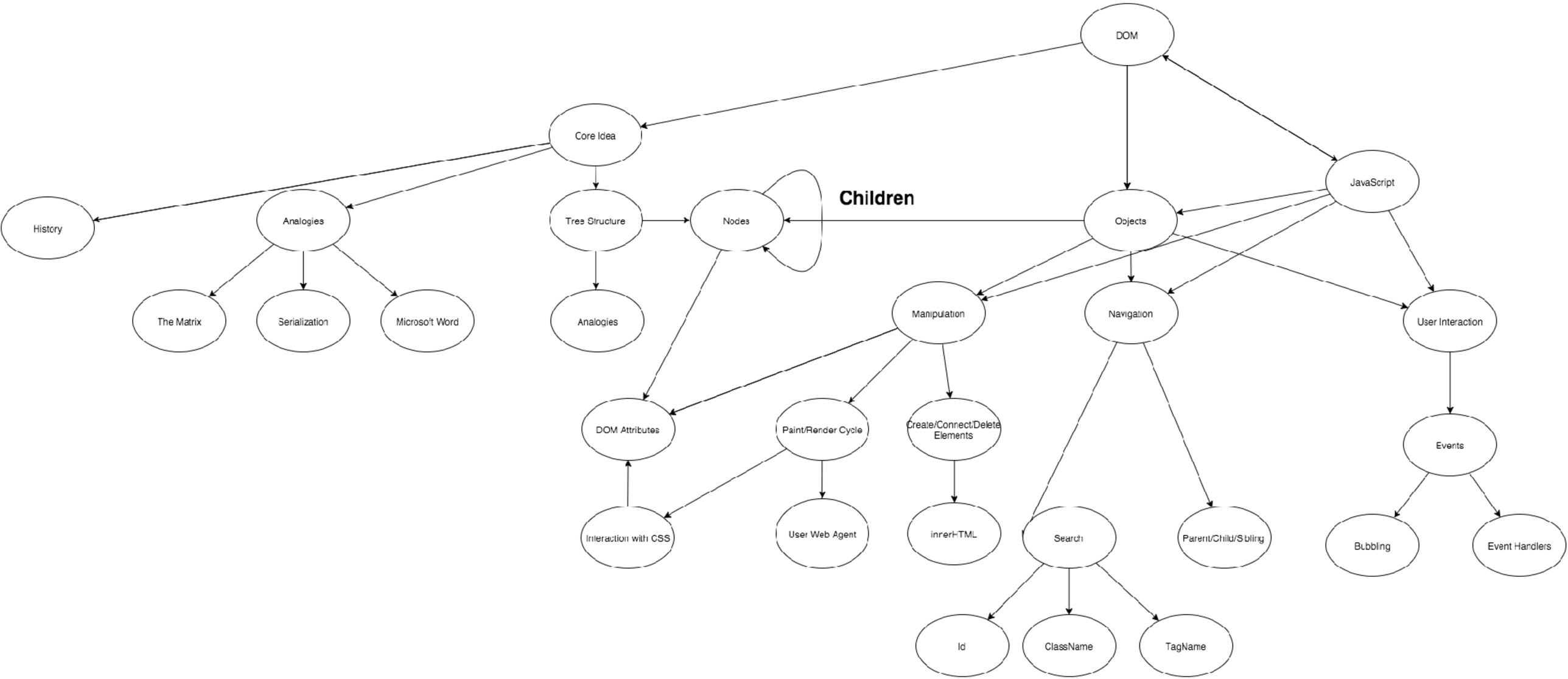
Introduction to the Document Object Model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Manipulation
Navigation
User Interaction
DOM Attributes
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Create/Connect/Delete Elements
Interaction with CSS
User Web Agent
innerHTML
Search
Parent/Child/Sibling
Id
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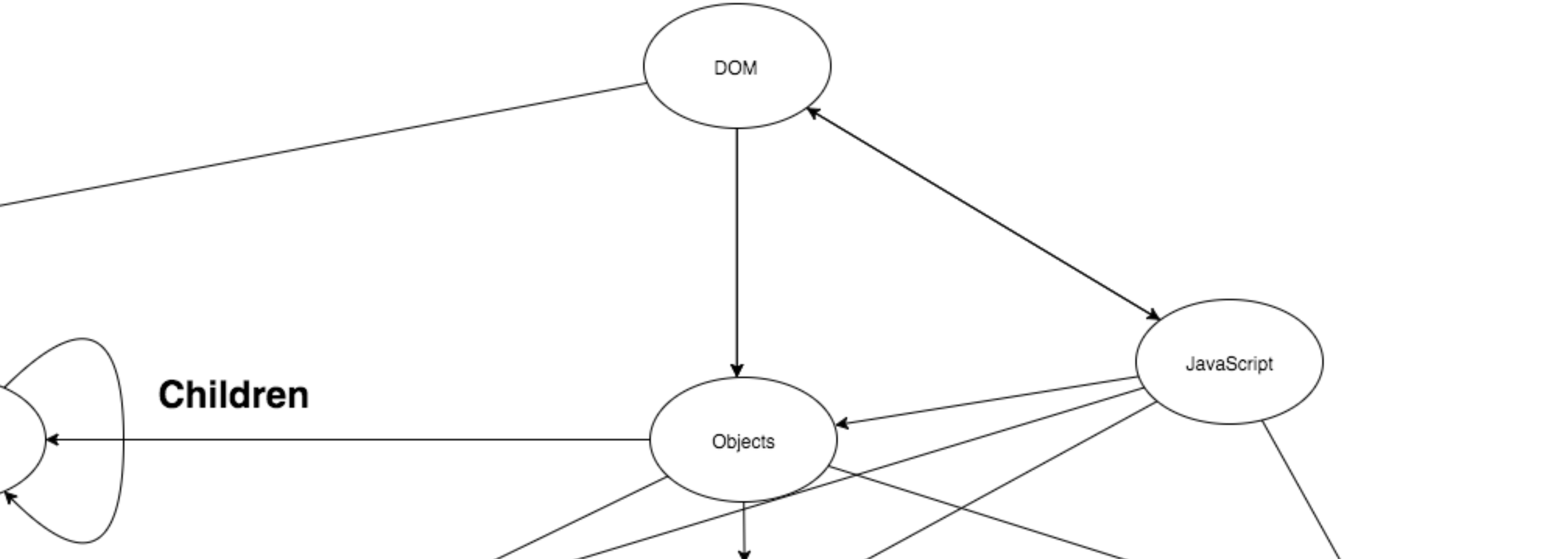
Events
Bubbling
Event Handlers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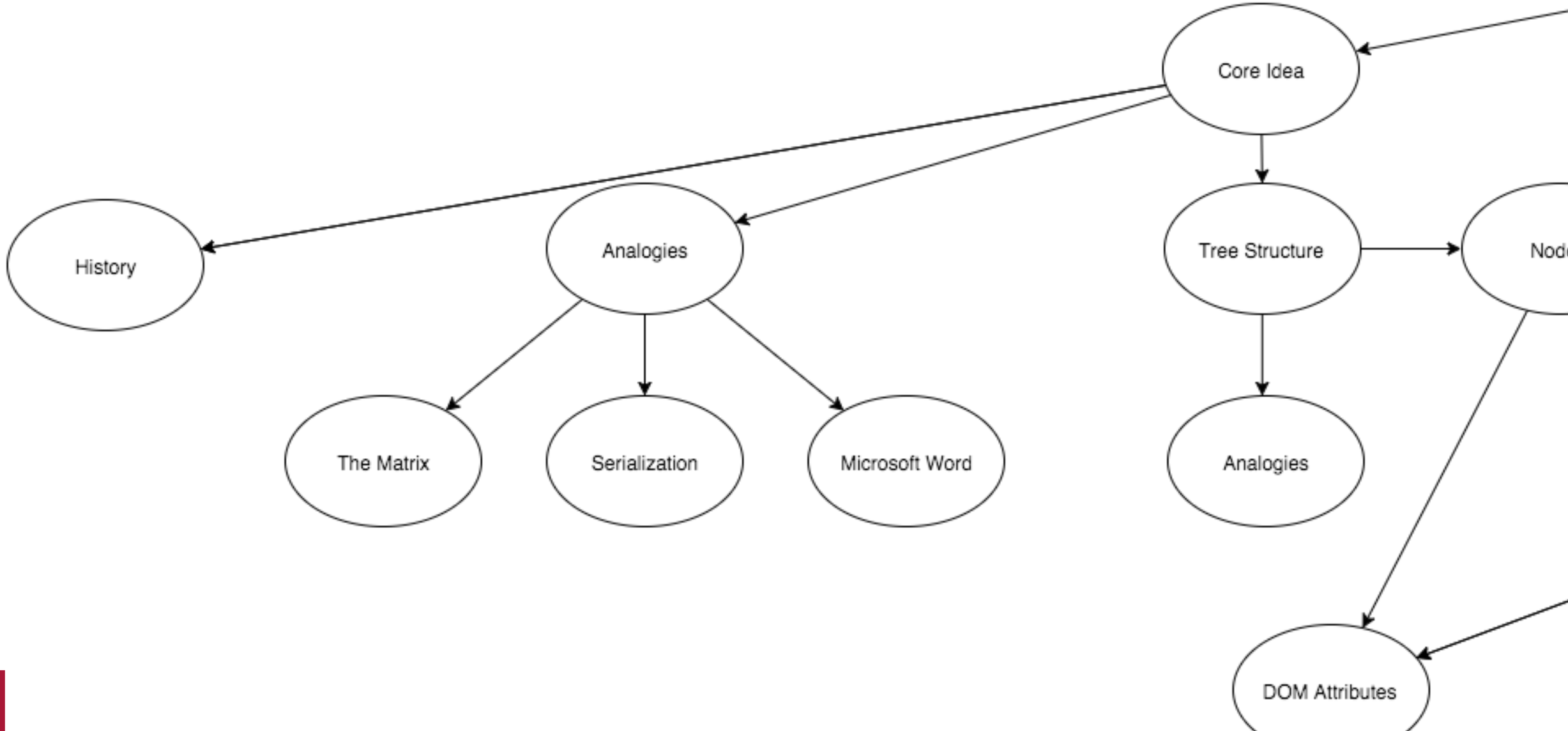
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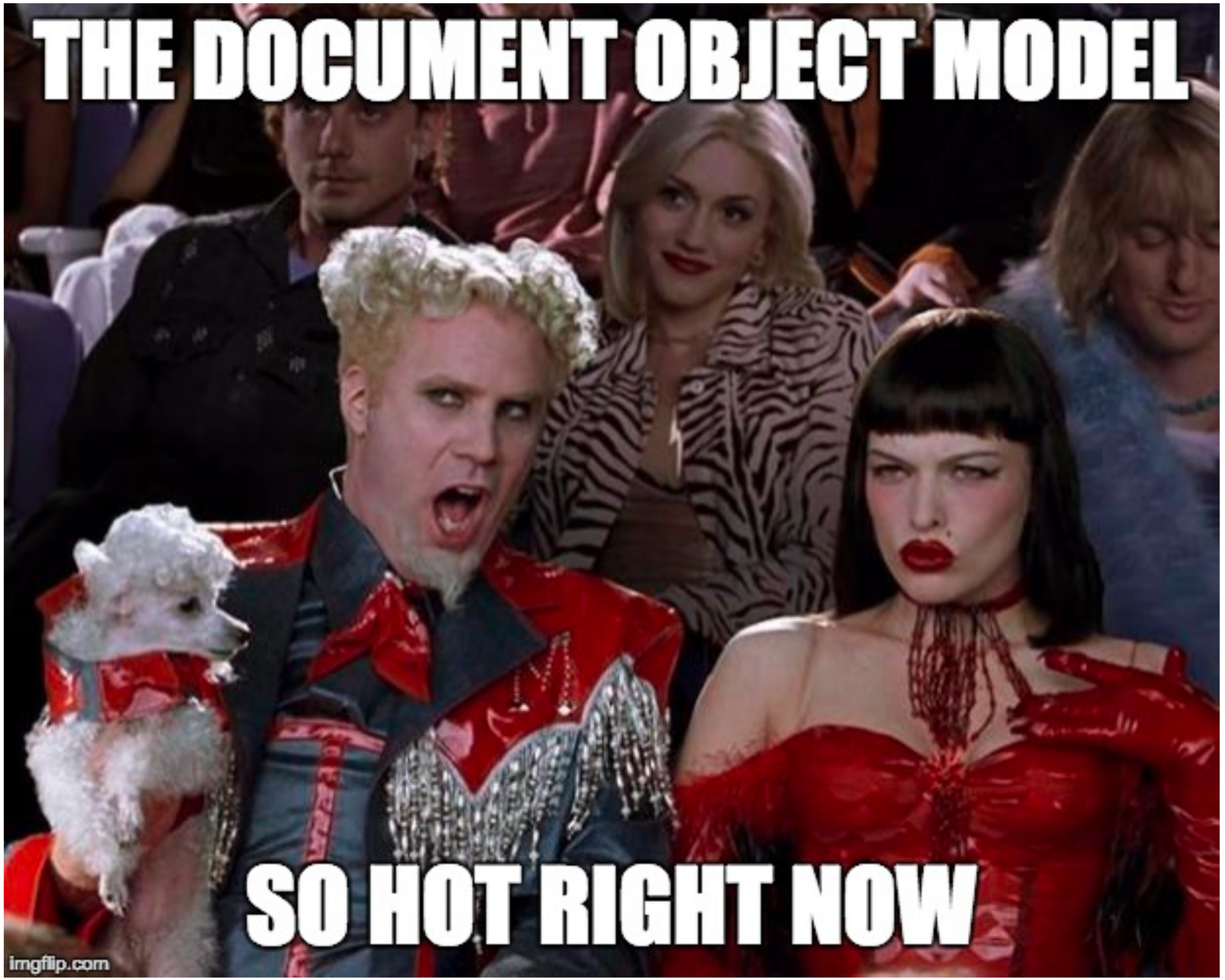
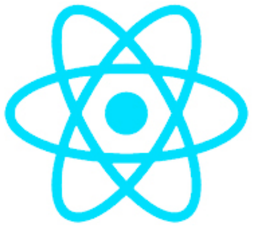
Why study the DOM?

