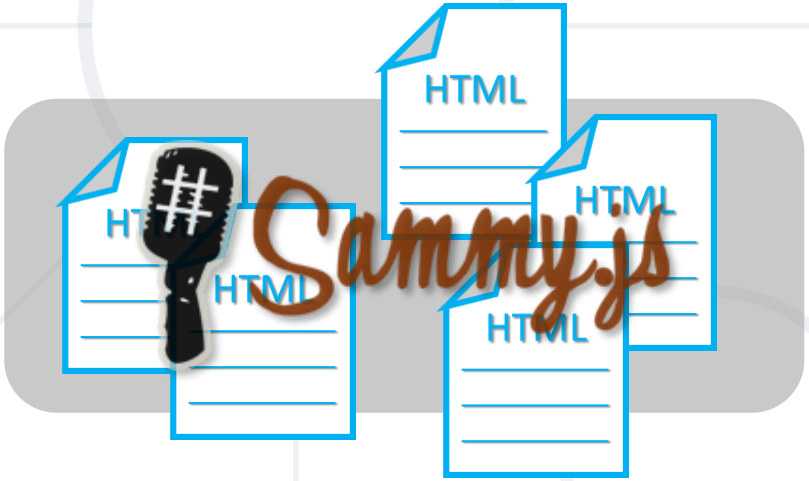
Routing and Patterns

Browser Routing Design Patterns in JS



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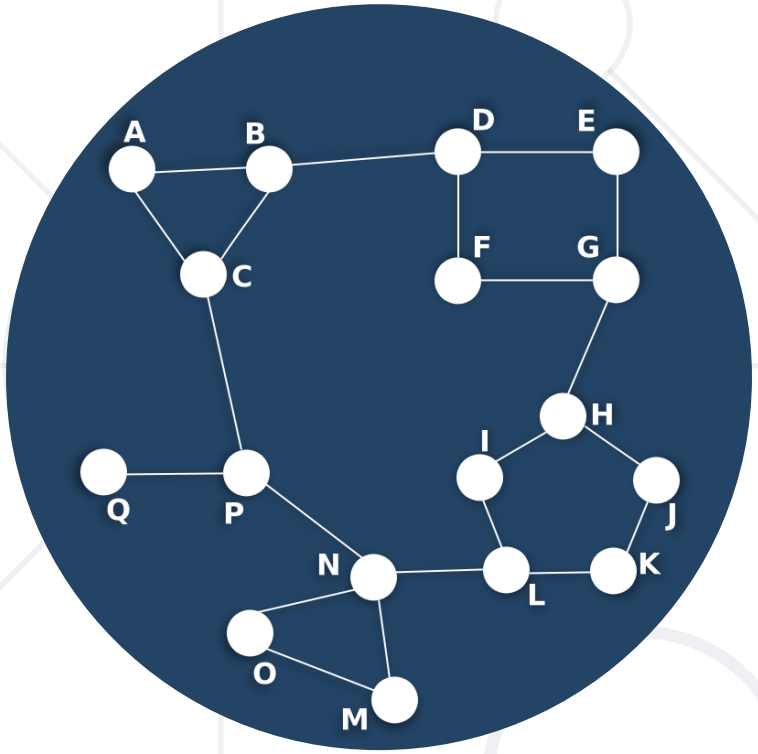

Routing Concepts

Navigation for Single Page Apps

SPA Applications

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- A **single-page application** (SPA) is a website that re-renders its content in response to navigation actions (e.g. clicking a link) **without reloading of the page**.
- Single-page applications can **use state from an external source** (i.e. the URL location) or **track state internally**
  - Internal state SPAs are limited because there is **only one** "entry"
  - With location-based SPAs, the location is **always updating** as you navigate
  - To have location-based SPA we need a special object "Router"

