More on JavaScript

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JavaScript Frameworks

What is a framework?

- A framework is an application structure written in JavaScript. It describes "how you should present your code".

e.g. Angular-s Angular.js->Angular2->Angular4,

How it differs from a JavaScript library?

- A library has predefined functions to be called by its parent code whereas a framework defines the entire application design.

e.g. jquery, ReactJS

They are devised because JavaScript functions are too many and too hard to remember.

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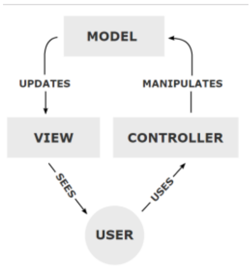
Frameworks *mostly* are based on MVC paradigm

- View- how the user interacts.
- Model- stores the data that is used by your application in SQLite database, HTML5 local storage…
- Controller- has an Application Programming interface to modify the underlying data.



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Documents, Events and Interfaces

- DOM Specifications
  - Describes the document structure, manipulates and events.
- CSSOM Specifications
  - Describes the stylesheets, style rules, manipulations with them.
- HTML Specifications
  - Describes HTML language and also BOM.

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Events

- An event is a signal that something has happened.
- All DOM nodes generate such signals (but events are not limited to DOM).

Mouse events:

- **click** – when a mouse clicks on an element (tap for touchscreen devices).
- **contextmenu** – when the mouse right-clicks on an element.
- **mouseover / mouseout** – when the mouse cursor comes over / leaves an element.
- **mousedown / mouseup** – when the mouse button is pressed / released over an element.
- **mousemove** – when the mouse is moved.

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Events

Form element events:

- submit – when the visitor submits a <form>.
- focus – when the visitor focuses on an element, e.g. on an <input>.

Keyboard events:

- keydown and keyup – when the visitor presses and then releases the button.

Document events

- DOMContentLoaded – when the HTML is loaded and processed, DOM is fully built.

CSS events:

- transitionend – when a CSS-animation finishes.

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Event Handlers

- To react to an event, we assign an event handler.

An event handler is a function that is run in case of an event.

How to assign a handler?

One of the simplest- on attributes

A handler can be set in HTML with an attribute named on<event>

For instance, to assign a click handler for an input, we can use onclick:

```
<input value="Click me" onclick="alert('Click!')" type="button">
```

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Writing Functions to be called on events

- An HTML-attribute is not a right place to write a lot of code, so we'd better create a JavaScript function and call it there.
- Here a click runs the function countPeople():

```
<script>
  function countPeople() {
    for(let i=1; i<=3; i++) {
      alert(“People number " + i);
    }
  }
</script>
<input type="button" onclick="countPeople()" value="Count People!">
```

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document.getElementById

```
<section id="elem">

  <article id="elem-content">Element</article>

</article>

</section>

<script>

        alert(elem);

       alert(window.elem);

        alert(window['elem-content']);

</script>
```

Better approach is to use: getElementById

```
<section id="elem">

  <article id="elem-
content">Element</article>

</section>

<script>

        alert(getElementById(elem));

</script>
```

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Other methods to look for nodes:

- getElementsByTagName(tag)

```
<table id="table">
  <tr>
    <td>Your age:</td>
    <td>
      <label>
        <input type="radio" name="age" value="young" checked> less than 18
      </label>
      <label>
        <input type="radio" name="age" value="mature"> from 18 to 50
      </label>
      <label>
        <input type="radio" name="age" value="senior"> more than 60
      </label>
    </td>
  </tr>
</table>
<script>
        let inputs = table.getElementsByTagName('input');
        for (let input of inputs) {
                alert( input.value + ': ' + input.checked );
        }
</script>
```

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getElementsByTagName

- It returns a collection, not an element!
- // doesn't work

document.getElementsByTagName('input').value = 5;

- That won’t work, because it takes a collection of inputs and assigns the value to it, rather to elements inside it.
- We should either iterate over the collection or get an element by the number, and then assign, like this:
- // should work (if there's an input)

document.getElementsByTagName('input')[0].value = 5;

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document.getElementsByName and getElementsByClassName

- <form name="my-form">
-   <div class="article">Article</div>
-   <div class="long article">Long article</div>
- </form>

- <script>
-   // find by name attribute
-   let form = document.getElementsByName('my-form')[0];

-   // find by class inside the form
-   let articles = form.getElementsByClassName('article');
-   alert(articles.length); // 2, found two elements with class "article"
- </script>

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querySelectorAll

- The call to elem.querySelectorAll(css) returns all elements inside elem matching the given CSS selector.

```
<ul>
  <li>The</li>
  <li>test</li>
</ul>
<ul>
  <li>has</li>
  <li>passed</li>
</ul>
<script>
  let elements = document.querySelectorAll('ul > li:last-child');
  for (let elem of elements) {
    alert(elem.innerHTML); // "test", "passed"
  }
</script>
```

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querySelector

- The call to elem.querySelector(css) returns the first element for the given CSS selector.

