Svelte

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

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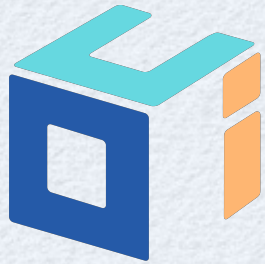


Why Consider Svelte?

- Better performance
  - reactivity without using a virtual Dom
- Smaller bundle sizes
  - much smaller framework library needed at runtime
  - example Todo app is 13% the same app in React
    - see https://github.com/mvolkmann/svelte-todo and https://github.com/mvolkmann/react-todo
- Easier state management
  - component variables, context, stores, and module context
- But ...
  - no TypeScript support yet, but it is coming
    - https://github.com/sveltejs/svelte/issues/1639
  - "Svelte Native" builds on NativeScript for creating mobile apps
    - perhaps not yet as mature as React Native

Svelte Overview ...

- A web application complier, not a runtime library
  - compiles `.svelte` files to `.js` files
  - no Svelte runtime **`dependencies`**, only **`devDependencies`**
- Alternative to web frameworks like React, Vue, and Angular
- Developed by Rich Harris
  - formerly at The Guardian; current at The New York Times
  - previously created the Ractive web framework - https://ractive.js.org/
    - used at The Guardian
    - inspired parts of Vue
  - created Rollup module bundler - https://rollupjs.org/
- Can build entire app or
  add components to existing apps implemented with other frameworks

… Svelte Overview

- Supports reactivity, not a virtual DOM
- Much faster
  - significantly faster than apps built with other frameworks; check the benchmarks!
  - mostly because it doesn't need to build a virtual DOM and perform DOM diffing
  - more suitable for running on low-powered devices
- Delivered code is much smaller
  - uses Rollup by default for module bundling, but can also use Parcel or Webpack
  - create production build with **`npm run build`**
- Provides live reload
- Provides runtime warnings for accessibility issues
  - ex. missing an **`alt`** attribute on an **`img`** element

Svelte Resources

- "Rethinking reactivity" - https://www.youtube.com/watch?v=AdNJ3fydeao
  - talk by Rich Harris at "You Gotta Love Frontend (YGLF) Code Camp 2019"
- Home page - https://svelte.dev/
- Tutorial - https://svelte.dev/tutorial/
- Online REPL - https://svelte.dev/repl/
- Discord chat room - https://discordapp.com/invite/yy75DKs

Getting Started

- Install Node.js from https://nodejs.org
  - installs the **`node`**, **`npm`**, and **`npx`** commands
- **`npx degit sveltejs/template`** ***`app-name`***
  - **degit** is an npm package that copies a git repository
  - useful for project scaffolding
- **`cd`** ***`app-name`***
- **`npm install`**
- **`npm run dev`**
  - provides live reload, unlike **`npm run start`**
  - syntax errors are reported in window where this is running,
    not in browser because it doesn't produce a new version of the app
- Browse **`localhost:5000`**
- Just outputs "Hello world!" in purple

`degit` was created by Rich Harris.
It downloads a git repo,
by default the master branch.
In this case **`sveltejs`** is the user name and **`template`** is the repo.
The second argument is the name of the directory to create.

Generated `index.html`

- In **`public/index.html`**

```
<!doctype html>
<html>
<head>
    <meta charset='utf8'>
    <meta name='viewport' content='width=device-width'>

    <title>Svelte app</title>

    <link rel='icon' type='image/png' href='favicon.png'>
    <link rel='stylesheet' href='global.css'>
    <link rel='stylesheet' href='bundle.css'>
</head>

<body>
    <script src='bundle.js'></script>
</body>
</html>
```

the Svelte logo

non-scoped CSS

scoped CSS from `.svelte` files

bundled JavaScript code

Generated Source Files

uses tabs for indentation by default

- In **`src/main.js`**

```
import App from './App.svelte';

const app = new App({
	target: document.body,
	props: {
		name: 'world'
	}
});

export default app;
```

- In **`src/App.svelte`**

```
<script>
	export let name;
</script>

<style>
	h1 {
		color: purple;
	}
</style>

<h1>Hello {name}!</h1>
```

exported variables can be set as props

Curly braces (interpolation) are used to output the value of a JavaScript expression. They are also used for dynamic attribute values.