- **The Document Object Model is:**
  - The most powerful publishing platform ever created
  - What allows web pages to render, respond to user events and change
  - Connects JavaScript to HTML


THE DOCUMENT OBJECT MODEL
SO HOT RIGHT NOW
imgflip.com

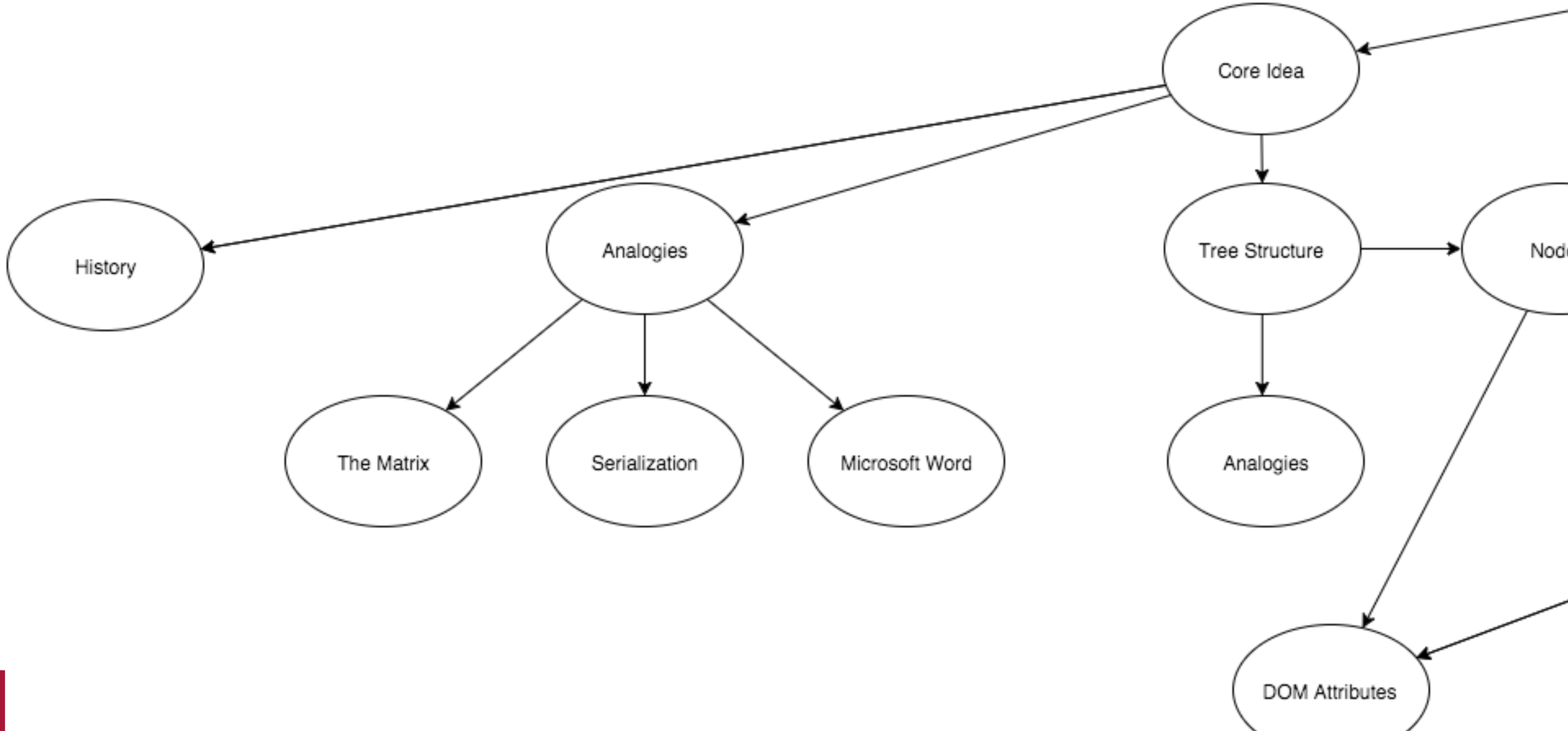
The DOM is Hot



React

polymer

WEB COMPONENTS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The History of the DOM

- The original World Wide Web was a simple idea: document retrieval through hyperlinks between documents
- No concepts of:
  - User Interactivity
  - Sessions
  - Presentation (no CSS!)

World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

What's out there?
Pointers to the world's online information, subjects , W3 servers, etc.
Help
on the browser you are using
Software Products
A list of W3 project components and their current state. (e.g. Line Mode ,X11 Viola , NeXTStep , Servers , Tools , Mail robot , Library)
Technical
Details of protocols, formats, program internals etc
Bibliography
Paper documentation on W3 and references.
People
A list of some people involved in the project.
History
A summary of the history of the project.
How can I help ?
If you would like to support the web..
Getting code
Getting the code by anonymous FTP , etc.

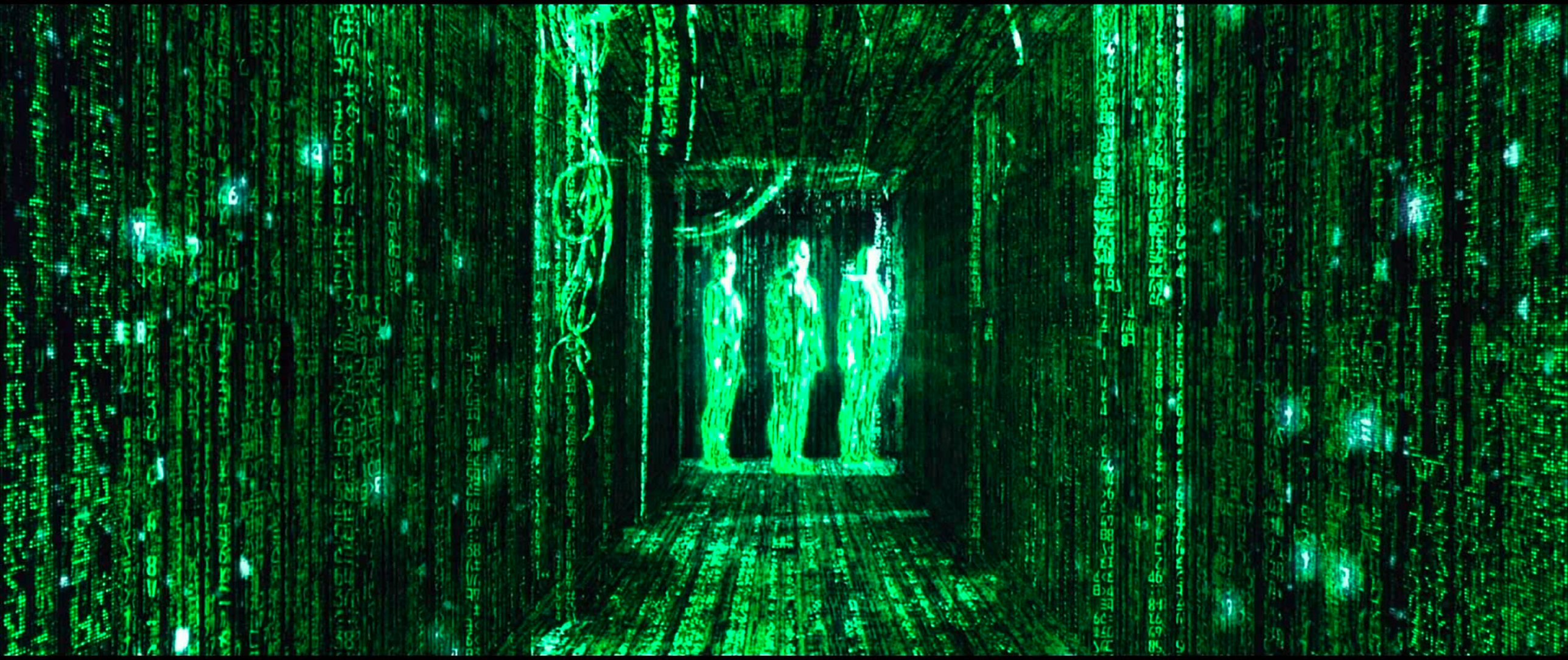
A technically correct definition of the DOM

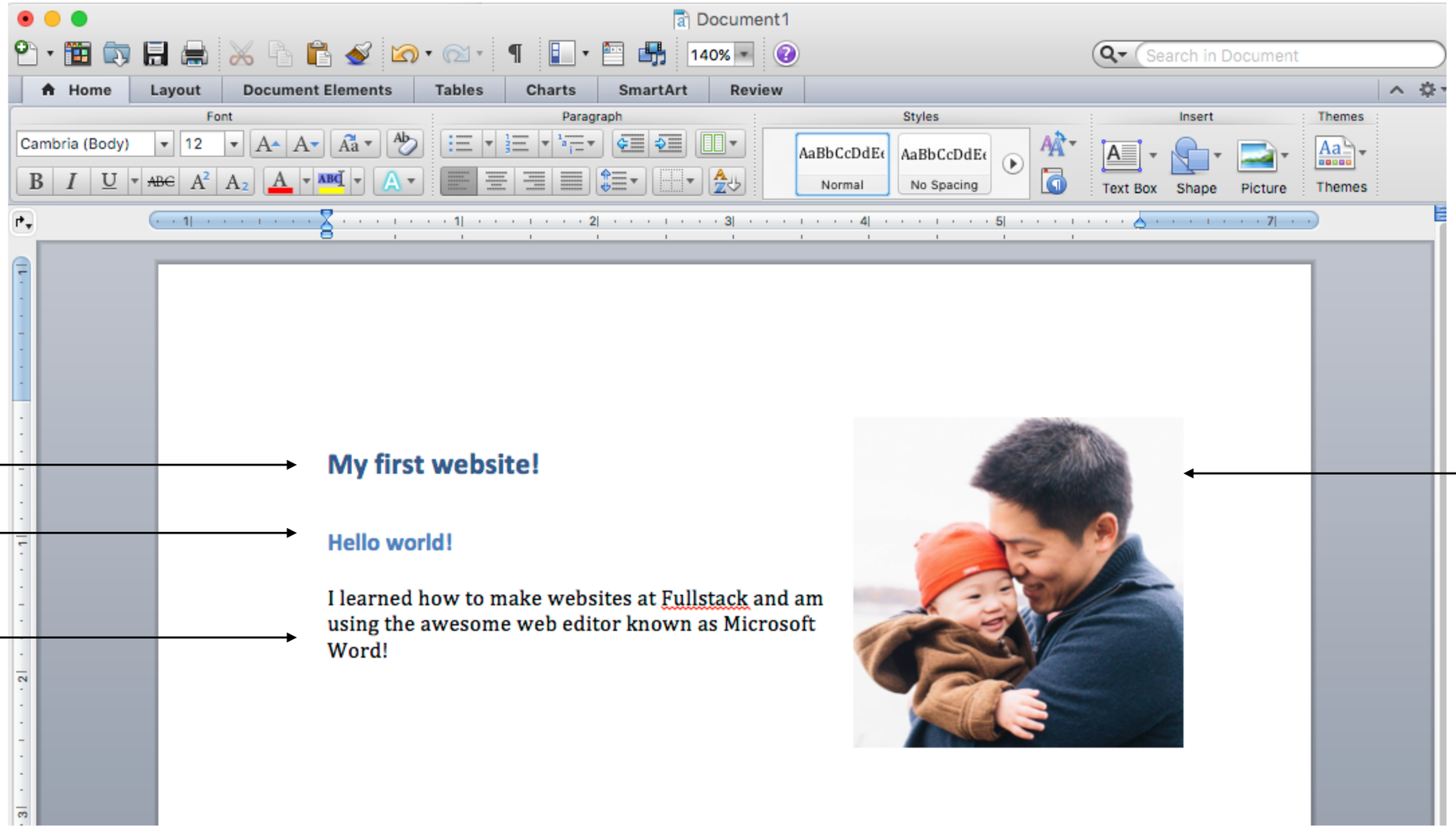
The Document Object Model (DOM) is a **cross-platform** and **language-independent** convention for representing and interacting with objects in **HTML, XHTML, and XML documents**.

