


# Programming with JavaScript

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Programming with JavaScript

WAVV 2006

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Agenda

■ Introduction

- Purpose of JavaScript
- History
- Uses

■ Object Based Technology

■ Core Language Syntax

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# Programming with JavaScript

## Agenda

- Using JavaScript in Web Pages
- JavaScript Examples
- Script Debugging Techniques
- Finding Pre-Written Scripts
- References
- Web 2.0



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## Introduction

### Purpose

- JavaScript was created to add intelligence to the client-side web environment
- Bridges the technology between HTML on the client side and CGI programs on the server side
- Introduces the ability to truly program HTML web pages



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## Introduction

### Purpose

- Can validate form data preventing unnecessary interaction with the server, reducing server usage and increasing responsiveness
- Can add dynamic functionality to web pages while offloading the processing from the server to the browser machine



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# Programming with JavaScript

## Introduction

### History

- JavaScript 1.0 was jointly introduced December 4, 1995 by Netscape and Sun as LiveScript
- Interpreted by the Navigator 2 browser
- Positioned as an interpreted language to complement Java
- Server side support allowed connection to data bases (LiveWire)
- Common language for developers to deploy network solutions and distribute processing



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## Introduction

### History

- Microsoft implemented the language as JScript, in Internet Explorer 3
- Because of differences between the two implementations, JavaScript was submitted to the European Computer Manufacturers Association (ECMA) to become a standard programming language specification
- Became ECMAScript (ECMA-262) June 1997



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## Introduction

### History

- Adopted by the International Organization for Standardization and International Electrotechnical Commission, April 1998 and became ISO/IEC 16262
- JavaScript is Netscape's implementation of ECMA-262
- JScript is Microsoft's implementation of ECMA-262



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# Programming with JavaScript

## Introduction

### Uses

- The primary use of JavaScript is in web pages
- Some web servers also support server side JavaScript (Netscape LiveWire, MS JScript .NET)
- Windows Script Host also runs JScript



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## Object Based Technology

- Like Java, JavaScript uses Object Oriented technology
  - Objects
  - Methods
  - Properties
- When a page is loaded into a browser:
  - Several core objects are created
  - Conditionally, derived objects are created based on HTML tags used in the page



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## Object Based Technology

- Derived objects
  - Inherit some characteristics of their parent object
  - Allow scripting access to the HTML tag's properties
- Understanding the hierarchy of objects is very important to the JavaScript programmer



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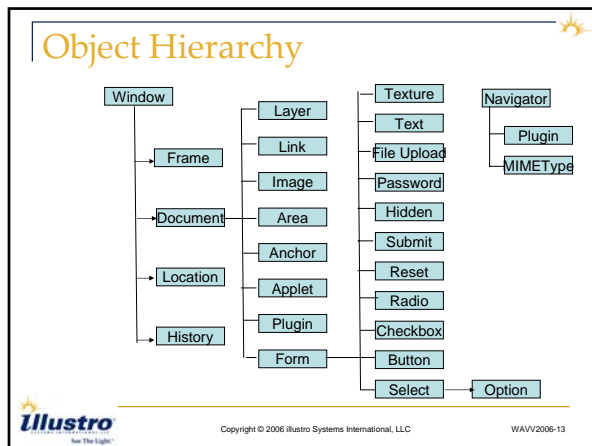
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# Programming with JavaScript



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### Object Hierarchy

- Object access is specified using the hierarchy
- If you want to access the value of a specific text box in a form

**window.document.formname.textboxname.value**

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### Object Hierarchy

- There are at least 3 ways to reference a form element
  - document.myForm.myElement
  - document.myForm.elements[2]
  - document.myForm.elements["myElement"]

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# Programming with JavaScript

## Core Language Syntax

- Free format text source statements
- Usually one instruction per statement
  - Instructions can span statements
  - Can have more than 1 instruction on a statement (semicolon required)
- Instructions end with semicolon (;) but no error message if its missing at end of statement



