WEBLOAD

Scripting Guide

Version 12.0

RADVIEW

WebLOAD Scripting Guide

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November, 2018, RadView Publication Number WL-PRO-0909-SCG84

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Chapter 1

Introduction

Welcome to WebLOAD, the premier performance, scalability, and reliability testing solution for internet applications.

WebLOAD is easy to use and delivers maximum testing performance and value. WebLOAD verifies the scalability and integrity of internet applications by generating a load composed of Virtual Clients that simulate real-world traffic.

This section provides a brief introduction to WebLOAD technical support, including both documentation and online support.

IMPORTANT NOTE: In previous WebLOAD versions, a WebLOAD script was called an “Agenda”. From version 12.0, it is referred to simply as a script. Wherever “Agenda” is still displayed, we are referring to the WebLOAD script.

WebLOAD IDE has been changed to WebLOAD Recorder.

WebLOAD Documentation

WebLOAD is supplied with the following documentation:

WebLOAD™ Installation Guide

Instructions for installing WebLOAD and its add-ons.

WebLOAD™ Recorder User Guide

Instructions for recording, editing, and debugging load test Scripts to be executed by WebLOAD to test your Web-based applications.

WebLOAD™ Console User Guide

A guide to using WebLOAD console, RadView’s load/scalability testing tool to easily and efficiently test your Web-based applications. This guide also includes a quick start section containing instructions for getting started quickly with WebLOAD using the RadView Software test site.

WebLOAD™ Analytics User Guide

Instructions on how to use WebLOAD Analytics to analyze data and create custom, informative reports after running a WebLOAD test session.

WebRM™ User Guide

Instructions for managing testing resources with the WebLOAD Resource Manager.

WebLOAD™ Scripting Guide

Complete information on scripting and editing JavaScript scripts for use in WebLOAD and WebLOAD Recorder.

WebLOAD™ JavaScript Reference Guide

Complete reference information on all JavaScript objects, variables, and functions used in WebLOAD and WebLOAD Recorder test scripts.

WebLOAD™ Extensibility SDK

Instructions on how to develop extensions to tailor WebLOAD to specific working environments.

WebLOAD™ Automation Guide

Instructions for automatically running WebLOAD tests and reports from the command line, or by using the WebLOAD plugin for Jenkins

WebLOAD™ Cloud User Guide

Instructions for using RadView's WebLOAD Cloud to view, analyze and compare load sessions in a web browser, with full control and customization of the display.

The guides are distributed with the WebLOAD software in online help format. The guides are also supplied as Adobe Acrobat files. View and print these files using the Adobe Acrobat Reader. Install the Reader from the Adobe website http://www.adobe.com.

Typographical Conventions

Before you start using this guide, it is important to understand the terms, icons, and typographical conventions used in the documentation.

The following icons appear next to the text to identify special information.

Table 1: Icon Conventions

Icon	Type of Information
✎	Indicates a note.
🧩	Indicates a feature that is available only as part of a WebLOAD Add-on.

The following kinds of formatting in the text identify special information.

Table 2: Typographical Conventions

Formatting Convention	Type of Information
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.
Emphasis	Use to emphasize the importance of a point or for variable expressions such as parameters.
CAPITALS	Names of keys on the keyboard. for example, SHIFT, CTRL, or ALT.
KEY+KEY	Key combinations for which the user must press and hold down one key and then press another, for example, CTRL+P, or ALT+F4.

Where to Get More Information

This section contains information on how to obtain technical support from RadView worldwide, should you encounter any problems.

Online Help

WebLOAD provides a comprehensive on-line help system with step-by-step instructions for common tasks.

You can press the F1 key on any open dialog box for an explanation of the options or select **Help ➤ Contents** to open the on-line help contents and index.

- Forums
- Script Library
- Documentation
- How To docs
- FAQ
- Developer Wiki

Technical Support Website

The technical support page on our website provides:

- The option of opening a ticket
- Links to WebLOAD documentation

Technical Support

For technical support in your use of this product, contact:

North American Headquarters	International Headquarters
e-mail: support@RadView.com Phone: 1-888-RadView (1-888-723-8439) (Toll Free) 908-526-7756 Fax: 908-864-8099	e-mail: support@RadView.com Phone: +972-3-915-7060 Fax: +972-3-915-7011

Note: We encourage you to use e-mail for faster and better service.

When contacting technical support please include in your message the full name of the product, as well as the version and build number.

