Napredni razvoj programske potpore za web

- predavanja -

2021./2022.

7. Jednostranične web-aplikacije (1/3)

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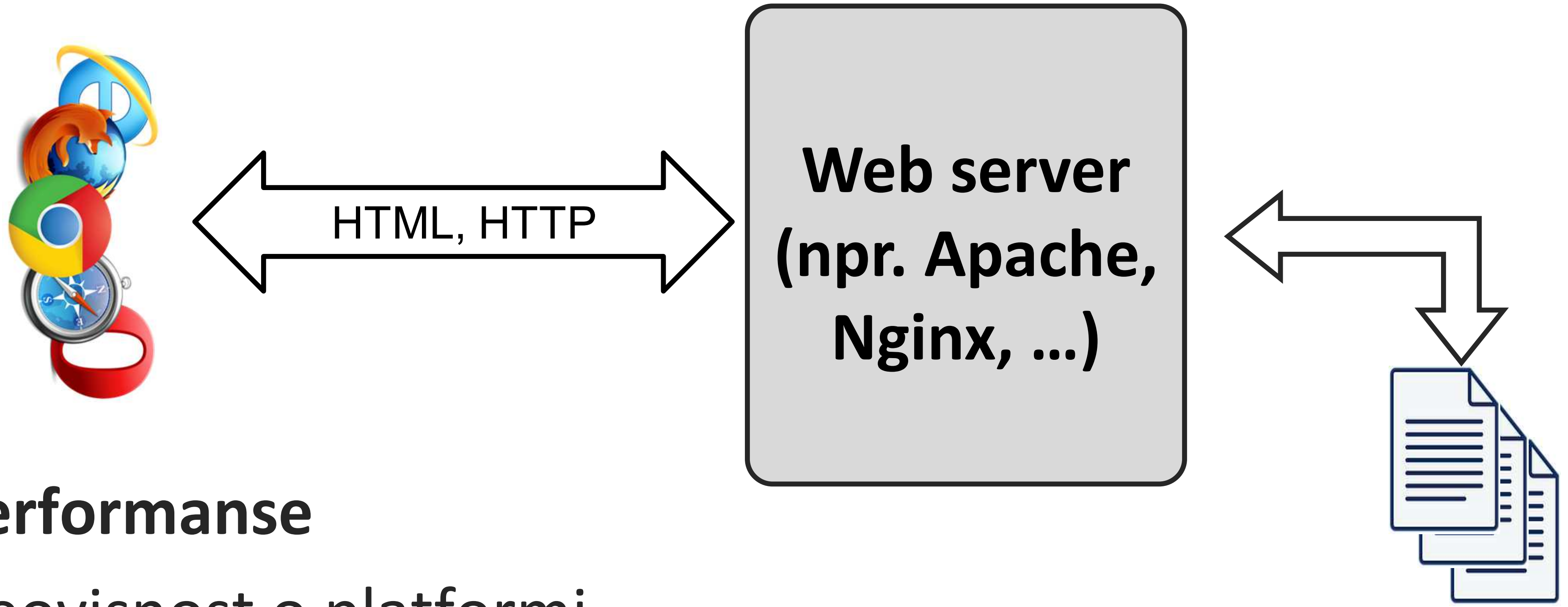
Podsjetimo se – tri arhitekture web-aplikacija

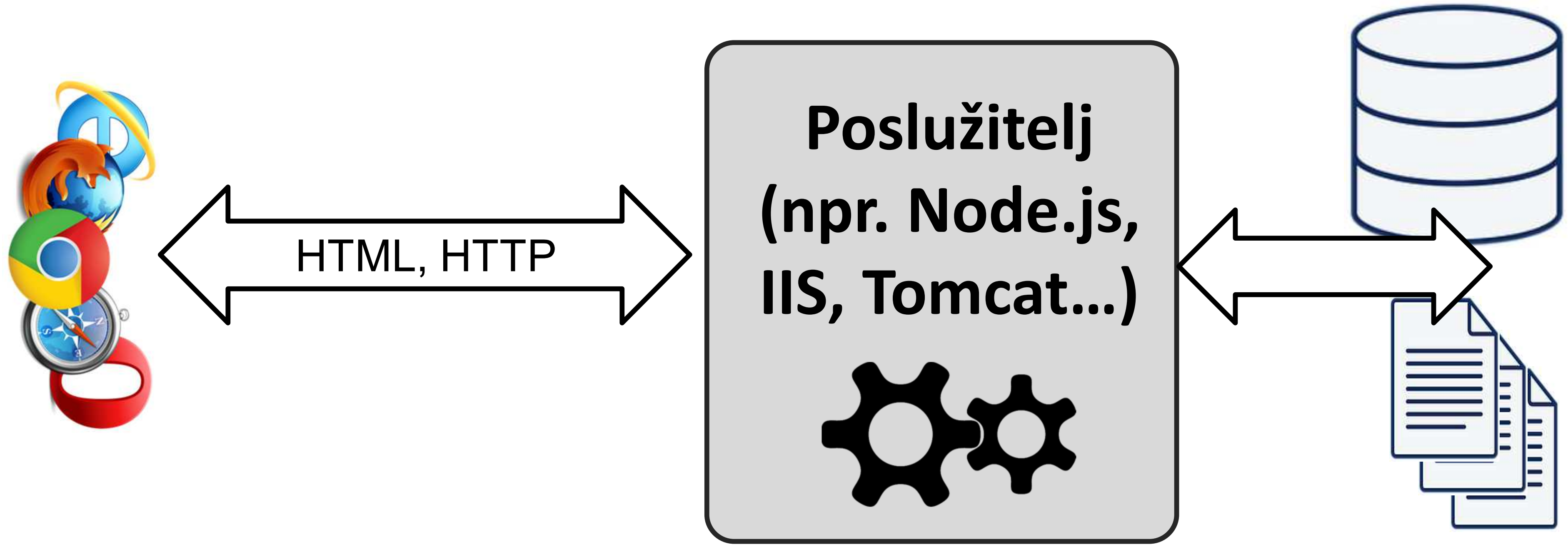
1. Statičke web-stranice



- ✓ **Performanse**
- ✓ Neovisnost o platformi
- ✓ Sigurnost
- ✗ „Statičnost”, klijent mora osigurati bilo kakvu interaktivnost

