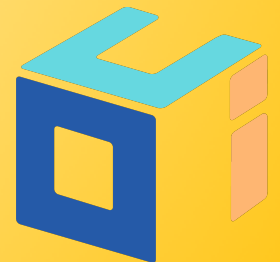




# Svelte - Web App Development Reimagined

slides at <https://github.com/mvolkmann/talks>

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OCI | TRAINING

# What Is Svelte?

- Alternative to web frameworks like React, Vue, and Angular
- A web application **compiler**, not a runtime library
  - compiles `.svelte` files to a single JavaScript file
  - no Svelte runtime **dependencies**, only **devDependencies**
- Doesn't use a virtual DOM
- Developed by **Rich Harris**
  - formerly at "The Guardian"; currently at "The New York Times"
  - previously created **Ractive** web framework - <https://ractive.js.org/>
    - used at "The Guardian"
    - inspired parts of Vue
  - created **Rollup** module bundler - <https://rollupjs.org/>
    - alternative to Webpack and Parcel

# What is SvelteKit?

- Framework on top of Svelte that replaces Sapper
- Like Next for React or Nuxt for Vue
- Features
  - file-based page routing
  - file-based endpoints (REST services)
  - layouts
    - ex. common page header, footer, and nav
  - error page
  - code splitting for JS and CSS
    - page visits only load the JS and CSS they need
  - hot module reloading (HMR)
    - provided by Vite; very fast!
  - static pages and sites
- setup of TypeScript
- setup of Sass or Less CSS preprocessors
- setup of ESLint
- setup of Prettier
- adapters for deployment targets
  - currently node, static, begin, netlify, and vercel
  - to change, modify `svelte.config.cjs`

## Important files and directories:

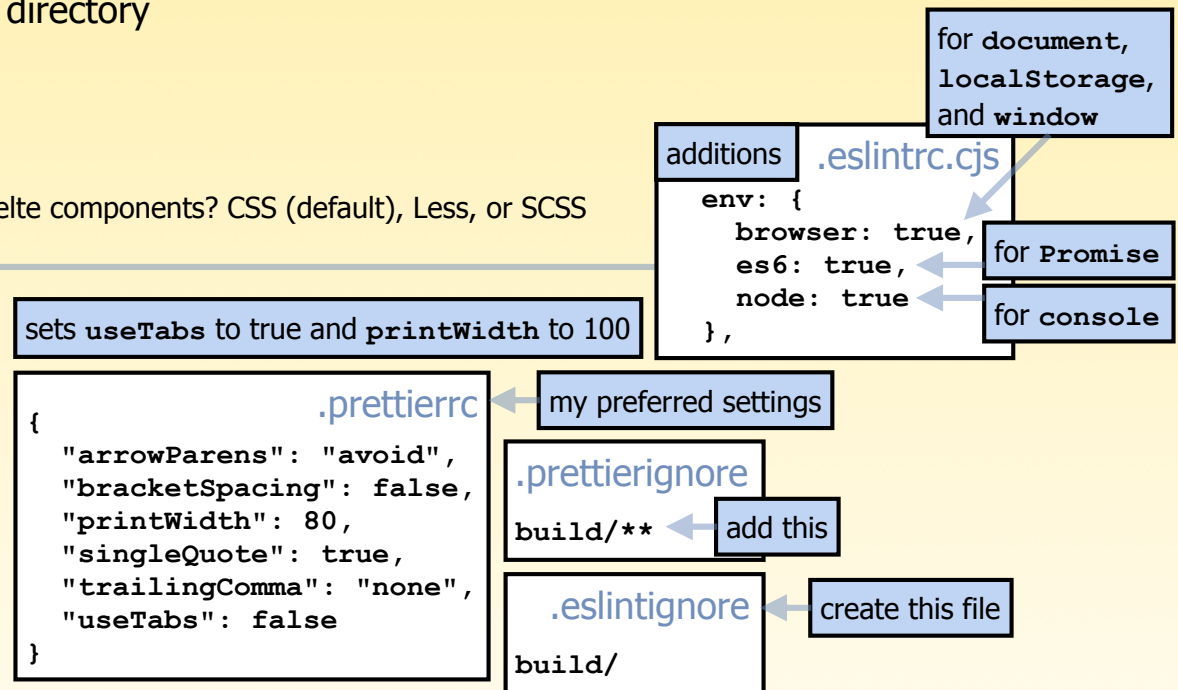
`src/app.html` - starting HTML file  
`src/routes` - holds page components and endpoints  
`src/lib` - holds other components and functions  
`build` - holds files generated by `npm run build`

