Chapter 3
Introduction to Javascript

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JavaScript

- JavaScript is the programming language of HTML and the Web.
- Programming makes computers do what you want them to do. JavaScript is easy to learn.
- This tutorial will teach you JavaScript from basic to advanced.

Why Study JavaScript?

- JavaScript is one of the 3 languages all web developers must learn:
  1. HTML to define the content of web pages
  2. CSS to specify the layout of web pages
  3. JavaScript to program the behaviour of web pages
- This lecture is about JavaScript, and how JavaScript works with HTML and CSS.

JavaScript Introduction

- JavaScript Can Change HTML Content
  One of many HTML methods is getElementById().
- This example uses the method to "find" an HTML element (with id="demo"), and changes the element content (innerHTML) to "Hello JavaScript”:

```
document.getElementById("demo").innerHTML
                        = "Hello JavaScript”;
```

Example

```
<!DOCTYPE html>
<html>
  <body>
    <h1>What Can JavaScript Do?</h1>
    <p id="demo">JavaScript can change HTML content.</p>
    <button type="button"
onclick="document.getElementById('demo').innerHTML =
'Hello JavaScript!'">
        Click Me!
    </button>
  </body>
</html>
```

JavaScript Can Change HTML Attributes

This example changes an HTML image, by changing the src attribute of an <img> tag:

```
<!DOCTYPE html><html>
<body>
  <h1>JavaScript Can Change Images</h1>
  <img id="myImage" onclick="changeImage()" src="pic_bulboff.gif" width="100" height="180”>
  <p>Click the light bulb to turn on/off the light.</p>
  <script>
    function changeImage() {
      var image = document.getElementById('myImage');
      if (image.src.match("bulbon")) {
        image.src = "pic_bulboff.gif"; } else {
        image.src = "pic_bulbon.gif"; }
      }
  </script>
</body> </html>
```

JavaScript Can Change HTML Styles (CSS)

```
<!DOCTYPE html>
<html>
  <body>
    <h1>What Can JavaScript Do?</h1>
    <p id="demo">JavaScript can change the style of an HTML element.</p>
    <script>
      function myFunction() {
        var x = document.getElementById("demo");
        x.style.fontSize = "25px";
        x.style.color = "red";
      }
    </script>
    <button type="button" onclick="myFunction()">Click Me!</button>
  </body>
</html>
```

JavaScript Can Validate Data

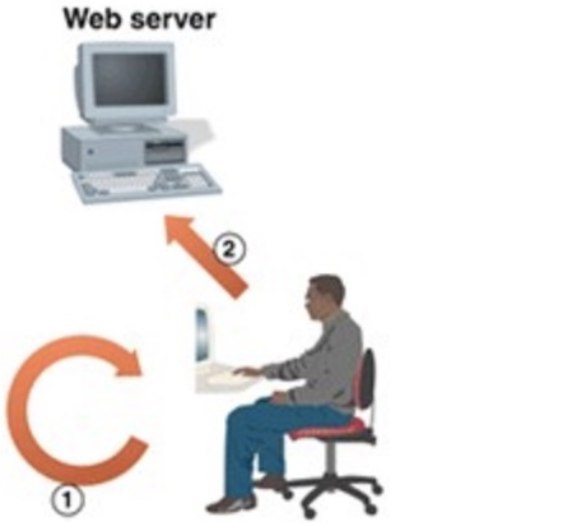
- JavaScript is often used to validate input

Server-side validation

1) The user submits the form to the Web server.

2) The Web server validates the user's responses and, if necessary, returns the form to the user for correction.

3) After correcting any errors, the user resubmits the form to the Web server for another validation.



Client-side validation

1) The user submits the form, and validation is performed on the user's computer.

2) After correcting any errors, the user submits the form to the Web server.

Did You Know?

- JavaScript and Java are completely different languages, both in concept and design.
- JavaScript was invented by Brendan Eich in 1995, and became an ECMA standard in 1997.
- ECMA-262 is the official name. ECMAScript 5 (JavaScript 1.8.5 - July 2010) is the current standard

JavaScript Where To

- JavaScript can be placed in the <body> and the <head> sections of an HTML page.
- The <script> Tag In HTML, JavaScript code must be inserted between <script> and </script> tag

```
<script>
 document.getElementById("demo").innerHTML = "My First JavaScript”;
</script>
```

JavaScript Functions and Events

- A JavaScript function is a block of JavaScript code, that can be executed when "asked" for.
- For example, a function can be executed when an event occurs, like when the user clicks a button.
- You will learn much more about functions and events in later chapters.