Chapter 2

Programming your JavaScript script

WebLOAD functions on many different levels. WebLOAD Recorder provides a wide range of testing tools and features, ranging from basic tools that are available through a simple graphic user interface, to features that require only a small amount of script 'tweaking', to complex functionality that assumes a sophisticated understanding of programming techniques. Beginning users may take advantage of the basic WebLOAD Recorder tool set without ever understanding exactly how these features are implemented. Most WebLOAD testing features and configuration settings are handled automatically by WebLOAD and never require any manual intervention. These GUI-only features are described in the *WebLOAD Recorder User Guide*.

Understanding JavaScript scripts

This chapter focuses on the options available to users who wish to customize their recorded scripts and are comfortable looking at, and possibly giving a small 'tweak' to the JavaScript code within script files. Major programming skills are not required for the tools in this chapter. A basic understanding of programming logic, an introduction to the internals of script files, and careful reading of the examples provided are enough to get started using the tools documented here.

Note: The topics presented in this chapter include fragments of JavaScript script code. To view the JavaScript code of a script, select JavaScript View from the toolbar or drop-down View menu. This opens a JavaScript View pane that automatically displays the JavaScript code corresponding to any item highlighted in the Script Tree.

The WebLOAD Recorder tools described in the rest of this manual involve some degree of intervention within the JavaScript code of a script. Users will have an easier time working with these tools if they have a basic understanding of JavaScript scripts. This chapter therefore begins with a description of the components, structure, and grammar of JavaScript scripts.

What are JavaScript scripts?

WebLOAD tests applications by running JavaScript scripts that simulate the actions of real users. You don't have to be familiar with the JavaScript language to work with

WebLOAD and WebLOAD Recorder, and test applications. JavaScript scripts are recorded through WebLOAD Recorder. As you execute a typical sequence of activities, WebLOAD Recorder records the HTTP protocol level traffic that is generated by the Web browser according to your accesses. By the conclusion of your recording session, a complete JavaScript script file is created.

The basic 'Building Blocks' of a recording session are HTTP requests, which are triggered by user actions. Each time a user navigates to a new URL or submits a form, the browser emits an HTTP method and the resulting HTTP request is recorded. Externally, user activities (at the protocol level) are represented on the WebLOAD Recorder desktop by a set of clear, intuitive icons and visual devices arranged in a visual Script Tree. Internally, WebLOAD Recorder automatically creates JavaScript scripts that act as scripts, recreating the HTTP traffic created by the actions of the original user during later test sessions.

Most users begin application testing by simply recording and then running a series of basic scripts, without ever looking into a script's internal Building Blocks to see the actual JavaScript code inside. As their understanding of the WebLOAD Recorder tool set grows, many users decide to expand or tailor their original set of scripts to meet a particular testing need, adding customized features that sometimes require some editing of the JavaScript code within the script itself. WebLOAD Recorder offers a wide range of features and options, for users who wish to add more functionality to their scripts, rather than simply replaying the same set of HTTP methods exactly as originally recorded. Many of these tools are available through the WebLOAD Recorder GUI and do not require any additional programming skills. These tools are documented in the *WebLOAD Recorder User Guide*. The more complex tools that require some familiarity with JavaScript programming are described in the remaining chapters of this guide, with detailed syntax specifications provided in the *WebLOAD JavaScript Reference Guide*.

