International JavaScript Conference

Svelte

Web App Development Reimagined

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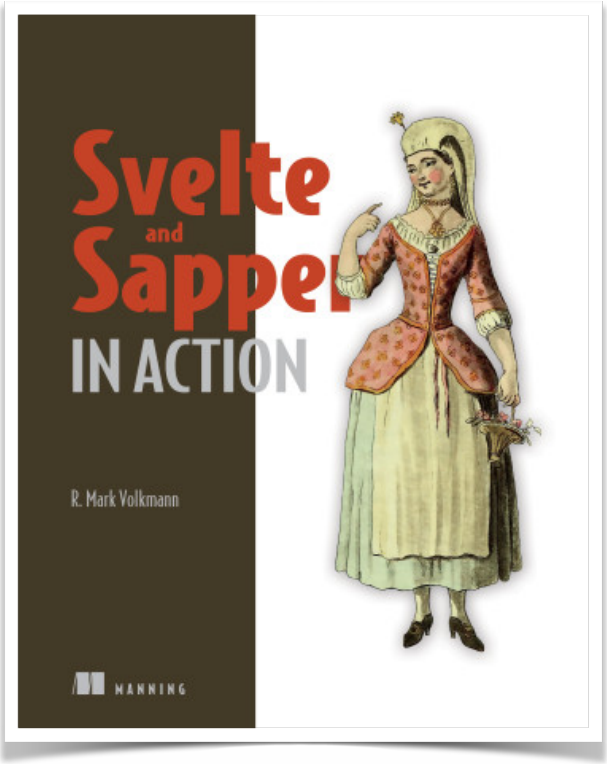
OBJECT COMPUTING
YOUR OUTCOMES ENGINEERED

About Me

- Partner and Distinguished Software Engineer at Object Computing, Inc. in St. Louis, Missouri USA
- 42 years of professional software development experience
- Writer and teacher
- Blog at https://mvolkmann.github.io/blog/
- Author of Manning book “Svelte and Sapper in Action”
  - Sapper has been replaced by SvelteKit which has many of the same features
  - Much less expensive to buy directly through Manning when there is a sale rather than through Amazon



Svelte is ...

- An alternative to React, Vue, Angular, ...
- A compiler, not a runtime library
- Able to use JavaScript or TypeScript
- Developed by Rich Harris
  - also created of Ractive and Rollup
  - worked in graphics departments at “The Guardian” and “The New York Times”
  - now at Vercel developing Svelte full-time

https://svelte.dev

Being a Compiler

- Enables many things that cannot easily be done in other frameworks
  - eliminate use of virtual DOM
    - https://svelte.dev/blog/virtual-dom-is-pure-overhead
  - detect where component state and app state is used
    - so those parts of the DOM can be efficiently rebuilt when values change
  - detect unused CSS
  - generate optimized JavaScript with no runtime library from `.svelte` files
    - only includes parts of Svelte framework that are used
- Can't just copy good ideas from Svelte and put them in other frameworks

Benefits

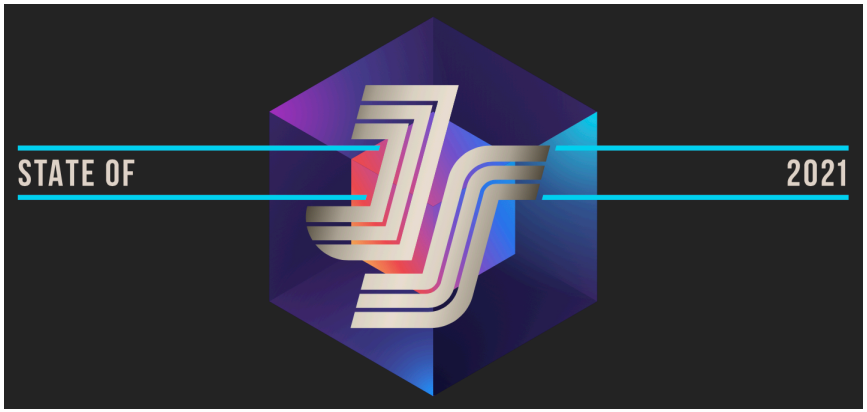
- Less code to write
- File-based component definitions - JS, HTML, and CSS
- CSS scoped by default
- Reactive statements (`?:`) - like spreadsheet formulas
- Two-way data bindings - ex. between variable and `<input>`
- Easy component state management - **reactivity**
- Easy app state management - **stores**
- Built-in animations
- Small bundle sizes

2021 State of JS Survey

- https://2021.stateofjs.com/en-US/libraries/front-end-frameworks
- Results from 2019, 2020, and 2021

```
Angular satisfaction - 38% 42% 45%
  React satisfaction - 89% 88% 84%
 Svelte satisfaction - 88% 89% 90%
    Vue satisfaction - 87% 85% 80%

  Svelte interest - 67% 66% 68%
     Svelte Usage -  8% 15% 20%
Svelte awareness - 75% 87% 94%
```