Defining Components

- **Angular** uses classes
- **React** uses functions or classes
- **Vue** uses object literals
- **Svelte** doesn't use an container
- JavaScript in source files is combined to form the component definition which is automatically becomes the default export

Svelte Components

- Implemented in `.svelte` files under `src` directory
- Three sections, all optional

```
<script>
  // JavaScript goes here.
</script>

<style>
  /* Scoped CSS rules go here. */
</style>

<!-- HTML goes here. -->
```

Note the different styles of comments that can be used in each section.

- Svelte components do not have names
  - not provided inside source file by a class name, function name, or property value like in other frameworks
  - name is associated when imported and must start uppercase
  - example

```
// Somewhat confusing
import AnyNameIWant from './some-name.svelte';
// Less confusing
import SameName from './SameName.svelte';
```

Sharing Data

- Four ways to share data between components
- **Props**
  - pass data from parent components to child components
- **Contexts**
  - pass data from ancestor components to descendant components
- **Stores**
  - store data outside any component and make available to all
- **Module Scope**
  - store data in component modules and
    make available to all instances of the component

Props ...

- Components can accept input through props
- Specified as attributes on a component element in parent components
- Declared in **`<script>`** section of component with **`export`** keyword
  - using valid JavaScript syntax in a Svelte-specific way
- Example
  - in parent component

```
<script>
  import Hello from './Hello.svelte';
</script>

<Hello name="Mark" />
```

prop values that are expressions or non-string literals are surrounded by curly braces instead of quotes

  - in child component defined in **`Hello.svelte`**

```
<script>
  export let name;
</script>

<div>
  Hello, {name}!
</div>
```

must use **`let`**, not **`const`**; can assign a default value

... Props

- Can use object spread to pass multiple props
  - example

```
<script>
  import Hello from './Hello.svelte';
  let helloProps = {name: 'Mark', color: 'yellow'};
</script>

<Hello {...helloProps} />
```

- Currently these is no prop type checking like in React, Vue, and Angular

Attributes

- Attribute values can be supplied as JavaScript expressions

  `<tag attr={expression}>`

- Can embed expressions in string values
  - example `<tag attr="foo{v1}bar{v2}baz">`
- Shorthand syntax if value is in a variable with same name as attribute
  - `<tag foo={foo}>` is same as `<tag {foo}>`
- Can use spread operator
  - if attributes are in an object where keys are attribute names and values are their values
  - example

```
<script>
  let score = 0;
  const inputAttrs = {
    type: 'number',
    max: 10,
    min: 0,
    value: score
  };
</script>

<input {...inputAttrs} bind:value={score} />
```

`bind` simulates a two-way binding; covered starting on slide 26

Styling

- Styles in **`<style>`** tags of **`.svelte`** files are automatically scoped to the component
  - adds same CSS class named **`svelte-`*`hash`*** to all rendered tags
- Global styles go in **`public/global.css`**
- Can use **`/* */`** comments, but not **`//`**
- Provides animation effects typically used for transitions
  - and makes it easy to implement custom animations
- "svelte3" ESLint plugin warns about unused CSS selectors
- Can conditionally add a CSS class to an element
  - example **`<div class:error={status > 0}>{result}</div>`**

Importing Components

- Components can import others inside their **`script`** tag
  - ex. `import Other from './Other.svelte';`
- Imported components can then be used in HTML section

Inserting HTML

- To render a JavaScript expression whose value is an HTML string

```
{@html expression}
```

- Example
  - suppose **markup** is a variable that holds a string of HTML

```
<p>{@html markup}</p>
```

- Cross-site Scripting
  - you must escape HTML from untrusted sources to avoid this