Location

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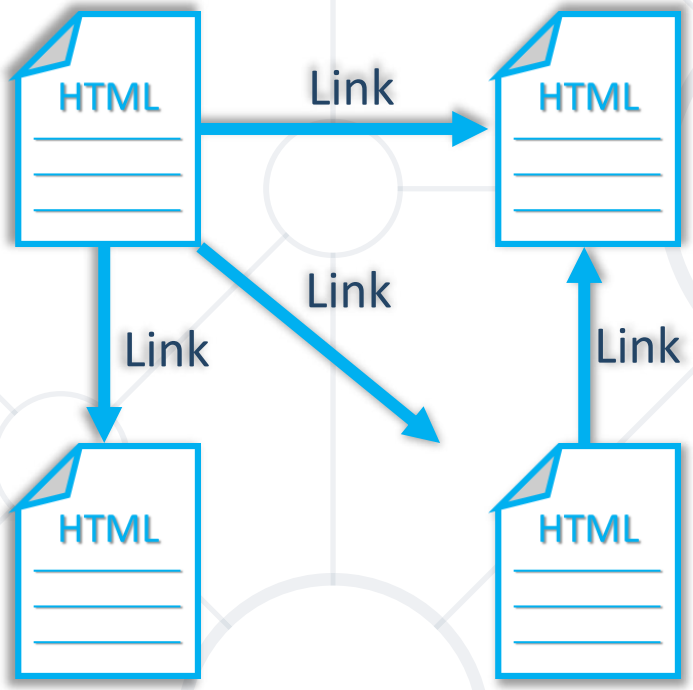
https://www.example.com/one?key=value#trending

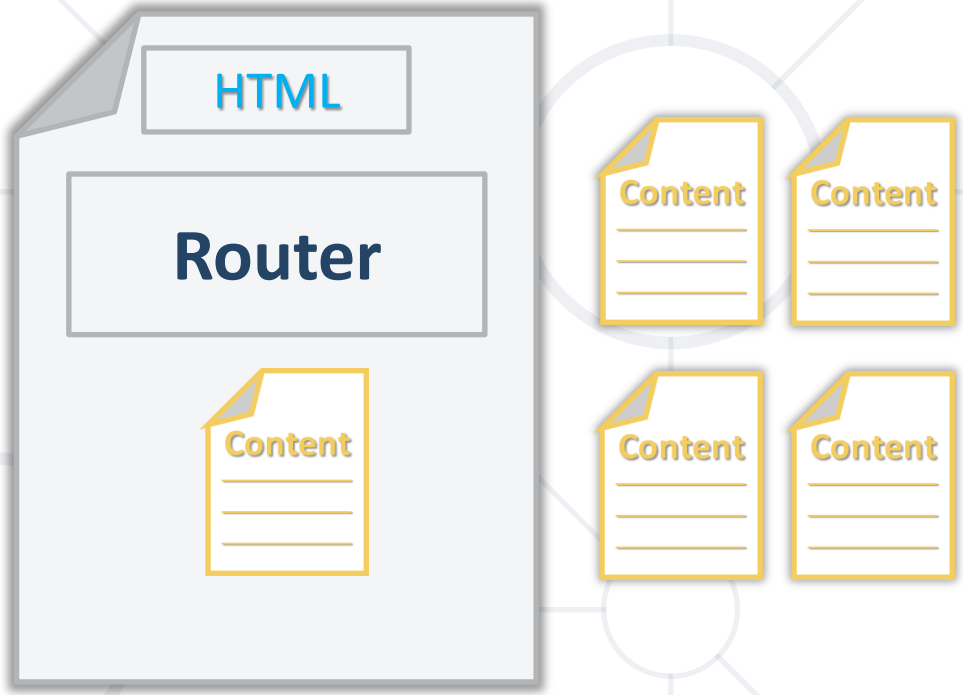
```
location = {
  protocol: "https:",
  hostname: "www.example.com",
  pathname: "/one",
  search: "?key=value",
  hash: "#trending"
}
```

What is Routing?