Podsjetimo se – tri arhitekture web-aplikacija

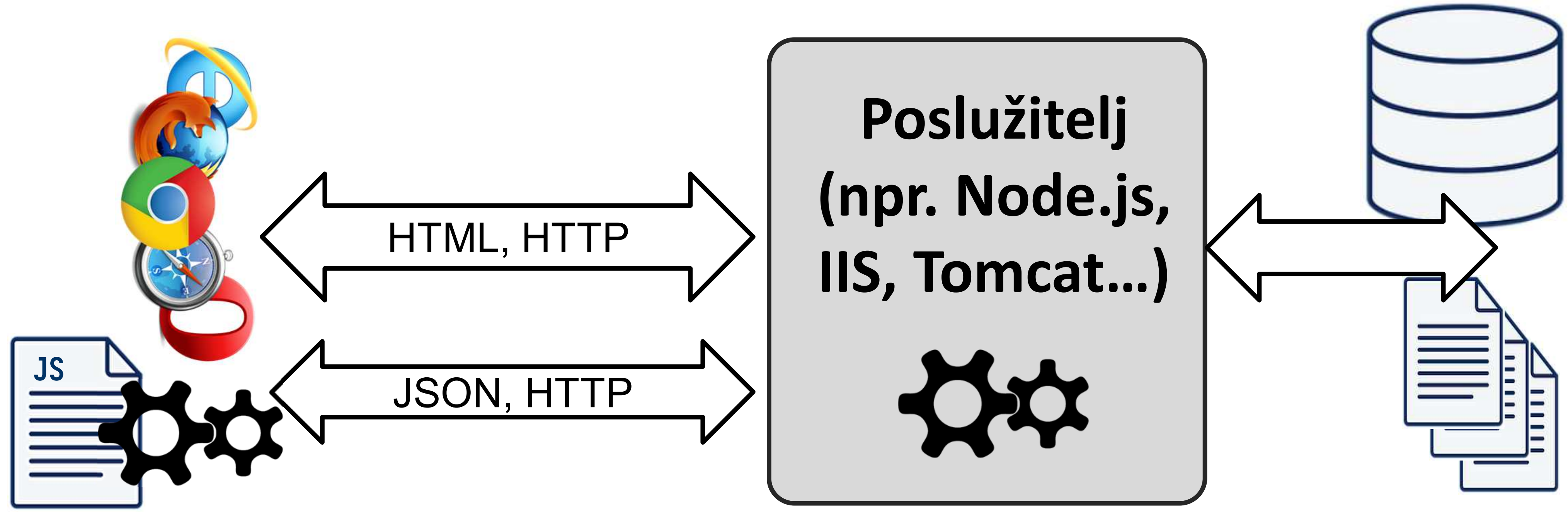
2. Dinamičke web-stranice (generirane na poslužitelju)



- ✓ **Dinamički sadržaj, prilagođen klijentu**
- ✓ Sigurnost, odabir tehnologije, …
- ✗ Procesiranje (opterećenje) na poslužitelju
- ✗ Responzivnost (UX): klijent predaje podatke i **čeka** odgovor

3. Jednostranične web-aplikacije

- SPA: *Single Page web Applications*



✓ **Dinamički sadržaj, prilagođen klijentu**

✓ **Performanse**: dobar dio opterećenja se prebacuje na klijenta

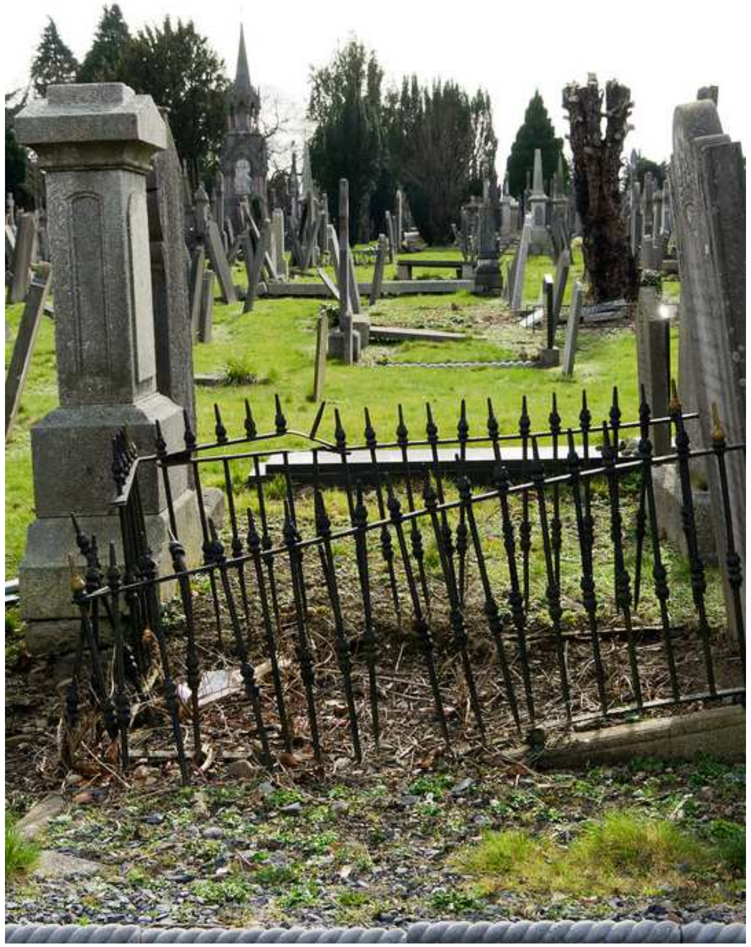
✓ **UX** – doima se kao (mobilna) aplikacija

✗ Kompleksnost, teže testiranje, sigurnost, zadan JS

Kao i obično, ideja nije nova…

- ***Java applets***
  - https://en.wikipedia.org/wiki/Java_applet
  - Java applets were introduced in the first version of the Java language, which was released in **1995**.
  - Beginning in 2013, major web browsers began to phase out support for the underlying technology applets used to run, with applets becoming completely **unable to be run by 2015–2017**.
- ***ActiveX***
  - https://en.wikipedia.org/wiki/ActiveX
  - Microsoft introduced ActiveX in **1996**
  - ActiveX is still supported as of Windows 10 through Internet Explorer 11, while ActiveX is not supported in their default web browser Microsoft Edge
- ***Flex/Flash***
  - https://en.wikipedia.org/wiki/Apache_Flex
  - In November **1996**, FutureSplash was acquired by Macromedia, and Macromedia re-branded and released FutureSplash Animator as Macromedia Flash 1.0.
  - Adobe donated Flex to the Apache Software Foundation in 2011[2] and it was promoted to a top-level project in December 2012.
- ***Silverlight***
  - https://en.wikipedia.org/wiki/Microsoft_Silverlight
  - 2007-2011
- ***Itd, …razni JS kalkulatori, …***

- Novo: **WASM** (https://en.wikipedia.org/wiki/WebAssembly)



As of March 2021, less than 0.01% of sites used Silverlight,[24] 2.1% used the discontinued Adobe Flash,[25] and less than 0.01% use Java (client-side; server-side 3.4% use Java).[26][27]
https://en.wikipedia.org/wiki/Microsoft_Silverlight

Primjer: µSPA

Izgradimo vlastiti mikro radni okvir za jednostranične web-aplikacije

Zašto radimo svoj FWK koji ćemo baciti u smeće?

