



CCWC 2023

Aspects of VR Web components

Phillip G. Bradford
University of Connecticut

Outline

Motivation

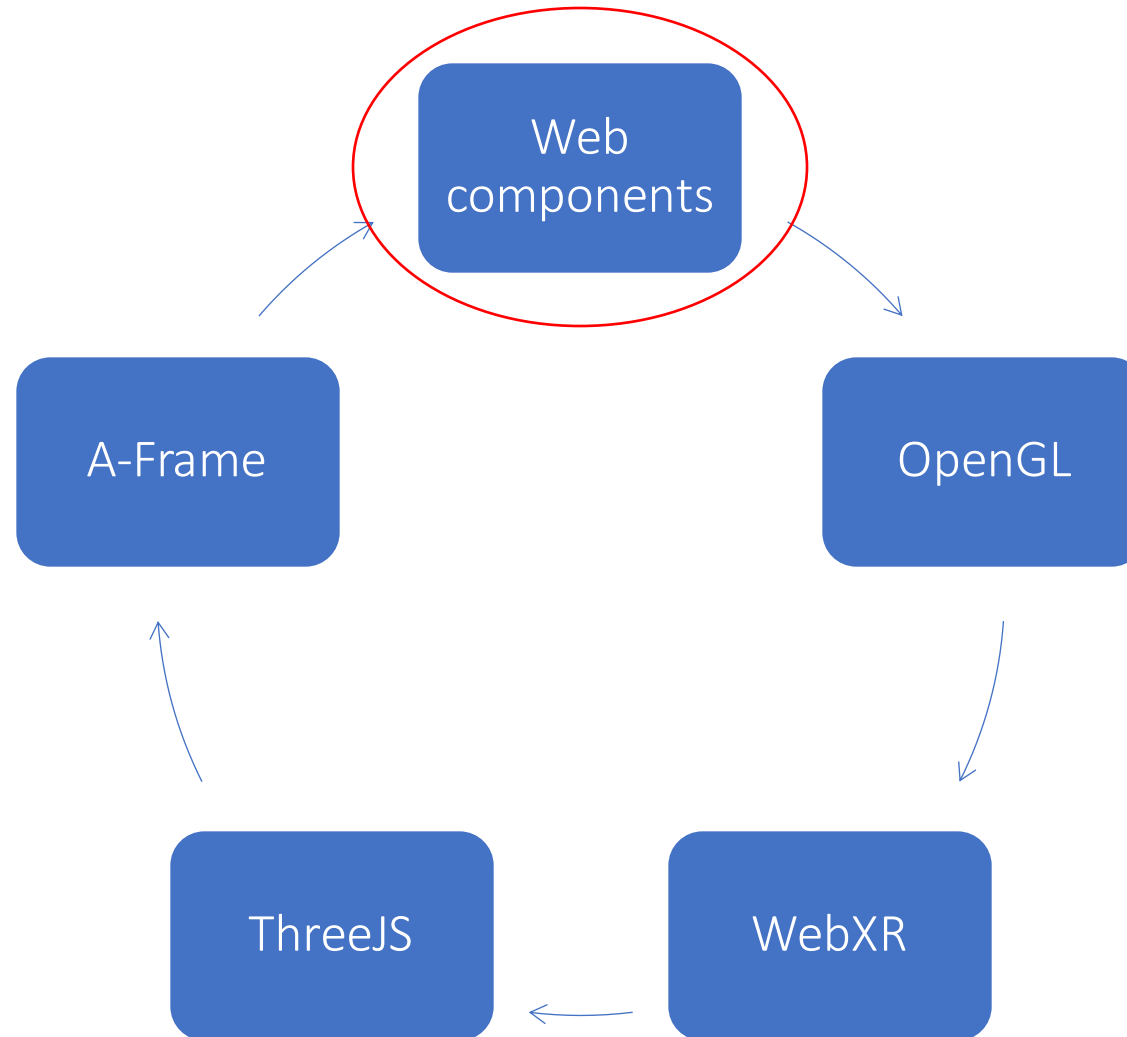
High level view and learning path

What are web components?

Really, HTML and VR?

Examples

High level view and learning path



What are web components?

Reusable and sharable parts for web pages – used in web frameworks

HTML – Hypertext Markup Language

DOM – document object model

DOM elements as HTML tags

Examples from: Mozilla Dev Network

<https://github.com/mdn/web-components-examples>

See also: Ben Farrell: Web components in action, Manning, 2019

Really, HTML and VR?

Ultimately, VR is presented on a screen

HTML/JS/CSS do a lot for screen presentation

- Hook to APIs

- Interactive

- Good separation of duties

Can leverage sophisticated libraries, e.g., OpenGL

DOM is a tree

```
<document>
  <html>
    <header>
    </header>
    <body>

    </body>
  </html>
```



Shadow DOM

Challenges with CSS over-riding your components?

