Routing and Architecture

Browser Routing Design Patterns in JS

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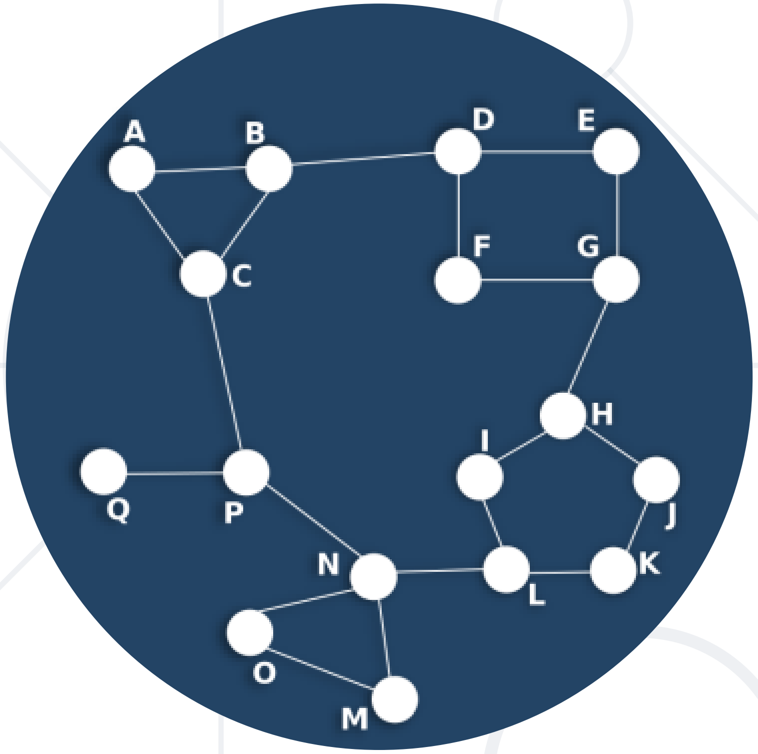
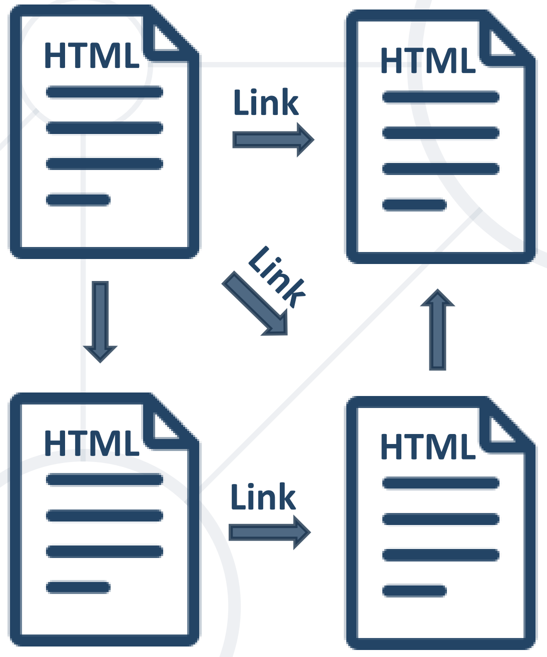