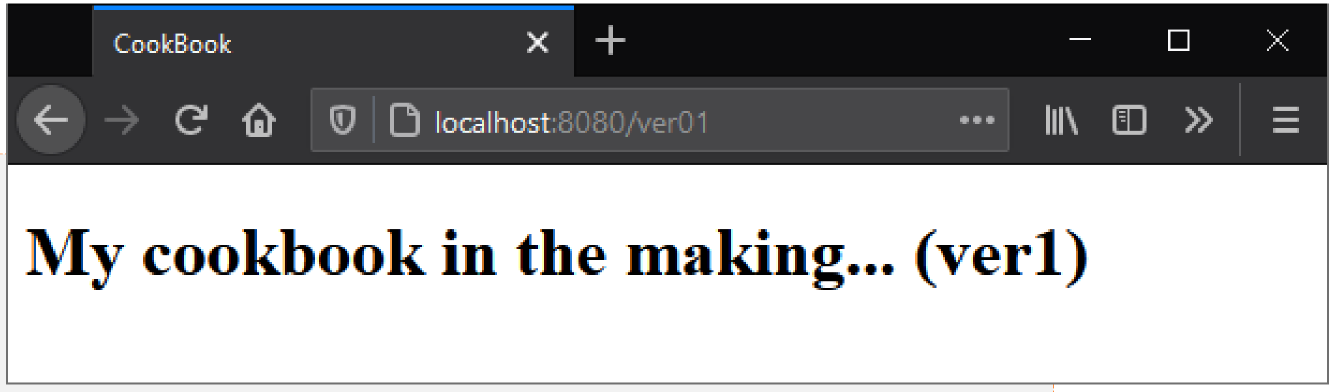
- Upoznati:
  - načela rada
  - mehanizme i tehnologiju
  - probleme, vidjeti što je teško
  - razumjeti
  - Možda i naučiti malo JS-a u procesu ☺
- Iz istog razloga što:
  - Učimo zbrajati i množiti na papiru
  - Učimo pokazivače u C-u da bi shvatili *by value, by reference*
  - Itd.

src

- `git clone git@gitlab.com:fer-web2/lectures/src.git`

ver1

Osnovno načelo: mijenjamo DOM iz JS koda

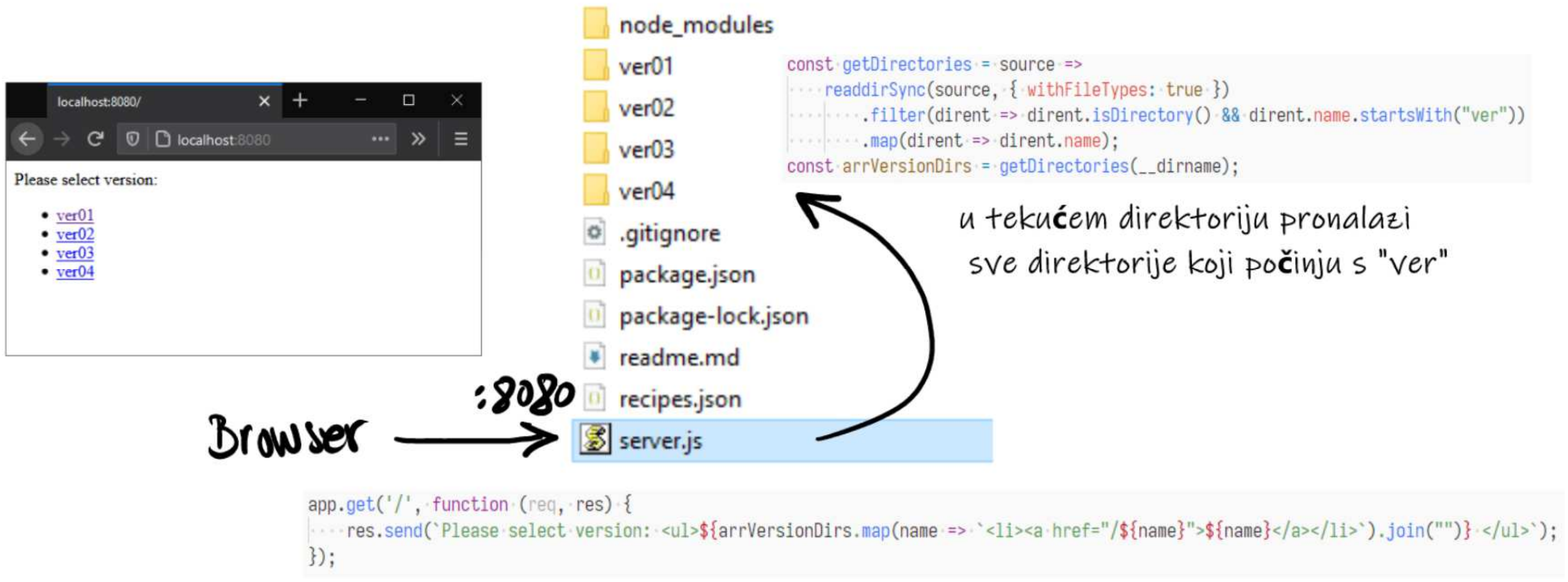


My cookbook in the making... (ver1)

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>CookBook</title>
</head>
<body>
    <div id="uspa-app"></div>
</body>
<script>
    document
      .getElementById("uspa-app")
      .innerHTML = "<h1>My cookbook in the making...</h1>";
</script>
</html>
```

Digresija: server.js

- FWK razvijamo kroz 4 verzije – jedan poslužitelj koji poslužuje sve 4 verzije na izbor



Please select version:

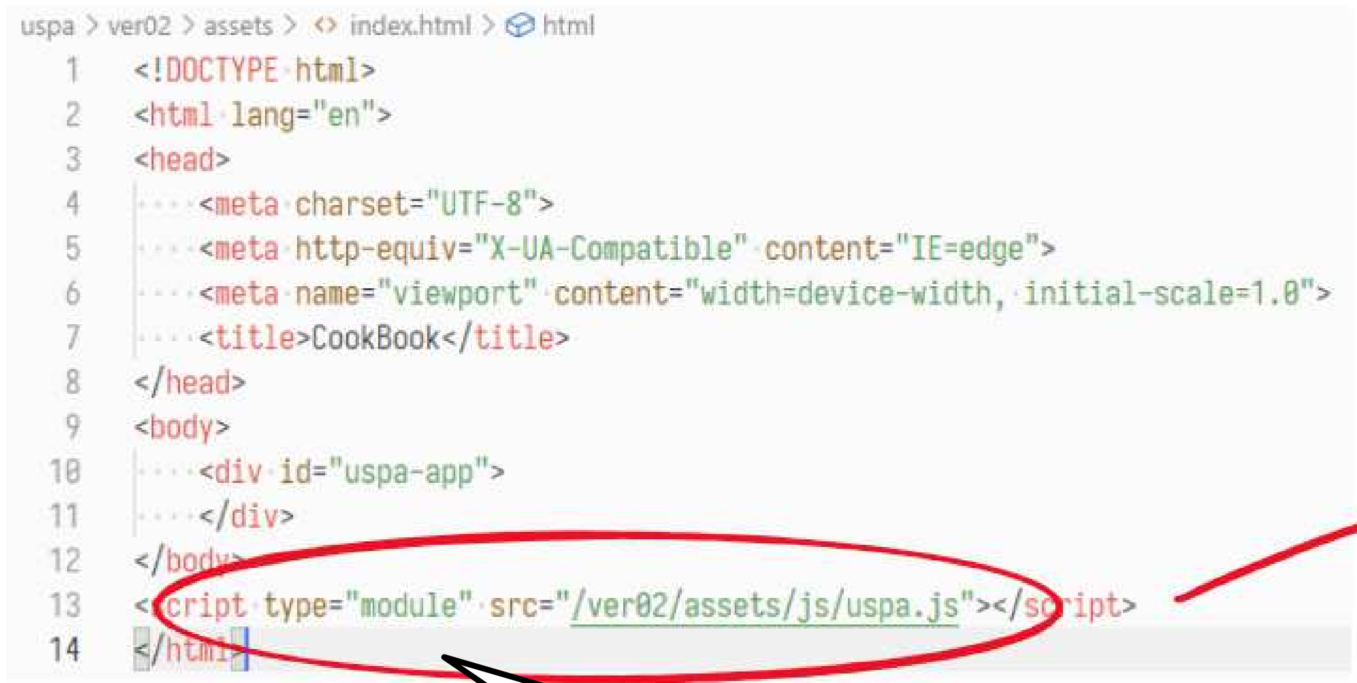
- ver01
- ver02
- ver03
- ver04