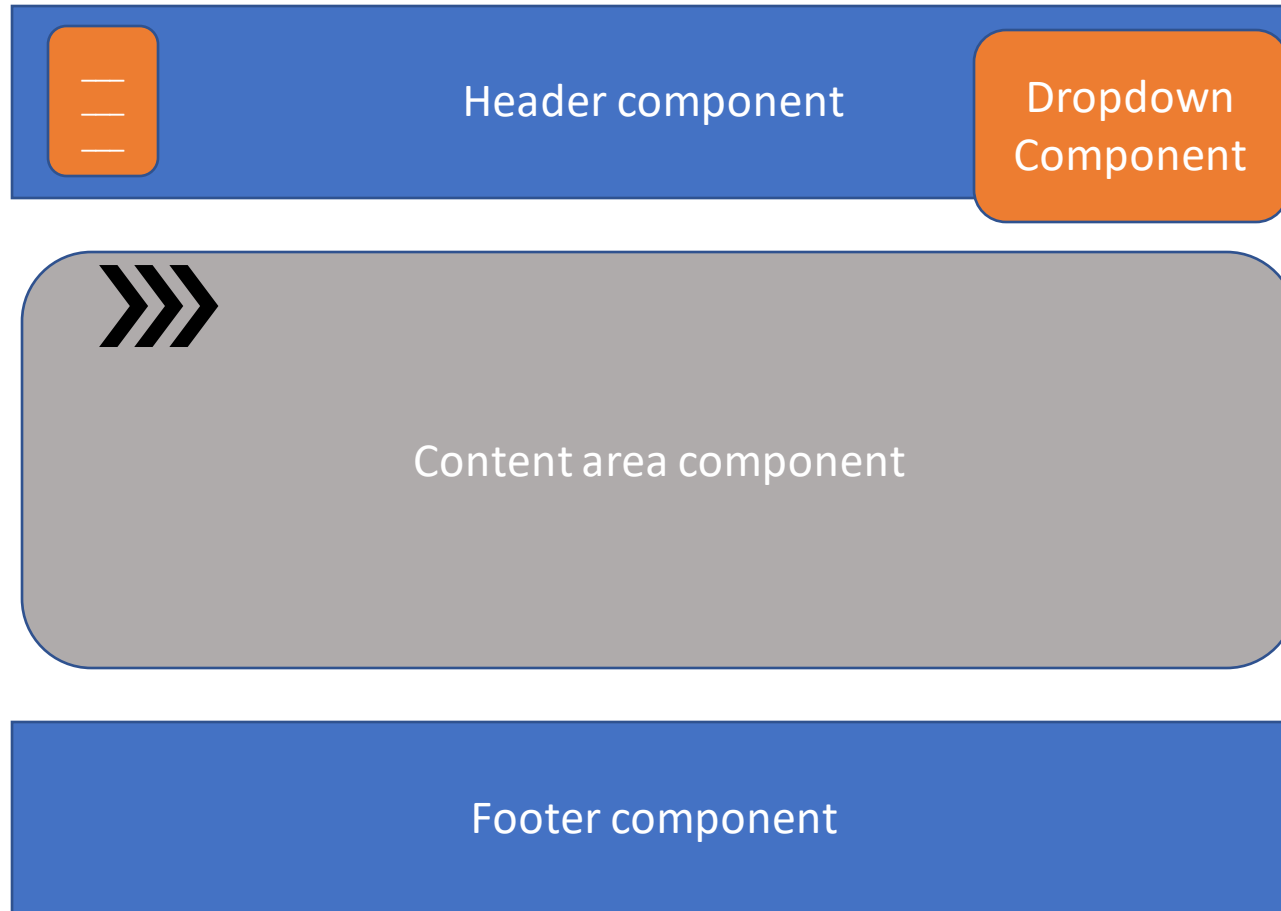
Inheritance in the DOM tree

Do we want CSS or other info inheriting down the DOM tree?

Always?

`Element.attachShadow()`

Component based development



Object oriented-ness of web components

```
customElements.define('a-new-frame', class extends HTMLElement {});

if (!customElements.get('a-new-frame')) {
    customElements.define('a-new-frame',
        class extends HTMLElement {});
}
```

MDN Word count example

Computer> git clone <https://github.com/mdn/web-components-examples.git>

Let's explore their WordCount subclass of HTMLParagraphElement

web-components-examples/edit-word

index.html

main.js

Two important attribute sets

Standard attributes – class, etc.

https://www.w3schools.com/tags/ref_standardattributes.asp

Event attributes – window, mouse, keyboard, media, etc.

https://www.w3schools.com/tags/ref_eventattributes.asp

Objective

Put up a component that counts words in the parent element

Word count rating widget

Hello! Count these words.

Words: 4

index.html

```
<html>
  <head>
    <meta charset="utf-8">
    <title>MDN Simple word count web component</title>
  </head>
  <body>
    <h1>Word count rating widget</h1>
    <article contenteditable="">
      <h2>Sample heading</h2>

      <p> three </p>
      <p> four   five </p>

      <p is="word-count"></p> // is – global attribute saying this HTML TAG should behave like a custom object
    </article>
    <script src="main.js"></script>
  </body>
</html>
```

main.js

```
class WordCount extends HTMLParagraphElement { // HTMLElement!?
  constructor() {
    super();

    const wcParent = this.parentNode;

    function countWords(node) { // method
      const text = node.innerText;
      return text.trim().split(/\s+/g).filter(a => a.trim().length > 0).length;
    }
    const count = `Words: ${countWords(wcParent)}`;
    const shadow = this.attachShadow({mode: 'open'});
    const text = document.createElement('span');
    text.textContent = count;
    shadow.appendChild(text);
  }
}
```

main.js

```
setInterval(function() {  
  const count = `Words: ${countWords(wcParent)}`;   
  text.textContent = count;  
}, 200);
```

```
customElements.define('word-count', WordCount, { extends: 'p' });
```

<https://developer.mozilla.org/en-US/docs/Web/API/setInterval>

Web Components Lifecycle

```
<html>
<head>
  <meta charset="utf-8">
  <title>MDN Life cycle callbacks test</title>
  <style>
    custom-square { margin: 20px; }
  </style>
  <script defer src="main.js"></script>
</head>
<body>
  <h1>Life cycle callbacks test</h1>

  <div>
    <button class="add">Add custom-square to DOM</button>
    <button class="update">Update attributes</button>
    <button class="remove">Remove custom-square from DOM</button>
  </div>

</body>
</html>
```


main.js

See main.js in

<https://github.com/mdn/web-components-examples/tree/main/life-cycle-callbacks>