The **nodes** of every **document** are organized in a **tree structure**, called the **DOM tree**. **Objects** in the DOM tree may be addressed and manipulated by using methods on the objects. The public interface of a DOM is specified in its application programming interface (API).

Analogies

- The Matrix
- Microsoft Word
- Serialization and JSON





<h1> → My first website!

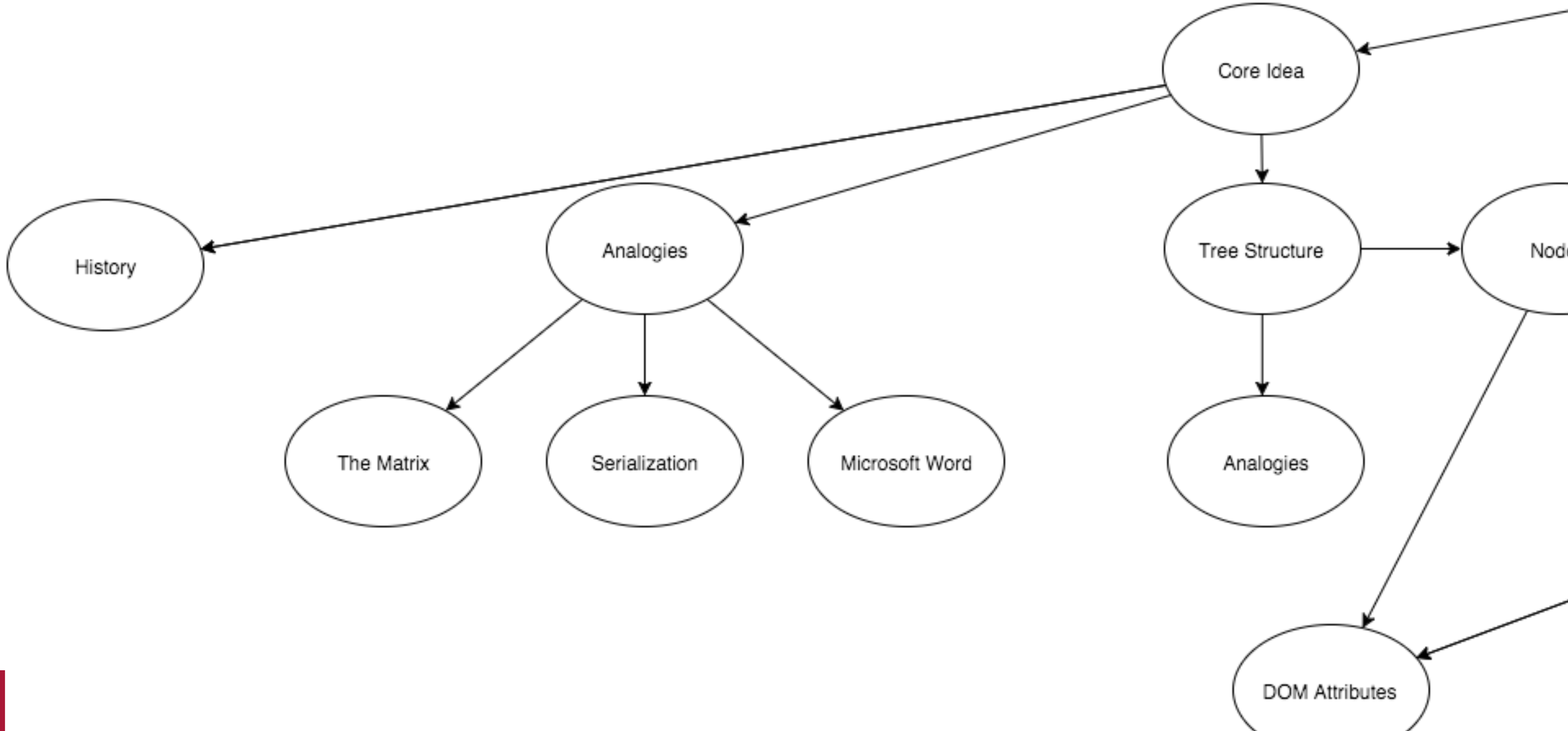
<h2> → Hello world!

<p> → I learned how to make websites at Fullstack and am using the awesome web editor known as Microsoft Word!

 ← <img>

Serialization

- In programming we often have a "thing" and a way to represent that "thing"
- We refer to that representation as the Serialization
- Human Example: Thoughts into words
- HTML: the serialized version of the DOM
- The DOM is the "deserialized" version of HTML
- Deserialization: Reading a book and visualizing the ideas in your mind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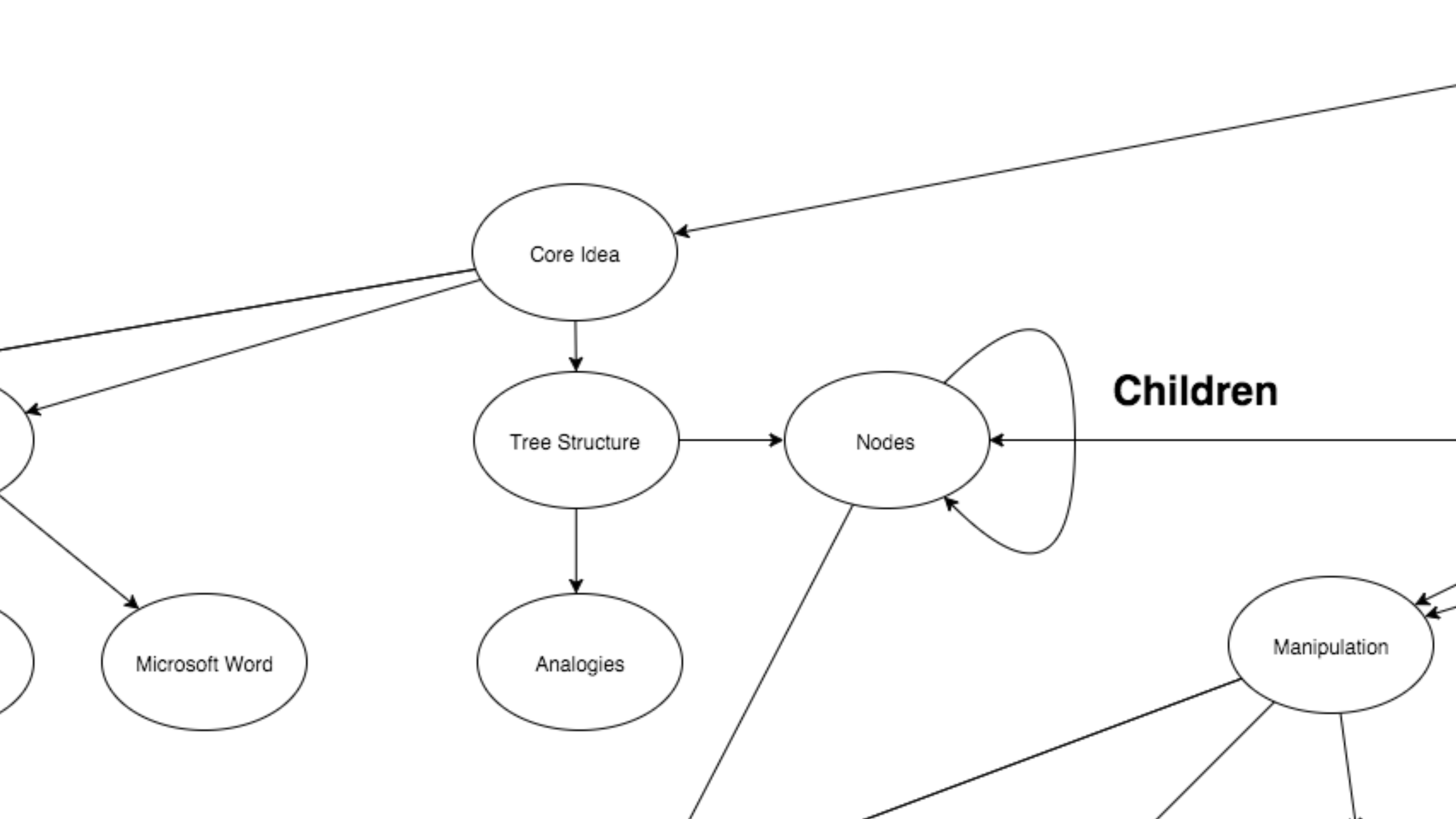
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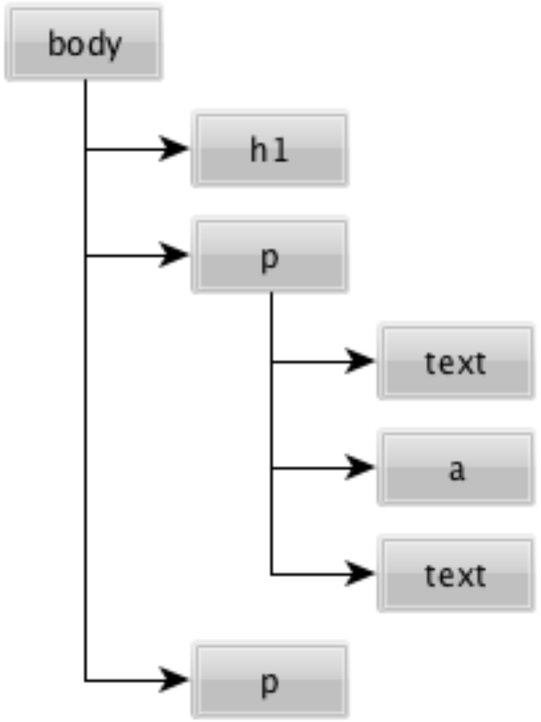
Manipulation

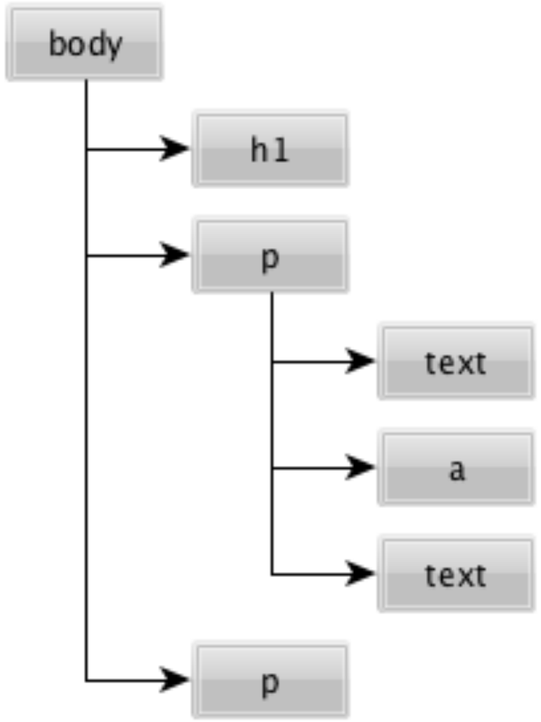
The DOM is a Tree

- Trees are a data structure from computer science
- The main idea here: There is a Node that branches into other Nodes (its children Nodes)
  - Each Node can have 0 to many children Nodes
  - Nodes can have 0 or 1 parent
  - Nodes can have 0 to many Sibling Nodes



The DOM is a Tree

```
<body>

  <h1>Hello</h1>

  <p>

    Check out my

    <a href="/page">Page!</a>

    It's the best page out there
  </p>



  <p>Come back soon!</p>
</body>
```