- Standard Navigation



- Navigation using Routing



- **Routing** allows navigation, **without reloading** the page

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

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

```
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();
```

How Routers work

- History API - The DOM **window** object provides access to the browser's history through the **history** object. It exposes useful methods and properties that let you move back and forth through the user's history, as well as manipulate the contents of the history stack
- **HTML5** introduced the **history.pushState()** and **history.replaceState()** methods, which allow you to add and modify **history entries**, respectively
- These methods work in conjunction with the **window.onpopstate** event

The pushState() method

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- **pushState()** takes three parameters: a **state object**, a **title** (which is currently ignored), and (optionally) a **URL**
  - **State** a JavaScript object which is associated with the new history entry
  - **Title** - browsers currently ignore this parameter
    - Passing the **empty string** here should be safe against future changes to the method
  - **URL** - The new history entry's URL is given by this parameter.
    - The browser won't attempt to load this URL after a call to pushState() but it might attempt to load the URL later, for instance after the user restarts the browser.
    - It must be of the same origin as the current URL.

The replaceState() method

- **history.replaceState()** operates exactly like history.pushState() except that replaceState() **modifies the current history entry** instead of creating a new one
- It is particularly useful when you want to update the **state object** or **URL** of the current history entry in response to some user action

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

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

The popstate event

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- 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** or affected by a call to **replaceState**, the **popstate** event's **state property** contains a copy of the history entry's state object
- You can read the state of the current history entry without waiting for a **popstate** event using the **history.state property**

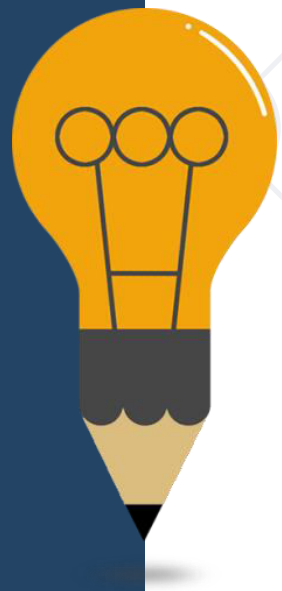
Live Demo

Routing with Sammy.js

Overview and Examples

Sammy.js Overview

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



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

Installation

- Download Sammy using WebStorm's terminal

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

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

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

- Sammy requires jQuery to work!

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

Application Initialization

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- 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

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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)

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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

