Client-side Technologies

Eng. Niveen Nasr El-Den
SD & Gaming CoE
iTi

Day 3

Basics of JavaScript

“

Don’t imitate..
Understand

Anonymous

JavaScript

- JavaScript is a scripting language.
- Designed to add interactivity to HTML pages and create dynamic web sites.
  - i.e. Change contents of document, provide forms and controls, animation, control web browser window, etc.
- JavaScript statements embedded in an HTML page can recognize and respond to User Events.

JavaScript

- You can use JavaScript without buying a license.
- You only need a web browser & a text editor.
- Can be used as object-oriented language.
- JavaScript is very simple and flexible
- Powerful, beautiful and full-fledged dynamic Programming Language

Scripting vs. Programming vs. Markup Language

- Scripting Language
  - Interpreted command by command, and remain in their original form.
  - Output isn't a standalone program or application
    - e.g. JavaScript, Action Script.
- Programming Language
  - Compiled, converted permanently into binary executable files (i.e., zeros and ones) before they are run.
  - Produce a standalone program or application
    - e.g. C,C++..
- Markup Language
  - A text-formatting language designed to transform raw text into structured documents, by inserting procedural and descriptive markup into the raw text.
    - e.g. HTML, XHTML

JavaScript History

http://www.ecma-international.org/ecma-262/5.1/

- Developed by Brendan Eich at Netscape in 1995 first was called Mocha then renamed to LiveScript.
- In Navigator 2.0, name changed to JavaScript as a result of an agreement with Sun, the developer of Java.

http://www.ecma-international.org/publications/standards/Ecma-262.htm

- Later, in 1997 ; ECMAScript was introduced by ECMA International as an attempt at standardization.
- Microsoft recognized the importance of JavaScript and entered the arena with two creations, JScript and VBscript.

JavaScript Characteristics

- Case sensitive.
- Object-based.
- Event-Driven.
- Browser-Dependent.
- Platform Independent.
- Interpreted language.
- Dynamic.

JavaScript Strength & Weakness

Strength

- Quick Development
- Easy to Learn
- Platform Independence
- Small Overhead

Weakness

- Limited Range of Built-in Methods
- No Code Hiding
- Altering the text on an HTML page will reload the entire document

What JavaScript can do

- Giving the user more control over the browser.
  - i.e. open and create new browser window
- Detecting the user's browser, OS, screen size, etc.
- Performing computations on the client side.
- Validating the user's input data.
  - i.e. it validates the data on the user's machine before it is forwarded to the server.
- Can handle events, exceptions, etc..
- Can create cookies.
- Can read and change the content of an HTML element.
- Powerful to manipulate the DOM
  - DOM is a representation of the web page, which can be modified with JavaScript.

What JavaScript can't do

- ***Directly*** **access files on the user's system or the client-side LAN ; the only exception is the access to the browser's cookie files, because it is created within the script itself.**

- ***Directly*** **access files on the Web server.**

Earlier, developers have to bear in mind ***the biggest JavaScript limitation***:
the user can always disable JavaScript!

How Does JavaScript Work?

- JavaScript statements are usually embedded directly in HTML code, using a *<script>* element.
- Scripts can go either in the head or body of the document.
- We can write JavaScript:
  1. Anywhere in the html file between <script></script> tags.
  2. As the value of the event handler attributes.
  3. In an external file and refer to it using the src attribute.

Embedding JavaScript in HTML

1. Anywhere in the html file between <script> tags.

```
<head>
      <title>A Simple Document</title>
      <script type="text/javascript">
            //JavaScript code goes here
            document.write ("Hello world")
      </script >
</head>
<body>
      <p>Page content</p>
      <script>
            document.write (" welcome to JavaScript world")
      </script>
</body>
```

Embedding JavaScript in HTML

2. As the value of the event handler attributes.

```
<head>
  <title>A Simple Document</title>
</head>
<body>
We can write it at the event handlers
<a href="try1.htm" onclick= "alert('Hello world') " >
 click here to run JavaScript code
</a>
</body>
```

Embedding JavaScript in HTML

3. In an external file and refer to it using the src attribute.

```
<head>
   <title>A Simple Document</title>
   <script src= ”MyJavascripFile.js"></script>
</head>
<body>
We can refer to JavaScript statements in another file.
</body>
```