- In other words, the result is the same as e**lem.querySelectorAll(css)[0],** but the latter is looking for all elements and picking one, while elem.querySelector just looks for one. So it’s faster and shorter to write.

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matches

```
<a href="http://anyfile.com">...</a>
<a href="http://ya.ru">...</a>
<script>
  // can be any collection instead of document.body.children
  for (let elem of document.body.children) {
  if (elem.matches('a[href$="zip"]')) {
  alert("The archive reference: " + elem.href );
    }
  }
</script>
```

- Previous methods were searching the DOM.
- The **elem.matches(css)** does not look for anything, it merely checks if elem matches the given CSS-selector. It returns true or false.
- The method comes handy when we are iterating over elements (like in array or something) and trying to filter those that interest us.

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closest

- Ancestors are: parent, the parent of parent, its parent and so on. The ancestors together form the chain of parents from the element to the top.
- The method elem.closest(css) looks the nearest ancestor that matches the CSS-selector. The elem itself is also included in the search.
- In other words, the method closest goes up from the element and checks each of parents. If it matches the selector, then the search stops, and the ancestor is returned.

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closest

- <h1>Contents</h1>
- <div class="contents">
-   <ul class="book">
-     <li class="chapter">Chapter 1</li>
-     <li class="chapter">Chapter 1</li>
-   </ul>
- </div>
- **<script>**
- **let chapter = document.querySelector('.chapter'); // LI**
- **alert(chapter.closest('.book')); // UL**
- **alert(chapter.closest('.contents')); // DIV**
- **alert(chapter.closest('h1')); // null (because h1 is not an ancestor)**
- **</script>**

One more method here to check for the child-parent relationship: elemA.contains(elemB) returns true if elemB is inside elemA (a descendant of elemA) or when elemA==elemB.

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getElementsBy

- All methods "getElementsBy" return the current state of document and auto-updates with the changes.

Method	Searches by...
getElementById	id
getElementsByName	name
getElementsByTagName	tag or '*'
getElementsByClassName	class
querySelector	CSS-selector
querySelectorAll	CSS-selector

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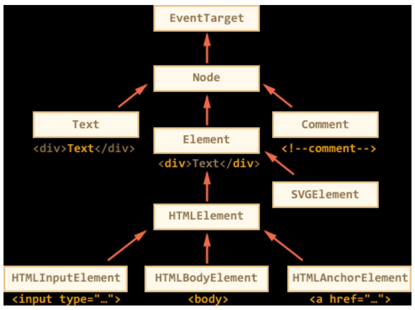
Node Properties: type, tag and contents



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Node Properties

- Lets Consider the DOM object for an <input> element. It belongs to HTMLInputElement class. It gets properties and methods as a superposition of:
  - **HTMLInputElement** – this class provides input-specific properties, and inherits from…
  - **HTMLElement** – it provides common HTML element methods (and getters/setters) and inherits from…
  - **Element** – provides generic element methods and inherits from…
  - **Node** – provides common DOM node properties and inherits from…
  - **EventTarget** – gives the support for events (to be covered),
  - …and finally it inherits from Object, so "pure object" methods like hasOwnProperty are also available.

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DOM node class name

- To see the DOM node class name, we can reference to the class constructor, and constructor.name is its name:

alert(document.body.constructor.name); // HTMLBodyElement

…Or we can just toString it:

alert(document.body); // [object HTMLBodyElement]

We can also use instanceof to check the inheritance.

```
alert( document.body instanceof HTMLBodyElement
); // true
alert( document.body instanceof HTMLElement ); //
true
alert( document.body instanceof Element ); // true
alert( document.body instanceof Node ); // true
alert( document.body instanceof EventTarget ); // true
```

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innerHTML: the contents

The innerHTML property allows to get the HTML inside the element as a string.

The example shows the contents of document.body and then replaces it completely:

```
<body> <p>A paragraph</p>
  <div>A div</div>
  <script>
    alert( document.body.innerHTML ); // read the
current contents
    document.body.innerHTML = 'The new BODY!';
// replace it
  </script> </body>
```

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textContent

- The textContent provides access to the text inside the element: only text, minus all <tags>.
- As we can see, only text is returned, as if all <tags> were cut out, but the text in them remained.
- In practice, reading such text is rarely needed.
- Writing to textContent is much more useful, because it allows to write text the "safe way".
- Let's say we have an arbitrary string, for instance entered by a user, and want to show it.
- With **innerHTML** we'll have it inserted "as HTML", with all HTML tags.
- With **textContent** we'll have it inserted "as text", all symbols are treated literally.