`.svelte` File Contents

All parts are optional.

```
<script context="module">
```

think of as class-level; can export functions and constants; not often used

```
</script>
<script>
  export let name;
</script>
<h1>Hello, {name}!</h1>
<style>
  h1 {
    color: red;
  }
</style>
```

think of as instance-level; automatically exports the component; cannot export anything else

declares a prop to be passed in

variables and functions are defined here

HTML that can include Svelte logic and interpolations of expressions

automatically scoped to this component

Component State / Reactivity

- Just variables declared at top-level of **`script`** element
- Changes trigger updates to parts of DOM where used

```
<script>
  let count = 0;
</script>

<div>
  <button disabled={count <= 0} on:click={() => count--}>-</button>
  <h1>{count}</h1>
  <button on:click={() => count++}>+</button>
</div>
```

- How much more code would be required to implement this in other frameworks?

Reactivity of Arrays

- Changing variable “value” causes DOM updates
- But adding, removing, and changing array elements does not change their value
  - still refers to same array
- Three ways to handle
  - `myArr = myArr.concat(newValue);`
  - `myArr = [...myArr, newValue];`
  - `myArr.push(newValue); myArr = myArr;` most efficient

Svelte REPL

- Online **R**ead **E**val **P**rint **L**oop at https://svelte.dev/repl/
- Write and run Svelte apps without installing anything
- View generated JS and CSS
- Save to recall later
- Export to continue development outside REPL
- See my examples at https://mvolkmann.github.io/blog/topics/#/blog/svelte/repls/
- Demo the Counter app in REPL

Reactive Statements

- Svelte interprets the JS label **`$`** to be a reactive statement
- Similar to spreadsheet formulas - ex. **`=B3+C3`**
- Code is re-executed every time a referenced variable changes
- Examples
  - `$: total = scores.reduce((acc, s) => acc + s, 0);`
  - `$: console.log('total =', total);`
  - `$: evaluateCart(cart, taxRate);`
  - `$: { ... }` block of code

Loan Calculator

- Calculates monthly payment from
  loan amount, interest rate, and number of years
- Great demo of using reactive statements
- Review code in REPL
- How much more code would be required
  to implement this in other frameworks?

Conditional Logic in HTML

- Uses Mustache-like syntax
- `{#if some-condition}` opens with #

```
  HTML to render
{:else if other-condition}
  other HTML to render
{:else}
  more HTML to render
{/if}
```

continues with :

ends with /

Iteration in HTML

- `{#each arrExpr as elemName, index (keyExpr)}`
  `HTML to render for each element`
  `{:else}`
  `HTML to render if array is empty`
  `{/each}`
- `, index` is optional
- `(keyExpr)` is optional
  - include when array elements will be sadded, deleted, or reordered
- `{:else}` block is optional

Animations

- Supported by four packages
  - **`svelte/animate`** - **`flip`** function
  - **`svelte/easing`** - easing functions
  - **`svelte/motion`** - **`spring`** and **`tweened`** functions
  - **`svelte/transition`** - many directives and **`crossfade`** function
- All are CSS-based rather than JS-based
  - good performance because main thread is not blocked
- Can define custom transitions

animates changes to x/y position from old to new

control rate of change through an animation

return a **`writable`** store used to animate changes to a value

directives include **`blur`**, **`draw`**, **`fade`**, **`fly`**, **`scale`**, and **`slide`**

Animation Demos

- See https://mvolkmann.github.io/blog/topics/#/blog/svelte/repls/
- Transition Animations
- Toast
- Pie Chart (svelte/motion)
- Crossfade Demo
- Flip Animation
- Custom Transition (spin)
- Draw Animation

Events

- Events go from child component to parent
- Events have a name and optional data
- To dispatch from child

MyChild.svelte

```
<script>
  import {createEventDispatcher} from 'svelte';
  const dispatch = createEventDispatcher();
  dispatch('my-event', someData);
</script>
```

typically called when some user interaction occurs

- To listen in parent

MyParent.svelte

```
<script>
  import MyChild from './MyChild.svelte';
  function handleMyEvent(event) {
    const data = event.detail;
    ...
  }
</script>
<MyChild on:my-event={handleMyEvent}>
```

if no handler function is specified, the event propagates up

Scoped CSS

- To achieve CSS scoping, Svelte ...
  - computes hash of all CSS in component
  - adds CSS class with name **`svelte-hash`** to all elements rendered by the component that are targeted by CSS
    - ex. **`<button>`** becomes **`<button class="svelte-4vhgyu">`**
  - adds same generated CSS class name to all CSS rules
    - ex. **`button { ... }`** becomes **`button.svelte-4vhgyu { ... }`**

You don't need to know this, but this is what happens behind the scenes.