JavaScript Variables Declarations

- Variables are containers that hold values.
- Variables are loosly typed, initial value is undefined.
  - var num; //num = undefined
- While it is not technically necessary, variable declarations should begin with the keyword var to keep tracking of a variable easily.
- Assignment:

  var myVar = value;

  - var month = "June";
  - month = "June";

JavaScript Variables Naming

- First character must be a letter (a-z or A-Z) or an underscore (_), and the rest of the name can be (a-z or A-Z), (0-9), or underscores (_).
- Don't use spaces inside names.
  - FirstName NOT First Name.
- Avoid reserved words, words that are used for other purposes in JavaScript.
  - i.e. you couldn't call a variable alert or goto.
- Case-sensitive
  - FirstName differ from firstName
- Variables should have meaningful and descriptive names to describe what they are.
- The common naming convention in JavaScript is to use two words with no space between them, and capitalize the second word but not the first.

JavaScript Datatypes

- JavaScript is a *loosely* typed *dynamic* language.
  - No need to declare the type of a variable before using it.
  - Same variable can contain different types of data values.
- The latest ECMAScript standard defines six primitives data types and an Object

JavaScript Primitive Datatypes

Value	Example
Number	Any numeric value (e.g., 3, 5.3, 45e8, 055, 0x4A)
String	Any string of alphanumeric characters (e.g., "Hello, World!", "555-1212" or "KA12V2B334")
Boolean	true or false values only

JavaScript Special Primitive Values

Value	Example
null	**A special keyword for the null value** (no value or empty variable)
undefined	**A special keyword means that a value hasn't even been assigned yet.** **Better to be used by JavaScript engine**

undefined is the value of a variable with no value (uninitialized).

Variables can be emptied by setting the value to **null**;

JavaScript Primitive Datatypes

- All primitives are **immutable**, i.e., they cannot be altered
- Except for null and undefined, all primitive values have object equivalents that wrap around the primitive values
- valueOf() method returns the primitive value

JavaScript Operators

- Operators are functions
- JavaScript supports:

  1- Binary operators:

  - Require two operands in the expression such as x+2

  2- Unary operators:

  - Requires one operand such as x++

  3- Ternary operators:

  - Requires three operands

Arithmetic Operators

Operator	Type	Description
+	Addition	Adds the operands together.
-	Subtarction	Subtracts the right operand from the left operand
*	Multiplication	Multiplies together the operands.
/	Division	Divides the left operand by the right operand.
%	Modulus arithmetic	Divides the left operand by the right operand and calculates the remainder.
-	unary	Negates the value of the operand.
++	Unary (Increment)	Increases the value of the supplied operand by one.
--	Unary (Decrement)	Decreases the value of the supplied operand by one.

Assignment Operators

(x = 10 and y =5)

Operator	Example	Description
=	x = y Sets x to the value of y	Assigns the value of the right operand to the left operand
+=	x += y i.e. x = x + y (15)	Adds together the operands and assigns the result to the left operand.
-=	x -= y i.e. x = x - y (5)	Subtracts the right operand from the left operand and assigns the result to the left operand.
*=	x *= y i.e. x = x * y (50)	Multiplies together the operands and assigns the result to the left operand.
/=	x /= y i.e. x = x / y (2)	Divides the left operand by the right operand and assigns the result to the left operand.
%=	x %= y i.e. x = x % y (0)	Divides the left operand by the right operand and assigns the result to the left operand.

Comparison Operators

Operator	Definition
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	Loose Equality (double equals)
!=	Inequality
===	Strict Equality (double equals or identity)
!==	Strict Inequality

Logical Operators

Operator	Description
A && B Logical "AND"	-Dealing with Boolean, it returns true when both operands are true; otherwise it returns false -otherwise, it returns A if it can be converted to false; otherwise, returns B
A || B Logical "OR"	-Dealing with Boolean, returns true if either operand is true. It only returns false when both operands are false -otherwise, it returns A if it can be converted to true; otherwise, returns B
! Logical "NOT"	returns true if the operand is false and false if the operand is true. This is a unary operator and precedes the operand

String Operators

- + operator

  Combines the operands into a single string.
  i.e. used in sting concatenation.