```
const getDirectories = source =>
    readdirSync(source, { withFileTypes: true })
        .filter(dirent => dirent.isDirectory() && dirent.name.startsWith("ver"))
        .map(dirent => dirent.name);
const arrVersionDirs = getDirectories(__dirname);
```

```
app.get('/', function (req, res) {
    res.send(`Please select version: <ul>${arrVersionDirs.map(name => `<li><a href="/${name}">${name}</a></li>`).join("")} </ul>`);
});
```

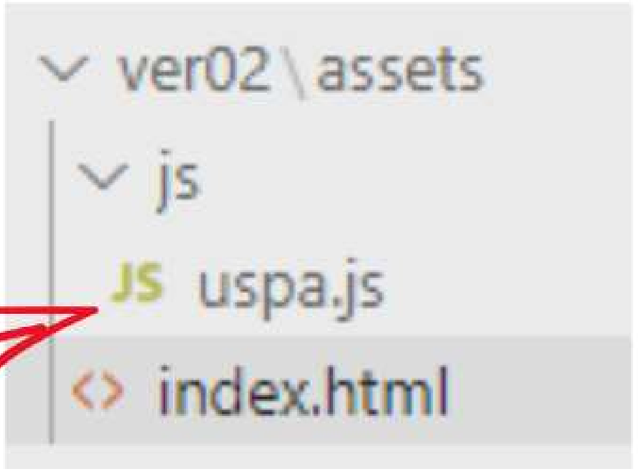
ver2

Ver2: izmjestimo kod u modul


uspa > ver02 > assets > index.html > html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>CookBook</title>
</head>
<body>
    <div id="uspa-app">
    </div>
</body>
<script type="module" src="/ver02/assets/js/uspa.js"></script>
</html>
```

novi ustroj projekta



ES modules
https://en.wikipedia.org/wiki/ECMAScript#6th_Edition_%E2%80%93_ECMAScript_2015

ver2

Ver2: presrećemo svaki klik!

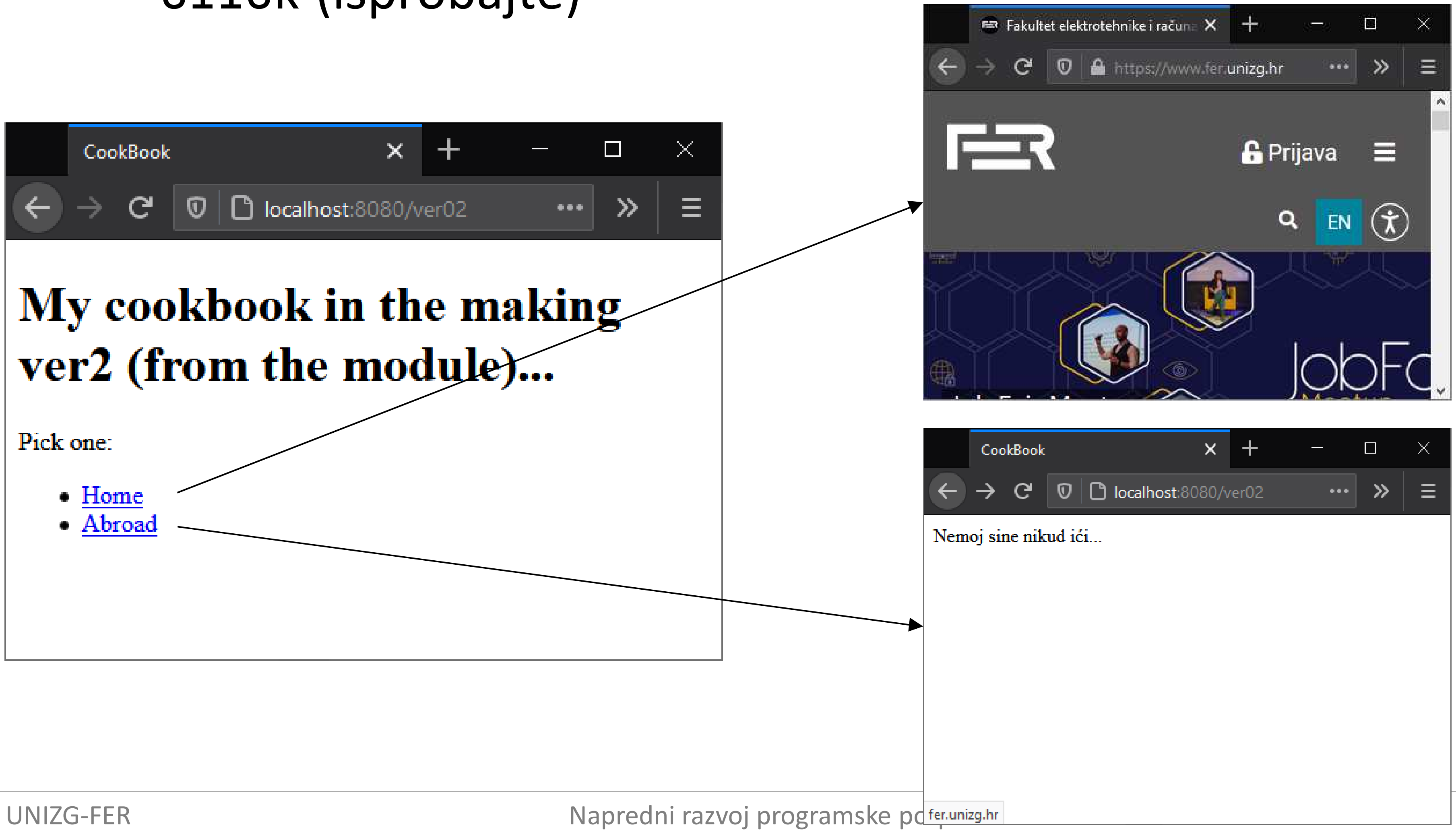
```
let template = `
<h1>My cookbook in the making ver2 (from the module)...</h1>
Pick one:
  <ul>
    <li><a href="http://fer.unizg.hr">Home</a></li>
    <li><a data-link href="http://fer.unizg.hr">Abroad</a></li>
  </ul>
`;

document.addEventListener("DOMContentLoaded", () => {
    document.body.addEventListener("click", e => {
        if (e.target.matches("[data-link]")) {
            e.preventDefault();
            document.getElementById("uspa-app")
                  .innerHTML = "Nemoj sine nikud ići...";
        }
    });
    document.getElementById("uspa-app").innerHTML = template;
});
```

ver2

Ver2: presrećemo klik

- Pomalo pretjerano, presrećemo svaki klik, pa onda gledamo zanima li nas
  - Mogli smo npr. pronaći samo a elemente pa premostiti njihov `click` (isprobajte)



My cookbook in the making ver2 (from the module)...

