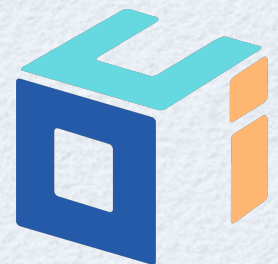




Svelte

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 **compiler**, 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>

To Do List

1 of 2 remaining Archive Completed

Add

☒ learn Svelte Delete

☐ build a Svelte app Delete

← a Todo component

```
src/main.js
import ToDoList from './ToDoList.svelte';
const app = new ToDoList({target: document.body});
export default app;
```


... Todo App ...

script and
style sections
are optional

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

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

src/Todo.svelte

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 ...

```
<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>
```

src/TodoList.svelte

Top-level variables ARE
the component state!

reactive
declarations

No methods,
just functions.

Not really archiving in this
simple implementation,
just deleting.

... Todo App ...

```
<style>                                     src/ToDoList.svelte
  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

```
<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>
```

src/TodoList.svelte

not doing anything on submit

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

Mustache-style markup

passing a prop; can be any JavaScript expression

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?

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}`
 - include markup to be rendered for each element
- Optional `{:else}`
 - renders when iterable is empty
- End with `{/each}`

- 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

Promises in Markup

- Can wait for promises to resolve or reject in markup and render different markup for each and while pending a bit like React Suspense
- Examples
 - assuming `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

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)
- Easy app state management (stores)
- Easy way to pass data from components to descendant components (context)
- Reactive declarations
- Two-way data bindings
- Easy animations built-in
- Runtime warnings for accessibility issues

ex. missing an `alt` attribute on an `img` element

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`
- <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

Does It Disappear?

- Some say Svelte disappears once an app is built
- The Svelte library is mostly defined by `.js` files in `node_modules/svelte`
 - main functions are defined in `internal.js` which is currently ~1400 line of code
 - other library files used for specific features
 - `easing.js`, `motion.js`, `register.js`, `store.js`, `transition.js`
- `npm run build` produces files in `public` directory
 - including `bundle.js`
- Svelte library functions that are used by the app are copied to the top of `bundle.js`
 - in the case of the Todo app shown earlier, this is ~500 lines of code
- So Svelte doesn't disappear, it is just very small

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
 - CSS rules for component only apply to elements with this class name
- Clear place for global CSS
 - `public/global.css`
- svelte3 ESLint plugin warns about unused CSS selectors
 - see <https://github.com/sveltejs/eslint-plugin-svelte3>

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

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
- **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

```
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 optional
second argument

error handling omitted

can calculate new value from current with
`update(currentValue => newValue)`

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. -->
```


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

More on Context

- Keys can be any kind of value, not just strings
- Values can be any kind of value including functions and objects with methods
- Context is not reactive!
 - descendant components are not re-rendered when context they use is changed in an ancestor component
 - use stores if reactivity is needed

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>
```

Reactive Declarations

- `$:` is a “labeled statement” with label name “`$`” that Svelte treats as a “reactive declaration”

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 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  
}
```

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

Two-way Data Bindings

- Form elements can be bound to a variable
- Simulates two-way data binding
- Provides current value and event handling for updating variable when user changes value

Binding Example ...

Name

Happy? ☒

Favorite Flavors ☒ vanilla ☐ chocolate ☒ strawberry

Favorite Season ☒ Spring ☐ Summer ☐ Fall ☐ Winter

Favorite Color

Life Story

Mark likes yellow, Spring, and is happy.
Mark's favorite flavors are vanilla, strawberry.
Story: Once upon a time ...

```
<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>
```

these variables
are bound to
form elements on
next two slides

... Binding Example ...

```
<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 Example

```
<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

to change a select to a scrollable list that allows selecting multiple options add `multiple` attribute; makes the value an array of selected values

Easy Animations Built-in

- **svelte/animate** provides
 - **flip**
- **svelte/motion** provides
 - **spring**
 - **tweened**
- **svelte/transition** provides
 - **crossfade**
 - **draw** - for SVG elements
 - **fade**
 - **fly** - set **x** and/or **y**
 - **scale**
 - **slide**
- Also see **svelte/easing**

basic example

```
<script>
  import {fade} from 'svelte/transition';
  ...
</script>

<li transition:fade>
  <!-- some content -->
</li>
```

this fades in when mounted
and fades out when destroyed

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

Creating a Project

- Install Node.js from <https://nodejs.org>
 - installs **node**, **npm**, and **npm** commands
- Approach #1
 - **npm** `deg`it `sveltejs/template` *app-name*
 - **deg**it is useful for project scaffolding
- Approach #2
 - browse <https://svelte.dev/repl>
 - click download button
 - unzip downloaded zip file
 - demo this!

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.

Installing and Running

- `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 if there are errors
- Browse `localhost:5000`
- Just renders "Hello world!"

Topics Not Covered Here

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

- 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
- 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

Related Tools

- **"Svelte" VS Code extension**
 - provides syntax highlighting and intellisense
- **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-vue
 - community-driven project
- **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"** - <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>
- **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>