

# JavaScript Essentials

*DOM*



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# Lesson Objectives

- Understand the fundamentals concepts behind DOM
- Able to access DOM in JavaScript
- Understand the fundamentals data type of DOM
- Able to location DOM elements using selectors

## Section 1

# Overview

- The Document Object Model (DOM) is a programming interface for HTML and XML documents.
- It represents the page so that programs can change the document structure, style, and content.
- The DOM represents the document as nodes and objects. That way, programming languages can connect to the page.

- A Web page is a document. This document can be either displayed in the browser window or as the HTML source. But it is the same document in both cases. The Document Object Model (DOM) represents that same document so it can be manipulated. The DOM is an object-oriented representation of the web page, which can be modified with a scripting language such as JavaScript.
- The W3C DOM and [WHATWG DOM](#) standards are implemented in most modern browsers. Many browsers extend the standard, so care must be exercised when using them on the web where documents may be accessed by various browsers with different DOMs.

- For example, the standard DOM specifies that the `getElementsByTagName` method in the code below must return a list of all the `<p>` elements in the document:

```
1 | const paragraphs = document.getElementsByTagName("p");  
2 | // paragraphs[0] is the first <p> element  
3 | // paragraphs[1] is the second <p> element, etc.  
4 | alert(paragraphs[0].nodeName);
```

- All of the properties, methods, and events available for manipulating and creating web pages are organized into objects (for example, the document object that represents the document itself, the table object that implements the special [HTMLTableElement](#) DOM interface for accessing HTML tables, and so forth). This documentation provides an object-by-object reference to the DOM.
- The modern DOM is built using multiple APIs that work together. The core DOM defines the objects that fundamentally describe a document and the objects within it. This is expanded upon as needed by other APIs that add new features and capabilities to the DOM. For example, the [HTML DOM API](#) adds support for representing HTML documents to the core DOM.



- The Document Object Model (DOM) is a programming interface for HTML and XML documents.
- It represents the page so that programs can change the document structure, style, and content.
- The DOM represents the document as nodes and objects.
- That way, programming languages (JavaScript) can connect to the page.

## Section 2

# DOM and JavaScript

- The short example above, like nearly all of the examples in this reference, is [JavaScript](#). That is to say, it's *written* in JavaScript, but it *uses* the DOM to access the document and its elements. The DOM is not a programming language, but without it, the JavaScript language wouldn't have any model or notion of web pages,
- HTML documents, XML documents, and their component parts (e.g. elements). Every element in a document—the document as a whole, the head, tables within the document, table headers, text within the table cells—is part of the document object model for that document, so they can all be accessed and manipulated using the DOM and a scripting language like JavaScript.

- In the beginning, JavaScript and the DOM were tightly intertwined, but eventually, they evolved into separate entities. The page content is stored in the DOM and may be accessed and manipulated via JavaScript, so that we may write this approximative equation:

$$\text{API} = \text{DOM} + \text{JavaScript}$$

- The DOM was designed to be independent of any particular programming language, making the structural representation of the document available from a single, consistent API. Though we focus exclusively on JavaScript in this reference documentation, implementations of the DOM can be built for any language, as this Python example demonstrates:

```
# Python DOM example
import xml.dom.minidom as m
doc = m.parse(r"C:\Projects\Py\chap1.xml")
doc.nodeName # DOM property of document object
p_list = doc.getElementsByTagName("para")
```

- The DOM is not a programming language, but without it, the JavaScript language wouldn't have any model or notion of web pages
- Every element in a document is part of the document object model for that document, so they can all be accessed and manipulated using the DOM and a scripting language like JavaScript.
- The DOM was designed to be independent of any particular programming language, making the structural representation of the document available from a single, consistent API

## Section 3

# Accessing the DOM

- You don't have to do anything special to begin using the DOM.
- Different browsers have different implementations of the DOM, and these implementations exhibit varying degrees of conformance to the actual DOM standard (a subject we try to avoid in this documentation),
- But every web browser uses some document object model to make web pages accessible via JavaScript.