JavaScript in <head> or <body>

- You can place any number of scripts in an HTML document.
- Scripts can be placed in the <body>, or in the <head> section of an HTML page, or in both.
- Keeping all code in one place, is always a good habit.

JavaScript in <head>

- In this example, a JavaScript function is placed in the <head> section of an HTML page.
- The function is invoked (called) when a button is clicked:

Example

```
<!DOCTYPE html>
<html>
  <head>
    <script>
      function myFunction() {
        document.getElementById("demo").innerHTML = "Paragraph
changed."; }
    </script>
  </head>
  <body>
    <h1>My Web Page</h1>
    <p id="demo">A Paragraph</p>
    <button type="button" onclick="myFunction()">Try it</button>
  </body>
</html>
```

JavaScript in <body>

- In this example, a JavaScript function is placed in the <body> section of an HTML page.
- The function is invoked (called) when a button is clicked:

Example

```
<!DOCTYPE html>
<html>
  <body>
    <h1>My Web Page</h1>
    <p id="demo">A Paragraph</p>
    <button type="button" onclick="myFunction()">Try it</button>
    <script>
      function myFunction() {
        document.getElementById("demo").innerHTML = "Paragraph changed."; }
    </script>
  </body>
</html>
```

External JavaScript

- Scripts can also be placed in external files.
- External scripts are practical when the same code is used in many different web pages.
- JavaScript files have the file extension .js.
  To use an external script, put the name of the script file in the src (source)
- attribute of the <script> tag:

```
<!DOCTYPE html>
<html>
  <body>
    <script src="myScript.js"></script>
  </body>
</html>
```

External JavaScript

- You can place an external script reference in <head> or <body> as you like.
- The script will behave as if it was located exactly where the <script> tag is located.
- External scripts cannot contain <script> tags.

External JavaScript Advantages

- Placing JavaScripts in external files has some advantages:
  - It separates HTML and code
  - It makes HTML and JavaScript easier to read and maintain
  - Cached JavaScript files can speed up page loads

JavaScript Output

- JavaScript does not have any built-in print or display functions.
- JavaScript Display Possibilities JavaScript can "display" data in different ways:

1. Writing into an alert box, using window.alert().
2. Writing into the HTML output using document.write().
3. Writing into an HTML element, using innerHTML.
4. Writing into the browser console, using console.log().

Using window.alert()

You can use an alert box to display:

```
<!DOCTYPE html>
<html>
  <body>
    <h1>My First Web Page</h1>
    <p>My first paragraph.</p>
    <script>
      window.alert(5 + 6);
    </script>
  </body>
</html>
```

Using document.write()

For testing purposes, it is convenient to use document.write():

```
<!DOCTYPE html>
<html>
  <body>
    <h1>My First Web Page</h1>
    <p>My first paragraph.</p>
    <script>
      document.write(5 + 6);
    </script>
  </body>
</html>
```

Using document.write()

Using document.write() after an HTML document is fully loaded, will delete all existing HTML:

```
<!DOCTYPE html>
<html>
  <body>
    <h1>My First Web Page</h1>
    <p>My first paragraph.</p>
    <button onclick="document.write(5 + 6)">Try it</button>
  </body>
</html>
```

Using innerHTML

- To access an HTML element, JavaScript can use the document.getElementById(id) method.

- The id attribute defines the HTML element. The innerHTML property defines the HTML content:

Example

```
<!DOCTYPE html>
<html>
<body>
  <h1>My First Web Page</h1>
  <p>My First Paragraph</p>
  <p id="demo"></p>
  <script>
    document.getElementById("demo").innerHTML = 5 + 6;
  </script>
</body>
</html>
```

Using console.log()

- In your browser, you can use the console.log() method to display data.
- Activate the browser console with F12, and select "Console" in the menu.

Example

```
<!DOCTYPE html>
<html>
  <body>
    <h1>My First Web Page</h1>
    <p>My first paragraph.</p>
    <script>
      console.log(5 + 6);
    </script>
  </body>
</html>
```

JavaScript Syntax

- JavaScript syntax is the set of rules, how JavaScript programs are constructed.
- A computer program is a list of "instructions" to be "executed" by the computer.
- In a programming language, these program instructions are called statements.
- JavaScript is a programming language. JavaScript statements are separated by semicolon.