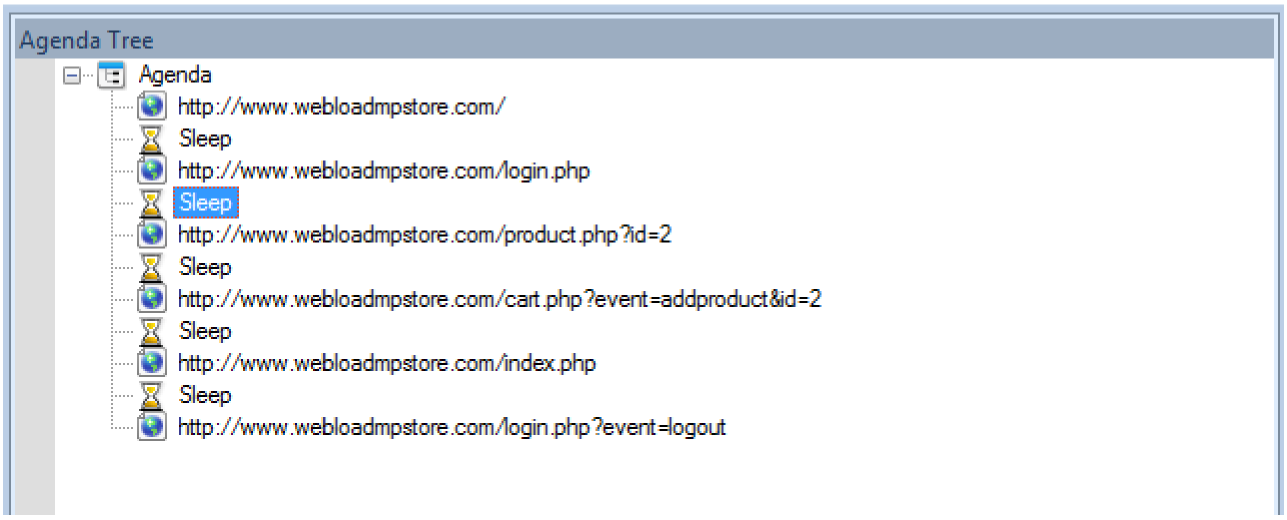
Test session scripts are written in JavaScript. JavaScript is an object-oriented scripting language originally developed by Netscape Communications Corporation and is currently maintained by the Mozilla Foundation. JavaScript is best known for its use in conjunction with HTML to automate World Wide Web pages. However, JavaScript is actually a full-featured programming language that can be used for many purposes besides Web automation. WebLOAD and WebLOAD Recorder have chosen JavaScript as the scripting language for test session scripts. WebLOAD Recorder JavaScript scripts combine the ease and simplicity of WebLOAD's visual, intuitive programming environment with the flexibility and power of JavaScript object-oriented programming.

Script Tree Structure

Script Tree Nodes

JavaScript scripts are represented on the WebLOAD Recorder desktop by a script Tree. Each item that appears in the Script Tree is a script node. As you work in your application during a recording session, WebLOAD Recorder adds nodes to the Script Tree. Each node in the Script Tree represents a single user action at the HTTP protocol level, such as submitting a form or navigating to a new URL. Script Tree nodes provide an intuitive, graphic representation of the underlying JavaScript code that actually implements the user activities to be recreated at run time.

The following figure illustrates a typical Script Tree fragment:



Agenda Tree
- Agenda
  - http://www.webloadmpstore.com/
  - Sleep
  - http://www.webloadmpstore.com/login.php
  - Sleep
  - http://www.webloadmpstore.com/product.php?id=2
  - Sleep
  - http://www.webloadmpstore.com/cart.php?event=addproduct&id=2
  - Sleep
  - http://www.webloadmpstore.com/index.php
  - Sleep
  - http://www.webloadmpstore.com/login.php?event=logout

Figure 1: Typical Script Tree Fragment

Script Tree nodes are arranged sequentially.

The sequential arrangement of icons in the Script Tree means that icons appear in the Script Tree in the order in which the user actions and HTTP methods occurred when originally recorded. URL nodes in a script Tree will appear in the order in which the browser requested each Web page over the course of a recording session. In cases where the browser emits asynchronous requests (for example, while using AJAX), the requests are recorded and appear in the Script Tree in the order that the browser emitted them.

Note: WebLOAD Recorder offers users a wide range of tools and features that can add very powerful functionality to a testing script. While users are certainly encouraged to incorporate these tools in their Script Tree, users must also be careful when editing URL nodes in the Script Tree. Because the order of HTTP activities within a script is so significant, changing the sequence of URLs in the Script Tree in effect means changing the sequence of activities, and may destroy the functionality of the script.

script Program Structure

After a user has finished recording a typical session with the system under test, WebLOAD Recorder saves a complete record of all user activities at the protocol level and converts the user activity information to a JavaScript script. This script can be run repeatedly, with a variety of testing configurations, until the user is satisfied that the system has been thoroughly tested. The script created by the WebLOAD Recorder JavaScript interpreter has the following underlying structure.

Main Script

The main script contains JavaScript code representing the user activities at the protocol level to be simulated during a test session. The main script is required. Without it, WebLOAD and WebLOAD Recorder cannot run a test.

The main script is constructed and based on an exact recording of the specific sequence of user activities, such as the following, which are completed during a recording session:

- Web page navigations
- Form submissions
- User think time (sleep)

In addition to the original recording session activities, users may also add other features to the script, such as messages or pause and sleep times. These features are usually added through WebLOAD Recorder. WebLOAD executes the main script repeatedly, presenting the results in a series of analysis reports produced at the end of testing sessions.