- When you create a script—whether it's inline in a `<script>` element or included in the web page by means of a script loading instruction—you can immediately begin using the API for the [document](#) or [window](#) elements to manipulate the document itself or to get at the children of that document, which are the various elements in the web page.
- Your DOM programming may be something as simple as the following, which displays an alert message by using the [alert\(\)](#) function from the [window](#) object, or it may use more sophisticated DOM methods to actually create new content, as in the longer example below.

- This following JavaScript will display an alert when the document is loaded (and when the whole DOM is available for use):

```
1 | <body onload="window.alert('Welcome to my home page!');">
```

## Practice accessing DOM

- You don't have to declare anything, the DOM is provided to you by the Browser
- Inside `<script>` tag or JavaScript file, you have access to [document](#) or [window](#) object
- [document](#) represents the HTML document. Use this when you want to manipulate the HTML page
- [window](#) represents the currently opened window (or browser Tab). Use this when you want to control the Browser behavior such as go to another url

## Section 4

# Fundamental data types

- This reference tries to describe the various objects and types in simple terms. But there are a number of different data types being passed around the API that you should be aware of.
- **Note:** Because the vast majority of code that uses the DOM revolves around manipulating HTML documents, it's common to refer to the nodes in the DOM as **elements**, although strictly speaking not every node is an element.

Data type (Interface)	Description
Document	When a member returns an object of type document (e.g., the ownerDocument property of an element returns the document to which it belongs), this object is the root document object itself. The <a href="#">DOM document Reference</a> chapter describes the document object.
Node	Every object located within a document is a node of some kind. In an HTML document, an object can be an element node but also a text node or attribute node.
Element	The element type is based on node. It refers to an element or a node of type element returned by a member of the DOM API. Rather than saying, for example, that the <a href="#">document.createElement()</a> method returns an object reference to a node, we just say that this method returns the element that has just been created in the DOM. element objects implement the DOM Element interface and also the more basic Node interface, both of which are included together in this reference. In an HTML document, elements are further enhanced by the HTML DOM API's <a href="#">HTMLElement</a> interface as well as other interfaces describing capabilities of specific kinds of elements (for instance, <a href="#">HTMLTableElement</a> for <code>&lt;table&gt;</code> elements).

Data type (Interface)	Description
<code>NodeList</code>	<ul style="list-style-type: none"><li>•A <code>nodeList</code> is an array of elements, like the kind that is returned by the method <code>document.getElementsByTagName()</code>. Items in a <code>nodeList</code> are accessed by index in either of two ways:<code>list.item(1)</code></li><li>•<code>list[1]</code></li></ul> <p>These two are equivalent. In the first, <code>item()</code> is the single method on the <code>nodeList</code> object. The latter uses the typical array syntax to fetch the second item in the list.</p>
<code>Attribute</code>	<p>When an attribute is returned by a member (e.g., by the <code>createAttribute()</code> method), it is an object reference that exposes a special (albeit small) interface for attributes. Attributes are nodes in the DOM just like elements are, though you may rarely use them as such.</p>
<code>NamedNodeMap</code>	<p>A <code>namedNodeMap</code> is like an array, but the items are accessed by name or index, though this latter case is merely a convenience for enumeration, as they are in no particular order in the list. A <code>namedNodeMap</code> has an <code>item()</code> method for this purpose, and you can also add and remove items from a <code>namedNodeMap</code>.</p>



- document node and element are three most important Data Type
- There are also some common terminology considerations to keep in mind.
- It's common to refer to any Attribute node as simply an attribute, for example, and to refer to an array of DOM nodes as a nodeList.
- You'll find these terms and others to be introduced and used throughout the documentation

## Section 5

# DOM interfaces

- This guide is about the objects and the actual *things* you can use to manipulate the DOM hierarchy. There are many points where understanding how these work can be confusing. For example, the object representing the HTML form element gets its name property from the HTMLFormElement interface but its className property from the HTMLElement interface. In both cases, the property you want is simply in that form object.
- But the relationship between objects and the interfaces that they implement in the DOM can be confusing, and so this section attempts to say a little something about the actual interfaces in the DOM specification and how they are made available.