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- **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>
```

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

Names of inputs

Integrating Handlebars

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- 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

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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 (2)

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- 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

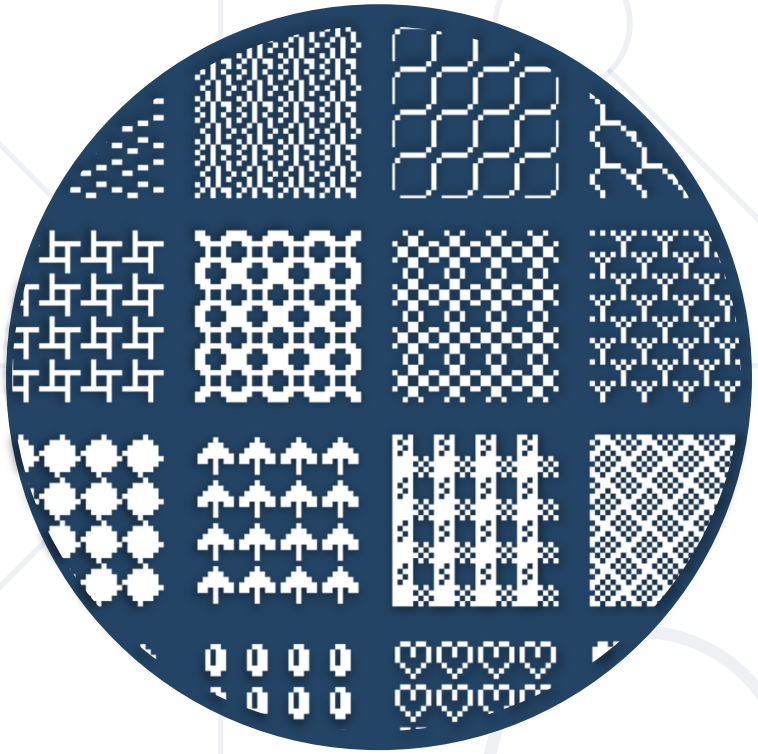
```
this.redirect('#/other/route');
this.redirect('#', 'other', 'route');
```

- 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

Live Exercise

Summary

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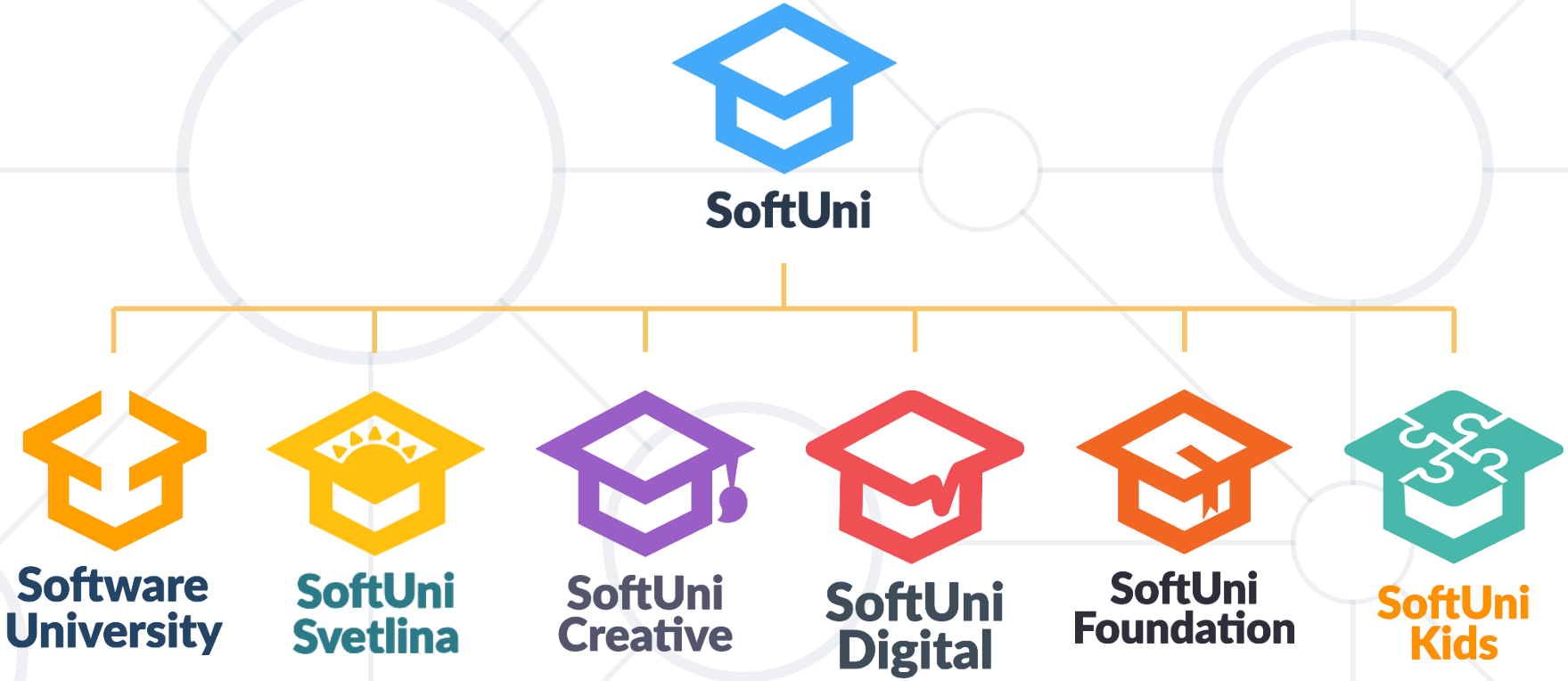
- Browser **Routing** allows SPAs to use **history**
- **Sammy.js** is a simple routing library

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

- **Modular code** is more maintainable

Questions?



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