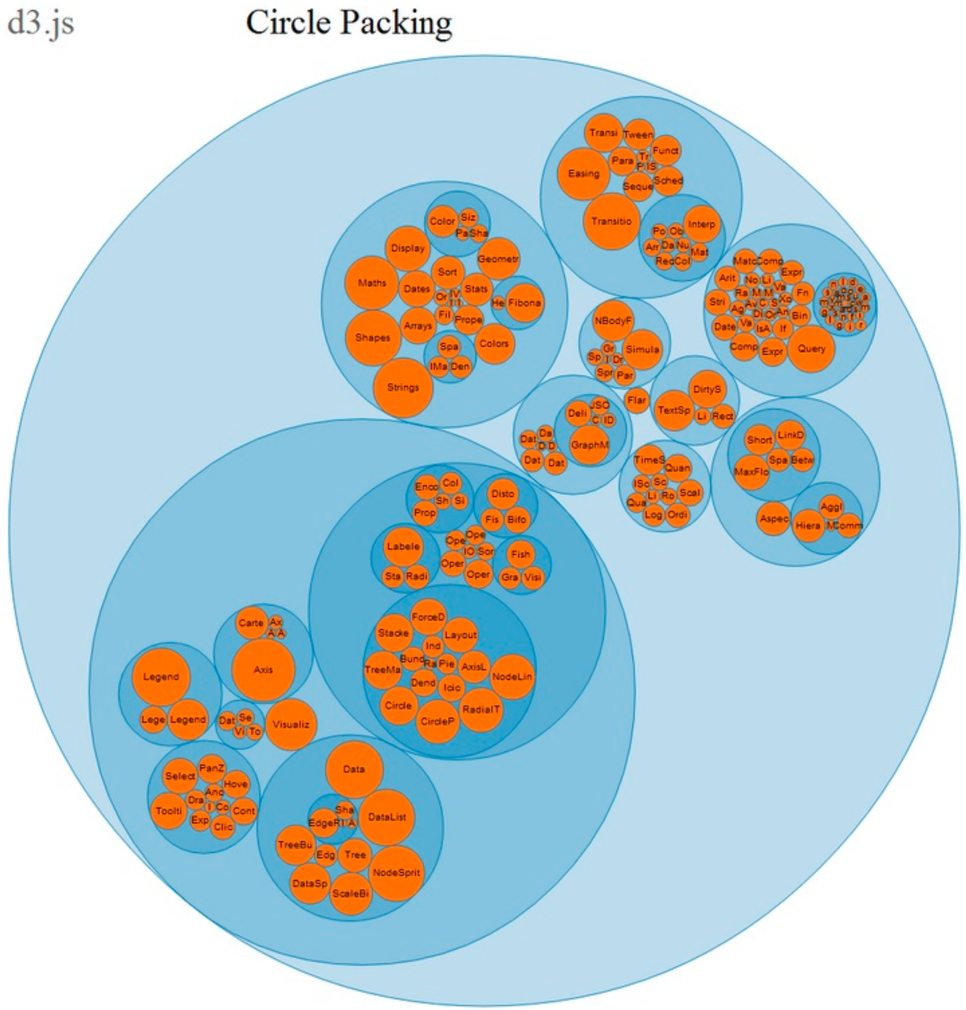


Indentation Is Important!

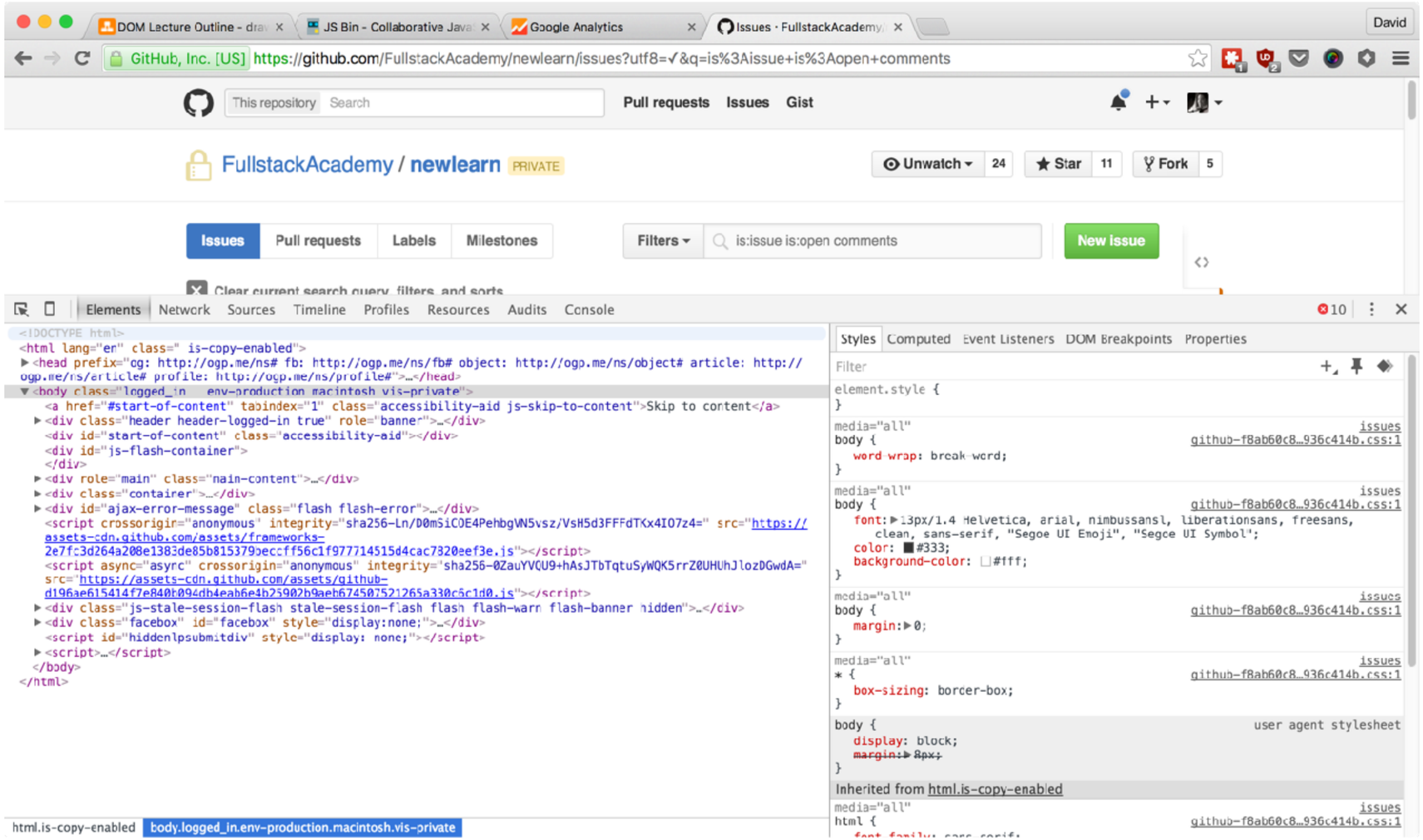
- No indentation makes it hard to see the tree structure:

```
<body>
<h1>Hello</h1>
<p>
Check out my
<a href="/page">Page!</a>
It's the best page out there
</p>
<p>Come back soon!</p>
</body>
```

Circle Packing

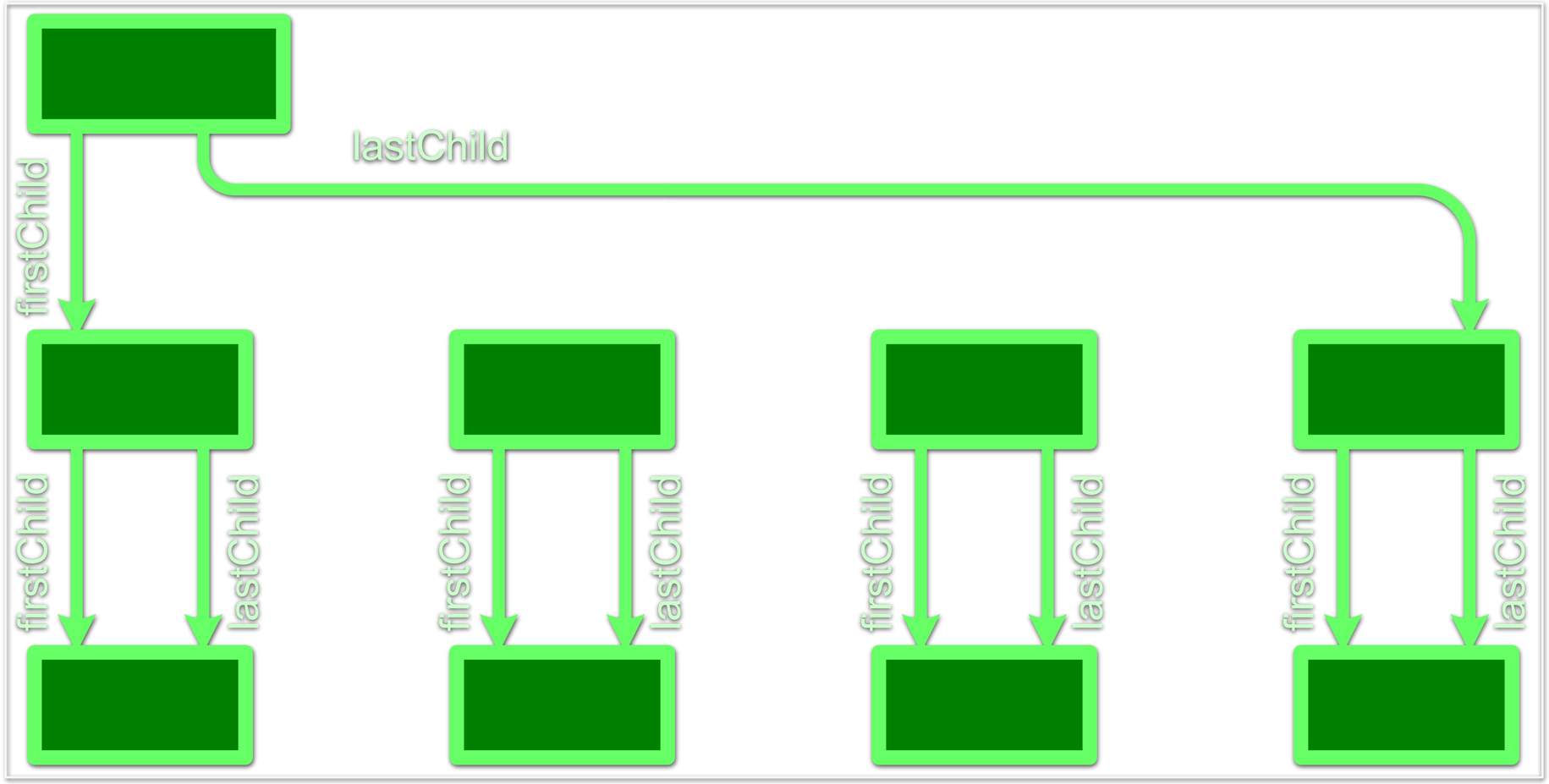


Chrome Developer Tools



Tree Structures are easy to navigate

- At any point in the DOM you are at a Node
- No matter where you go, you're still at a Node
  - Child
  - Parent
  - Sibling
  - All return Nodes
- All Nodes share similar DOM navigation methods