## Config files:

`.eslintrc.cjs`  
`.prettierignore`  
`.prettierrc`  
`jsconfig.json`  
`package.json`  
`svelte.config.cjs`

# Creating a SvelteKit Project

- Install Node.js
- `npm init svelte@next [project-name]`
  - omit `project-name` to create in current directory
  - asks these questions
    - Use TypeScript in components? defaults to no
    - What do you want to use for writing Styles in Svelte components? CSS (default), Less, or SCSS
    - Add ESLint for code listing? defaults to no
    - Add Prettier for code formatting? defaults to no
  - outputs instructions for next steps
- `cd project-name`
- `npm install`



# Running a SvelteKit Project

- `npm run lint` to run ESLint
- `npm run format` to run Prettier
- `npm run dev` to run in development mode
  - provides watch and live reload
  - options go after `--`
  - to open in default browser add `--open` or `-o`
  - to specify port add `--port #` or `-p #` (defaults to 3000)
- `npm build` to build for deployment
  - creates files in `build` directory that should be deployed

# An Example

- Since you are all experienced web developers,  
**let's look at an example app**  
so you can **compare** the look of the code  
to your current favorite web framework
- On to the classic ... todo app!
- Code at
  - <https://github.com/mvolkmann/sveltekit-todo>
  - <https://github.com/mvolkmann/sveltekit-todo-w-endpoints>

# Todo App ...

## To Do List

1 of 2 remaining Archive Completed

Add

☒ ~~learn Svelte~~ Delete

☐ build a Svelte app Delete

a Todo component

# ... Todo App ...

src/lib/ToDo.svelte

```
1 <script>
2   import {createEventDispatcher} from 'svelte';
3   import {fade} from 'svelte/transition';
4   const dispatch = createEventDispatcher();
5   export let todo; // the only prop
6 </script>
7
8 <li transition:fade>
9   <input
10     type="checkbox"
11     checked={todo.done}
12     on:change={ () => dispatch('toggleDone')}
13   />
14   <span class:done={todo.done}>{todo.text}</span>
15   <button on:click={ () => dispatch('delete')}>Delete</button>
16 </li>
17
18 <style>
19   .done {
20     color: gray;
21     text-decoration: line-through;
22   }
23   li {
24     margin-top: 5px;
25   }
26 </style>
```

script and  
style sections  
are optional

export makes it a prop

interpolation

What is the name of this component?  
Can't tell.  
Names are assigned when other  
components import this one.



# ... Todo App ...

```
1 <script>
2   import Todo from '../lib/Todo.svelte';
3
4   let lastId = 0;
5   const createTodo = (text, done = false) => ({id: ++lastId, text, done});
6
7   let todoText = '';
8   let todos = [
9     createTodo('learn Svelte', true),
10    createTodo('build a Svelte app')
11  ];
12
13  $: uncompletedCount = todos.filter(t => !t.done).length;
14  $: status = `${uncompletedCount} of ${todos.length} remaining`;
15
16  function addTodo() {
17    todos = todos.concat(createTodo(todoText));
18    todoText = '';
19  }
20
21  const archiveCompleted = () => todos = todos.filter(t => !t.done);
22
23  const deleteTodo = todoId => todos = todos.filter(t => t.id !== todoId);
24
25  function toggleDone(todo) {
26    const {id} = todo;
27    todos = todos.map(t => t.id === id ? {...t, done: !t.done} : t);
28  }
29 </script>
```

src/routes/index.svelte

**Top-level variables ARE the component state** if used in HTML!  
When state changes, only the relevant part of DOM are updated.

reactive  
declarations

No methods,  
just functions.

Not really archiving in this  
simple implementation,  
just deleting.

No this anywhere,  
just plain functions!