Routing Concepts

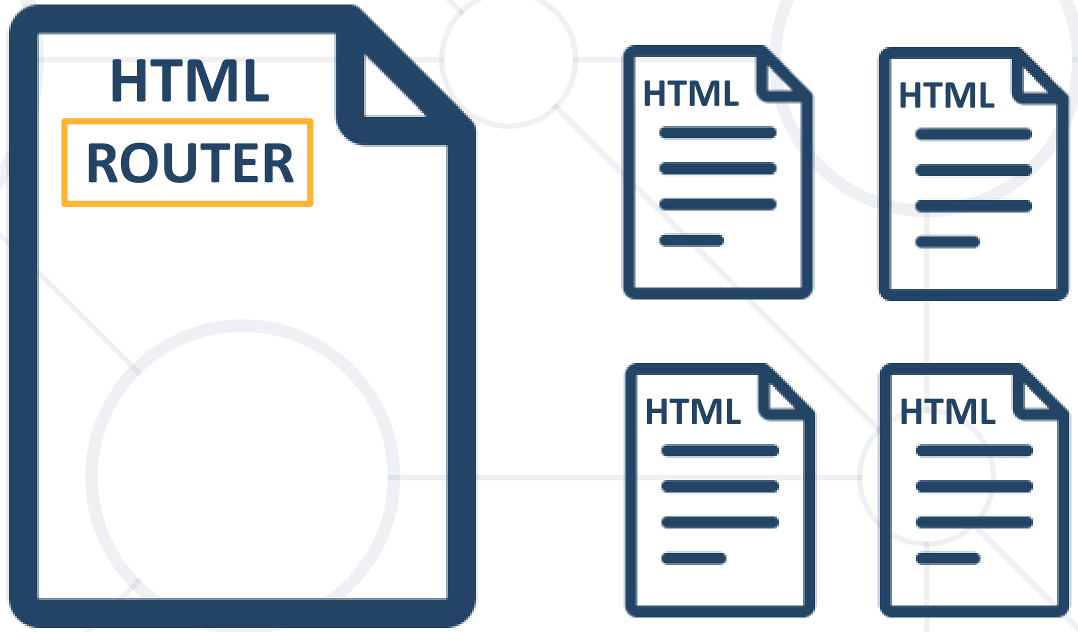
Navigation for Single Page Applications

What is Routing?

- Allows navigation, **without reloading** the page
- Pivotal element of writing **Single Page Applications**



Standard Navigation



Navigation using Routing

Single-page applications (SPA)

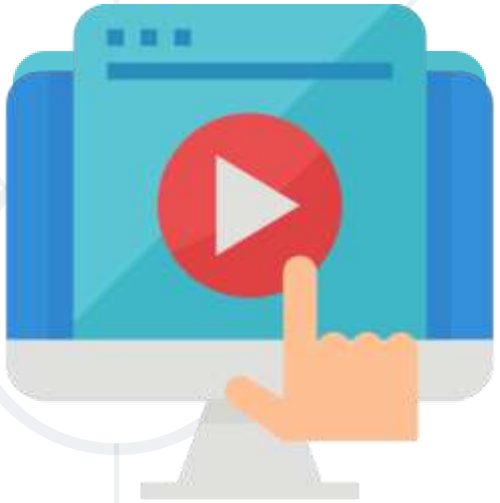
- **One web page** that you visit which then loads all other content using JavaScript
- Does **not require** page **reloading during use**
- Request just the peace you need
- Take **advantage** of the **repetition**
- Can use **state** from an **external source** or **track state internally**

How Routers Work

- A **Router** loads the appropriate content when the **location changes**
  - E.g. when the user manually **enters an address**
- Conversely, a change in content is reflected in the address bar
  - E.g. when the user **clicks on a link**
- Benefits:
  - Load all scripts **only once**
  - **Maintain state** across multiple pages
  - Browser **history** can be used
  - Build User Interfaces that **react quickly**

How Routers Work

- Hash-based routing
- Using the **#hash** part of the URL to simulate different content
- The routing is possible because changes in the hash **don't trigger page reload**



How Routers Work (2)

```
var url = null;
var getCurrent = function () {
  return window.location.hash;
};
var listen = function () {
  var current = getCurrent();
  if (current !== url) {
    console.log('URL changed to' + current);
    url = current;
  }
  setTimeout(listen, 200);
};
Listen();
```

The pushState() method

- **pushState()** takes three parameters: a **state object**, a **title** and a **URL**
  - **State** - object which is associated with the new history entry
  - **Title** - browsers currently ignore this parameter
  - **URL** - The new history entry's URL is given by this parameter