Reactivity

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

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

<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);
```

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

Reactive Declarations

- `$:` is a "labelled statement" with label name "`$`" that Svelte treats as a "reactive declaration"

interestingly it is not an error in JavaScript to use same label more than once in same scope

- Add as a prefix on top-level statements that should be repeated whenever any referenced variables change
- Examples

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

like "computed properties" in Vue

great for debugging

when applied to an assignment to an undefined variable the `let` keyword is not required

- Can apply to a block

```
$: {
  // statements to be repeated go here
}
```

- Can apply to multiline statements like if statements

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

executes if any variables referenced in condition or body change, but of course the body only executes when condition is true

for example, if condition includes calls to functions, they will be called if any references in the body have changed

Logic in Markup

- Three approaches for conditional and iteration logic
- **React**
  - uses JSX where logic is implemented by 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}`

Markup `if` Statement

- Begin with **`{#if condition}`**
  - starting with **`#`** indicates a block opening tag
- Can use **`{:else if condition}`** and **`{:else}`**
  - starting with **`:`** indicates a block continuation tag
- End with **`{/if}`**
  - starting with **`/`** indicates a block ending tag
- Include markup to be conditionally rendered
- Example

```
{#if color === 'yellow'}
  <div>Nice color!</div>
{:else if color === 'orange'}
  <div>That's okay too.</div>
{:else}
  <div>Questionable choice.</div>
{/if}
```

Markup `each` Statement ...

- Begin with **`{#each iterable as element}`**
  - starting with **`#`** indicates a block opening tag
  - include markup to be rendered for each element
- Optional **`{:else}`**
  - renders when iterable is empty
- End with **`{/each}`**
  - starting with **`/`** indicates a block ending tag
- Examples

```
{#each colors as color}
  <div style='color: {color}'>{color}</div>
{/each}
```

red
green
blue

```
{#each colors as color, index}
  <div>{index + 1}) {color}</div>
{/each}
```

1) red
2) green
3) blue

```
{#each people as {name, age}}
  <div>{name} is {age} years old.</div>
{:else}
  <div>There are no people.</div>
{/each}
```

can use destructuring when elements are objects

... Markup `each` Statement

- Need a unique identifier for each element if items will be added, removed, or modified
  - similar to a key in React and Vue
- Example

```
{#each people as person (person.id)}
  <div>{name} is {age} years old.</div>
{/each}
```

Promises in Markup

- Can wait for promises to resolve or reject in markup and render different elements for each
- Examples
  - `getData` function returns a `Promise`

```
{#await getData()}
  <div>Waiting for data ...</div>
{:then result}
  <div>result = {result}</div>
{:catch error}
  <div class="error">Error: {error.message}</div>
{/await}
```

can use any name for variables after `:then` and `:catch`

```
{#await getData() then result}
  <div>result = {result}</div>
{:catch error}
  <div class="error">Error: {error.message}</div>
{/await}
```

can omit block to render while waiting for resolve or reject

can omit `catch` block

Slots

- Allow child elements to be passed to a component
- Component can decide whether and where to render them
- `<slot />` is a "default slot" that marks the spot where all children are unconditionally rendered
- `<slot>default content</slot>` is the same, but specifies content to render if there is no child content
  - note that whitespace counts as child content
- `<slot name="slotName">default content</slot>` is a named slot
  - can have any number of these in component
  - children specify target slot with `slot` attribute on any child element
    - example

```
<div slot="address">
  123 Some Street<br>
  Some City, Some State  12345
</div>
```

Binding Form Elements ...

- Form elements can be bound to a variable
  - provides current value and event handling for updating the variable when user changes value
- For **`input`** elements with type **`number`** or **`range`**, automatically coerces values from strings to numbers
- Example

... Binding Form Elements ...