- Many objects borrow from several different interfaces. The table object, for example, implements a specialized [HTMLTableElement](#) interface, which includes such methods as createCaption and insertRow. But since it's also an HTML element, table implements the Element interface described in the DOM [Element](#) Reference chapter. And finally, since an HTML element is also, as far as the DOM is concerned, a node in the tree of nodes that make up the object model for an HTML or XML page, the table object also implements the more basic Node interface, from which Element derives.

- When you get a reference to a table object, as in the following example, you routinely use all three of these interfaces interchangeably on the object, perhaps without knowing it.

```
1  const table = document.getElementById("table");
2  const tableAttrs = table.attributes; // Node/Element interface
3  for (let i = 0; i < tableAttrs.length; i++) {
4      // HTMLTableElement interface: border attribute
5      if(tableAttrs[i].nodeName.toLowerCase() == "border")
6          table.border = "1";
7  }
8  // HTMLTableElement interface: summary attribute
9  table.summary = "note: increased border";
```

- This section lists some of the most commonly-used interfaces in the DOM. The idea is not to describe what these APIs do here but to give you an idea of the sorts of methods and properties you will see very often as you use the DOM. These common APIs are used in the longer examples in the [DOM Examples](#) chapter at the end of this book.
- The document and window objects are the objects whose interfaces you generally use most often in DOM programming. In simple terms, the window object represents something like the browser, and the document object is the root of the document itself. Element inherits from the generic Node interface, and together these two interfaces provide many of the methods and properties you use on individual elements. These elements may also have specific interfaces for dealing with the kind of data those elements hold, as in the table object example in the previous section.

- The following is a brief list of common APIs in web and XML page scripting using the DOM.
- [document.getElementById\(id\)](#)
- [document.getElementsByTagName\(name\)](#)
- [document.createElement\(name\)](#)
- [parentNode.appendChild\(node\)](#)
- [element.innerHTML](#)
- [element.style.left](#)
- [element.setAttribute\(\)](#)
- [element.getAttribute\(\)](#)
- [element.addEventListener\(\)](#)
- [window.content](#)
- [window.onload](#)
- [window.scrollTo\(\)](#)

## Practice DOM interfaces



- The document and window objects are the objects whose interfaces you generally use most often in DOM programming
- Use Node/Element/Specific Element interfaces interchangeably on the object, perhaps without knowing it

## Section 6

# Locating DOM elements using selectors

- The Selectors API provides methods that make it quick and easy to retrieve [Element](#) nodes from the DOM by matching against a set of selectors. This is much faster than past techniques, wherein it was necessary to, for example, use a loop in JavaScript code to locate the specific items you needed to find.

- querySelector() Returns the first matching [Element](#) node within the node's subtree. If no matching node is found, null is returned.
- querySelectorAll() Returns a [NodeList](#) containing all matching Element nodes within the node's subtree, or an empty NodeList if no matches are found.
- **Note:** The [NodeList](#) returned by querySelectorAll() is not live, which means that changes in the DOM are not reflected in the collection. This is different from other DOM querying methods that return live node lists.

- The selector methods accept one or more comma-separated selectors to determine what element or elements should be returned. For example, to select all paragraph (p) elements in a document whose CSS class is either warning or note, you can do the following:

```
var special = document.querySelectorAll( "p.warning, p.note" );
```

- You can also query by ID. For example:

```
var el = document.querySelector( "#main, #basic, #exclamation" );
```

- After executing the above code, el contains the first element in the document whose ID is one of main, basic, or exclamation.
- You may use any CSS selectors with the **querySelector()** and **querySelectorAll()** methods.

## Practice Selectors API

- Use any CSS selectors with the `querySelector()` and `querySelectorAll()` methods to locating the desired Element
- Once you selected an Element, you can modify its text content, change its appearance or even append new Element



# Thank you

Q&A