- Example:

```
<script>
        A="Welcome "
        B="Ali"
        C=A+B
        document.write (C)
        // the result will be "Welcome Ali"
</script>
```

Special Operators

- ? : Conditional Ternary Operator
- , Comma Operator
- new Operator
- this Operator
- Unary Operators
  - delete Operator
  - typeof Operator
  - void Operator
- Relational Operators
  - instanceof Operator
  - in Operator

Ternary Operator

- (test_Condition) **?** if true **:** if false

  Evaluates to one of two different values based on a condition.

- Example :

```
<script>
    var temp=120
    var newvar=(temp>100) ? ”red” : “blue”
    // the value of newvar will be “red”
   temp=20
   newvar=(temp>100) ? ”red” : “blue”
   // the value of newvar will be “blue”
</script>
```

Comma Operator

- The (, operator) cause two expressions to be executed sequentially.
- It is commonly used when
  - naming variables,
  - in the increment expression of a **for** loop,
  - in function calls, arrays and object declarations.
- The (, operator) causes the expressions on either side of it to be executed in left-to-right order, and obtains the value of the expression on the right.
  - Example:

```
var k=0, i, j=0;
```

typeof Operator

- typeof Operator
  - A unary operator returns a string that represents the data type.
  - The return values of using typeof can be one of the following:
    - "number", "string", "boolean", "undefined", "object", or "function".. etc.
- Example:

```
var myName = “javascript”;
typeof myName;      //string
```

void Operator

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Operators/void

- void Operator
  - A unary operator used to explicitly return undefined.
  - It can be used as shown

```
void expression;
void(expression);
```

- Example:

```
var x = 10;
void x;//undefined
void (x==10);      // void(false)→ undefined
void (x==undefined); //void(true)→ undefined
```

JavaScript Expression

- An expression is a part of a statement that is evaluated as a value.

- Main types of expressions:
  - Left-hand-side “Assignment”
    - a = 25; → assign RHS to variable of LHS
  - Arithmetic
    - 10 + 12; → evaluates to sum of 10 and 12
  - String
    - “Hello” + ” All !!”; → evaluates to new string
  - Logical
    - 25<27 → evaluates to the Boolean value

Coercion

- Coercion is forcing conversion from one data type to another when expression is executed giving a result without causing any error.
- Sometimes gives surprising results from human perspective
- JavaScript engine coerce
  - Number to string
    - 1+"2" →12
  - Boolean to number
    - 3<2<1 →true
  - Both undefined and null coerce to false

Avoid it by using
===
( )

Precedence & Association

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Operators/Operator_Precedence

- Operator precedence
  - Determines the order in which operators are evaluated. Operators with higher precedence are evaluated first
- Operator Associativity
  - Determines the order in which operators of the same precedence are processed

Operator Precedence

- The operators that you have learned are evaluated in the following order (from highest precedence to lowest):
  1. Parentheses(())
  2. Multiply/divide/modulus (*, /, %)
  3. Addition/Subtraction (+, -)
  4. Relational (<, <=, >=, >)
  5. Equality (==, !=)
  6. Logical and (&&)
  7. Logical or (||)
  8. Conditional (?:)
  9. Assignment operators (=, +=, -=, *=, /=, %=)

Example:

5 + 3 * 2 = 11 → 3*2=6 , then 6+5 = 11.
BUT
(5 + 3) * 2 = 16 → 5+3 = 8 , then 8*2 = 16.

Controlling Program Flow

- Program flow is normally linear, i.e. each statement is processed in its turn.
- One of the more common approaches to changing the program flow in JavaScript is through *Control Statements*.
- Control Statements that can be used are:
    1. Conditional Statements
        a. if ….else
        b. switch/case
    2. Loop Statements
        a. for
        b. for..in
        c. while
        d. do…while