```
<script>
  const colors = ['red', 'orange', 'yellow', 'green', 'blue', 'purple'];
  const flavors = ['vanilla', 'chocolate', 'strawberry'];
  const seasons = ['Spring', 'Summer', 'Fall', 'Winter']
  let favoriteColor = '';
  let favoriteFlavors = [];
  let favoriteSeason = '';
  let happy = true;
  let name = '';
  let story = '';
</script>
```

```
<style>
  div {
    margin-bottom: 10px;
  }

  input,
  select {
    border: solid gray 1px;
    border-radius: 4px;
    padding: 4px;
  }

  input[type='checkbox'],
  input[type='radio'] {
    margin-left: 5px;
  }

  label {
    display: inline-block;
    font-weight: bold;
    margin-right: 5px;
    vertical-align: top;
  }
</style>
```

... Binding Form Elements ...

```
<div class="form">
  <div>
    <label>Name</label>
    <input type="text" bind:value={name} />
  </div>
  <div>
    <label>Happy?</label>
    <input type="checkbox" bind:checked={happy} />
  </div>
  <div>
    <label>Favorite Flavors</label>
    {#each flavors as flavor}
      <label>
        <input type="checkbox" value={flavor} bind:group={favoriteFlavors} />
        {flavor}
      </label>
    {/each}
  </div>
```

for checkboxes, bind to **checked** property rather than **value**

using **bind:group** with a set of related checkboxes makes the value an array of strings

... Binding Form Elements ...

```
<div>
  <label>Favorite Season</label>
  {#each seasons as season}
    <label>
      <input type="radio" value={season} bind:group={favoriteSeason} />
      {season}
    </label>
  {/each}
</div>
<div>
  <label>Favorite Color</label>
  <select bind:value={favoriteColor}>
    <option />
    {#each colors as color}
      <option>{color}</option>
    {/each}
  </select>
</div>
<div>
  <label>Life Story</label>
  <textarea bind:value={story} />
</div>
```

using **bind:group** with a set of related radio buttons makes the value a single string

add **multiple** attribute to a **select** to change it to a scrollable list that allows selecting multiple options

option elements can have a **value** attribute and its value can be a string, number, or object

... Binding Form Elements

This part just reports the variable values set by the binds.

```
  {#if name}
    <div>
      {name} likes {favoriteColor}, {favoriteSeason},
      and is {happy ? 'happy' : 'unhappy'}.
    </div>
    <div>{name}'s favorite flavors are {favoriteFlavors}.</div>
    <div>Story: {story}</div>
  {/if}
</div>
```

- When **`#each`** is used to iterate over objects in an array, form elements inside can bind to properties of those objects
  - user input then causes those objects to be mutated

Binding Custom Props

- Can bind a child component prop to a variable in parent component
- Allows child component to change value of a parent component variable
- Example

Parent.svelte

```
<script>
  import Child from './Child.svelte';
  let pValue = 1;
</script>

<div>pValue = {pValue}</div>
<Child bind:cValue={pValue} />
```

Child.svelte

```
<script>
  export let cValue = '';
  const double = () => cValue *= 2;
</script>

<div>cValue = {cValue}</div>
<button on:click={double}>Double</button>
```

  - when **Child** button is pressed,
    cValue is doubled and
    that becomes the new value of **pValue**
    because it is bound to **cValue**

Event Handling ...

- Specify with **`on:event-name`** attribute set to a function
- Examples

```
<button on:click={handleClick}>Press Me</button>
```

reference to function define in **`script`** section

```
<button on:click={event => clicked = event.target}>Press Me</button>
```

inline event handling

- Event object is passed to event handling function
- Can specify any number of event modifiers
  - with vertical bars following by modifier names
  - ex. `<button on:click|once|preventDefault={handleClick}>Press Me</button>`
  - modifiers are
    - **`capture`** - invokes handler only in capture phase instead of default bubbling phase
    - **`once`** - removes handler after first occurrence
    - **`passive`** - can improve scrolling performance
    - **`preventDefault`** - prevents default action from occurring
    - **`stopPropagation`** - prevents subsequent handlers in capture/bubbling flow from being invoked

... Event Handling

- Can register multiple event listeners for the same event
  - example `<button on:click={doOneThing} on:click={doAnother}>Press Me</button>`
- Shorthand to forward events up to parent
  - if component hierarchy is **A** > **B** > **C**
    and **C** emits event "**foo**",
    B can forward it up to **A** with `<C on:foo />`
  - just omits value of "**on**" attribute
    which otherwise is an event handling function
  - also works with DOM events
    to forward from child component to parent

Dispatching Events

- Components can dispatch events