Example

```
<!DOCTYPE html>
<html>
<body>
  <h1>JavaScript Statements</h1>
  <p>Statements are separated by semicolons.</p>
  <p>The variables x, y, and z are assigned the values 5, 6, and 11:</p>
  <p id="demo"></p>
  <script>
    var x = 5;
    var y = 6;
    var z = x + y;
    document.getElementById("demo").innerHTML = z;
  </script>
</body>
</html>
```

JavaScript Statements

- JavaScript statements are composed of:
  - Values.
  - Operators.
  - Expressions.
  - Keywords.
  - Comments.

1-JavaScript Values

- The JavaScript syntax defines two types of values: Fixed values and variable values.
- 1.1-Fixed values are called **literals**.
- 2.1-Variable values are called **variables**.

1.1-JavaScript Literals

- The most important rules for writing fixed values are:
- **Numbers** are written with or without decimals:
  - 10.50
  - 1001
- **Strings** are text, written within double or single quotes:
  - "John Doe”
  - 'John Doe’
- **Expressions** can also represent fixed values:
  - 5+6
  - 5 * 10

1.2-JavaScript Variables

- In a programming language, variables are used to store data values.
- JavaScript uses the var keyword to define variables.
  An equal sign is used to assign values to variables.
- In this example, x is defined as a variable. Then, x is assigned (given) the value 6:
  - var x;
  - x = 6;

2-JavaScript Operators

- JavaScript uses an assignment operator (=) to assign values to variables:
  - var x = 5;
  - var y = 6;
- JavaScript uses arithmetic operators (+ - * /) to compute values: (5 + 6) * 10

Object literals

- You don't declare the *types* of variables in JavaScript
- JavaScript has object *literals,* written with this syntax:
  - { ***name1*** : ***value1*** , … , ***nameN*** : ***valueN*** }
- Example (from Netscape's documentation):
  - car = {myCar: "Saturn", 7: "Mazda",
    getCar: CarTypes("Honda"), special: Sales}
    - The fields are myCar, getCar, 7 (this is a legal field name) , and special
    - "Saturn" and "Mazda" are Strings
    - CarTypes is a function call
    - Sales is a variable you defined earlier
  - Example use: document.write("I own a " + car.myCar);

Three ways to create an object

- You can use an object literal:
  - `var course = { number: "CIT597", teacher: "Dr. Dave" }`
- You can use new to create a "blank" object, and add fields to it later:
  - ```
    var course = new Object();
    course.number = "CIT597";
    course.teacher = "Dr. Dave";
    ```
- You can write and use a constructor:
  - ```
    function Course(n, t) {  // best placed in <head>
        this.number = n;     // keyword "this" is required, not optional
        this.teacher = t;
    }
    ```
  - `var course = new Course("CIT597", "Dr. Dave");`

Array literals

- You don't declare the *types* of variables in JavaScript
- JavaScript has array *literals,* written with brackets and commas
  - Example: color = ["red", "yellow", "green", "blue"];
  - Arrays are *zero-based:* color[0] is "red"
- If you put two commas in a row, the array has an "empty" element in that location
  - Example: color = ["red", , , "green", "blue"];
    - color has 5 elements
  - However, a single comma at the end is ignored
    - Example: color = ["red", , , "green", "blue",]; still has 5 elements

Four ways to create an array

- You can use an array literal:
  ```
  var colors = ["red", "green", "blue"];
  ```
- You can use `new Array()` to create an empty array:
  - `var colors = new Array();`
  - You can add elements to the array later:
    `colors[0] = "red"; colors[2] = "blue"; colors[1]="green";`
- You can use `new Array(`***n***`)` with a single numeric argument to create an array of that size
  - `var colors = new Array(3);`
- You can use `new Array(...)` with *two or more* arguments to create an array containing those values:
  - `var colors = new Array("red","green", "blue");`

The length of an array

- If myArray is an array, its length is given by myArray.length
- Array length can be changed by assignment beyond the current length
  - Example: var myArray = new Array(5); myArray[10] = 3;
- Arrays are sparse, that is, space is only allocated for elements that have been assigned a value
  - Example: myArray[50000] = 3; is perfectly OK
  - But indices must be between 0 and 2^{32}-1
- As in C and Java, there are no two-dimensional arrays; but you can have an array of arrays: myArray[5][3]

Arrays and objects

- Arrays *are* objects
- car = { myCar: "Saturn", 7: "Mazda" }
  - car[7] is the same as car.7
  - car.myCar is the same as car["myCar"]
- If you *know* the name of a property, you can use dot notation: car.myCar
- If you *don't know* the name of a property, but you have it in a variable (or can compute it), you *must* use array notation: car["my" + "Car"]

