Svelte

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

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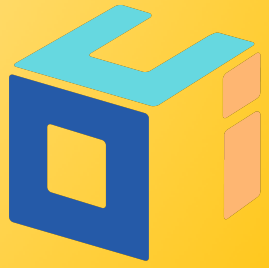


OCI | TRAINING

What Is It?

- Alternative to web frameworks like React, Vue, and Angular
- A web application **complier**, not a runtime library
  - implemented in TypeScript
  - 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

Syntax Podcast Quotes

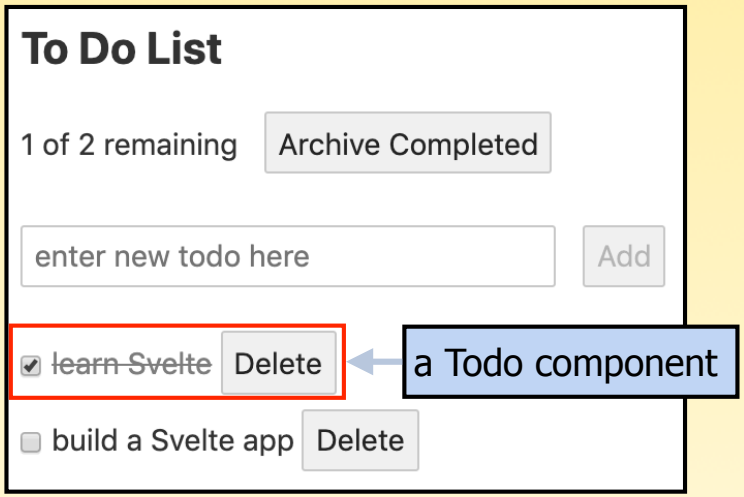
- From Scott Tolinski
- Recently created a course on Svelte
- In episode 182: "Practical - How would we build Airbnb, Twitter, or Reddit?"
  - "I love Svelte man!"
  - "I just want to do everything in that now."
  - "There's so many cool little things about it."
  - "I can't believe what we're able to accomplish with so little code."
  - "It's really super fantastic!"

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!

Todo App ...

code and tests at
https://github.com/mvolkmann/svelte-todo



src/main.js

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

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

export default app;
```

... Todo App ...

src/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  <style>
9    .done-true {
10     color: gray;
11     text-decoration: line-through;
12   }
13   li {
14     margin-top: 5px;
15   }
16 </style>
17
18 <li transition:fade>
19   <input
20     type="checkbox"
21     checked={todo.done}
22     on:change={() => dispatch('toggleDone')}
23   />
24   <span class={'done-' + todo.done}>{todo.text}</span>
25   <button on:click={() => dispatch('delete')}>Delete</button>
26 </li>
```

`script` and `style` sections are optional

`export` makes it a prop

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

interpolation

... Todo App ...

src/TodoList.svelte

```
1  <script>
2    import Todo from './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>
```

Top-level variables ARE the component state if used in HTML!

reactive declarations

No methods, just functions.

Not really archiving in this simple implementation, just deleting.

No `this` anywhere, just plain functions!

... Todo App ...

src/TodoList.svelte

```
<style>
  button {
    margin-left: 10px;
  }

  /* This removes bullets from a bulleted list. */
  ul.unstyled {
    list-style: none;
    margin-left: 0;
    padding-left: 0;
  }
</style>
```

... Todo App

src/TodoList.svelte

```
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>
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} on:click={addTodo}>
16       Add
17     </button>
18   </form>
19   <ul class="unstyled">
20     {#each todos as todo}
21       <Todo
22         todo={todo}
23         on:delete={() => deleteTodo(todo.id)}
24         on:toggleDone={() => toggleDone(todo)}
25       />
26     {/each}
27   </ul>
28 </div>
```

not doing anything on submit

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

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 (`$:`)
- Easy app state management (stores)
- Easy way to pass data from components to descendant components (context)

Small Bundle Sizes

- Delivered code is much smaller,
  so loads faster in browsers
- Uses Rollup by default for module bundling,
  but can also use Webpack or Parcel
- Create production build with **`npm run build`**
- A RealWorld Comparison of Front-End Frameworks with Benchmarks
  - https://www.freecodecamp.org/news/a-realworld-comparison-of-front-end-frameworks-with-benchmarks-2019-update-4be0d3c78075/

Gzipped App Size in KBs

Angular+ngrx: 134
React+Redux: 193
Vue: 41.8
Svelte: 9.7

Lines of Code

Angular+ngrx: 4210
React+Redux: 2050
Vue: 2076
Svelte: 1116

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`** tag
    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
  - **`public/global.css`**

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"

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.

- 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 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

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
  - components cannot modify
- **Derived**
  - derive data from current values of other stores
- **Custom**
  - must implement `subscribe` method
  - can provide custom methods to update state

Defining Writable Stores

stores.js

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

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

initial value

using optional second argument

```
export const fancyStore = writable(
  initialValue,
  async set => {
    // Called when subscribe 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 () => {
      // Called when subscriber count goes to 0.
    }
  }
);
```

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

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. -->
```

Easy Passing Data to Descendants

- Use "context"
- Alternative to props and stores for making data available in descendant components

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

- Ancestor components set context associated with the component

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

  - must be called during component initialization

- Descendant components get context from closest ancestor that has context with given key

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

  - must be called during component initialization

- Keys can be any kind of value, not just strings
- Values can be any kind of value including functions and 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>
```

context data is **not reactive**;
use stores when that is needed

Outstanding Issues

- TypeScript support
  - it's coming, but not ready yet
  - https://github.com/sveltejs/svelte/issues/1639
  - but `svelte.preprocess` can be used now to enable use of TypeScript inside `<script>` tags
    - won't type check code in HTML interpolations
- Popularity
  - perhaps Svelte is now considered the #4 most popular approach for building web apps
  - isn't easy to find developers that already know it
  - but it's very easy to learn and there is less to learn than other approaches

Related Tools

- **Svelte VS Code extension**
- **Sapper** - https://sapper.svelte.dev/
  - "application framework powered by Svelte"
  - 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
  - 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/

Topics Not Covered Here

but covered at https://objectcomputing.com/resources/publications/sett/july-2019-web-dev-simplified-with-svelte

- 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
  - can use `page` on npm or Sapper
- 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
- **Discord chat room** - https://discordapp.com/invite/yy75DKs
- **GitHub** - https://github.com/sveltejs/svelte
- **Awesome Svelte** - https://github.com/CalvinWalzel/awesome-svelte
- **Awesome Svelte Resources** - https://github.com/ryanatkn/awesome-svelte-resources

Conclusion

- **Svelte is a worthy alternative** to the current popular options of React, Vue, and Angular

- For more, see **my long article**
  - https://objectcomputing.com/resources/publications/sett/july-2019-web-dev-simplified-with-svelte