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## Core Language Syntax

- Blocks of code are enclosed within braces
  - Multiple statements within a condition
  - Functions
- Functions can be coded for reusable processing
  - Called by other JavaScript code
  - Called as event handler



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## Core Language Syntax

- A JavaScript function is coded:

```
function myFunction() {  
    statement1;  
    statement2;  
    ...  
}
```

- And called using:  
myFunction()



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# Programming with JavaScript

## Core Language Syntax

- Everything in JavaScript is case sensitive
- Loosely typed language
  - Variables do not have to be declared (but they can be)
  - The datatype of a variable can not be declared
- Variable names must start with a letter or underscore, following characters can be letters, numbers or underscore



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## Core Language Syntax

- Variables have a global scope unless they are declared inside a function
- Variables declared inside a function are local to that function
- Type conversions are performed automatically
- Array support is very handy tool in JavaScript



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## Core Language Syntax

- **Assignment**
  - You can assign a value to a variable simply by using the "=" sign
    - `myString = "Hello World";`
    - `myNumber = 15;`
    - `myBoolean = true;`
- **Math Operators**
  - Use the "+", "-", "\*", and "/" to perform addition, subtraction, multiplication, and division of numeric variables
    - `myNumber2 = myNumber1 + 9;`
    - `myNumber3 = myNumber2 / myNumber1;`
    - `myNumber4 = 3 * myNumber3;`



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# Programming with JavaScript

## Control Structures

- In order to use JavaScript control structures, it is important to understand how to compare values
- These comparison operators are used in the control structures:
  - If/Else Statements
  - Switch/Case Statements
  - For Loops
  - While Loops
  - Do While Loops
  - For In Loops

==	Equal To
!=	Not Equal To
>	Greater Than
<	Less Than
>=	Greater Than or Equal To
<=	Less Than or Equal To



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## Conditional Statements

- The If/Else statement allows you to execute JavaScript commands only if certain conditions are true

```
if (condition) statement1;
else statement2;
```
- The Else portion of the statement is optional



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## Conditional Statements

- By using "{" and "}" you can execute multiple JavaScript statements based on one conditional:

```
if (correctValue == false) {
    alert("Incorrect value! "+myVal);
    myVal = 0;
}
else {
    alert("That is correct!");
}
```



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# Programming with JavaScript

## Conditional Statements

- You can string together If/Else conditional statements for multiple options:

```
if (value == 1) { ... }  
else if (value == 2) { ... }  
else if (value == 3) { ... }  
.....  
else { ... }
```



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## "For" Loops

- A "For" Loop is used to execute a series of JavaScript statements a specified number of times:

```
for (i=0; i<10; i++) {  
    total = total + i;  
    product = product * i;  
}
```



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## "For" Loops

- Loop Structure: `for (i=0; i<10; i++) { ... }`
  - `"i=0;"` - initializes a variable named `i` to have a value of 0
  - `"i<10;"` - the loop will repeat until this condition is false (for values of `i` from 0 to 9)
  - `"i++;"` - increments the value of `"i"` after each pass through the loop



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# Programming with JavaScript

## "While" Loops

- A "While" Loop is used to repeat a series of statements until a certain condition is no longer true:  

```
while (condition) { ... }
```
- **Careful!** Make sure that some statement within the "{" and "}" can modify the condition so that it will eventually be false. Otherwise, you could have an infinite loop!



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## Adding JavaScript to Web Pages

- How do I include JavaScript in an HTML page?
  - There is an HTML tag for inserting JavaScript...

```
<SCRIPT LANGUAGE="" TYPE="" SRC="" ></SCRIPT>
```

    - For JavaScript, the LANGUAGE attribute is specified as LANGUAGE="JAVASCRIPT"
    - The TYPE attribute is optional and has a default value of TYPE="Text/JavaScript". It is not necessary to specify this value



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## Adding JavaScript to Web Pages

- How do I include JavaScript in an HTML page?...
  - There is an HTML tag for inserting JavaScript...

```
<SCRIPT LANGUAGE="" TYPE="" SRC="" ></SCRIPT>
```

