" />`

HTML sample

- **HTML relations:**
- Parent - Child -> child is parent's content
- Siblings - two elements with the same parent

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Sofascore Frontend Academy</title>
  </head>

  <body>
    <p>Hello!</p>
  </body>
</html>
```

Semantic HTML

- The same content can be described in different ways
- Write HTML in a way it conveys meaning when read, not just in browser

HTML examples

04

CSS

CSS

- **C**ascading **S**tyle **S**heets
  - How HTML elements are displayed on device
  - CSS3 specification
- Syntax: cssProperty: valueOfProperty;
  - e.g. color: blue;
- Cascading -> styles cascade (apply to lower levels) if not overridden

CSS Selectors

- CSS defines styles and can be applied to single element, or to the group of elements
- Inline styling - for single element
  - Text
- Style all elements with the same tag
  - h2 { text-transform: uppercase; }
  - useful for resetting default browser styling (e.g. ul or button elements)
- Style all elements with the same class attribute set to className
  - .className { background-color: tomato; }
- Style all elements with the same id attribute
  - #uniqueId { text-align: center; }

CSS Selectors 02

- Selectors can be mixed
  - h2.specialHeading { padding: 8px; }
  - h2 .specialHeading { margin: 16px 8px; }
- Universal selector (*), Grouping selector (div, p { ... })
- **Specificity: Inline style > Id Styling > Class styling > Tag styling**
- Notes:
  - Id attributes should be unique for each element and should appear only once on each page
  - Same element can have multiple classes (e.g.)
  - Adding !important to value of CSS property will override a rule that can't be overridden in any other way
    - Multiple !important values can make CSS extremely confusing

Adding CSS to HTML

- <link rel="stylesheet" type="text/css" href="myStyleSheet.css">
- Embedded in <style></style> element
- Directly on element
- It is applied in order they are linked and order in the file in which they were defined
- Do separate HTML and CSS files!

CSS

CSS Box model

- Each element is a box defined with x, y, width and height
  - x and y mark the top left edge of the box
  - width and height are applied to content part of the box
- Where are content, padding, border and margin on the cats image?

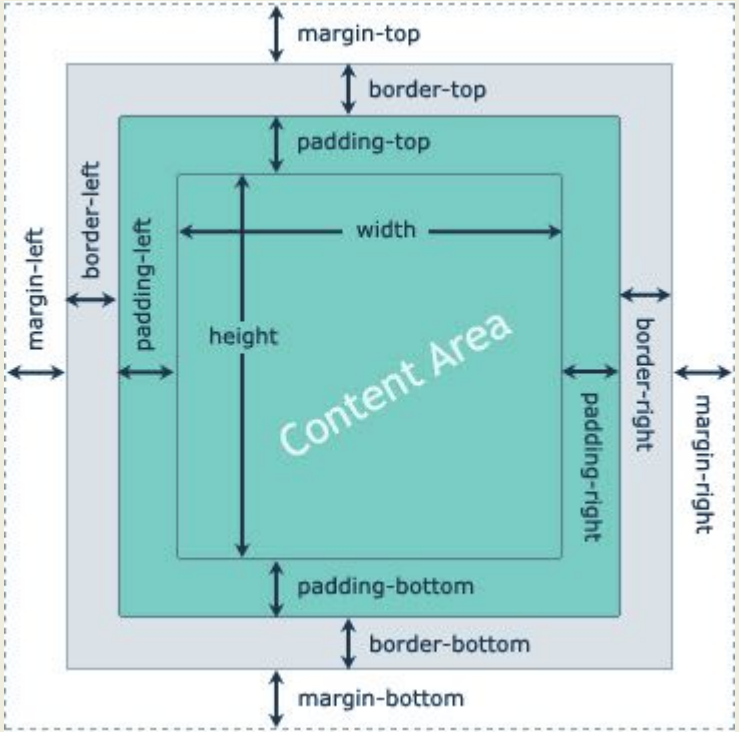
CSS

CSS Box model

- Content can be distributed in the box with padding
- Box can be spaced from other boxes with margin

  (e.g. spacing between sibling elements)

  - Margins of adjacent elements don't stack!!! They collapse. Bigger wins.
  - Rules of margins
  - Margin can be negative - a bit hackish
- Box can be made visible with border - draws line on the edge of the box



CSS Box model and box-sizing

- box-sizing property changes how browser calculates size of the element
  - Whether to border or padding included or excluded from the width
  - Default value is content-box, which includes only content
  - We at Sofascore use box-sizing: border-box -> includes content, padding and border
    - Very simple example why border-box can be superior: link

CSS examples

Thank you for your attention!

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CSS Appendix

01

Display

Display

CSS Display Properties

- Display property is used to specify how should element behave in the parent element.
- Elements have default display properties defined in HTML specification
- Common display properties:
  - block
  - inline
  - inline-block
  - none - removes element from screen
  - grid, table, **flex** - special layouts

Display

CSS Display Properties

- Display: block - e.g. div, ul, main, p
  - Element will take as much space as possible in the single row
  - No two block elements in the same row
- Display: inline - e.g. span, b
  - Element will use minimal width needed
  - Ignores width and height set
  - Possible multiple elements in the same row