lastChild
firstChild
firstChild
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firstChild
lastChild
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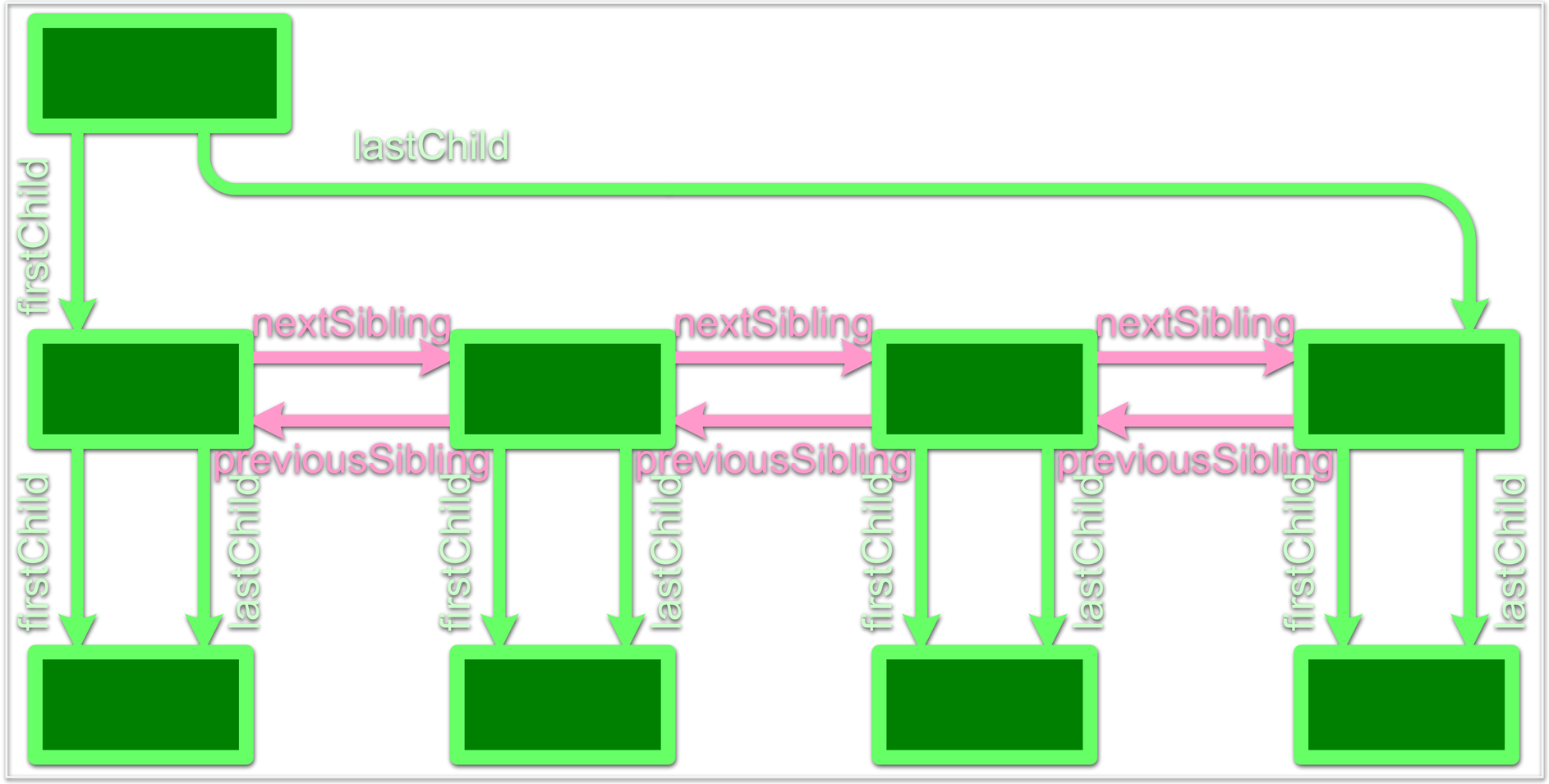
lastChild
firstChild
lastChild


lastChild
firstChild
nextSibling
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nextSibling
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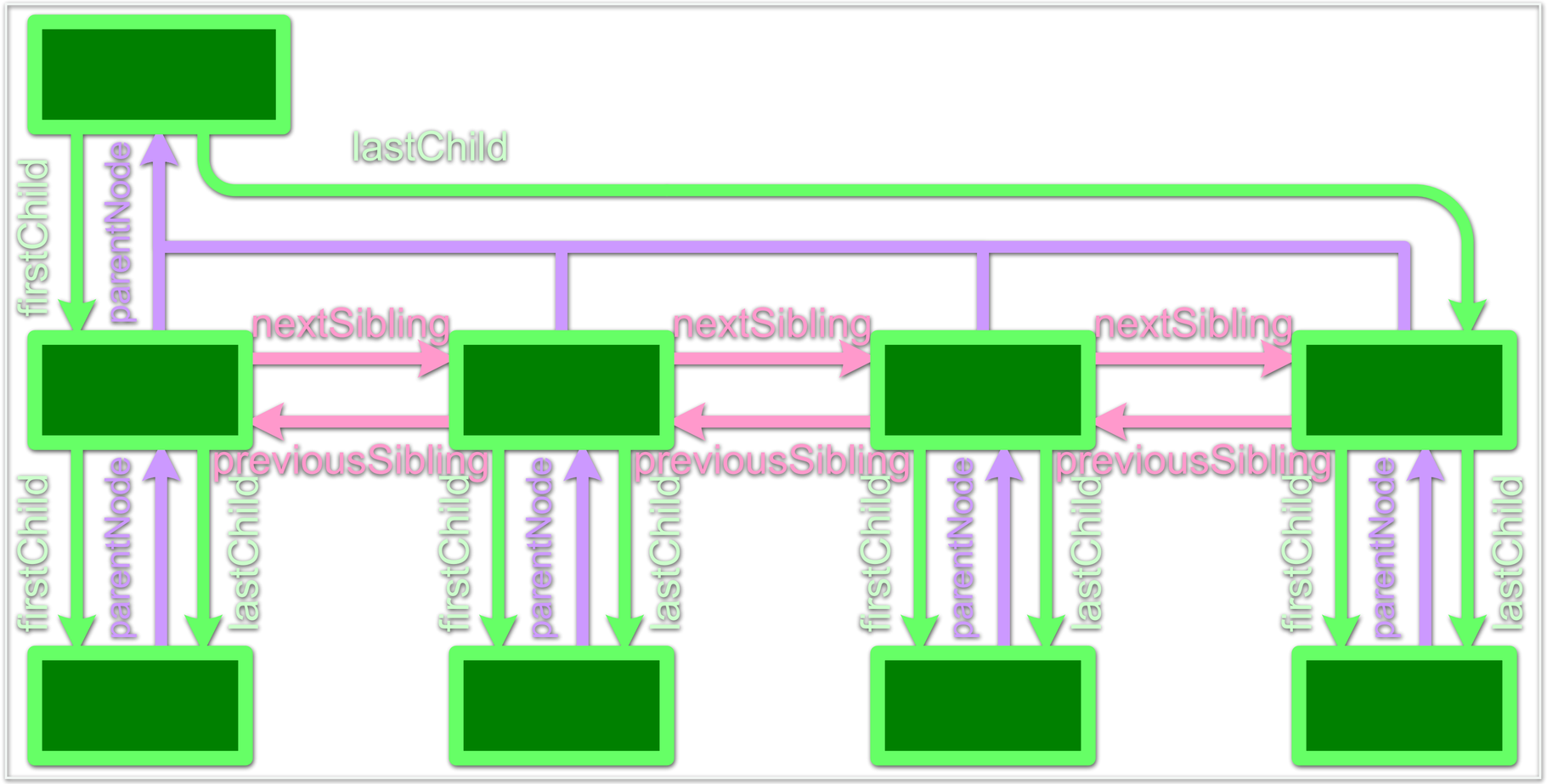
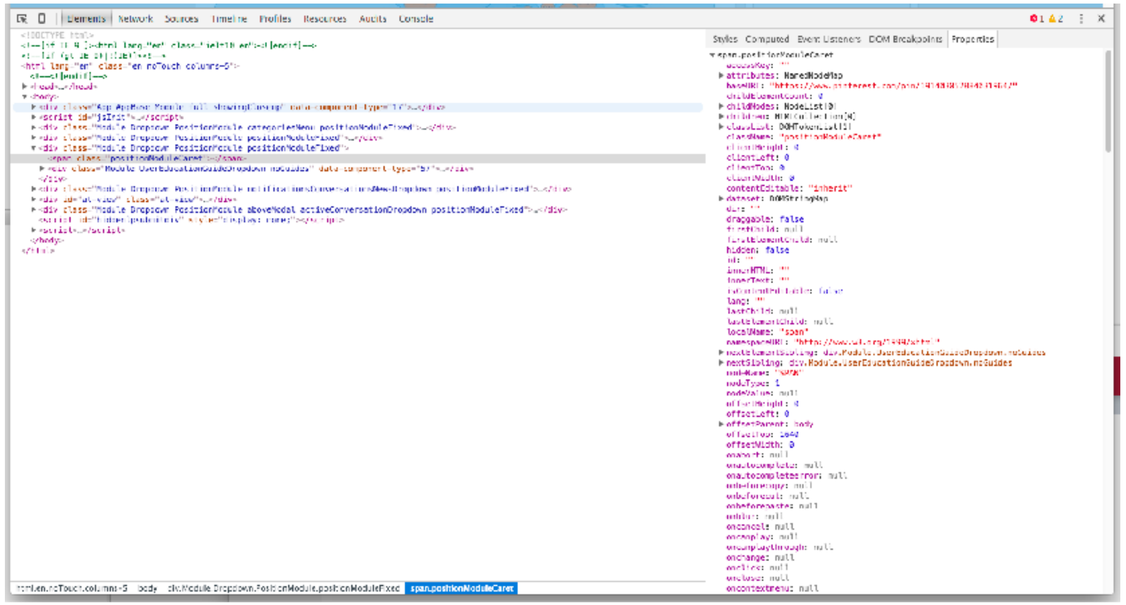
lastChild
firstChild
lastChild


lastChild
firstChild
parentNode
nextSibling
nextSibling
nextSibling
previousSibling
previousSibling
previousSibling
firstChild
parentNode
lastChild
firstChild
parentNode
lastChild
firstChild
parentNode
lastChild
firstChild
parentNode
lastChild

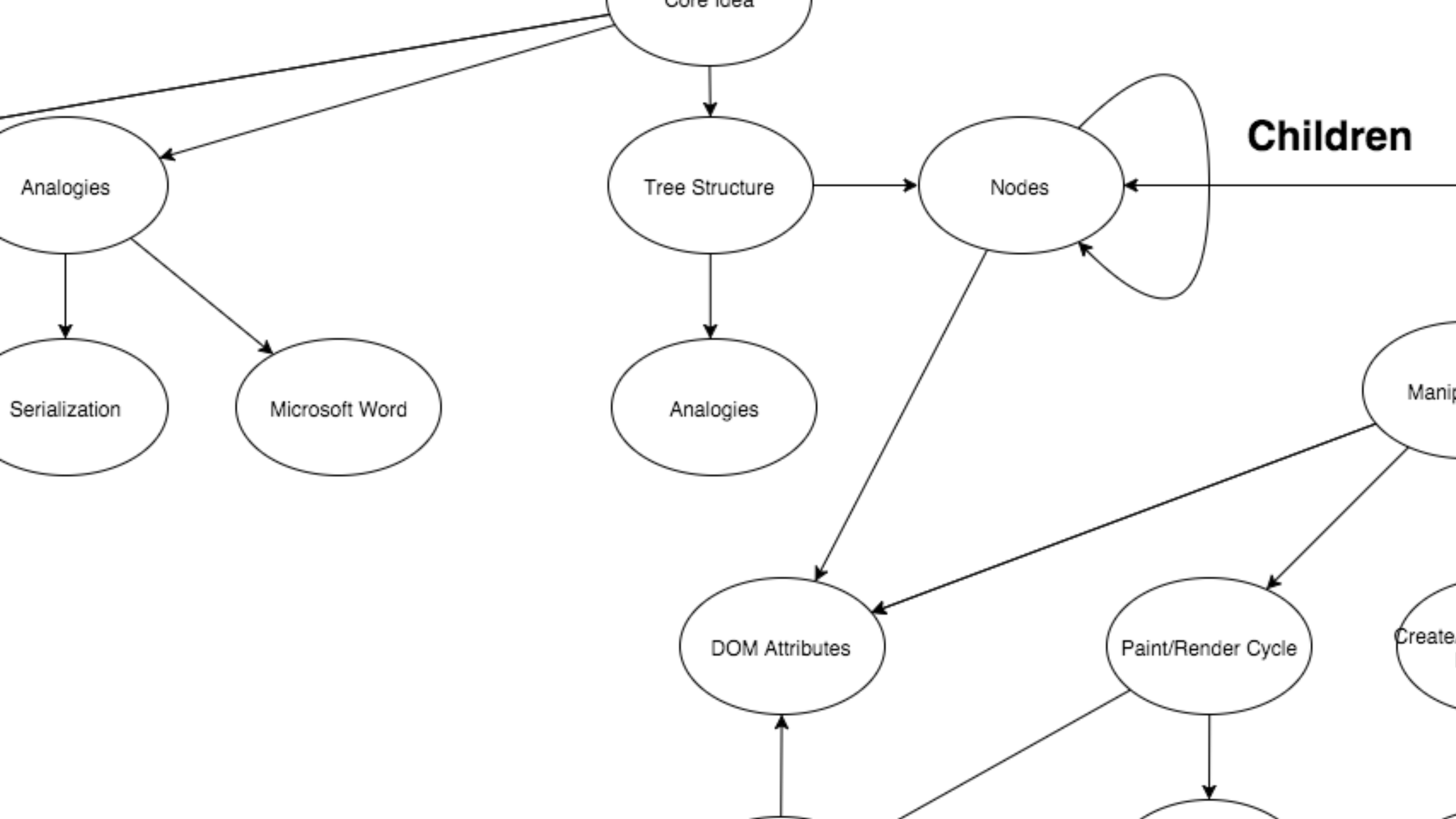
Nodes have lots of Attributes

- Nodes are JavaScript Objects
- Nodes have Attributes that are JavaScript properties
- Attributes define how the Node looks and responds to User activity



