Svelte

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

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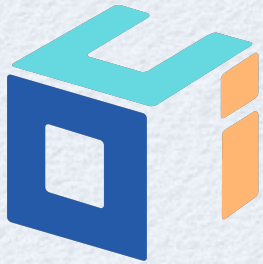


What Is It?

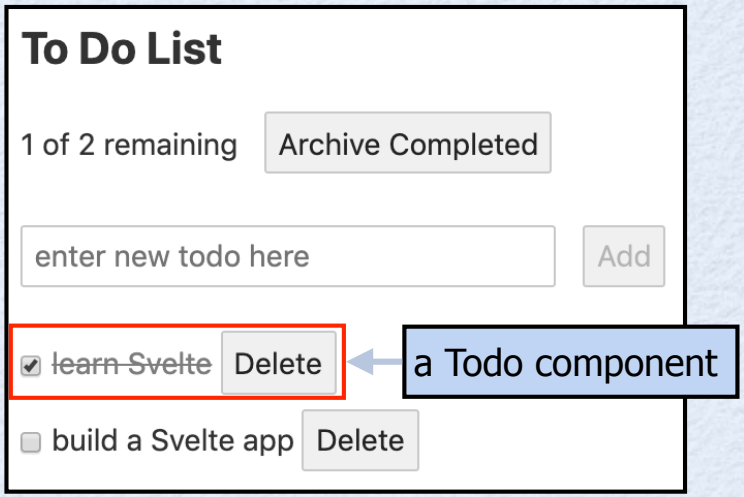
- Alternative to web frameworks like React, Vue, and Angular
- A web application **complier**, not a runtime library
  - implemented in TypeScript
  - compiles `.svelte` files to a single JavaScript file
  - no Svelte runtime `dependencies`, only `devDependencies`
- Doesn't use a virtual DOM
- Developed 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

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

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

`export` makes it a prop

`script` and `style` sections are optional

```
<style>
  .done-true {
    color: gray;
    text-decoration: line-through;
  }
  li {
    margin-top: 5px;
  }
</style>
```

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

```
<li transition:fade>
  <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>
```

interpolation

... Todo App ...

src/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')
  ];

  $: uncompletedCount = todos.filter(t => !t.done).length;
  $: status = `${uncompletedCount} of ${todos.length} remaining`;

  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>
```

Top-level variables ARE the component state!

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

```
<div>
  <h2>To Do List</h2>
  <div>
    {status}
    <button on:click={archiveCompleted}>Archive Completed</button>
  </div>
  <form on:submit|preventDefault>
    <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>
```

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 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}`
  - 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

- 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
    - can't tell from looking at source file what names might be used
  - 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

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>
```

Outstanding Issues

- TypeScript support
  - it's coming, but not ready yet
  - https://github.com/sveltejs/svelte/issues/1639
- Popularity
  - perhaps Svelte will soon be 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/

Svelte Resources

- **"Rethinking Reactivity" talk by Rich Harris**
  - delivered multiple times, most recently at "Shift Conference" June 20, 2019
  - explains motivation for Svelte and compares to React
- **Home page** - https://svelte.dev
- **Tutorial** - https://svelte.dev/tutorial
- **API Docs** - https://svelte.dev/docs
- **Examples** - https://svelte.dev/examples
- **Online REPL** - https://svelte.dev/repl
  - great for trying small amounts of Svelte code
  - can save for sharing and submitting issues
- **Blog** - https://svelte.dev/blog
- **Discord chat room** - https://discordapp.com/invite/yy75DKs
- **GitHub** - https://github.com/sveltejs/svelte

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

Feedback from Rich Harris

at 2:55 PM on 7/30/19

@mvolkmann was all spot on as far as I could see. there were some good questions from the audience. the one about 'why is this considered different to Angular's compilation?' — I think the main difference is that Angular AOT (and this may be changing with Ivy? not sure) is really generating an intermediate representation, whereas Svelte is generating executable code. Given the presence of an internal library, it's arguably more of a spectrum than it first appears (and then you have things like Glimmer going in a different direction altogether), but I think that's the difference people have latched onto.

Re the cost of reactive declarations — this is one of the neat things about being a compiler, we're not 'watching' for changes in any traditional sense of that word (which usually involves some sort of subscription/tracking mechanism). Instead the compiler can basically replace the `$:` in `$: average = total / count` with `if ($$dirty.total || $$dirty.count)` and stick the whole thing inside a function that is called whenever props change. So it doesn't have the overhead traditionally associated with dependency tracking.