- Display: inline-block - e.g. img
  - Inline element which doesn't ignore width and height set

02

Flex

Flex

Flexbox - display: flex

- Displays element as block level container - it appears the same, children will be changed
- Applies flexible width (or height) and positioning to children
- Aligns children on defined axis - row, column
- Children positioning can be specified
    - Align all with start, center or end of the parent container
- If children take more space than available - define wrapping
- If children take less space than available - define layout

Flexbox - display: flex

- Best additional resources to learn flex
  - W3C - Schools - usually great, but it’s not their best work, in my humble opinion
  - A Complete Guide to Flexbox - phenomenal, great read even if you know flex
  - Flexbox Froggy game - when you feel ready, try this out
- Flex vs grid
  - Flex can do everything grid can, not exactly visa versa
  - Flex is more supported on older browsers, but it’s becoming moot point in 2023
  - Grid is better for very simple layouts (designed for Windows 8 start menu)

Flexbox - parent (flex container) properties

- Most important parent properties:
  - flex-direction - the direction (axis) of flex-container
    - row (default), row-reverse, column, column-reverse
  - justify-content - strategy of organizing children along the flex axis
  - align-items - strategy of organizing children along the other axis
  - flex-wrap - whether to wrap children in the next row/column when there isn't enough space
  - gap - default space between children on the container
    - Example of problematic Safari property, but less so in 2024 - Can I use link

Flex

Flexbox - child properties

- Most important children properties:
  - flex-grow - should the child grow and in what ratio
  - flex-shrink - should the child shrink and in what ratio
  - flex-basis - basis dimension for grow and shrink calculation
    - Can be used in combination with [max|min]-[width|height]
  - flex - shorthand for flex-grow, flex-shrink and flex-basis
    - e.g. flex: 3 2 50px;
  - align-self & justify-self - ignore how the container aligns/justifies children and set own rule

Flex

Practise makes perfect

Flexbox examples

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03

Position and transition

CSS Position

- Type of positioning used for an element
- Used to define how should element be positioned based on its top, bottom, left and right, properties
- Default value: **static**
    - Ignore position properties
- z-index - tells browser how to display overlapping elements (higher number first)
    - default: first element on top

CSS Position - common values (other than static)

- relative -> position element relative to element's normal position (top, left, ...)
  - stays in normal flow, reserves its space
- fixed -> positions element relative to a screen (not content on the screen)
  - stays on the same place when page is scrolled
- absolute -> positions element relative to nearest positioned ancestor
  - positioned ancestor -> any element with position property different then static (default) !!!
  - common use with relative parent
  - removed from normal flow, no space reserved
- sticky -> positioning depends on scroll position, alternates between absolute and fixed
- MDN position documentation

Position and transition

CSS Transition

- Allow gradual/smooth transition between states, e.g. changing color, appearance, etc.
    - There are many many libraries which do more than basic CSS transition
    - Basic CSS is faster 😁
- THE most common problem in basic CSS:
    - Exiting element has to stay in HTML (DOM) until the animation finishes and then disappear
- We use Framer motion when tasked to do something more than basic CSS
    - Going way ahead of ourselves, but AnimatePresence is easy solution for the problem

Position and transition example

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