Initialization and Termination Functions

These are JavaScript functions that WebLOAD or WebLOAD Recorder executes once, in a fixed sequence, before or after the main script. These functions are used to prepare for or clean up from a testing session. The following functions are automatically included in the script when needed:

- `InitAgenda()` — Initialize global objects shared by all WebLOAD Recorder clients that run the script.

- `InitClient()` — Initialize local objects and variables for individual clients.
- `TerminateClient()` — Free resources of individual clients.
- `TerminateAgenda()` — Free global resources shared by all clients running the script.
- `OnScriptAbort()` — Executes user-defined code to free resources whenever the script stops the execution of a round (ErrorMessage), a session (SevereErrorMessage), or in the event of an error. In addition, OnScriptAbort() is called in the Console whenever the script stops abruptly. This occurs when the end of a scheduled session is in the middle of a round, or when a user manually stops the session.
- `OnErrorTerminateClient()` — Clean up and free resources after a runtime error (per client).
- `OnErrorTerminateAgenda()` — Clean up and free resources after a runtime error (per script).

The initialization and termination functions are not part of the WebLOAD performance test. WebLOAD does not include the operations of these functions in the performance statistics.

Use the initialization and termination functions to create or free objects or to set global variables. Besides these tasks, the functions may contain other JavaScript statements and may call other functions in your script. The termination functions are used both when a test session finishes successfully, and when it is terminated early by an error. See *script Execution Sequence* (on page 11), and *Non-Standard script Execution Sequence* (on page 39), for more information.

Initialization and termination functions may be added directly to the code in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 15).

To bring up a list of available functions:

- While working in Java Editing mode, select the node in the Script Tree to which you want to add a function, right-click the JavaScript pane, and select **Insert ➤ General ➤ Init/Terminate Functions** from the pop-up menu.

WebLOAD Recorder automatically inserts the correct code for the selected function into the script file. You may then add any other necessary commands to the functions without any concerns about mistakes in the function syntax.