Array functions

- If myArray is an array,
  - myArray.sort() sorts the array alphabetically
  - myArray.sort(function(a, b) { return a - b; }) sorts numerically
  - myArray.reverse() reverses the array elements
  - myArray.push(...) adds any number of new elements to the end of the array, and increases the array's length
  - myArray.pop() removes and returns the last element of the array, and decrements the array's length
  - myArray.toString() returns a string containing the values of the array elements, separated by commas

The for...in statement

- You can loop through all the properties of an object with for (***variable*** in ***object***) ***statement***;
  - Example:
```
for (var prop in course) {
    document.write(prop + ": " + course[prop]);
}
```
  - Possible output:
```
teacher: Dr. Dave
number: CIT597
```
  - The properties are accessed in an *undefined* order
  - If you add or delete properties of the object within the loop, it is *undefined* whether the loop will visit those properties
  - Arrays *are* objects; applied to an array, for...in will visit the "properties" 0, 1, 2, …
  - Notice that course["teacher"] is equivalent to course.teacher
    - You must use brackets if the property name is *in a variable*

3-JavaScript Keywords

- JavaScript keywords are used to identify actions to be performed.
- The var keyword tells the browser to create a new variable:
  - var x = 5 + 6;
  - var y = x * 10;

4-JavaScript Comments

- Not all JavaScript statements are "executed".
- Code after double slashes // or between /* and */ is
- treated as a comment.
- Comments are ignored, and will not be executed:

```
var x = 5; // I will be executed
// var x = 6; I will NOT be executed
```

JavaScript is Case Sensitive

- All JavaScript identifiers are case sensitive.
  The variables lastName and lastname, are two different variables.

```
lastName = "Doe”;
lastname = “Peterson";
```

JavaScript and Camel Case

- Historically, programmers have used three ways of joining multiple words into one variable name:
- Hyphens:
  - first-name, last-name, master-card, inter-city.
- Underscore:
  - first_name, last_name, master_card, inter_city.
- Camel Case:
  - FirstName, LastName, MasterCard, InterCity.
- Hyphens are not allowed in JavaScript. It is reserved for subtractions.

JavaScript Statements

- In HTML, JavaScript statements are "instructions" to be "executed" by the web browser.
- This statement tells the browser to write "Hello Dolly." inside an HTML element with id="demo":
- Example:

```
document.getElementById("demo").innerHTML = "Hello Dolly.”;
```

JavaScript Programs

- Most JavaScript programs contain many JavaScript statements.
- The statements are executed, one by one, in the same order as they are written.
- In this example, x, y, and z is given values, and finally z is displayed: Example:

```
var x = 5;
var y = 6;
var z = x + y;
document.getElementById("demo").innerHTML = z;
```

- JavaScript programs (and JavaScript statements) are often called JavaScript code.

Semicolons ;

- Semicolons separate JavaScript statements.
- Add a semicolon at the end of each executable statement:

```
a = 5;
b = 6;
c = a + b;
```

When separated by semicolons, multiple statements on one line are allowed: a = 5; b = 6; c = a + b;

- On the web, you might see examples without semicolons. Ending statements with semicolon is not required, but highly recommended.

JavaScript White Space

- JavaScript ignores multiple spaces. You can add white space to your script to make it more readable.
- The following lines are equivalent: var person = "Hege"; var person=“Hege”;
- A good practice is to put spaces around operators (= + - * /):

```
var x = y + z;
```

JavaScript Line Length and Line Breaks

- For best readability, programmers often like to avoid code lines longer than 80 characters. If a JavaScript statement does not fit on one line, the best place to break it, is after an operator:

```
document.getElementById("demo").innerHTML = "Hello
Dolly.";
```

JavaScript Code Blocks

- JavaScript statements can be grouped together in code blocks, inside curly brackets {...}.
- The purpose of code blocks this is to define statements to be executed together.
- One place you will find statements grouped together in blocks, are in JavaScript functions:

```
function myFunction() {
    document.getElementById("demo").innerHTML = "Hello Dolly.";
    document.getElementById("myDIV").innerHTML = "How are you?";
}
```

JavaScript Keywords

- JavaScript statements often start with a keyword to identify the JavaScript action to be performed.
- Here is a list of some of the keywords you will learn about in this lecture:
- JavaScript keywords are reserved words. Reserved words cannot be used as names for variables.