one node

hundreds of properties!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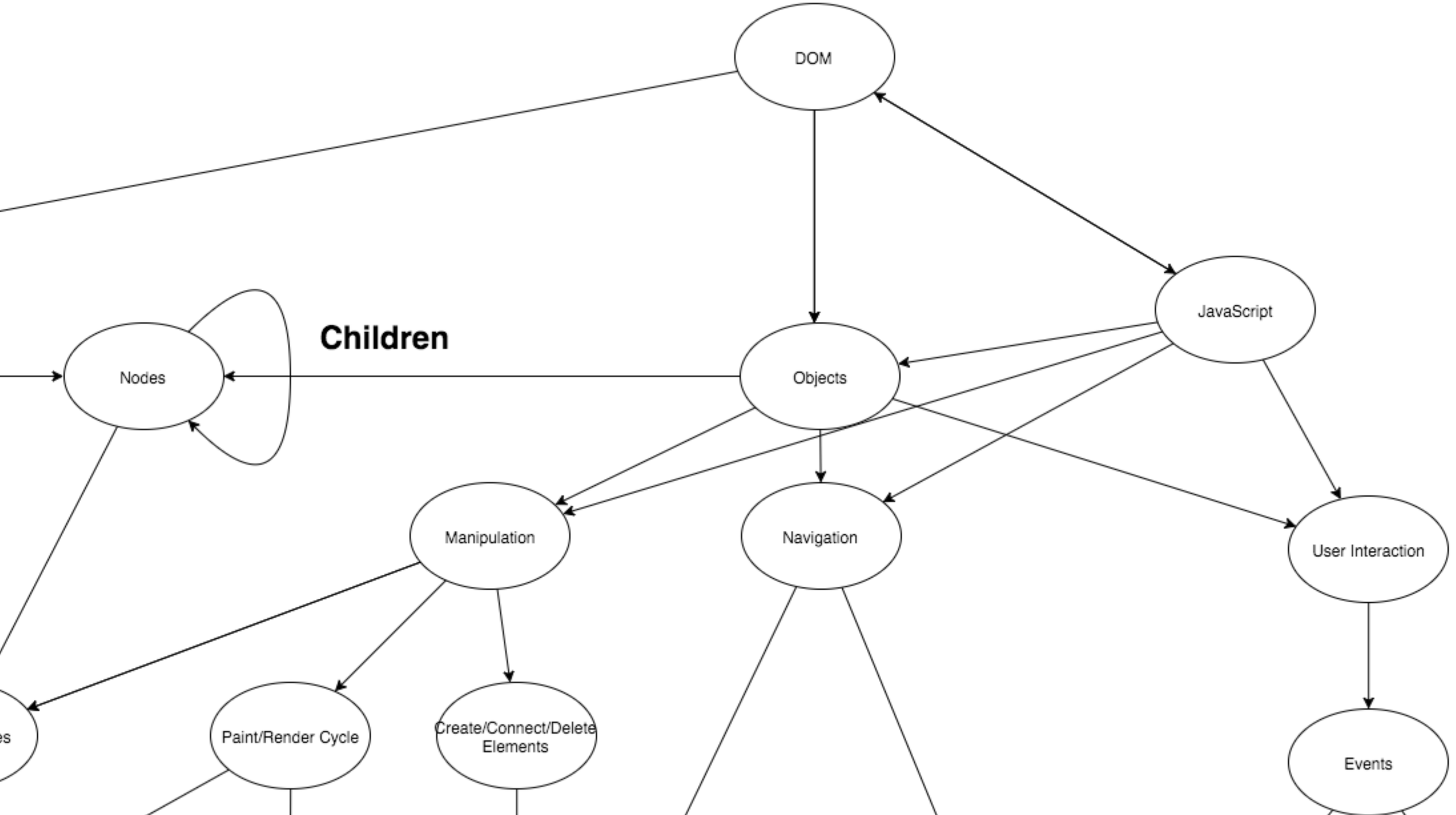
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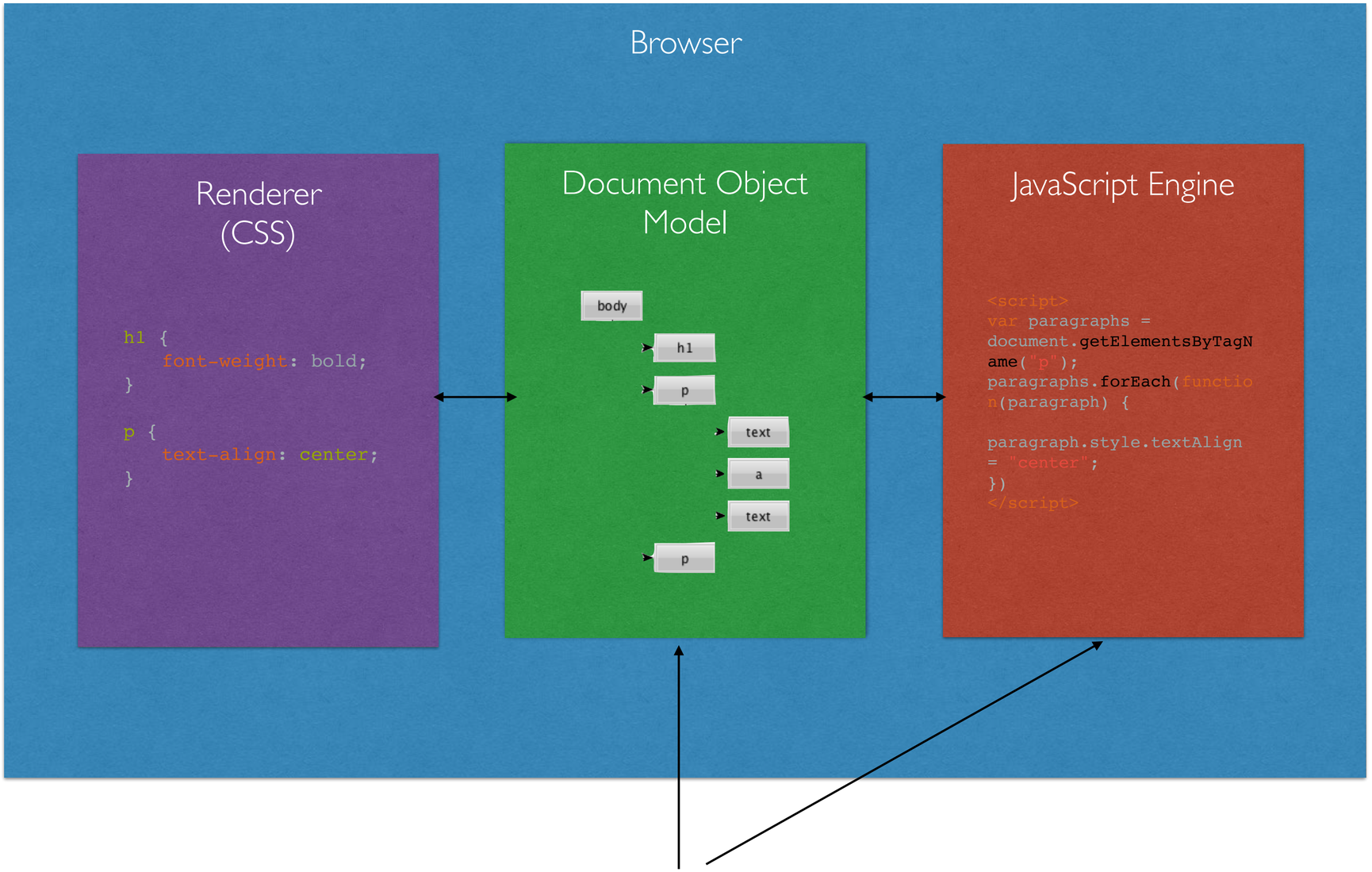
Create/Connect/Delete Elements
Events

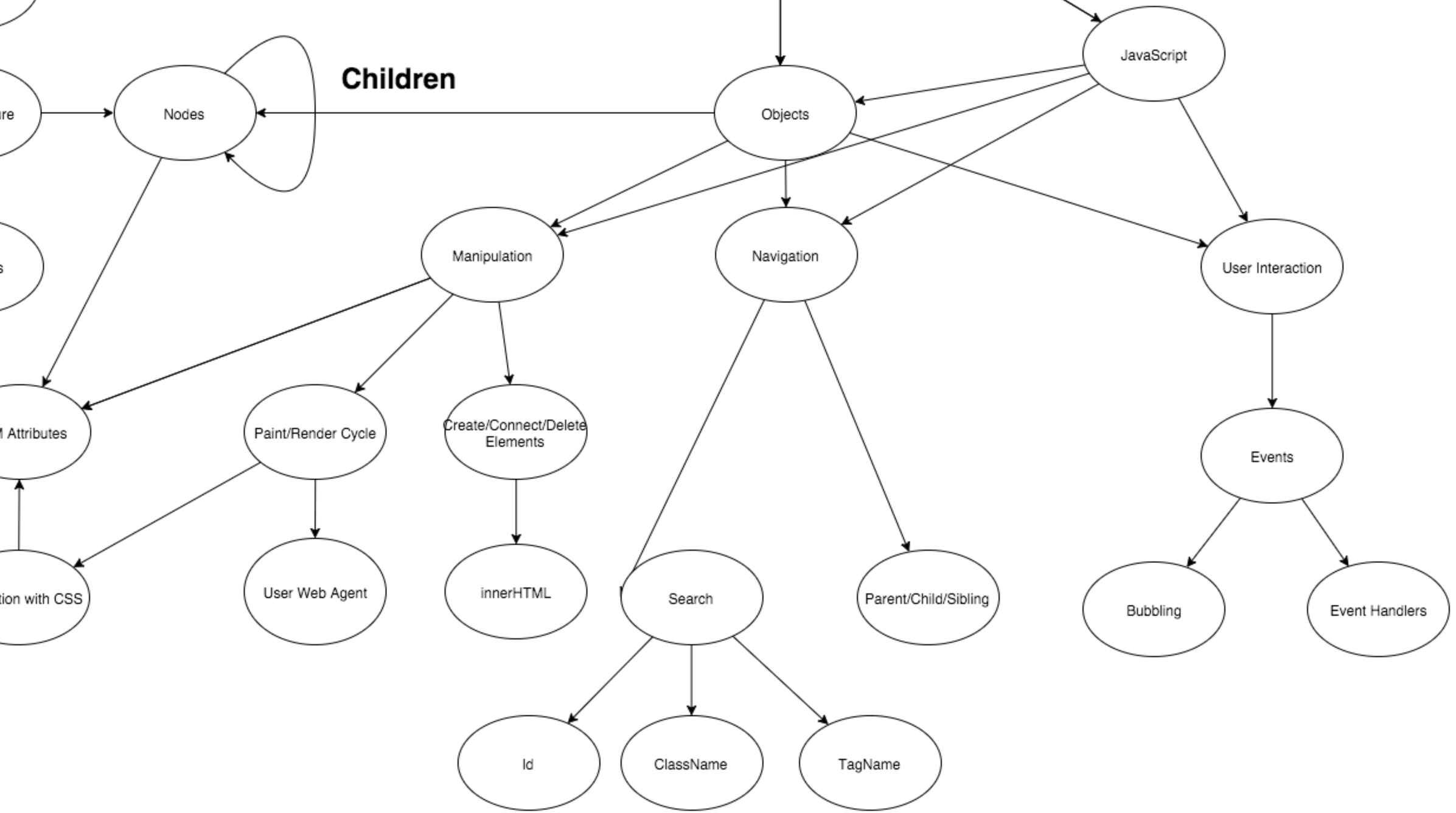
JavaScript 💚 DOM

- **We have this Object Model of an HTML document, how do we manipulate it?**
  - <script> elements!
  - We can put <script> elements of JavaScript into our DOM that can interact with the DOM
- **How do you reference the DOM inside JavaScript?**
  - The *document* object

The *document* Object

- Global reference to the HTML document
- Provides methods for:
  - Navigating the DOM
  - Manipulating the DOM
- The *document* object is the important connection between the DOM and JavaScript code


Browser
Renderer
(CSS)
h1 {
font-weight: bold;
}
p {
text-align: center;
}
Document Object
Model
body
h1
p
text
a
text
p
JavaScript Engine
<script>
var paragraphs =
document.getElementsByTagN
ame("p");
paragraphs.forEach(functio
n(paragraph) {
paragraph.style.textAlign
= "center";
})
</script>
the document object is what connects these two things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Navigating the DOM