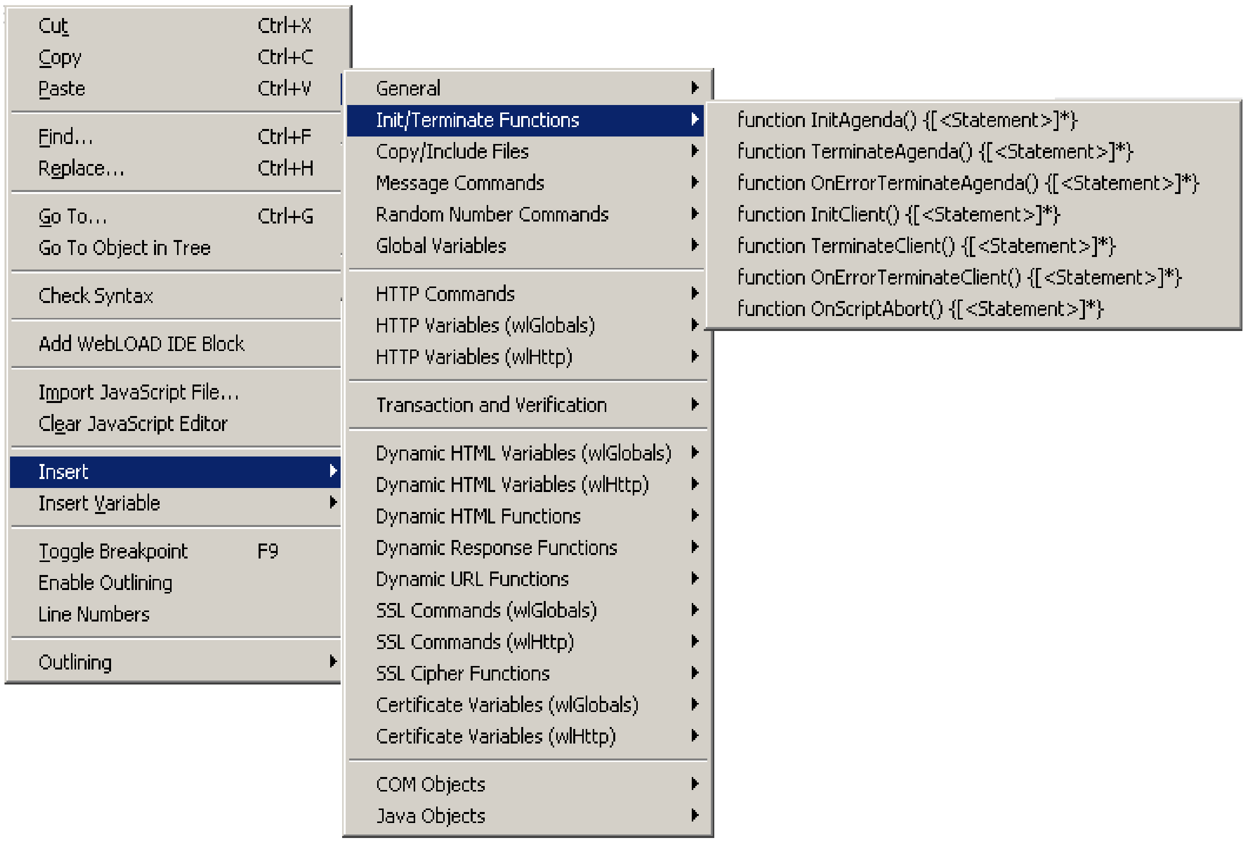

Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Find... Ctrl+F
Replace... Ctrl+H
Go To... Ctrl+G
Go To Object in Tree
Check Syntax
Add WebLOAD IDE Block
Import JavaScript File...
Clear JavaScript Editor
Insert
Insert Variable
Toggle Breakpoint F9
Enable Outlining
Line Numbers
Outlining
General
Init/Terminate Functions
Copy/Include Files
Message Commands
Random Number Commands
Global Variables
HTTP Commands
HTTP Variables (wlGlobals)
HTTP Variables (wlHttp)
Transaction and Verification
Dynamic HTML Variables (wlGlobals)
Dynamic HTML Variables (wlHttp)
Dynamic HTML Functions
Dynamic Response Functions
Dynamic URL Functions
SSL Commands (wlGlobals)
SSL Commands (wlHttp)
SSL Cipher Functions
Certificate Variables (wlGlobals)
Certificate Variables (wlHttp)
COM Objects
Java Objects
function InitAgenda() {[<Statement>]*}
function TerminateAgenda() {[<Statement>]*}
function OnErrorTerminateAgenda() {[<Statement>]*}
function InitClient() {[<Statement>]*}
function TerminateClient() {[<Statement>]*}
function OnErrorTerminateClient() {[<Statement>]*}
function OnScriptAbort() {[<Statement>]*}

Figure 2: Function Insertion using the Insert Menu

Navigation Functions

When a URL node is selected in the Script Tree, the corresponding script code that appears in the JavaScript View pane will usually include basic navigation and validation functions such as `wlHTTP.Get()` and `wlHTTP.Post()`. The `wlHTTP.Get()` and `wlHTTP.Post()` methods store the HTML from the navigated page in the document.wlSource property. The code is refreshed when the script calls `wlHTTP.Get()` or `wlHTTP.Post()` again. The stored code includes any scripts or other data embedded in the HTML, which the script can retrieve and interpret in any desired way.

These functions are almost always visible at the start of the JavaScript code for every URL node in the Script Tree. While additional Tree nodes add their own additional corresponding JavaScript code to the script, these functions form the basis for all test session scripts.

script Execution Sequence

Basic Execution Sequence

WebLOAD executes JavaScript scripts in a simple, fixed sequence. The normal sequence is as follows.

1. The optional InitAgenda() initialization function runs once for each Load Generator, initializing the global WebLOAD objects, or any other global data or resources, that are shared by all clients in a Load Generator process.
2. The script splits into a separate thread for each client. Load Generator processes may include any number of Virtual Clients, all running the same script. After WebLOAD runs `InitAgenda()`, it runs each client in a separate thread. Each thread can have its own local variables and objects. In essence, each client runs an independent instance or copy of the script.

   For example, suppose you want each WebLOAD client to connect to a different Web page. You can use a local object within each thread to store the Web address and perform the HTTP connection. Because the object is local, there is no confusion between the addresses. Each thread connects to the appropriate address, without any effect on the other threads of the same script.

3. The optional `InitClient()` initialization function runs once for each thread, initializing local WebLOAD objects, or any other variables or resources, which belong to an individual thread of the script. In this way, each thread of a script can work with different data and can operate independently of the other threads.
4. The main script runs repeatedly in a separate loop for each thread. When WebLOAD reaches the end of the main script, it starts again at the beginning. The main script continues to iterate until you stop the WebLOAD test. You can stop the test by issuing a Stop command in the WebLOAD Console, or you can tell the Console to stop the test automatically after a predefined time.

   WebLOAD collects performance statistics while the main script runs. The various statistics that WebLOAD displays (round time, average round time, etc.) apply only to the main script, not to operations in the initialization and termination functions.