JavaScript Keywords

Keyword	Description
break	Terminates a switch or a loop
continue	Jumps out of a loop and starts at the top
debugger	Stops the execution of JavaScript, and calls (if available) the debugging function
do ... while	Executes a block of statements, and repeats the block, while a condition is true
for	Marks a block of statements to be executed, as long as a condition is true
function	Declares a function
if ... else	Marks a block of statements to be executed, depending on a condition
return	Exits a function
switch	Marks a block of statements to be executed, depending on different cases
try ... catch	Implements error handling to a block of statements
var	Declares a variable

Value = undefined

- In computer programs, variables are often declared without a value. The value can be something that has to be calculated, or something that will be provided later, like user input.
- A variable declared without a value will have the value undefined. The variable carName will have the value undefined after the execution of this statement:
- Example

```
var carName;
```

Control Structures

- There are three basic types of control structures in JavaScript: the `if` statement, the `while` loop, and the `for` loop
- Each control structure manipulates a block of JavaScript expressions beginning with { and ending with }

The If Statement

- The `if` statement allows JavaScript programmers to a make decision
- Use an `if` statement whenever you come to a "fork" in the program

```
If ( x  = =  10)
{      y  =  x*x;
}
else
{      x  =  0;
}
```

Repeat Loops

- A repeat loop is a group of statements that is repeated until a specified condition is met
- Repeat loops are very powerful programming tools; They allow for more efficient program design and are ideally suited for working with arrays

The While Loop

- The while loop is used to execute a block of code while a certain **condition** is true

```
count = 0;
while (count <= 10) {
    document.write(count);
    count++;
}
```

The For Loop

- The for loop is used when there is a need to have a **counter** of some kind
- The counter is initialized before the loop starts, tested after each iteration to see if it is below a target value, and finally updated at the end of the loop

Example: For Loop

```
// Print the numbers 1
   through 10

for (i=1; i<= 10; i++)
   document.write(i);
```

i=1 initializes the counter

i<=10 is the target value

i++ updates the counter at the end of the loop

Example: For Loop

```
<SCRIPT>
document.write("1");
document.write("2");
document.write("3");
document.write("4");
document.write("5");
</SCRIPT>
```

```
<SCRIPT>
for (i=1; i<=5; i++) {
   document.write(i);
}
</SCRIPT>
```

Functions

- Functions are a collection of JavaScript statement that performs a specified task
- Functions are used whenever it is necessary to repeat an operation

Functions

- Functions have inputs and outputs
- The inputs are passed into the function and are known as **arguments** or **parameters**
- Think of a function as a "black box" which performs an operation

Defining Functions

- The most common way to define a function is with the `function` statement.
- The function statement consists of the function keyword followed by the name of the function, a comma-separated list of parameter names in parentheses, and the statements which contain the body of the function enclosed in curly braces

Example: Function

```
function square(x) {
    return x*x;
}

z = 3;
sqr_z = square(z);
```

Name of Function:
square

Input/Argument: x

Output: x*x

Example: Function

```
function sum_of_squares(num1,num2) {
    return (num1*num1) + (num2*num2);
}

function sum_of_squares(num1,num2) {
    return (square(num1) + square(num2));
}
```

Javascript Events

- Events are actions that can be detected by Javascript
- Every element on a web page has certain events which can trigger Javascript functions
- Often placed within the HTML tag
  - <tag attribute1 attribute2 onEventName="javascript code;">
  - <a href="" onMouseOver="popupFunc();">
- The set of all events which may occur and the page elements on which they can occur is part of the Document Object Model(DOM) not Javascript
  - Browsers don't necessarily share the same set of events