Global CSS

- Can define in a **`.css`** file and import into top component **`.svelte`** file
- Can avoid scoping in **`<style>`** of a component using **`:global(`*`selector`*`) { `*`properties`*` }`**
  - typically used to style nested components

```
<div class="my-component">
  <OtherComponent />
</div>
<style>
  .my-component :global(.other-component h1) {
    color: red;
  }
</style>
```

goal here is to change **`h1`** styling only for those rendered by **`OtherComponent`**

Todo App

- Classic app that demonstrates many Svelte features including
  - importing components
  - passing props
  - interpolation and `#each` in HTML
  - two-way data binding
  - reactivity
  - events
  - animation
  - scoped CSS
- Review code in REPL

App State / Stores

- Stores use publish/subscribe to share data between components
- Four kinds: writable, readable, derived, and custom
- Easiest approach is to define and export all in **`stores.js`**
- Can import in any components
- Subscribing and unsubscribing is automatic
  when store names are preceded by **`$`**

Store Example

stores.js

```
import {writable} from 'svelte/store';
export const user = writable({
  firstName: '',
  lastName: ''
});
```

routes/index.svelte

```
<script>
  import {user} from '../stores.js';
  import Report from '../Report.svelte';
</script>
<input type="text" placeholder="First Name" bind:value={$user.firstName} />
<input type="text" placeholder="Last Name" bind:value={$user.lastName} />
<Report />
```

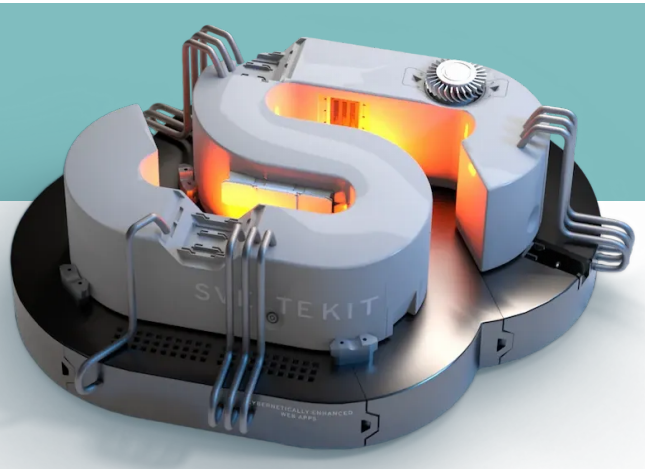
Report.svelte

```
<script>
  import {user} from './stores.js';
  function clear() {
    $user = {firstName: '', lastName: ''};
  }
</script>
<h1>Hello, {$user.firstName} {$user.lastName}.</h1>
<button on:click={clear}>Clear</button>
```

Component Communication Options

Need	Solution
parent passes data to child	props
parent passes HTML and components to child	slots
child notifies parent, optionally including data	events
ancestor makes static data available to descendants	context
component shares data between all instances	module context
any component subscribes to and publishes data	stores

SvelteKit



- Framework on top of Svelte that replaces Sapper
- Like Next for React and Nuxt for Vue
- Features
  - file-based page routing
  - file-based endpoints (APIs)
  - layouts - common header/footer/nav
  - error page
  - code splitting for JS and CSS
  - prefetching based on hover and focus
  - hot module reloading using Vite
  - TypeScript, ESLint, and Prettier setup
  - static pages and sites
  - adapters for deployment targets
    - official: static, Node, Netlify, Vercel
    - community: Begin, Cloudflare Workers, Deno, Firebase, and more

https://kit.svelte.dev

Creating a New Project

- **`npm init svelte@next`** ***`project-name`***
- Answer questions
  - Which Svelte app template?
    - SvelteKit demo app or Skeleton project (preferred)
  - Use TypeScript?
  - Add ESLint for code linting?
  - Add Prettier for code formatting?
  - Add Playwright for browser testing?

Running a Project

- Follow instructions that are output to install dependencies and run locally
  - **`cd project-name`**
  - **`npm install`**
  - **`npm run dev -- --open`** listens on port 3000 by default

SvelteKit Page Routing

- Pages and their URLs are described by directory and file names under **`src/routes`**
- File and directory names inside square brackets indicate that a path parameter will be captured

Page Routing Example

routes/index.svelte

```
<script>
  import '../global.css';
</script>
<nav>
  <a href="/page1">Page 1</a>
  <a href="/page2">Page 2</a>
</nav>
<main>
  <h1>Home Page</h1>
</main>
<style>
  a {
    color: white;
    font-size: 2rem;
    text-decoration: none;
  }
  main {
    padding: 1rem;
  }
  nav {
    display: flex;
    gap: 1rem;
    background-color: orange;
    padding: 1rem;
  }
</style>
```

global.css

```
body {
  font-family: sans-serif;
  margin: 0;
}
```

routes/page1.svelte

```
<h1>First Page</h1>
```

routes/page2.svelte

```
<h1>Second Page</h1>
```

Wrap Up

- Developers like Svelte for many reasons,
  but the biggest reasons are that it
  reduces the amount of code that must be written
  and the code is easy to understand
- Delivering an excellent developer experience (DX)
  is not at the exclusion of good user experience (UX)
- Give Svelte a try and see if it
  simplifies web development for you!