# ... Todo App

```
1 <div>
2   <h2>To Do List</h2>
3   <div>
4     {status}
5     <button on:click={archiveCompleted}>Archive Completed</button>
6   </div>
7   <form on:submit|preventDefault={addTodo}>
8     <input
9       type="text"
10      size="30"
11      autofocus
12      placeholder="enter new todo here"
13      bind:value={todoText}
14    />
15    <button disabled={!todoText}>Add</button>
16  </form>
17  <ul>
18    {#each todos as todo}
19      <Todo
20        {todo}
21        on:delete={ () => deleteTodo (todo.id) }
22        on:toggleDone={ () => toggleDone (todo) }
23      />
24    {/each}
25  </ul>
26 </div>
```

src/routes/index.svelte

binds value of form element to a variable;  
simulates two-way data binding;  
provides current value and  
event handling for updating variable  
when user changes value

Mustache-style markup

# ... Todo App ...

```
1 <style>                                     src/routes/index.svelte
2   button {
3     margin-left: 10px;
4   }
5
6   h2 {
7     margin-top: 0;
8   }
9
10  /* This removes bullets from a bulleted list. */
11  ul {
12    list-style: none;
13    margin-left: 0;
14    padding-left: 0;
15  }
16 </style>
```

# Logic in Markup



- Three approaches for conditional and iteration logic

- **React**

- uses JSX where logic is implemented with JavaScript code in curly braces

- **Angular and Vue**

- support framework-specific attributes for logic
  - ex. `ngIf`, `ngFor`, `v-if`, `v-for`, ...

- **Svelte**

- supports mustache-like custom syntax that **wraps** elements
  - ex. `{#if}` and `{#each}`
  - can wrap multiple elements without introducing a new, common parent

Why does it make sense to specify conditional and iteration logic INSIDE elements using attributes?

Imagine if you could do that with JavaScript functions.

```
doSomething(  
  arg1,  
  arg2,  
  if (arg1 > 10),  
  for (arg1 in someCollection));
```

Isn't that weird?

# Top Svelte Features

- It's fast!
  - see <https://krausest.github.io/js-framework-benchmark/current.html>
  - can select frameworks to compare
- Small bundle sizes
- File-based component definitions
- CSS scoped by default
- Clear place to put global CSS
- Easy component state management (reactivity)
- Reactive statements (\$ : )
- Two-way data bindings
- Built-in animations
- Easy app state management (stores) We haven't seen this yet.

# Small Bundle Sizes



- Delivered code is much smaller, so loads faster in browsers
- Create production build with `npm run build`
- A RealWorld Comparison of Front-End Frameworks with Benchmarks
  - <https://medium.com/dailyjs/a-realworld-comparison-of-front-end-frameworks-2020-4e50655fe4c1>

Gzipped App Size in KBs

**Angular+ngrx:** 694  
**React+Redux:** 193  
**Vue:** 71  
**Svelte:** 15

Lines of Code

**Angular+ngrx:** 4210  
**React+Redux:** 2050  
**Vue:** 2076  
**Svelte:** 1057

# File-based Component Defs



- **Angular** uses classes
- **React** uses functions or classes
- **Vue** uses object literals
- **Svelte** doesn't use any JavaScript container
  - JavaScript, CSS, and HTML in source files are combined to form the component definition which automatically becomes the default export
  - name is associated when imported and must start uppercase
  - lowercase names are reserved
    - for predefined elements like those in HTML and SVG

# CSS



- Scoped by default
  - CSS specified in a component `style` element is automatically scoped to the component
  - achieved by adding the same generated CSS class name, `svelte-hash`, to each rendered element of the component affected by these CSS rules
- Clear place for global CSS
  - in Svelte see `public/global.css`; linked by `public/index.html`
  - in SvelteKit see `src/app.css`; imported by `src/routes/$layout.svelte`



# Easy Component State Mgmt.

("reactivity")

- Changes to top-level variables referenced in interpolations automatically cause those interpolations to be reevaluated
- Example

```
<script>
  let count = 0;
  const increment = () => count++;
</script>

<div>count = {count}</div>
<button on:click={increment}>+</button>
```

- Must assign a new value to trigger
  - pushing new elements onto an array doesn't do this

```
myArr = myArr.concat(newValue);
```

works

```
myArr = [...myArr, newValue];
```

works

```
// Alternative trick
myArr.push(newValue);
myArr = myArr;
```

works

# Reactive Statements

a.k.a. "destiny operator"

- `$:` is a "labeled statement" with label name "`$`" that Svelte treats as a "reactive statement"
- Add as a prefix on top-level statements that should be repeated whenever any referenced variables change

Labeled statements can be used as targets of `break` and `continue` statements. It is not an error in JavaScript to use same label more than once in same scope.