The replaceState() method

- **history.replaceState()** - **modifies the current history entry** instead of creating a new one
- It is useful when you want to update the **state object** or **URL**

```
var stateObj = { facNum: "56789123" };
history.pushState(stateObj, "", "student.html");

history.replaceState(stateObj, "", "newStudent.html");
```

The popstate event

- A **popstate** event is dispatched to the window every time the active history entry changes
- If the history entry being activated:
  - was created by a call to **pushState**
  - affected by a call to **replaceState**
- The **popstate** event's **state property** contains a copy of the history entry's state object

Live Demo

Routing with Sammy.js

Overview and Examples

Sammy.js Overview

- Sammy is a lightweight **routing library**
- Modular design with **plugins** and **adapters**
- **Requires** jQuery
- Many **additional features**

```
const app = Sammy('#main', function() {
  this.get('#/index.html', () => {
    this.swap('Index');
  })
});
```

Installation

- Download Sammy, by using WebStorm's terminal

```
npm install --save sammy
```

- Or download from sammyjs.org
- Browser builds will be located in:

```
node_modules/sammy/lib/
```

- It's best if your project has a `package.json` file

Application Initialization

- Create a Sammy instance to initialize your application

Invoke library

Element selector

```
const app = Sammy('#main', function () {
  // Define routes and other logic here
});

$(() => app.run()); // Activate
```

- You may have **multiple apps** running
- Each selector can only hold one app
  - If you refer to it again, it **extends the functionality**

Creating Routes

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- The main **building block** of Sammy is the **route**
  - Defined by **method** and **address** (URI)
- Place this block inside a **Sammy initializer**:

Route **Method**

Route **address**

```
this.route('get', '#/about', function() {
  this.swap('<h2>Contact Page</h2>');
});
```

- A note on using **this**: it holds a **reference** to the **router object**, but may not work correctly in an **arrow function**

Route Aliases

- Each method has an **alias** for shorter code

```
this.get('#/catalog', loadBooks);
```

```
this.post('#/login', userLogin);
```

```
this.put('#/catalog/:bookId', updateBook);
```

```
this.del('#/catalog/:bookId', deleteBook);
```

URL Parameters

- Parameters allow for dynamic routes
  - E.g. products in a catalog will load the same page

Parameter name

Receive context

```
this.get('#/catalog/:productId', (context) => {
  console.log(context.params.productId);
});
```

Access passed in value

- You can get the whole path using **this.path**

Hello Sammy

index.html

```html
<!DOCTYPE html>
<head>
  <meta charset="UTF-8">
  <title>Hello Sammy</title>
  <!-- Include jQuery and Sammy distributions -->
</head>
<body>
  <header>
    <h1>Hello Sammy</h1>
    <a href="#/index.html">Home</a>
    <a href="#/about">About</a>
    <a href="#/contact">Contact</a>
  </header>
  <div id="main"></div>
</body>
</html>
```

Hello Sammy (2)

app.js

```
const app = Sammy('#main', function () {
    this.get('#/index.html', () => {
        this.swap('<h2>Home Page</h2>');
    });
    this.get('#/about', () => {
        this.swap('<h2>About Page</h2>');
    });
    this.get('#/contact', () => {
        this.swap('<h2>Contact Page</h2>');
    });
});

$(() => {
    app.run();
});
```

Handling Forms

Forms inside the main element are automatically handled

Route address

Route method

```
<form action="#/login" method="post">
  User: <input name="user" type="text">
  Pass: <input name="pass" type="password">
  <input type="submit" value="Login">
</form>
```

Names of inputs

```
this.post('#/login', (context) => {
  console.log(context.params.user);
  console.log(context.params.pass);
});
```

Integrating Handlebars

- Download and include the Handlebars source in your HTML
- Include **sammy.handlebars.js** (found under **lib/plugins**)
- Load the plugin inside a Sammy initializer:

```
this.use('Handlebars', 'hbs');
```