Pick one:

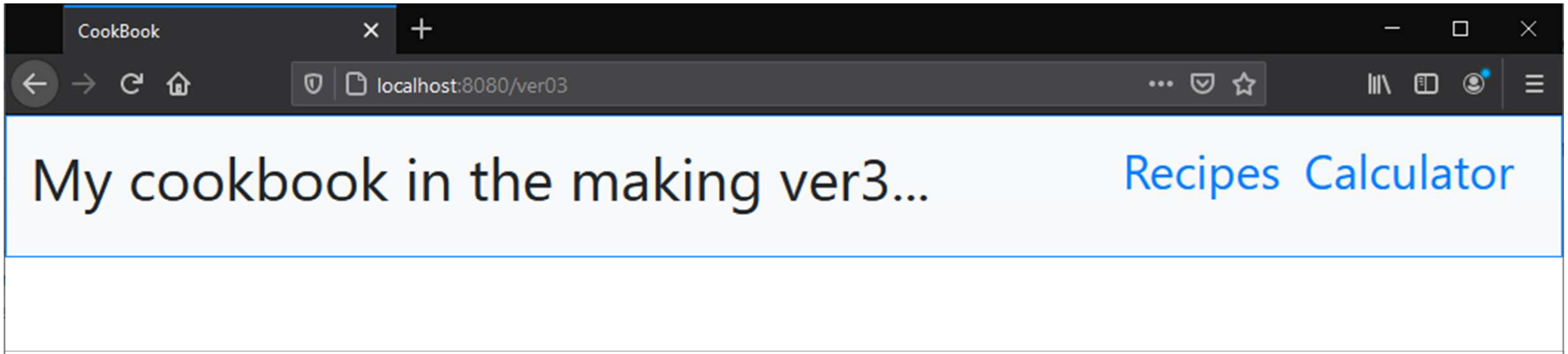
- Home
- Abroad

Nemoj sine nikud ići...

ver3

µSPA - ver3

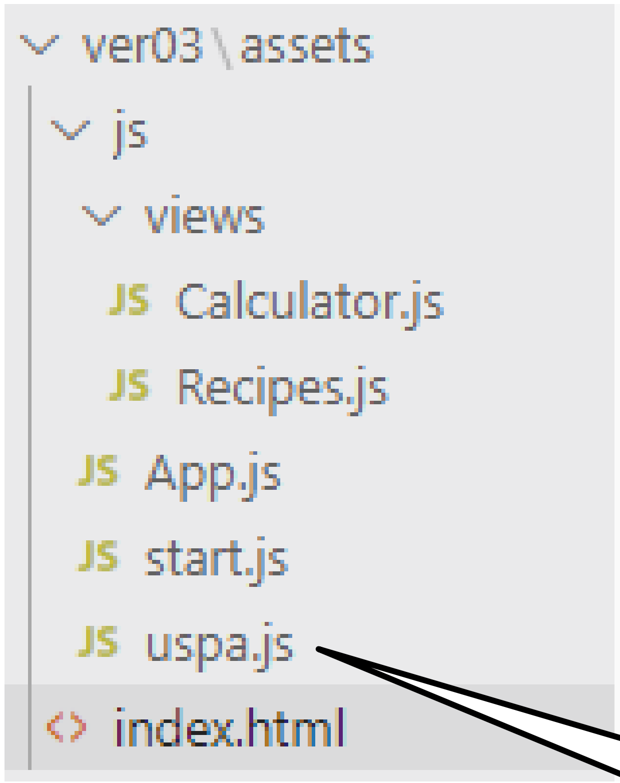
- Znamo:
  - Dinamički promijeniti sadržaj stranice
  - Presresti (i promijeniti) klik, npr. kod linkova
- Napravimo:
  - **Višestraničnu** web-aplikaciju – sami upravljamo promjenom stranica!
    - **routing**
  - Pritom preustrojimo kod tako da je svaka stranica poseban ***view*** odnosno posebna datoteka/modul
    - App view (defaultni view, aplikacija)
    - Recipes view (pregled recepata)
    - Calculator view (preračunavanje C <-> F (u ver4))



My cookbook in the making ver3...

ver3

Novi ustroj projekta



```
ver03 \ assets
  js
    views
      Calculator.js
      Recipes.js
    App.js
    start.js
    uspa.js
  index.html
```

start.js

```
import Uspa from "./uspa.js"
import App from "./App.js"

const app = new Uspa();

app.mount("my-app", new App());
```

FWK je sad posebna datoteka tj. modul

ver3

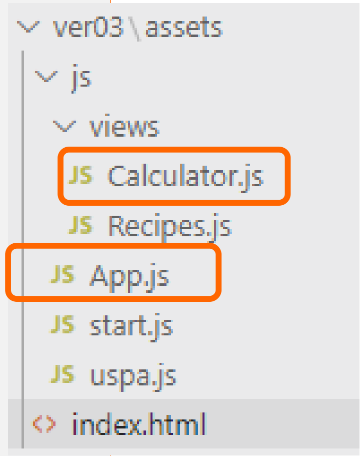
Svi viewovi moraju imati async getHtml()

App.js

```
import Recipes from "./views/Recipes.js";
import Calculator from "./views/Calculator.js";
export default class  {
    getViews() {
        return {
            Recipes,
            Calculator
        };
    }
    async getHtml() {
        return `
        <div class="d-flex justify-content-between bg-light border border-bottom border-primary p-3">
            <h1>My cookbook in the making ver3...</h1>
            <h2 class="d-flex">
                <ul class="d-flex ml-5 "  style="list-style: none;">
                    <li class="mr-3"><a data-link href="Recipes">Recipes</a></li>
                    <li class="mr-3"><a data-link href="Calculator" >Calculator</a></li>
                </ul>
            </h2>
        </div>
        <router-view></router-view>
        `;
    }
}
```

Calculator.js

```
export default class  {
    async getHtml() {
        return `
            <h1>Calc view</h1>
        `;
    }
}
```