Common Javascript Events

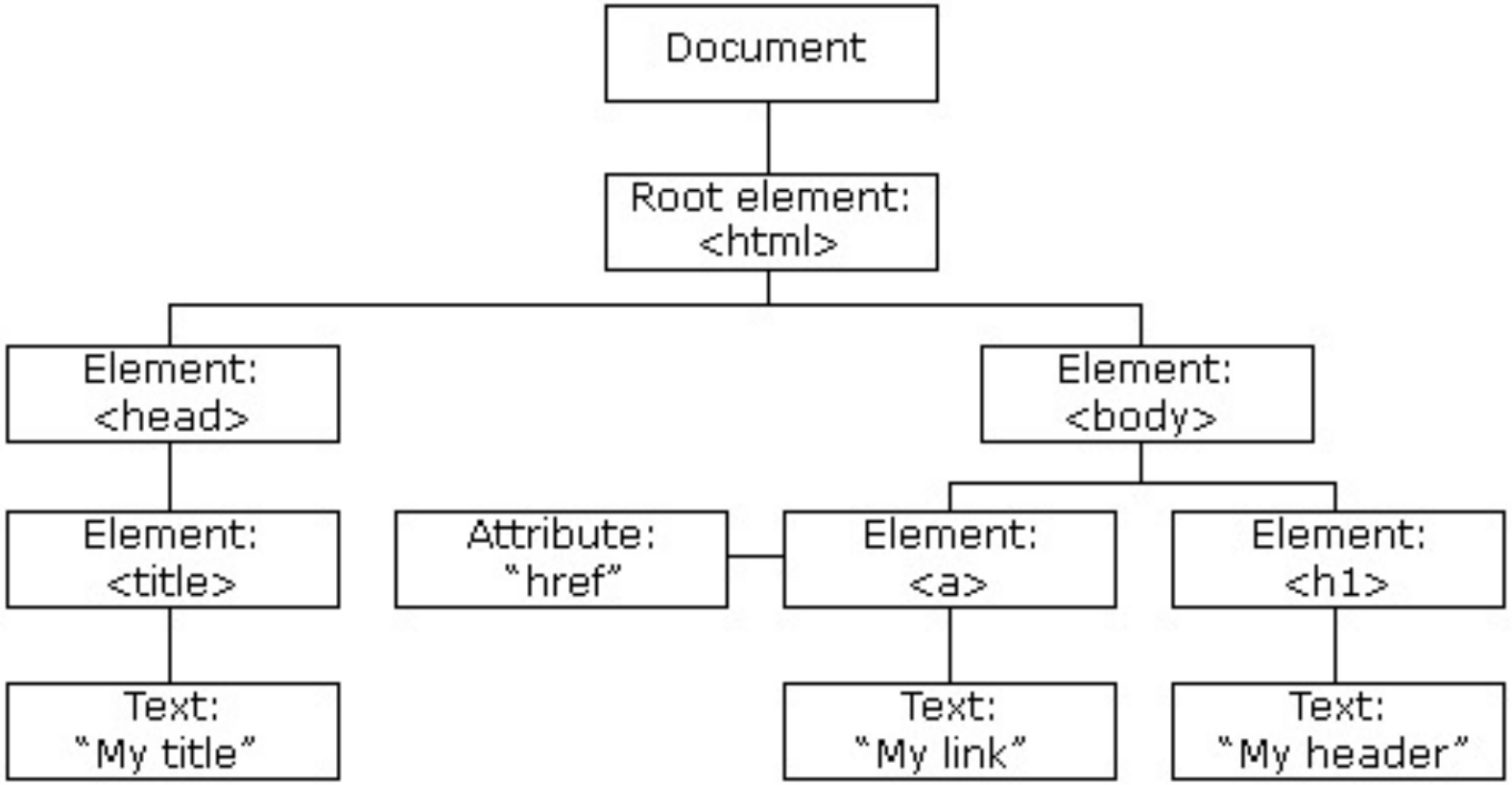
Event	Occurs when...	Event Handler
click	User clicks on form element or link	onClick
change	User changes value of text, textarea, or select element	onChange
focus	User gives form element input focus	onFocus
blur	User removes input focus from form element	onBlur
mouseover	User moves mouse pointer over a link or anchor	onMouseOver
mouseout	User moves mouse pointer off of link or anchor	onMouseOut
select	User selects form element's input field	onSelect
submit	User submits a form	onSubmit
resize	User resizes the browser window	onResize
load	User loads the page in the Navigator	onLoad
unload	User exits the page	onUnload

5.2 DOM (Document Object Model)

The Document Object Model

- When a document is loaded in the web browser, a number of objects are created.
  - Most commonly used are window and document
- Window
  - open(), close(), alert(), confirm(), prompt()
- Document
  - Contains arrays which store all the components of your page
  - You can access and call methods on the components using the arrays
  - An object may also be accessed by its name
    - document.myform.address.value = "123 Main"
    - document.myform.reset()
  - Can also search for element by name or id
    - document.getElementById("myelementid")
    - document.getElementsByName("myelementname")

DOM Example



Source: w3schools.com

DOM & DHTML

- Dynamic web pages with JavaScript and DOM
  - DHTML (Dynamic HTML)
- DOM nodes and DOM tree
- Traversing, editing and modifying DOM nodes
- Editing text nodes
- Accessing, editing and modifying elements' attributes

DOM Concept

- DOM makes all components of a web page accessible
  - HTML elements
  - their attributes
  - text
- They can be created, modified and removed with JavaScript