```
<script>
  import {createEventDispatcher} from 'svelte';
  const dispatch = createEventDispatcher();
  function sendEvent() {
    dispatch('event-name', optionalData);
  }
</script>
```

must be called when component is instantiated

data can be a primitive or an object

event names with dashes may not work

- These events only go to parent component
  - they do not automatically bubble further up
  - parent listens for events on child instance

```
<Child on:event-name={handleEvent} />
```

`handleEvent` is a parent component function

onMount ...

- Most commonly used lifecycle function
- Registers a function to be called when a component is mounted in DOM
- Some uses
  - move focus into a given form element
  - retrieve data from a REST service (recommended place to do this)
- Example

```
<script>
  import {onMount} from 'svelte';
  let name = '';
  let nameInput;
  onMount(() => nameInput.focus());
</script>

<input bind:this={nameInput} bind:value={name} />
```

- To run a function when component is destroyed, return it from `onMount`
  - similar to React `useEffect` hook

... onMount

- Can be called from helper functions
  - similar to defining custom React hooks
  - can share these between components
  - recommended to name these starting with "`on`"
    - React hook names that start with "`use`"

Actions

- Somewhat related to onMount
  - onMount registers a function to run when each instance of a component is mounted
  - use:name={args} on an element renders when that element is mounted
    - could be conditionally rendered

Other Lifecycle Functions

- **`beforeUpdate`**
  - registers a function to be called immediately before component DOM updates
  - first run is before component is mounted,
    and no component DOM will be present yet
- **`afterUpdate`**
  - registers a function to be called immediately after component DOM updates

Context

- Alternative to props and stores for passing data from a component to a descendant

```
import {getContext, setContext} from 'svelte';
```

- Ancestor components set context

```
setContext(key, value);
```

- Descendant components get context

```
const value = getContext(key);
```

- Keys can be any kind of value, not just strings
- Values can be any kind of value including objects with methods

Context Example

A.svelte

```
<script>
  import {setContext} from 'svelte';
  import B from './B.svelte';
  setContext('favorites', {color: 'yellow', number: 19});
</script>

<div>
  This is in A.
  <B />
</div>
```

Output

```
This is in A.
This is in B.
This is in C.
favorite color is yellow
favorite number is 19
```

B.svelte

```
<script>
  import C from './C.svelte';
</script>

<div>
  This is in B.
  <C />
</div>
```

C.svelte

```
<script>
  import {getContext} from 'svelte';
  const {color, number} = getContext('favorites');
</script>

<div>
  This is in C.
  <div>favorite color is {color}</div>
  <div>favorite number is {number}</div>
</div>
```

Stores

- Holds application state outside any component
- Alternative to using props to share state between components
- Recommended to define and export all stores needed by an app in **`src/stores.js`**
- Three provided kinds of stores
  - **writable** stores - only kind that can be modified by components
  - **readable** stores
  - **derived** stores - derive their value from current values of other stores
  - all have **`subscribe`** method

not described further here

- Can implement custom stores
  - any object with a properly implemented **`subscribe`** method
  - see example at https://svelte.dev/tutorial/custom-stores

Writable Stores

- Call **`writable`** function to create
- Also have these methods
  - **`set`**`(`***`newValue`***`)`
  - **`update`**`(`***`currentValue => newValue`***`)` calculated from current value
- To create

stores.js