    - The SRC attribute is used to reference an external file containing JavaScript, instead of embedding the script in the HTML file itself
    - All content between the <SCRIPT> and </SCRIPT> tags is interpreted by the browser as JavaScript



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# Programming with JavaScript

## Adding JavaScript to Web Pages

- Where does the JavaScript go?
  - You can place <SCRIPT> tags anywhere in an HTML page
  - JavaScript is an **interpreted** language, so the statements in a script are not processed until the browser gets to them during its rendering of the HTML page



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## Adding JavaScript to Web Pages

- Where does the JavaScript go?...
  - JavaScript will be executed at the point in the HTML page that you place it except for functions
- JavaScript functions are usually defined in the <HEAD> section of a page
  - They are not executed unless called



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## Using JavaScript in Web Pages

### Basics

- Each object on a page has properties, methods and events associated with them that can be used in JavaScript
- As an example, lets look at the TEXT object (input element in a form created by <INPUT TYPE="TEXT"> HTML statement)



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# Programming with JavaScript

## Using JavaScript in Web Pages

Basics

- Text Object
  - Properties
    - defaultValue Returns value= attribute
    - form Returns reference to form containing the text box
    - name Returns the name= attribute
    - type Returns the type of this element (always TEXT)
    - value Returns the actual value in the text box



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## Using JavaScript in Web Pages

Basics

- Text Object
  - Methods
    - blur() Removes focus from text box
    - focus() Gives focus to text box
    - fireEvent() Invokes handler for specified event type
    - select() Selects text in the text box



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## Using JavaScript in Web Pages

Basics

- Text Object
  - Event Handlers
    - onBlur Executes when text box loses focus
    - onChange Executes when text box loses focus and text was modified
    - onFocus Executes when text box gets focus
    - onSelect Executes when text in box is selected



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# Programming with JavaScript

## Using JavaScript in Web Pages

### Manipulating Properties

- You can place a value in an input element with a JavaScript statement such as:

```
document.myForm.myInput.value="ABC" ;
```

- If "myInput" is a text box, "ABC" will appear in the box as soon as this JavaScript statement is executed



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## Using JavaScript in Web Pages

### Manipulating Properties

- You can change the graphic that is displayed on the page by modifying the Image source value such as:

```
document.myForm.myJPG1.src =  
"altpic.jpg" ;
```

- This is the way images change when you roll the mouse over them



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## Using JavaScript in Web Pages

### Calling Methods

- Calling a Method of an object invokes some action (code execution) on that object

```
document.myForm.textBox1.focus( )
```

- The available methods depend on the type of object



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# Programming with JavaScript

## Using JavaScript in Web Pages

### Calling Methods

#### ■ Useful methods of the **Window** object

- `window.open` & `window.close`
  - Opens/closes browser windows
- `window.moveTo`
  - Move location of window on display
- `window.setTimeout`
  - Evaluates an expression after specified number of milliseconds elapsed
- `window.alert`
  - Display application alert box



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## Using JavaScript in Web Pages

### Calling Methods

#### ■ Useful methods of the **Document** object

- `document.focus`
  - Give focus to an element
- `document.write`
  - Dynamically writes HTML lines into a document

#### ■ Useful methods of the **Form** object

- `document.formname.scrollIntoView`
  - Scroll form element into view on display
- `document.formname.submit`
  - Submits the form



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## Using JavaScript in Web Pages

### Events

#### ■ Most user actions can be used to drive JavaScript event handlers

- Clicking a button
  - the **onClick** event
- Moving the mouse over a link or button
  - the **onMouseOver** event
- The submission of a form
  - the **onSubmit** event



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# Programming with JavaScript

## Using JavaScript in Web Pages

### Events

- Events for HTML elements are defined in element tags, just like attributes

```
<input type="button" value="Click Me"
      onClick="buttonWasClicked()">
```



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## JavaScript Examples

- Lets look at some live examples



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## When JavaScripts Go Bad

- Debugging tips
  - Turn on script debugging in your browser
  - Use the alert() function to display suspect data
  - Open a debug window and write trace information to it