- Examples

```
$: average = total / count;  
$: console.log('count =', count);
```

like "computed properties" in Vue

great for debugging

When applied to an assignment to an undeclared variable it is called a "reactive declaration" and the `let` keyword is not allowed.

- Can apply to a block

```
$: {  
  // statements to repeat go here  
}
```

- Can apply to multiline statements like `if` statements

```
$: if (someCondition) {  
  // body statements  
}
```

re-evaluates condition if any variables it references change, and executes body only when true

# Loan Example

```
1 <script>
2   let interestRate = 3;
3   let loanAmount = 200000;
4   let years = 30;
5   const MONTHS_PER_YEAR = 12;
6
7   $: months = years * MONTHS_PER_YEAR;
8   $: monthlyInterestRate = interestRate / 100 / MONTHS_PER_YEAR;
9   $: numerator = loanAmount * monthlyInterestRate;
10  $: denominator = 1 - (1 + monthlyInterestRate) ** -months;
11  $: payment =
12    !loanAmount || !months ? 0 :
13    interestRate ? numerator / denominator :
14    loanAmount / months; // no interest
15 </script>
16
17 <label for="loan">Loan Amount</label>
18 <input id="loan" type="number" bind:value={loanAmount} />
19
20 <label for="interest">Interest Rate</label>
21 <input id="interest" type="number" bind:value={interestRate} />
22
23 <label for="years">Years</label>
24 <input id="years" type="number" bind:value={years} />
25
26 <div>
27   Monthly Payment: ${payment.toFixed(2)}
28 </div>
```

# Easy App State Mgmt.

- “Stores” hold application state outside any component
- Alternative to using props or “context” to make data available in components
- Where to define?
  - for stores that should be available to any component, define and export them in a file like `src/stores.js` and import them from that file wherever needed
  - for stores that should only be available to descendants of a given component, define them in that component and pass them to descendants using props or context

# Kinds of Stores

- **Writable**

- only kind that can be modified by components
- methods
  - `set(newValue)`
  - `update(currentValue => newValue)`

calculates new value from current value

- **Readable**

- handle computing their data, perhaps from a REST call
- components cannot modify

- **Derived**

- derive data from current values of other stores

- **Custom**

- must implement `subscribe` method
- can provide custom methods to update state and not expose `set` and `update` methods

# Defining Writable Stores

stores.js

```
import {writable} from 'svelte/store';  
export const dogStore = writable([]);
```

initial value

```
export const fancyStore = writable(  
  initialValue,  
  async set => {  
    // Called when subscriber count goes from 0 to 1.  
    // Compute initial value and pass to set function.  
    const res = await fetch('/some/url');  
    const data = await res.json();  
    set(data);  
  
    return () => {  
      // Place cleanup code here.  
      // Called when subscriber count goes to 0.  
    }  
  }  
);
```

using optional  
second argument

add try/catch  
for error handling

# Using Stores

- Option #1 - **subscribe** method - very verbose
- Option #2 - **\$** auto-subscription shorthand - much better
  - variables whose names begin with **\$** must be stores
  - automatically subscribes when first used and unsubscribes when removed from DOM

```
<script>
  import {onDestroy} from 'svelte';
  import {dogStore} from './stores.js';
  let dogs;
  const unsubscribe = dogStore.subscribe(value => dogs = value);
  onDestroy(unsubscribe);
</script>
```

uses **subscribe** method

```
<!-- Use dogs in HTML. -->
```

```
<script>
  import {dogStore} from './stores.js';
</script>
```

uses auto-subscription

```
<!-- Use $dogStore in HTML. -->
```

# Issues to Consider

- **Popularity**

- perhaps Svelte is now considered the #4 most popular approach for building web apps
- isn't yet easy to find developers that already know it
- but it's very easy to learn and there is less to learn than other approaches

- **Component libraries**

- fewer available than for other frameworks, but perhaps enough for your app
- just a matter of time for more to arrive

- **Cannot generate HTML in functions**

- encourages creating additional `.svelte` files in cases where React would use functions that return JSX