Uspa.js – nova verzija radnog okvira

ver3

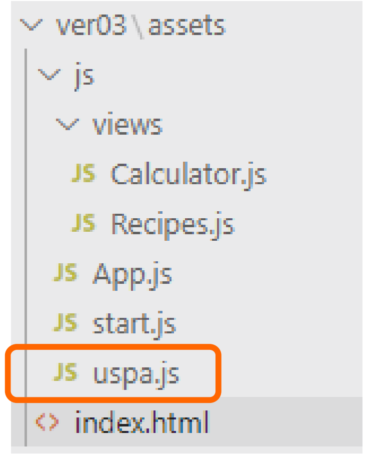
uspa.js

```
export default class Uspa {
   async setView(viewName) {
        let viewClass = this.currView.getViews()[viewName];
        document.querySelector("router-view").innerHTML = await (new viewClass()).getHtml();
        history.pushState(null, null, `${this.stubUrl}/${viewName}`);
    }
    mount(selector, initalView) {
        this.currView = initalView;
        this.stubUrl = window.location.pathname;  // this is only because of server-side ver00 magic
        initalView.getHtml()
            .then(html => {
                document.getElementById(selector).innerHTML = html;
                return html;
            }).then(html => {
                if (html.indexOf("data-link" > 0)) {
                    document.body.addEventListener("click", e => {
                        if (e.target.matches("[data-link]")) {
                            e.preventDefault();
                            let viewName = e.target.getAttribute("href");
                            this.setView(viewName);
                        }
                    });
                }
            }).catch(err => {
                console.log("USPA: error occured:", err);
            });
    }
}
```

History API

Npr. „Calculator”

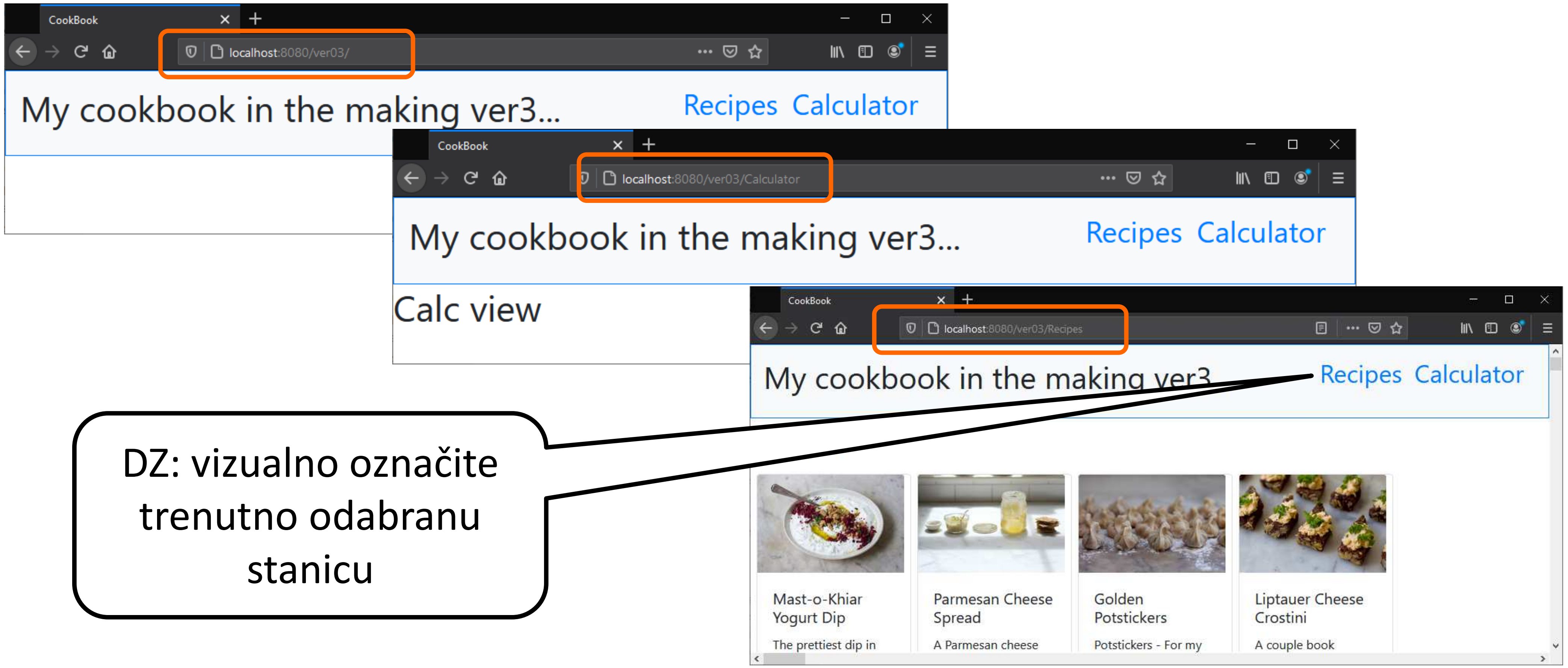
```
...
app.mount("my-app", new App());
```


```
ver03 \ assets
  js
    views
      Calculator.js
      Recipes.js
    App.js
    start.js
    uspa.js
  index.html
```

ver3

Višestranična web-aplikacija

- Sve se odvija na klijentu, aplikacija je responzivnija
- Mijenja se URL (s konačnim ciljem: *bookmarking*)
  - Routing nije dalje razvijan, koga zanima kompletniji primjer može pogledati https://www.youtube.com/watch?v=6BozpmSjk-Y&ab_channel=dcode ili https://blog.jeremylikness.com/blog/build-a-spa-site-with-vanillajs/