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The hidden property

- The "hidden" attribute and the DOM property specifies whether the element is visible or not.
- We can use it in HTML or assign using JavaScript, like this:

```
<div>Both divs below are hidden</div>
<div hidden>With the attribute "hidden"</div>
<div id="elem">JavaScript assigned the property "hidden"</div>
<script>   elem.hidden = true; </script>
```

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Attributes and Properties

- DOM nodes are regular JavaScript objects. We can alter them.
- Attributes – is what's written in HTML.
- Properties – is what's in DOM objects.

Methods to work with attributes are:

- elem.hasAttribute(name) – to check for existence.
- elem.getAttribute(name) – to get the value.
- elem.setAttribute(name, value) – to set the value.
- elem.removeAttribute(name) – to remove the attribute.
- elem.attributes is a collection of all attributes.

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Attributes

- Attributes are in the HTML itself, rather than in the DOM. They are very similar to properties, but not quite as good. When a property is available it's recommended that you work with properties rather than attributes.
- An attribute is only ever a string, no other type.
- Their name is case-insensitive (that's HTML: id is same as ID).

```
<body>
  <div id="elem" about="Elephant"></div>
  <script>
    alert( elem.getAttribute('About') ); // (1) 'Elephant', reading
    elem.setAttribute('Test', 123);       // (2), writing
    alert( elem.outerHTML );               // (3), see it's there
    for (let attr of elem.attributes) {     // (4) list all
      alert( attr.name + " = " + attr.value );
    }
  </script>
</body>
```

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DOM Properties

- DOM properties are not always strings. For instance, input.checked property (for checkboxes) is boolean:

<input id="input" type="checkbox" checked> checkbox

<script>

  alert(input.getAttribute('checked')); // the attribute value is: empty string

  alert(input.checked); // the property value is: true

</script>

```
<div id="div" style="color:red;font-size:120%">Hello</div>
<script>
  // string
  alert(div.getAttribute('style')); // color:red;font-size:120%
  // object
  alert(div.style); // [object CSSStyleDeclaration]
  alert(div.style.color); // red
</script>
```

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Custom-made attributes, dataset

- <!-- mark the div to show "name" here -->
- <div show-info="name"></div>
- <!-- and age here -->
- <div show-info="age"></div>
- <script>
-   // the code finds an element with the mark and shows what's requested
-   let user = {
-     name: "youName",
-     age: 20
-   };
-   for(let div of document.querySelectorAll('[show-info]')) {
-     // insert the corresponding info into the field
-     let field = div.getAttribute('show-info');
-     div.innerHTML = user[field]; // yourName, then age
-   }
- </script>

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data-

- All attributes starting with "data-" are reserved for programmers' use. They are available in dataset property.
- For instance, if an elem has an attribute named "data-about", it's available as elem.dataset.about.
- <body data-about="Elephants">
- <script>
- alert(document.body.dataset.about); // Elephants
- </script>

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Non-standard

```
<style>
   .order[order-state="new"] {
    color: green;
  }
  .order[order-state="pending"] {
    color: blue;
  }
 .order[order-state="canceled"] {
    color: red;
  } </style>
<div class="order" order-state="new">   A new order.
</div>
<div class="order" order-state="pending">   A pending
order.
</div>
<div class="order" order-state="canceled">   A
canceled order.
</div>
```

Use of Data with non-standard

```
<style>
  .order[data-order-state="new"] {
    color: green;
  }
  .order[data-order-state="pending"] {
    color: blue;
  }
  .order[data-order-state="canceled"] {
    color: red;
  }</style>
<div id="order" class="order" data-order-
state="new">
  A new order.
</div>
<script>  // read
  alert(order.dataset.orderState); // new
  // modify
  order.dataset.orderState = "pending"; // (*)
</script>
```

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Creating an element

- There are two methods:

  document.createElement(tag)

  let div = document.createElement('div');

Creating a text node:

let textNode = document.createTextNode('Here I am');

Creating the message:
let div = document.createElement('div');
div.className = "alert alert-success";
div.innerHTML = "<strong>Hi there!</strong> You've read an important message.";

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Insertion methods

- To make the div show up, we need to insert it somewhere into document. For instance, in document.body.
- There's a special method for that: document.body.appendChild(div).

```
<style>
.alert {
  padding: 15px;
  border: 1px solid #d6e9c6;
  border-radius: 4px;
  color: #3c763d;
  background-color: #dff0d8;
}
</style>
<script>
  let div = document.createElement('div');
  div.className = "alert alert-success";
  div.innerHTML = "<strong>Hi
there!</strong> You've read an important
message.";
  document.body.appendChild(div);
</script>
```

```
<ol id="list">
  <li>0</li>
  <li>1</li>
  <li>2</li>
</ol>

<script>
  let newLi =
document.createElement('li');
  newLi.innerHTML = 'Hello, world!';

  list.appendChild(newLi);
</script>
```

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