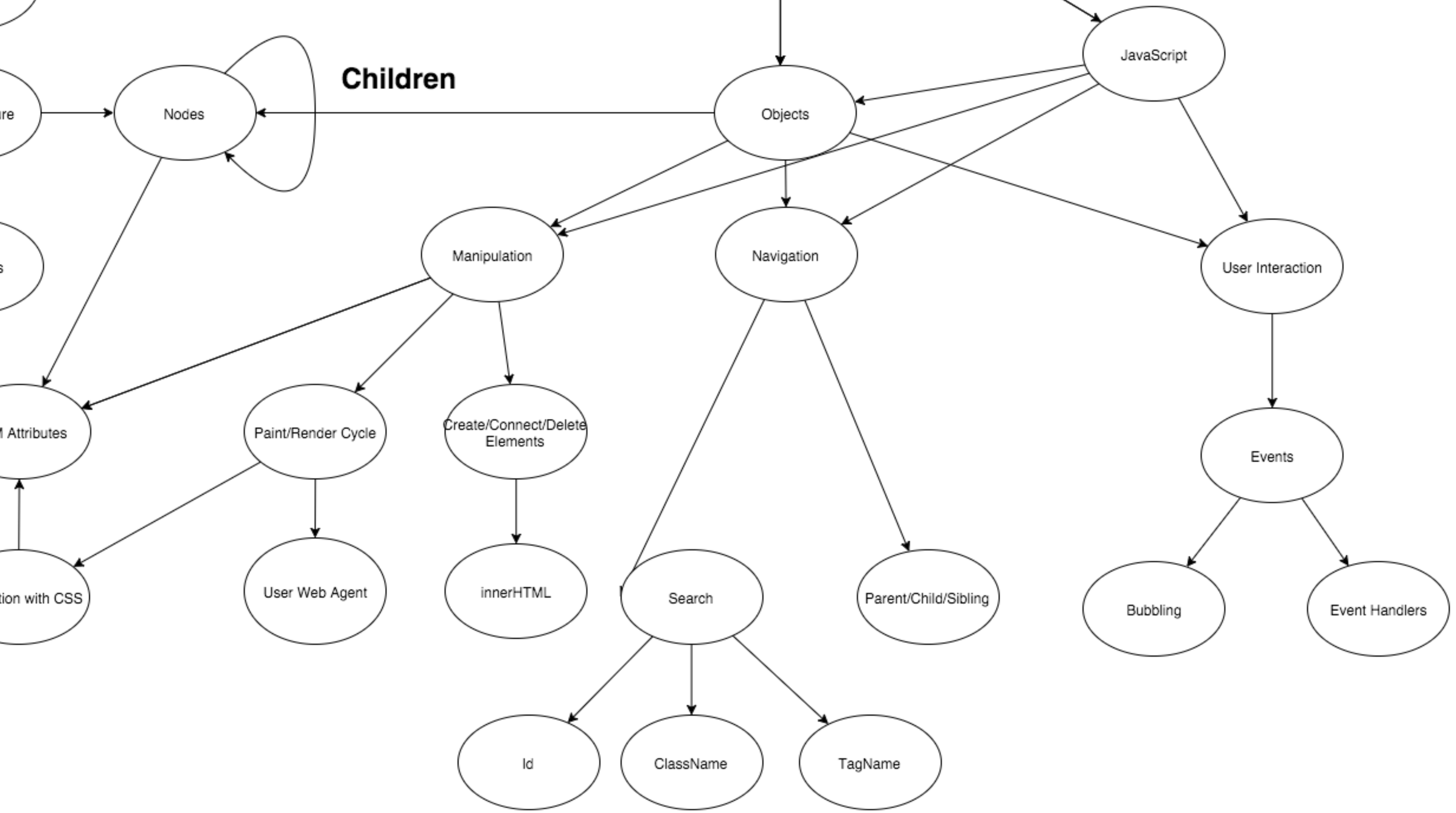
- https://jsbin.com/jijuweh/edit?html,js,output

Navigating the DOM

- **Searching the DOM**
  - getElementById (find nodes with a certain ID attribute)
    - `document.getElementById("will");`
  - getElementsByClassName (find nodes with a certain CLASS ATTRIBUTE)
    - `document.getElementsByClassName("will");`
  - getElementsByTagName (find nodes with a certain HTML tag)
    - `document.getElementsByTagName("div");`
  - querySelector, querySelectorAll (search using CSS selectors)
    - `document.querySelectorAll("#will");`

Traversing the DOM

- Access children
  - `element.children, element.lastChild, element.firstChild`
- Access siblings
  - `element.nextElementSibling, element.previousElementSibling`
- Access parent
  - `element.parentElement`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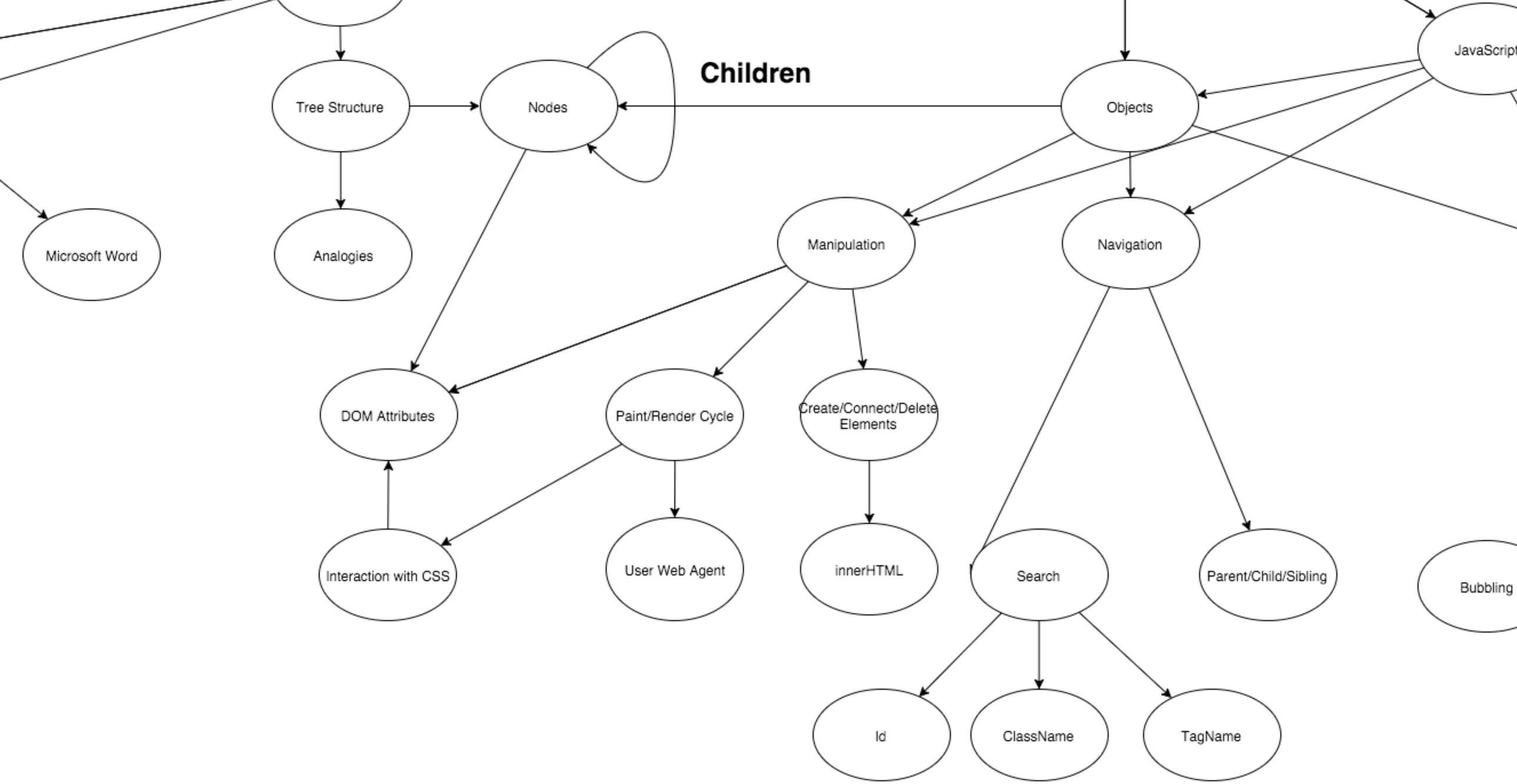
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Manipulating the DOM

- Changing Attributes for Style
- Making Elements
- Putting them into the DOM
- Remove Elements
- innerHTML and the DOM HTML Reader

Changing style attributes

```
element.style.backgroundColor = “blue”;
```

- **CSS**
  - background-color
  - border-radius
  - font-size
  - list-style-type
  - word-spacing
  - z-index
- **JavaScript**
  - backgroundColor
  - borderRadius
  - fontSize
  - listStyleType
  - wordSpacing
  - zIndex

Changing CSS Classes

- *classList* is HTML5 way to modify which classes are on a Node

```
document.getElementById("MyElement").classList.add('class');

document.getElementById("MyElement").classList.remove('class');

if ( document.getElementById("MyElement").classList.contains('class') )

document.getElementById("MyElement").classList.toggle('class');
```

Creating Elements

- Create an element
  - `document.createElement(tagName)`
- Duplicate an existing node
  - `node.cloneNode()`

- Nodes are just free floating, not connected to the document itself, until you *link* them to the DOM.

Adding elements to the DOM

- Insert newNode at end of current node
  - `node.appendChild(newNode);`
- Insert newNode at end of current node
  - `node.prependChild(newNode);`
- Insert newNode before a certain childNode
  - `node.insertBefore(newNode, sibling);`

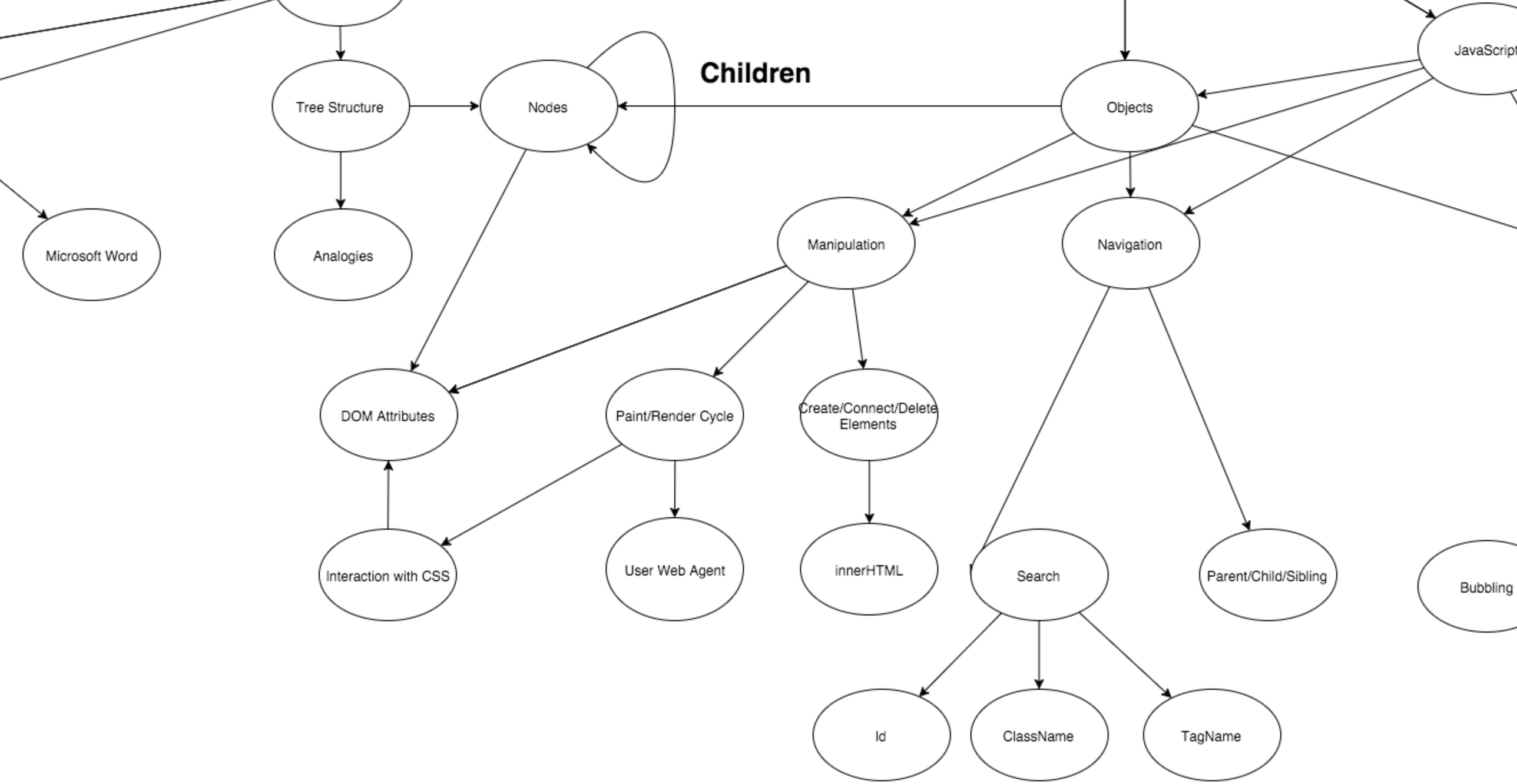
Removing Elements

- **Removes the oldNode child.**
  - `node.removeChild(oldNode);`

- **Quick hack:**
  - oldNode.parentNode.removeChild(oldNode);