Template file **extension**

- Create a **RenderContext** with **render**, **load** or **partial**

Using Handlebars

greeting.hbs

```
<h1>{{title}}</h1>
<p>Hello, {{name}}!</p>
```

app.js

```
const app = Sammy('#main', function () {
  this.use('Handlebars', 'hbs');
  this.get('#/hello/:name', function() {
    this.title = 'Hello!'
    this.name = this.params.name;
    this.partial('greeting.hbs');
  });
});
$(() => app.run());
```

Load and swap in the template

Using Handlebars

- Load a list of **partial templates** (inside a **route** definition):

```
this.loadPartials({
  firstPartial: 'path-to/first.hbs',
  secondPartial: 'path-to/second.hbs',
  thirdPartial: 'path-to/third.hbs'
}).then(function(context) => {
  console.log(context.partials);
  this.partial('pageTemplate.hbs');
});
```

- The **callback** will be executed once all partials are loaded
- Templates are **cached** - there's no need to manually cache them

Additional Features

- Redirect

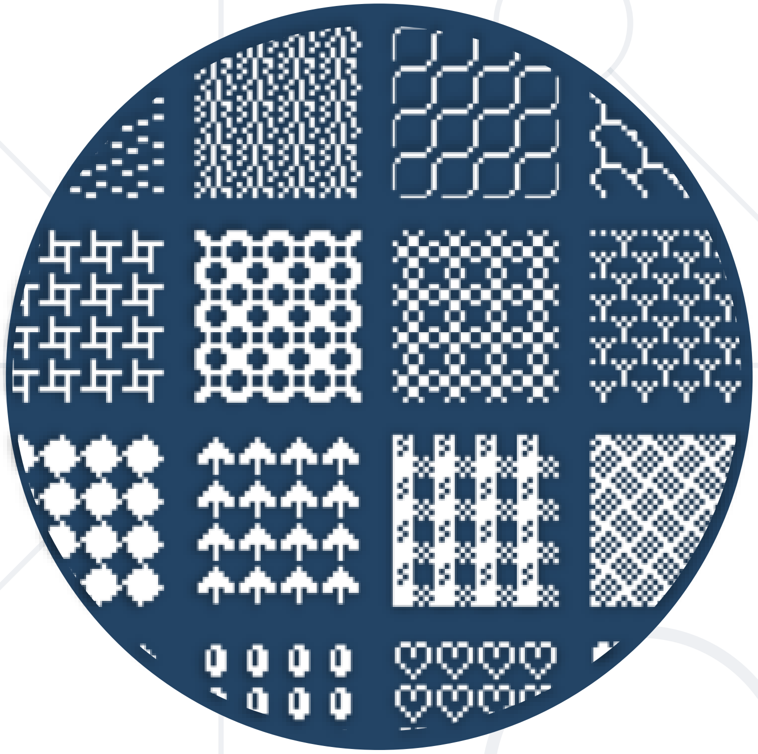
```
this.redirect('#/other/route');
this.redirect('#', 'other', 'route');
```

- Custom events

```
// Register event handler
this.bind('event-name', eventHandlerFunction);

// Raise event
this.trigger('event-name', data);
```

- Useful plugins (found under **lib/plugins**):
  - Storage and Session
  - OAuth2



Routing with Sammy.js

Overview and Examples

What are Design Patterns

- **Design Patterns** are general approaches to solving **commonly occurring** problems
- They provide:
  - Tested, **proven** programming paradigms
  - Guidelines to **organizing** our code
  - A **common vocabulary** between developers
- Using a pattern may **increase** complexity - misuse often creates more problems than it solves

Splitting Your Code

- Splitting your code aims to **separate concerns** (only change the parts that need to be changed)
- Sample code organization
  - Main script
  - Requester (Remote API)
  - Authenticator
  - Router
  - View Controllers

Live Exercise

Summary

- Browser **Routing** allows SPAs to use **history**
- **Sammy.js** is a simple routing library

```
const app = Sammy('#main',
function () {
  this.get('index.html', () => {
    this.swap('<h1>Index
Page</h1>');
  })
});
```

- **Modular code** is more maintainable

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