DOM Objects

- DOM components are accessible as objects or collections of objects
- DOM components form a tree of nodes
  - relationship parent node – children nodes
  - `document` is the root node
- Attributes of elements are accessible as text
- Browsers can show DOM visually as an expandable tree
  - Firebug for Firefox
  - in IE -> Tools -> Developer Tools

DOM Standards

- W3C www.w3.org defines the standards
- DOM Level 3 recommendation
  - www.w3.org/TR/DOM-Level-3-Core/
- DOM Level 2 HTML Specification
  - www.w3.org/TR/DOM-Level-2-HTML/
  - additional DOM functionality specific to HTML, in particular objects for XHTML elements
- **But,** the developers of web browsers
  - **don't** implement all standards
  - implement some standards **differently**
  - implement some **additional features**

Accessing Nodes by `id`

- Access to elements by their `id`
  - `document.getElementById(<id>)`
    - returns the element with `id` `<id>`
  - `id` attribute can be defined in each start tag
    - `div` element with `id` attribute can be used as an root node for a dynamic DOM subtree
    - `span` element with `id` attribute can be used as a dynamic inline element
- The preferred way to access elements

Other Access Methods

- Access by elements' tag
  - there are typically several elements with the same tag
  - `document.getElementsByTagName(<tag>)`
    - returns the collection of all elements whose tag is `<tag>`
    - the collection has a `length` attribute
    - an item in the collection can be reached by its index
  - e.g.
    - `var html = document.getElementsByTagName("html")[0];`
- Access by elements' `name` attribute
  - several elements can have the same name
  - `document.getElementsByName(<name>)`
    - returns the collection of elements with `name` `<name>`

Traversing DOM tree

- Traversal through node properties
  - `childNodes` property
    - the value is a collection of nodes
      - has a `length` attribute
      - an item can be reached by its index
    - e.g. `var body = html.childNodes[1];`
  - `firstChild`, `lastChild` properties
  - `nextSibling`, `previousSibling` properties
  - `parentNode` property

Other Node Properties

- `nodeType` property
  - `ELEMENT_NODE`: HTML element
  - `TEXT_NODE`: text within a parent element
  - `ATTRIBUTE_NODE`: an attribute of a parent element
    - attributes can be accessed another way
  - `CDATA_SECTION_NODE`
    - CDATA sections are good for unformatted text
- `nodeName` property
- `nodeValue` property
- `attributes` property
- `innerHTML` property
  - not standard, but implemented in major browsers
  - very useful
- `style` property
  - object whose properties are all style attributes, e.g., those defied in CSS

Accessing JS Object's Properties

- There are two different syntax forms to access object's properties in JS (
  - `<object>.<property>`
    - dot notation, e.g., `document.nodeType`
  - `<object>[<property-name> ]`
    - brackets notation, e.g., `document["nodeType"]`
    - this is used in `for-in` loops
- this works for properties of DOM objects, too

Attributes of Elements

- Access through `attributes` property
  - `attributes` is an array
  - has a `length` attribute
  - an item can be reached by its index
  - an item has the properties `name` and `value`
  - e.g.
    - `var src = document.images[0].attributes[0].value;`
- Access through function `getAttribute(<name>)`
  - returns the value of attribute `<name>`
  - e.g.
    - `var src = document.images[0].getAttribute("src");`

Text Nodes

- Text node
  - can only be as a leaf in DOM tree
  - it's `nodeValue` property holds the text
  - `innerHTML` can be used to access the text