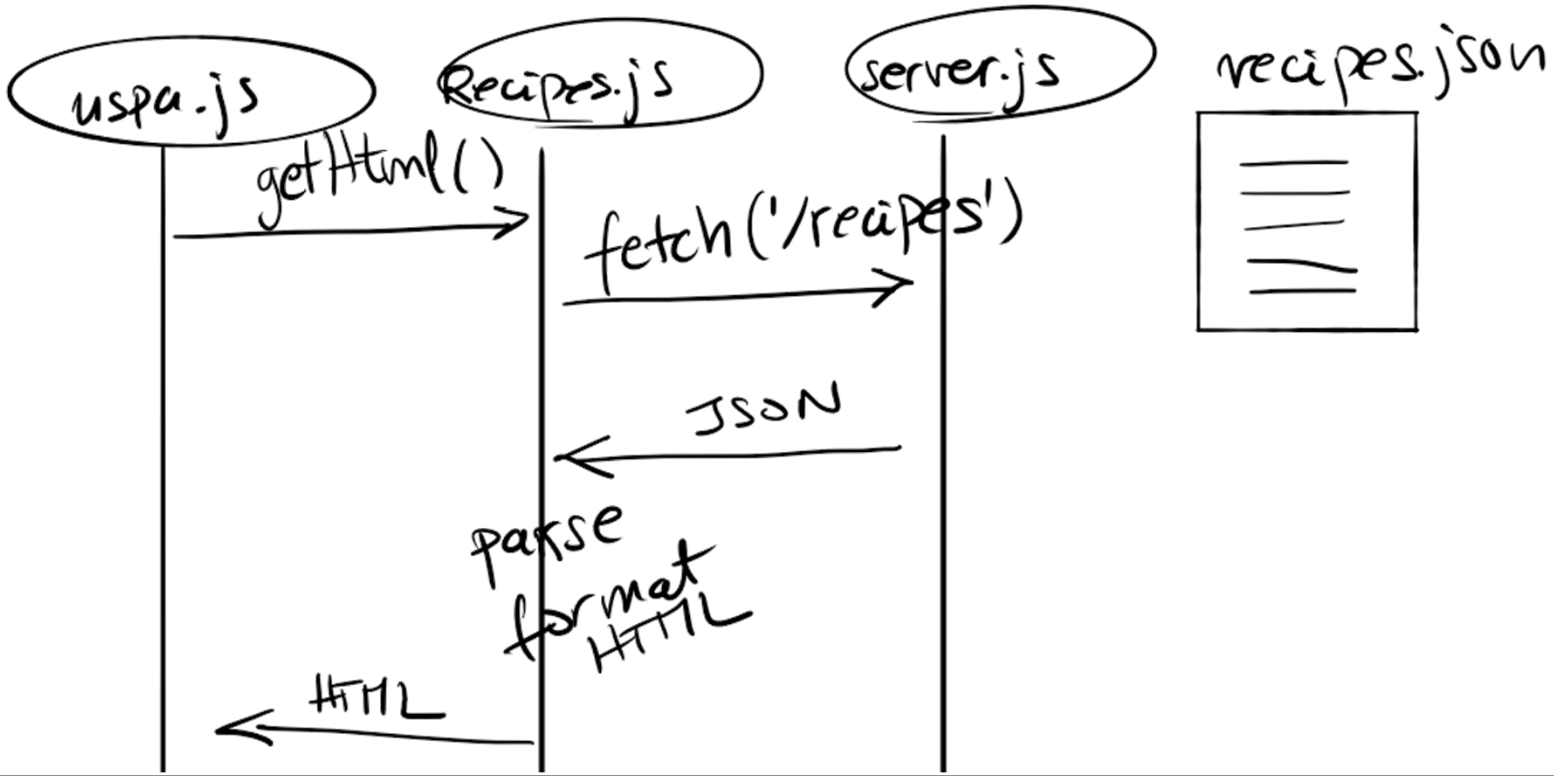


DZ: vizualno označite trenutno odabranu stanicu

ver3

Recipes view

- Dohvatiti ćemo recepte s poslužitelja, formatirati i vratiti HTML
- Sad je jasno zašto getHtml() mora biti **async**
- **Uobičajen obrazac kod SPA – dohvat s poslužitelja putem Ajax poziva**



ver3

Pogledajmo prvo server.js (iako je van fokusa)

server.js

```
const fs = require('fs');
let jsonRecipes;
fs.readFile('recipes.json',
    function (err, data) {
        var jsonData = data;
        jsonRecipes = JSON.parse(jsonData);
        console.log(jsonRecipes.length + " recipes parsed...");
    });

...
app.get('/recipes', function (req, res) {
    res.json(jsonRecipes);
});
```

ver3

recipes.json

Preuzeto s:
https://github.com/fictivekin/openrecipes

recipes.js

```
[{
    "name": "Easter Leftover Sandwich",
    "ingredients": "12 whole Hard Boiled Eggs\n1/2 cup Mayonnaise\n3 Tablespoons Grainy Dijon Mustard\n Salt And Pepper, t
o taste\n Several Dashes Worcestershire Sauce\n Leftover Baked Ham, Sliced\n Kaiser Rolls Or Other Bread\n Extra Mayonnais
e And Dijon, For Spreading\n Swiss Cheese Or Other Cheese Slices\n Thinly Sliced Red Onion\n Avocado Slices\n Sliced Tomat
oes\n Lettuce, Spinach, Or Arugula",
    "url": "http://thepioneerwoman.com/cooking/2013/04/easter-leftover-sandwich/",
    "image": "http://static.thepioneerwoman.com/cooking/files/2013/03/leftoversandwich.jpg",
    "cookTime": "PT",
    "recipeYield": "8",
    "datePublished": "2013-04-01",
    "prepTime": "PT15M",
    "description": "Got leftover Easter eggs?    Got leftover Easter ham?    Got a hearty appetite?    Good! You've come t
o the right place!    I..."
},
{
    "name": "Pasta with Pesto Cream Sauce",
    "ingredients": "3/4 cups Fresh Basil Leaves\n1/2 cup Grated Parmesan Cheese\n3 Tablespoons Pine Nuts\n2 cloves Garlic,
 Peeled\n Salt And Pepper, to taste\n1/3 cup Extra Virgin Olive Oil\n1/2 cup Heavy Cream\n2 Tablespoons Butter\n1/4 cup Gr
ated Parmesan (additional)\n12 ounces, weight Pasta (cavitappi, Fusili, Etc.)\n2 whole Tomatoes, Diced",
    "url": "http://thepioneerwoman.com/cooking/2011/06/pasta-with-pesto-cream-sauce/",
    "image": "http://static.thepioneerwoman.com/cooking/files/2011/06/pesto.jpg",
    "cookTime": "PT10M",
    "recipeYield": "8",
    "datePublished": "2011-06-06",
    "prepTime": "PT6M",
    "description": "I finally have basil in my garden. Basil I can use. This is a huge development.    I had no basil dur
ing the winter. None. G..."
```