```
import {writable} from 'svelte/store';

export const dogStore = writable([]);
```

pass initial value

- Can bind to a writable store
  - example `<input bind:value={$someStore}>`
  - user changes to the **`input`** update the store

Readable Stores

- Call `readable` function to create
- Specify initial value
- Optionally provide function that takes `set` function
  - called when first subscriber subscribes
  - obtain value and pass to `set`
- Optionally return a function
  - called when last subscriber unsubscribes to perform cleanup
- Example

stores.js

```
import {readable} from 'svelte/store';

export const catStore = readable(
  [], // initial value
  set => {
    const res = await fetch('/cats');
    const cats = await res.json();
    set(cats);
    // Can return cleanup function here.
  }
);
```

can use `setInterval` to continuously change value

Using Stores

- Import from where defined
- Two options to access
  - `subscribe` method - very verbose!
  - `$` auto-subscription shorthand - much better!
    - requires store to be imported at top-level of component
    - all variables whose names begin with `$` must be stores

uses `subscribe` method

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

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

uses auto-subscription

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

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

Module Context

- To run JavaScript code in a component source file only once instead of once for each component instance created, include code in

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

- When a **`script`** tag doesn't specify a **`context`**, it is "instance context"
- Can specify both kinds of **`script`** tags in a component source file
  - can export values from both contexts
  - cannot specify a default export because the component itself is automatically treated as the default export
- Can declare variables and define functions in module context
  - accessible in instance context of all component instances
  - allows sharing data between all instances
  - instance context variables and functions are **not** accessible in module context

It's not important to move functions that don't access component state to module context because "Svelte **will hoist** any functions that don't depend on local state out of the component definition."

Batched DOM Updates

- "When you invalidate component state in Svelte, it doesn't update the DOM immediately.
  Instead, it waits until the next microtask to see
  if there are any other changes that need to be applied,
  including in other components.
  Doing so avoids unnecessary work and
  allows the browser to batch things more effectively."

by changing component variables

- The `tick` function "returns a promise that resolves as soon as any pending state changes have been applied to the DOM (or immediately, if there are no pending state changes)."
- To make state changes after DOM updates have been applied

```
<script>
  import {tick} from 'svelte';
  ...
  // Make some state changes.
  await tick();
  // Make more state changes after DOM updates.
  ...
</script>
```

prevents batching of updates that occur after the call to `tick`

Animation ...

- **`svelte/animate`** provides
  - **`flip`**
- **`svelte/motion`** provides
  - **`spring`**
  - **`tweened`**
- **`svelte/transition`** provides
  - **`crossfade`**
  - **`draw`**
  - **`fade`**
  - **`fly`**
  - **`scale`**
  - **`slide`**
- Also see **`svelte/easing`**

... Animation

- Can implement custom transitions
  - see example at https://svelte.dev/tutorial/custom-css-transitions
- Can listen for events to know when a transition is complete
  - `on:introstart`
  - `on:introend`
  - `on:outrostart`
  - `on:outbound`
- Also see local transitions and delayed transitions

Special Elements ...

- **`<svelte:component this={componentRef} optionalProps>`**
  - renders component specified by variable **`componentRef`**
  - renders nothing if **`componentRef`** is falsy
  - extra props are passed to the component that is rendered

- **`<svelte:self props>`**
  - allows a component to render an instance of itself
  - supports recursive components
  - needed because a component cannot import itself

... Special Elements ...

- **`<svelte:window on:`*`eventName`*`={`*`handler`*`}>`**
  - listens for events on **`window`** object
- **`<svelte:window bind:`*`propertyName`*`={`*`variable`*`}>`**
  - binds a variable to a **`window`** property (ex. **`innerWidth`**)
- **`<svelte:body on:`*`eventName`*`={`*`handler`*`}>`**
  - listens for events on **`body`** object (ex. **`mouseEnter`** and **`mouseLeave`**)

... Special Elements ...

- **`<svelte:head>`*`elements`*`</svelte:head>`**
  - inserts elements in **`head`** of document (ex. **`link`** and **`script`** tags)
  - When is it useful for a component to do this?
  - Is it discouraged?

... Special Elements

- **`<svelte:options option={value} />`**
  - placed at top of file, not inside **`script`** tag
  - specifies compiler options including:
  - **`immutable`** means props will be treated as immutable (an optimization)
    - default is false
    - means parent components will create new objects for object props rather than modify properties of existing object
    - allows Svelte to determine whether a prop has changed by comparing object references to rather than object properties
    - if parent component modifies object properties, the child component will not detect the change and will not re-render
  - **`accessors`** adds getter and setter methods for the component props
    - default is false; not clear why having these is useful
  - **`namespace="`*`value`*`"`** specifies namespace of component
    - useful for SVG components with a namespace of "svg"; other common uses?
  - **`tag="`*`value`*`"`** specifies name to use when compiled as a custom element
    - allows Svelte components to be used in non-Svelte apps as web components

Debugging

- To break when given variables change
  and output their values in devtools console