- Watch out:
  - **There are many more text nodes than you would expect!**

Modifying DOM Structure

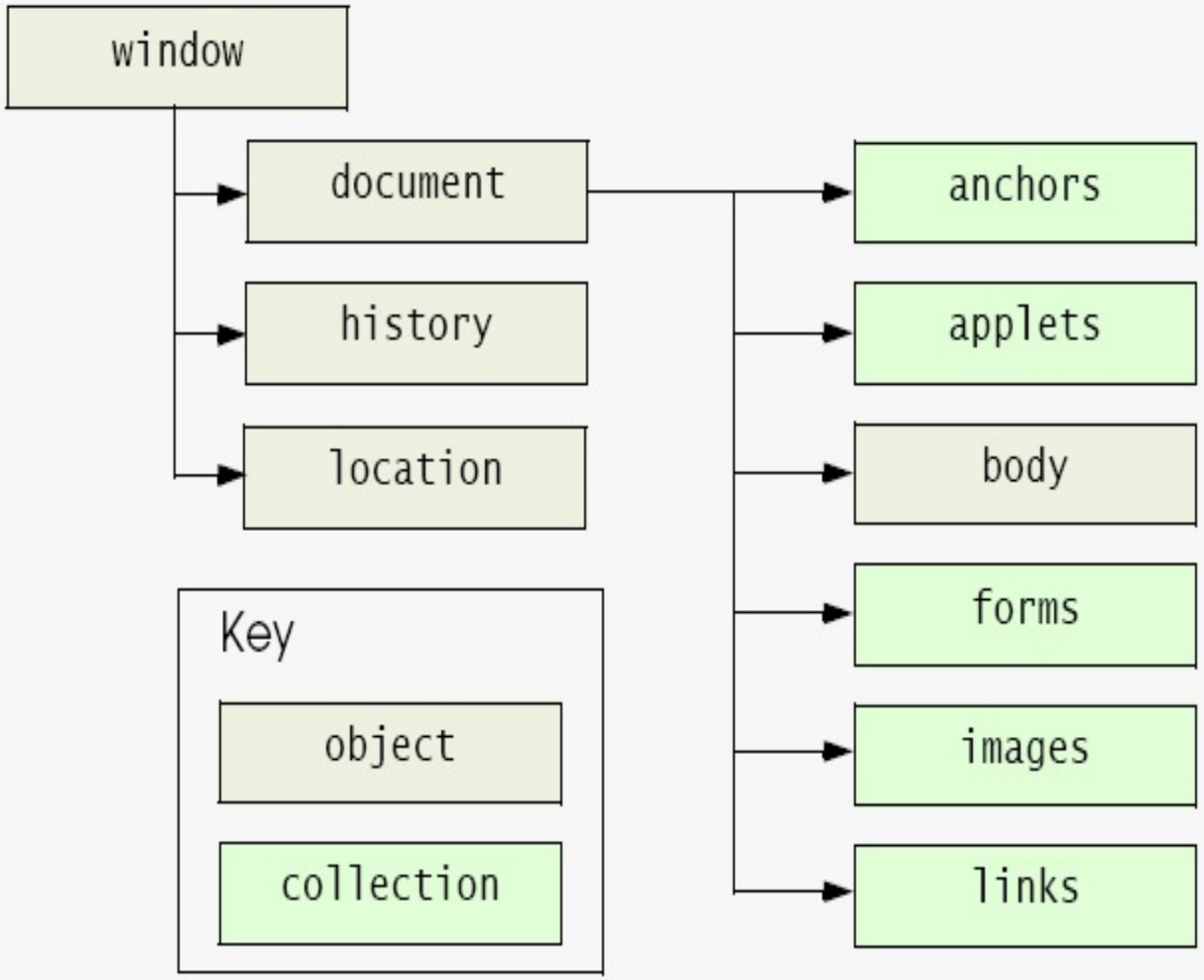
- `document.createElement(<tag>)`
  - creates a new DOM element node, with `<tag>` tag.
  - the node still needs to be inserted into the DOM tree
- `document.createTextNode(<text>)`
  - creates a new DOM text with `<text>`
  - the node still needs to be inserted into the DOM tree
- `<parent>.appendChild(<child>)`
  - inserts `<child>` node behind all existing children of `<parent>` node
- `<parent>.insertBefore(<child>,<before>)`
  - inserts `<child>` node before `<before>` child within `<parent>` node
- `<parent>.replaceChild(<child>,<instead>)`
  - replaces `<instead>` child by `<child>` node within `<parent>` node
- `<parent>.removeChild(<child>)`
  - removes `<child>` node from within `<parent>` node

Modifying Node Attributes

- **<node>.setAttribute(<name>,<value>)**
  - sets the value of attribute **<name> to <value>**
  - e.g.
    - `document.images[0].setAttribute("src","keiki.jpg");`

- That's the standard
  - but it doesn't work in IE, there you have to use
    - **setAttribute(<name=value>)**
  - e.g.
    - `document.images[0].setAttribute("src=\"keiki.jpg\"");`

W3C Document Object Model



Special DOM Objects

- `window`
  - the browser window
  - new popup `window`s can be opened
- `document`
  - the current web page inside the `window`
- `body`
  - `<body>` element of the `document`
- `history`
  - sites that the user visited
  - makes it possible to go back and forth using scripts
- `location`
  - URL of the `document`
  - setting it goes to another page

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- [2] W3Schools, http://www.w3schools.com/html/default.asp