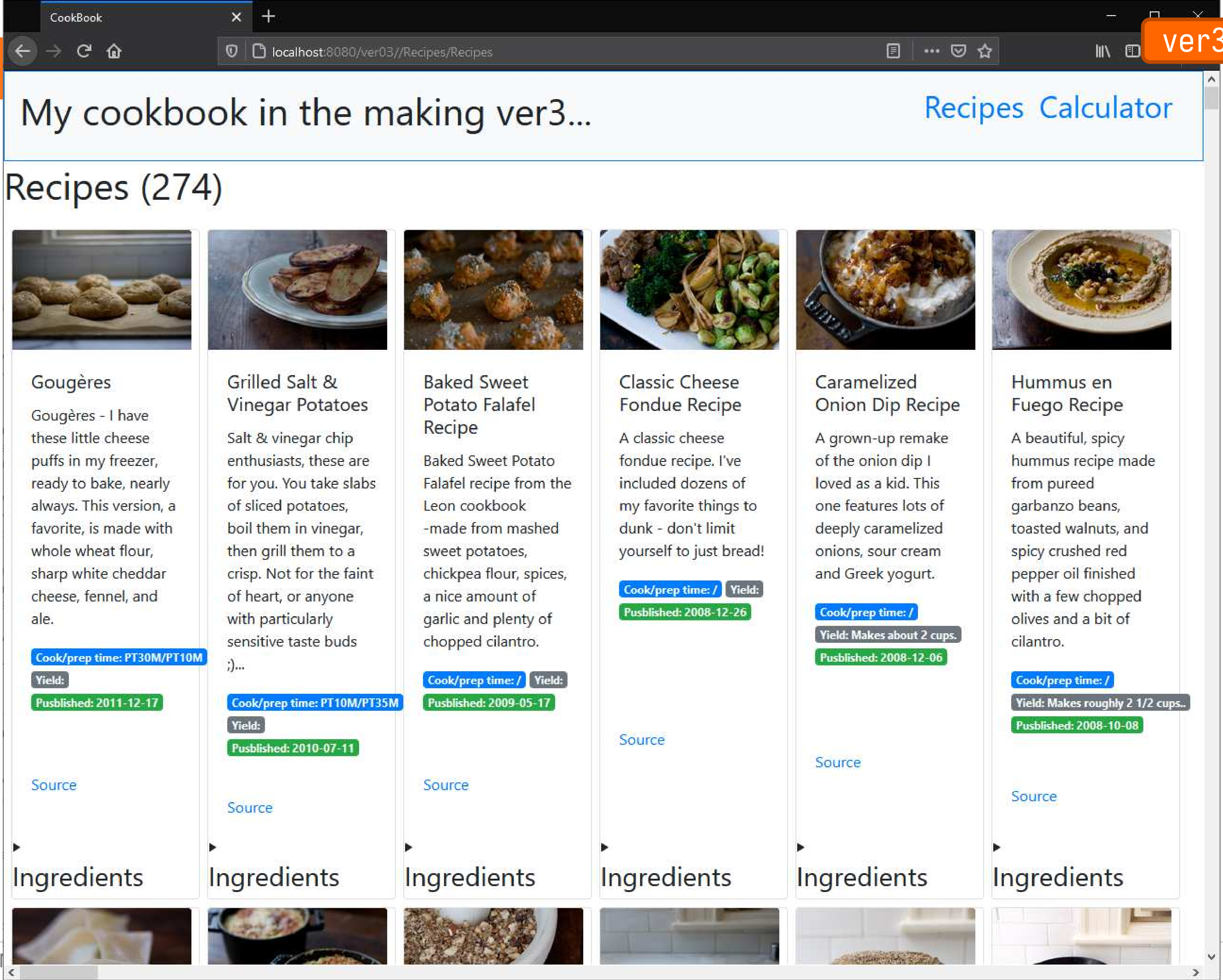
Recipes.js

ver3

```
export default class {
  async getHtml() {
      try {
          let response = await fetch('/recipes');
          if (response.ok) {
              let allRecipes = await response.json();
              let recipes = allRecipes.filter(x => Math.random()>0.75).reverse();
              return `<h1>Recipes (${recipes.length})</h1>
                     <div class="container-fluid p-2 d-flex flex-wrap">`
                    + recipes.map(rcp => `
               <div class="card mt-2 mr-2" style="width: 200px;">
               <img class="card-img-top" style="width: 190px;" src="${rcp.image}">
               <div class="card-body">
                 <h5 class="card-title">${rcp.name}</h5>
                 <p class="card-text">${rcp.description}</p>
                 <span class="badge badge-primary">
                     Cook/prep time: ${rcp.cookTime}/${rcp.prepTime}</span>
                 (...izbačen dio kod koji formatira...)
             </div>
               `).join('') + '</div>';
          } else { throw new Error("HTTP-Error: " + response.status); }
      } catch (error) {
          return `<h1>Home view (error occured)</h1>`;
      }
  }
}
```

Samo ~četvrtinu slučajno odabranih (ima ih 1042)

ver3



CookBook

localhost:8080/ver03//Recipes/Recipes

My cookbook in the making ver3...

Recipes Calculator

Recipes (274)

Gougères	Grilled Salt & Vinegar Potatoes	Baked Sweet Potato Falafel Recipe	Classic Cheese Fondue Recipe	Caramelized Onion Dip Recipe	Hummus en Fuego Recipe
Gougères - I have these little cheese puffs in my freezer, ready to bake, nearly always. This version, a favorite, is made with whole wheat flour, sharp white cheddar cheese, fennel, and ale.	Salt & vinegar chip enthusiasts, these are for you. You take slabs of sliced potatoes, boil them in vinegar, then grill them to a crisp. Not for the faint of heart, or anyone with particularly sensitive taste buds ;)...	Baked Sweet Potato Falafel recipe from the Leon cookbook -made from mashed sweet potatoes, chickpea flour, spices, a nice amount of garlic and plenty of chopped cilantro.	A classic cheese fondue recipe. I've included dozens of my favorite things to dunk - don't limit yourself to just bread!	A grown-up remake of the onion dip I loved as a kid. This one features lots of deeply caramelized onions, sour cream and Greek yogurt.	A beautiful, spicy hummus recipe made from pureed garbanzo beans, toasted walnuts, and spicy crushed red pepper oil finished with a few chopped olives and a bit of cilantro.
Cook/prep time: PT30M/PT10M	Cook/prep time: PT10M/PT35M	Cook/prep time: /	Cook/prep time: /	Cook/prep time: /	Cook/prep time: /
Yield:	Yield:	Yield:	Yield:	Yield: Makes about 2 cups.	Yield: Makes roughly 2 1/2 cups..
Pusblished: 2011-12-17	Published: 2010-07-11	Pusblished: 2009-05-17	Pusblished: 2008-12-26	Pusblished: 2008-12-06	Pusblished: 2008-10-08
Source	Source	Source	Source	Source	Source
Ingredients	Ingredients	Ingredients	Ingredients	Ingredients	Ingredients

UI

Ver 3 osvrt

ver3

- ✓ Razložili smo aplikaciju na viewove
  - Pravi radni okviri će omogućiti i manje gradivne blokove - komponente
  - View se brine samo za sebe i stvaranje svog HTML-a
- ✓ (Proto)usmjeravanje, mijenjamo stranice na klijentu, kozmetički mijenjamo URL

- ✗ Loše:
  - ✗ Kako formiramo HTML – string concatenation, spaghetti code
- Treba nam:
  - Templating „engine”, elegantan sustav kako ćemo napraviti HTML

Primjer: stvaranje HTML-a: React i Vue

```
class App extends React.Component {
    render() {
      const planets = ['Merkur', 'Venera', 'Zemlja'];
      return (
        <ol>
          {planets.length > 0 && planets.map(n => (
              <li key={"section-" + n}>Planet {n}</li>
          ))}
        </ol>
      );
    }
  }
```

JSX, or JavaScript XML, is an extension to the JavaScript language syntax

```
<ol>
  <li>Planet Merkur</li>
  <li>Planet Venera</li>
  <li>Planet Zemlja</li>
</ol>
```

```
<template>
  <div id="app">
    <ol>
      <li v-for="planet in planets">Planet {{ planet }}</li>
    </ol>
  </div>
</template>
<script>
export default {
  data() {
      return {
        planets: ['Merkur', 'Venera', 'Zemlja']
      }
    }
}; </script>
```

Ni jedno ni drugo nije validan JS, treba prevesti…

V4 u sljedećem predavanju…