```
{@debug var1, var2, var3}
```

- Variables can refer to any kind of value including objects and arrays

ESLint Setup

- Create **`.eslintrc.json`** file

```
{
  "env": {
    "browser": true,
    "es6": true
  },
  "extends": [
    "eslint:recommended",
    "plugin:import/recommended"
  ],
  "parserOptions": {
    "ecmaVersion": 2019,
    "sourceType": "module"
  },
  "plugins": ["svelte3"],
  "rules": {
    "no-console": "off",
    "svelte3/lint-template": true
  }
}
```

- **`npm install -D`** ***`name`*** where ***`name`*** is
  - **`eslint`**
  - **`eslint-plugin-html`**
  - **`eslint-plugin-import`**
  - **`eslint-plugin-svelte3`**
- Add npm script

```
"lint": "eslint --fix --quiet src --ext .js,.svelte",
```

- Run with **`npm run lint`**
- For more info see https://github.com/sveltejs/eslint-plugin-svelte3

Prettier Setup

- Create **`.prettierrc`** file

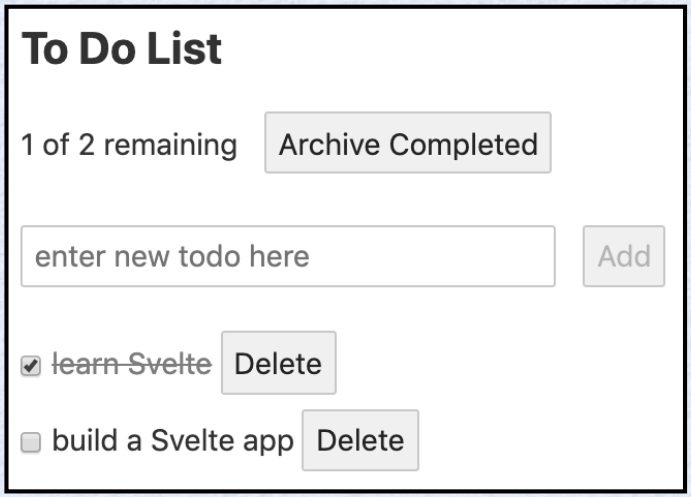
```
{
  "bracketSpacing": false,
  "singleQuote": true
}
```

- **`npm install -D`** ***`name`*** where ***`name`*** is
  - **`prettier`**
  - **`prettier-plugin-svelte`**
- Add npm script

```
"format": "prettier --write '{public,src}/**/*.{css,html,js,svelte}'",
```

- Run with **`npm run lint`**
- Will enforce section order of **`<script>`**, **`<style>`**, and HTML

Todo App ...



main.js

```
import TodoList from './TodoList.svelte';

const app = new TodoList({target: document.body});

export default app;
```

... Todo App ..

Todo.svelte

```
<script>
  import {createEventDispatcher} from 'svelte';
  const dispatch = createEventDispatcher();
  export let todo;
</script>

<style>
  .done-true {
    color: gray;
    text-decoration: line-through;
  }
</style>