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# Programming with JavaScript

## When JavaScripts Go Bad

- Turn on script debugging in your browser
  - In IE
    - Menu **Tools->Internet Options**
    - Click **Advanced** tab
    - Near top of **Browsing** options
      - Uncheck **Disable script debugging**
      - Check **Display a notification about every script error**
  - In Netscape 7
    - Menu **Tools->Web Development->JavaScript Console**



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## When JavaScripts Go Bad

- The alert() function
  - Often problems occur because of unexpected data since you can't natively see the data represented by objects
  - Use a JavaScript alert to show you the data
  - Can also show you what code is executing

```
Alert("The fourth element in my form is named:" +  
document.myForm.elements[3].name);
```



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## When JavaScripts Go Bad

- Use a "debug window" for complex tracing of events or large scripts that require long term support

```
debug = true;  
dwFeat="scrollbars=yes,resizable=yes,width=400,height=200";  
if (debug) {  
    debugWindow = window.open("Debug Trace", "",dwFeat);  
    debugWindow.document.write("<title>Debug Output Information</title>");  
}
```



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# Programming with JavaScript

## When JavaScripts Go Bad

- Write a trace output function

```
function debugTrace(data) {  
  if (debug) {  
    debugWindow.document.write(data);  
    debugWindow.document.write("<br>"); }  
}
```



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## When JavaScripts Go Bad

- Call the trace function anywhere you want to display some data

```
function funct1() {  
  debugTrace("Function funct1() called.");  
}  
  
function funct2() {  
  debugTrace("Function funct2() called.");  
}
```



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## JavaScripts on the Web

- There are thousands of already written scripts available on the web
- Just google for JavaScript and you will find lots of sites offering free scripts
  - [www.javascript.com](http://www.javascript.com)
  - [www.dynamicdrive.com](http://www.dynamicdrive.com)
  - [www.javascriptkit.com](http://www.javascriptkit.com)



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# Programming with JavaScript

## References

- Netscape's Core JavaScript Reference
  - [developer.mozilla.org/en/docs/Core\\_JavaScript\\_1.5\\_Reference](http://developer.mozilla.org/en/docs/Core_JavaScript_1.5_Reference)
- Microsoft Scripting Technologies
  - [msdn.microsoft.com/scripting](http://msdn.microsoft.com/scripting)
- ECMA-262
  - [www.ecma-international.org/publications/standards/ecma-262.htm](http://www.ecma-international.org/publications/standards/ecma-262.htm)



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## Web 2.0

- Future of the World Wide Web
  - Assumes everything up to now was 1.0
- It's all about performance and the user experience
  - 1.0
    - For every server interaction we wait for an entirely new web page to load
    - Nothing can be done with the current page while we wait for the new page



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## Web 2.0

- It's all about performance and the user experience...
  - 2.0
    - Asynchronous server requests made in background
    - User interface on current page continues to function
- Much more of the application code resides in the web page in the form of scripting instead of being on the server



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# Programming with JavaScript

## Web 2.0

- Uses Asynchronous JavaScript and XML (Ajax)
  - Phrase coined by Jesse James Garrett of Adaptive Path
- JavaScript XMLHttpRequest method used to make asynchronous requests to same server from which web page was retrieved
- Call back JavaScript function handles result data when it arrives



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## Web 2.0

- Dynamic HTML used to update existing web page instead of entirely replacing it with a new page
- User interface in existing page continues to be active while background requests are made
- User experience is more like a desktop application than a web application



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## Web 2.0

- In spite of the method name, the received data can be any format the JavaScript is prepared to handle
  - HTML
  - Plain text with delimiters
  - XML documents processed with DOM



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# Programming with JavaScript

## Web 2.0 Resources

- IBM Developerworks web site, multi-part Ajax article
  - <http://www-128.ibm.com/developerworks/web/library/wa-ajaxintro1.html?ca=dgr-Inxw01MasterAJAX>
- AJAX World Magazine
  - <http://ajax.sys-con.com>
- Google for AJAX or WEB 2.0 for additional information



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