Using innerHTML

- What if you have a string of HTML and want to use the browser's HTML renderer instead of creating all the nodes by hand?
- You can use innerHTML
  - `element.innerHTML = '<ul><li>First</li><li>Second</li></ul>';`
- Reads a string of HTML and replaces the children of current Node with the parsed HTML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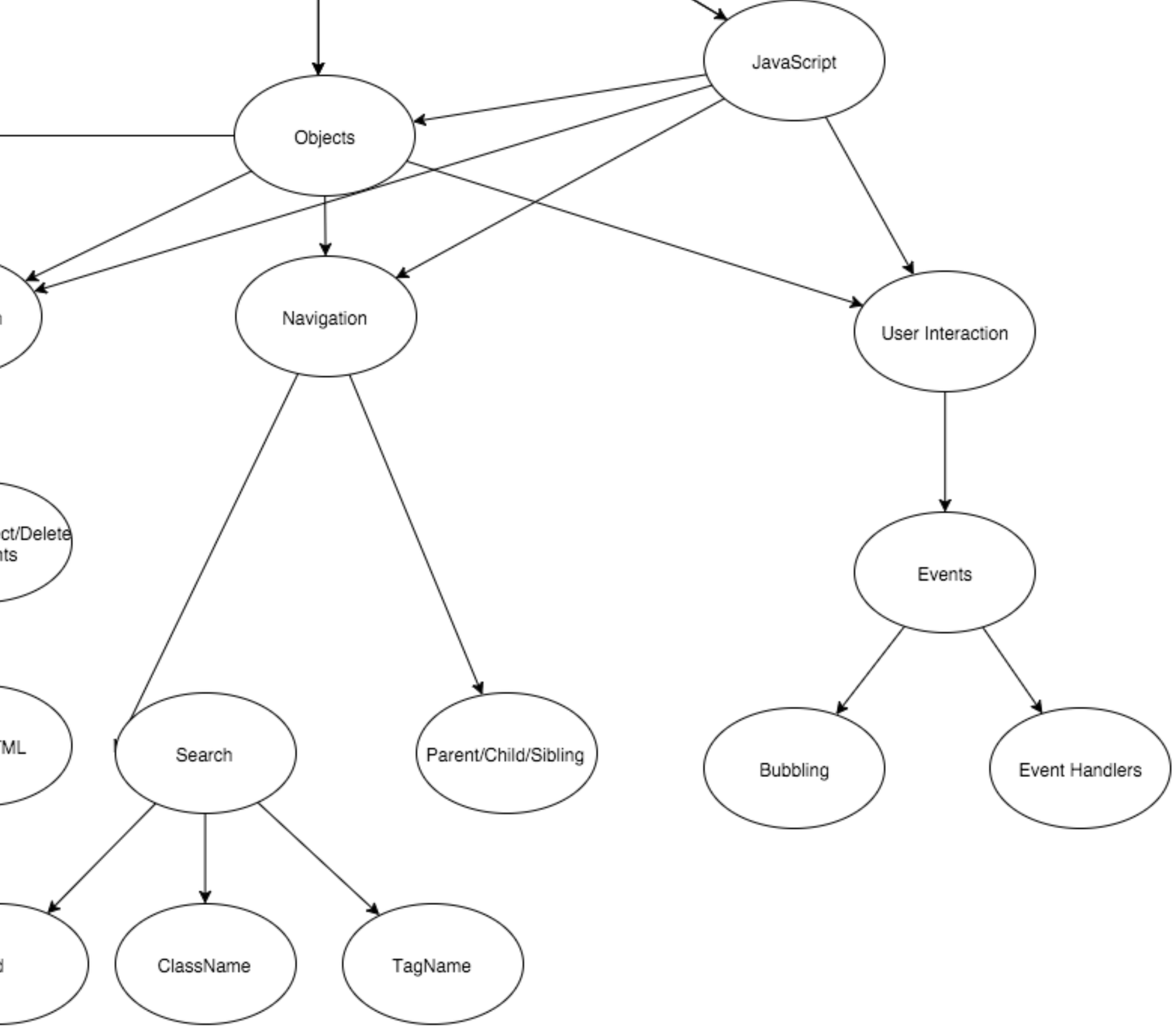
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Responding to User Activity

- Event Handlers
- Default Events
- Bubbling and Propagation of Events

https://jsbin.com/sarohuyivu/1/edit?html,js,output

Event Handlers

```
element.addEventListener('click', function(event) {
    // Run this code on click
});
```

- JS that handles things that happen in the DOM
- Event examples:
  - click
  - (form) submit
  - hover
  - mouseover

Preventing Default Events

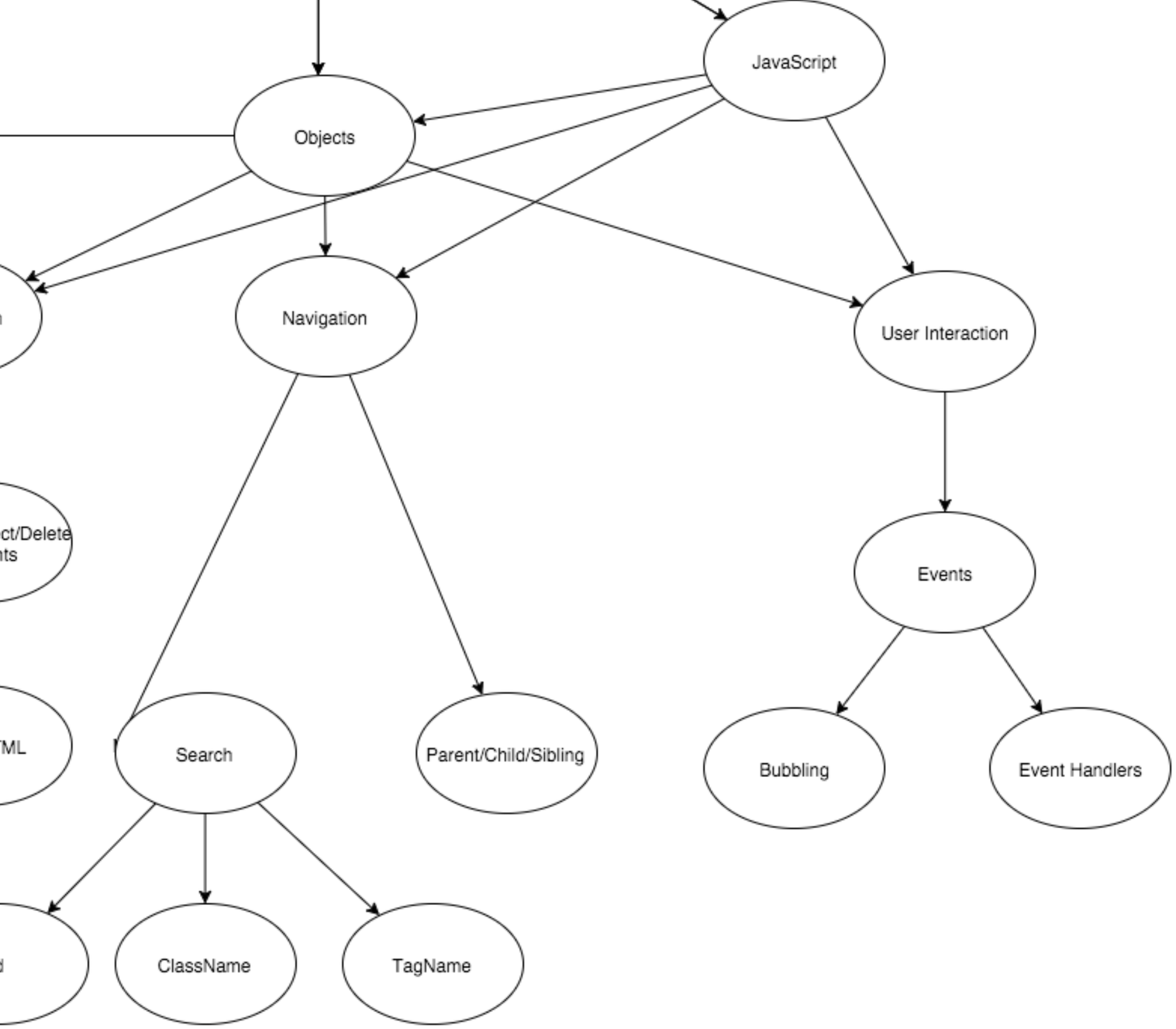
- **Just like the DOM has default styling, it also has default events**
  - Forms submit to the server
  - Clicks take you to new URLs
- **You can prevent these default events from occurring:**

```
element.addEventListener('click', function(event) {
    event.preventDefault();
    // the rest of your code
});
```

Preventing Event Bubbling

- Events also fire at all the parent nodes of an element
- Why?
  - Performance: Don't have to create 100 event listeners, just create one at the parent Node
- To prevent events from “bubbling” up:

```
element.addEventListener('click', function(event) {
    event.stopPropagation();
    // the rest of your code
});
```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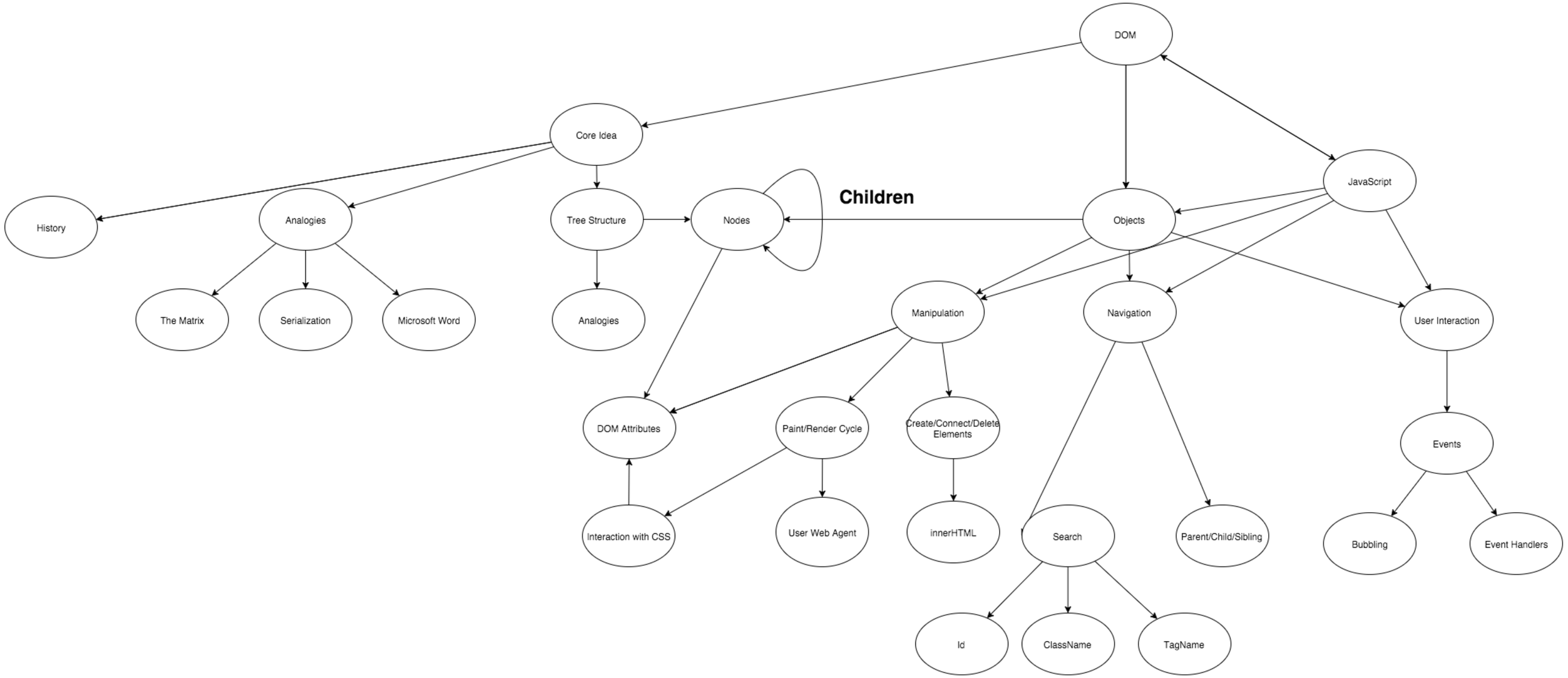
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