<li>
  <input
    type="checkbox"
    checked={todo.done}
    on:change={() => dispatch('toggleDone')}
  />
  <span class={'done-' + todo.done}>{todo.text}</span>
  <button on:click={() => dispatch('delete')}>Delete</button>
</li>
```

... Todo App

TodoList.svelte

```
<script>
  import Todo from './Todo.svelte';

  let lastId = 0;
  const createTodo = (text, done = false) => ({id: ++lastId, text, done});

  let todoText = '';
  let todos = [
    createTodo('learn Svelte', true),
    createTodo('build a Svelte app')
  ];

  let uncompletedCount = 0;
  $: uncompletedCount = todos.filter(t => !t.done).length;

  function addTodo() {
    todos = todos.concat(createTodo(todoText));
    todoText = '';
  }

  const archiveCompleted = () => todos = todos.filter(t => !t.done);

  const deleteTodo = todoId => todos = todos.filter(t => t.id !== todoId);

  function toggleDone(todo) {
    const {id} = todo;
    todos = todos.map(t => t.id === id ? {...t, done: !t.done} : t);
  }
</script>
```

... Todo App ...

TodoList.svelte

```
<style>
  body {
    font-family: sans-serif;
    padding-left: 10px;
  }

  button {
    margin-left: 10px;
  }

  li {
    margin-top: 5px;
  }

  ul.unstyled {
    list-style: none;
    margin-left: 0;
    padding-left: 0;
  }
</style>
```

... Todo App

TodoList.svelte

```
<div>
  <h2>To Do List</h2>
  <div>
    {uncompletedCount} of {todos.length} remaining
    <button on:click={archiveCompleted}>Archive Completed</button>
  </div>
  <br />
  <form>
    <input
      type="text"
      size="30"
      autofocus
      placeholder="enter new todo here"
      bind:value={todoText}
    />
    <button disabled={!todoText} on:click={addTodo}>
      Add
    </button>
  </form>
  <ul class="unstyled">
    {#each todos as todo}
      <Todo
        todo={todo}
        on:delete={() => deleteTodo(todo.id)}
        on:toggleDone={() => toggleDone(todo)}
      />
    {/each}
  </ul>
</div>
```

Cypress E2E Tests ...

- Setup
  - `npm i -D cypress`
  - edit `package.json` and add script `"test:e2e": "cypress open",`
  - `npm test:e2e`
    - creates `cypress` directory with subdirectories
      - `fixtures` - can hold data used by tests; typically `.json` files that are imported into tests
      - `integration` - your tests go here; can have sudirectories
      - `plugins` - extend Cypress functionality; ex. https://github.com/bahmutov/cypress-svelte-unit-test
        - Cypress automatically runs code in `index.js` in this directory before running each spec file
      - `screenshots` - holds screenshots produced by calling `cy.screenshot()`
      - `support` - can add custom Cypress commands, making them available in tests
        - Cypress automatically runs code in `index.js` in this directory before running each spec file
    - opens browser window and runs all the provided tests
  - close Cypress browser window
  - delete all sample files in `cypress` subdirectories

… Cypress E2E Tests

- Create your test files in **`cypress/integration`** with a file extension of **`.spec.js`**
- **`npm run test:e2e`**
- Press "Run all specs" button
- Example

Related Tools

- **Svelte** VS Code extension
- **Sapper** - https://sapper.svelte.dev/
  - "application framework powered by Svelte"
  - name may be a traction of "Svelte" and "Application"
  - similar to Next and Gatsby
  - provides routing, server-side rendering, and code splitting
- **Svelte Native** - https://svelte-native.technology/
  - for implementing native mobile apps
  - based on nativescript-vue
  - a community-driven project
- **Svelte GL** - https://github.com/Rich-Harris/svelte-gl
  - in-work Svelte version of Three.js
- **Svelte Testing Library** - https://testing-library.com/docs/svelte-testing-library/intro
- **Storybook** with Svelte - https://storybook.js.org/docs/guides/guide-svelte/