Control Statements

Conditional Statements

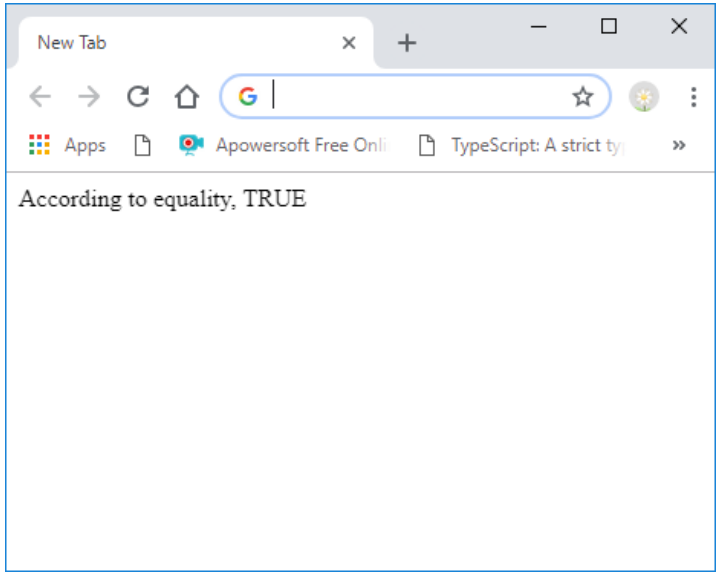
a) **if….else**

```
if (condition)
 {
    statements if condition is
true;
   }
else
 {
    statements if condition is
false;
 }
```

b) **switch / case**

```
switch (expression)
{
case label1:statements
 break
case label2:statements
break
default :
}
```

Control Statements



- Example:

```
var nValue = 3.0;
var sValue = "3.0";

if (nValue == sValue)
        document.write(“According to equality, TRUE”);

if (nValue === sValue)
        document.write(“According to idenity, FALSE”);
```

Control Statements

Looping Statements

a) **for**

```
for ( initExp ; condition ; updateExp)
{
    statements;
}
```

b) **for..in**

```
for (variablename in object)
{
      statement;
}
```

c) **while**

```
while (condition)
{
statements
}
```

d) **do…while**

```
do
{
    statements
}while(condition)
```

Continue

```
do{
Statements
 continue;
   }while(condition)
```

Break

```
do{
Statements
 break;
   }while(condition)
```

Communicating with the User

- Four ways of communication:
  - one that displays a text message in a pop-up window,
  - one that asks for information in a pop-up window,
  - one that asks a question in a pop-up window,
  - and one that displays a text message in the browser window.

Outputting text with JavaScript *(on the current window)*

- You can write out **plain text** or you can mix **HTML tags** in with the text being written using **document.write()** to return text to the browser screen.

document.write(“ ”) Or
document.writeln(“ ”) Methods

- Example:

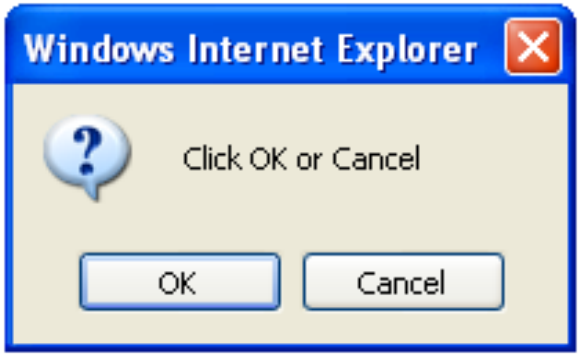
```
document.write(”Hello There!“)
document.writeln(”Hello There!“)
```

Dialogue Boxes in JavaScript

- alert dialog box

Dialogue Boxes in JavaScript

- confirm dialog box



alert() : Giving the user a pop up message

- pop up when it is called

- **Syntax**

```
alert("message");
```

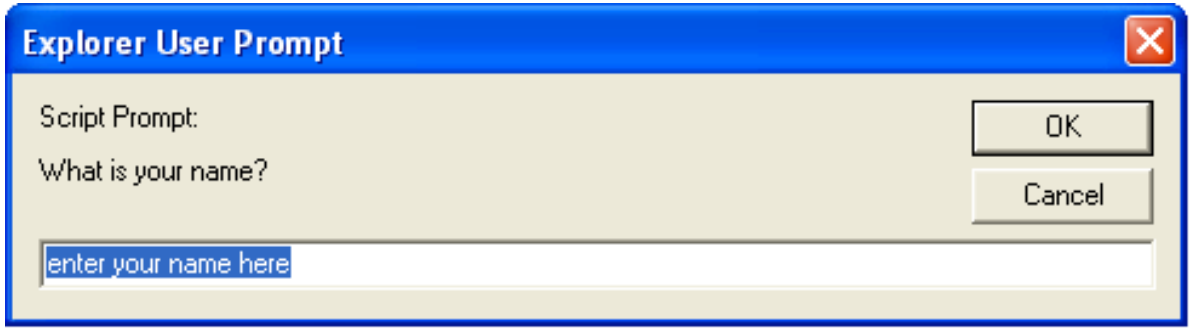
- The script

  alert(“Good Morning!");