# Related Tools

- **Svelte VS Code extension**
- **SvelteKit** - <https://kit.svelte.dev>
  - “a framework for building web applications of all sizes, with a beautiful development experience and flexible filesystem-based routing”
  - provides routing, server-side rendering, code splitting, and building static sites
  - uses Vite “Next Generation Frontend Tooling” which provides “instant server start”, “lightning fast HMR”, and “optimized builds”
- **Svelte Testing Library**
  - <https://testing-library.com/docs/svelte-testing-library/intro/>
- **Storybook** with Svelte
  - <https://storybook.js.org/docs/svelte/get-started/introduction>
  - <https://mvolkmann.github.io/blog/topics/#!/blog/svelte/storybook/>
- **Svelte Native** - <https://svelte-native.technology/>
  - for implementing native mobile apps
  - builds on top of NativeScript
  - community-driven project

# Topics Not Covered Here

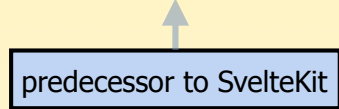


but covered in my book

- Two-way data bindings
  - more options than shown here
- Easy animations built-in
- Inserting HTML
- Slots
  - for passing child elements to a component
- Event details
  - handling, modifiers, dispatching
- Lifecycle functions
  - `onMount`, `beforeUpdate`, `afterUpdate`, and `onDestroy`
- Actions
  - register a function to be called when a specific element is added to DOM
  - ex. moving focus
- Routing
  - use SvelteKit file-based routing or `page` on npm
- Context
  - to share static data with descendant components
- Module Context
  - to run JavaScript code in a component source file only once instead of once for each component instance created
- Special Elements
  - `<svelte:name ...>`
- Debugging with `{@debug}`
  - debugger breaks on state changes
- Unit tests
  - with Jest and Svelte Testing Library
- End-to-end tests
  - with Cypress
- Compiling to custom elements
  - can be used with any framework

# Svelte Resources

- **“Rethinking Reactivity” talk by Rich Harris**
  - delivered multiple times, most recently at “Shift Conference” June 20, 2019
  - explains issues with using virtual DOM (like React and Vue) and motivation for Svelte
- **Home page** - <https://svelte.dev>
  - contains **Tutorial**, **API Docs**, **Examples**, online **REPL**, **Blog**, and **Sapper** link
    - REPL is great for trying small amounts of Svelte code
    - REPL can save for sharing and submitting issues
- **SvelteKit** - <https://kit.svelte.dev>
- **GitHub** - <https://github.com/sveltejs/svelte>
- **Svelte Community** - <https://github.com/sveltejs/community>
  - “contains data for Svelte meetups, packages, resources, recipes, and showcase websites”
- **Discord chat room** - <https://discordapp.com/invite/yy75DKs>

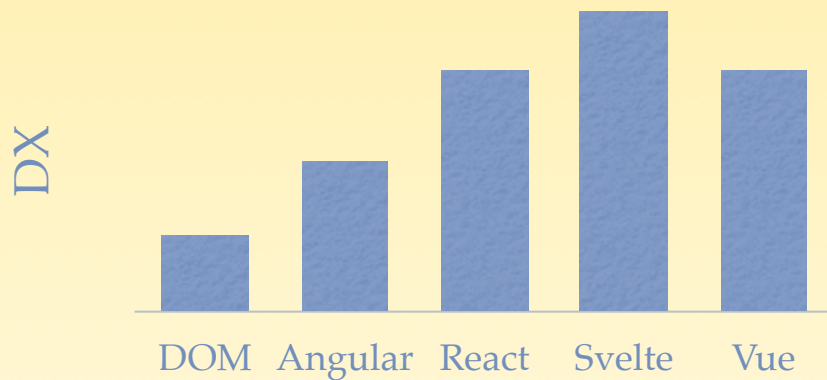


predecessor to SvelteKit

The diagram consists of a light blue rectangular box with a black border containing the text 'predecessor to SvelteKit'. A light blue arrow points upwards from the top center of this box to the word 'Sapper' in the list item above it.

# Conclusion

- **Svelte is a worthy alternative** to React, Vue, and Angular



UX is similar for all,  
but built-in animations in Svelte  
may encourage their use.

- Check out **my book**
  - <https://www.manning.com/books/svelte-and-sapper-in-action>