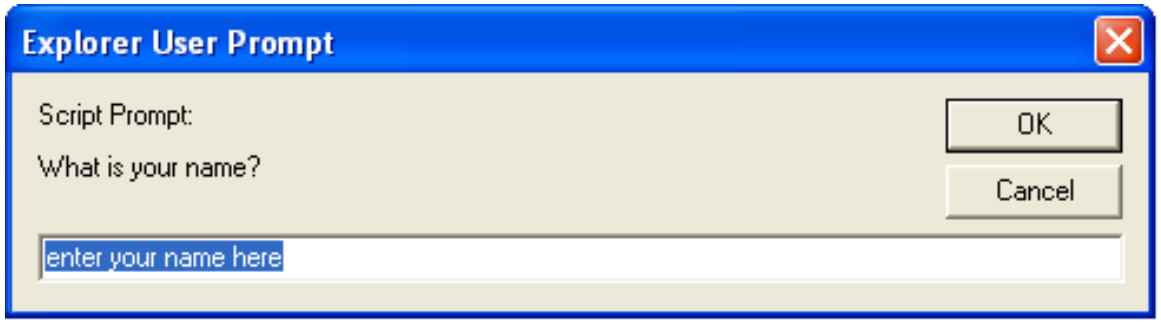
  HTML holding the script will not continue or execute until the user clicks the OK button.

Dialogue Boxes in JavaScript

- prompt dialog box



prompt() : Getting data from the user



- The user needs to fill in a field and then press *OK* or *Cancel* button.

- **Syntax**

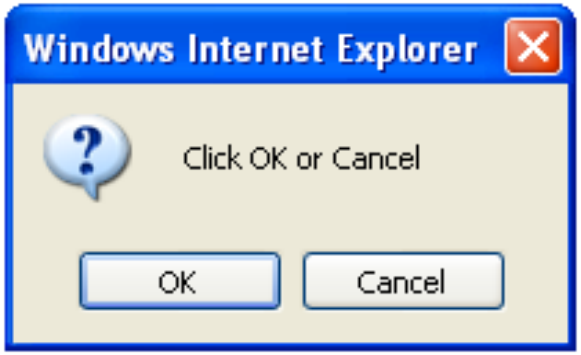
```
prompt("Message to user", "default response text");
```

- When you press *OK* the value you typed in the field is returned.
- When you press *Cancel* the value null is returned.

confirm() : ask the user a simple "yes or no" type of question

- Confirm displays a dialog box with two buttons: OK and Cancel
- It is similar to the alert() method with one significant exception: confirm() returns a value of either true or false.
- **Syntax**

  confirm("Question to the user?");



- It is a message box that provides both OK and Cancel buttons
  - If the user clicks on ***OK*** it will return **true**.
  - If the user clicks on the ***Cancel*** it will return **false**.

JavaScript Functions

- A function is an organized block of reusable code (a set of statements) that handles and performs actions generated by user events
- Functions categorized into
  - built-in functions improve your program's efficiency and readability.
  - user defined functions , created by developer to make your programs scalable.
- Function executes when it is called.
  - from another function
  - from a user event, called by an event or
  - from a separate <script> block.

JavaScript Built-in functions

Name	Example

parseInt(s,r)	parseInt("3") //returns 3
	parseInt(“3a”) //returns 3
	parseInt(“a3”) //returns NaN
	parseInt("110", 2)// returns 6
	parseInt("0xD9", 16)// returns 217

parseFloat(s)	parseFloat("3.55") //returns 3.55
	parseFloat(“3.55a”) //returns 3.55
	parseFloat(“a3.55”) //returns NaN

Number(objArg)	converts the **object** argument to a number representing the object's value.
String(objArg)	converts the **object** argument to a string representing the object's value.

JavaScript Built-in functions

Name	Description	Example
isFinite(num) **(used to test number)**	returns true if the number is finite, else false	**document.write(isFinite(“2.2345”))** **//returns true** **document.write(isFinite(“Hello”))** **//returns false**
isNaN(val) **(used to test value)**	validate the argument for a number and returns true if the given value is not a number else returns false.	**document.write(isNaN(“hello”))** **//returns true** **document.write(isNaN("348"))** **//returns false**

Assignment