5. The optional `TerminateClient()` termination function runs once for each thread. Strictly speaking, most scripts do not need a `TerminateClient()` function, because JavaScript automatically frees objects and releases most resources when the script terminates. In a complex script, however, it is good programming practice to free local objects and resources explicitly using `TerminateClient()`.
6. The separate threads for each client terminate.

7. The optional `TerminateAgenda()` termination function runs once for each Load Generator process. Most simple scripts do not need a `TerminateAgenda()` function. In a complex script, including `TerminateAgenda()` is recommended to free global resources.
8. The `OnScriptAbort()`, `OnErrorTerminateClient()`, and `OnErrorTerminateAgenda()` functions clean up and free resources after a runtime error. For more information about handling errors during a test session, see *Error Management* (on page 35).

The following figure illustrates the steps in a normal script execution sequence:

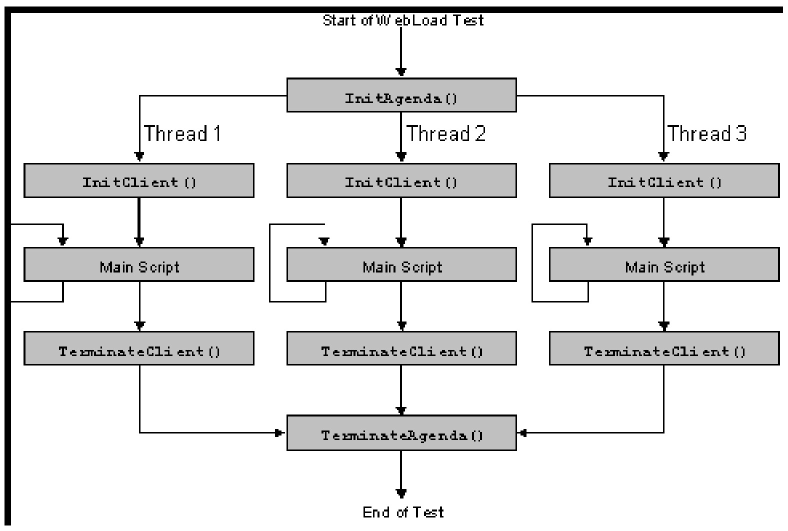


Figure 3: Steps in a Typical script Execution Sequence

EvaluateScript Function

The `EvaluateScript()` function is used to define JavaScript code to be executed at specific points during the execution of the script. The function allows testers to include scripts from an external library and specify the point during script execution at which the script should be executed. You can specify to execute the script at any of the following points within the script:

- WLBeforeInitClient
- WLAfterInitAgenda
- WLBeforeThreadActivation
- WLOnThreadActivation
- WLAfterTerminateClient
- WLBeforeRound
- WLAfterTerminateAgenda

- WLAfterRound

If the script run is successful, the value from the last executed expression statement processed in the script is saved and then parsed when the engine reaches the relevant point. The saved value includes the following information:

- The text of the script.
- The size of the script text, in bytes.
- The name of the file or URL containing the script text.

If the script run is unsuccessful, the value is left undefined.

The following example is used to call a function that is defined in an external file:

```
IncludeFile(filename.js)
EvaluateScript("MyFunction()",WLAfterRound)
```

In this example, the `EvaluateScript` string is parsed, executed, and instructs the JavaScript engine to call the `MyFunction()` function right after each round is completed. At this point WebLOAD returns any syntax or runtime errors.

For more information on the EvaluateScript function, see the *WebLOAD's JavaScript Reference Guide*.

Cleanup at the End of Each Round

The main script retains its variables and objects from one round (iteration) to the next. For example, you can increment a variable in each round, or you can store data in an object in one round and access the data in the next.

There are three exceptions to this rule. At the end of each round:

- Any cookies that the script sets are deleted.
- The SSL Cache is cleared.
- Any open HTTP connections are closed.

Execution Sequence for Scheduled Clients

WebLOAD lets you schedule the number of clients running a single script in a single Load Generator. WebLOAD runs the initialization and termination functions of the script according to your schedule.

For example, suppose you configure a Load Generator to run a script according to the following schedule:

Table 3: Load Generator Schedule—Sample 1

Number of Threads	Scheduled Time
50 threads	For the first 30 minutes.
20 threads	From 30 to 60 minutes.
100 threads	For the remainder of the test.

In this case:

- WebLOAD runs the `InitAgenda()` function when the Load Generator starts to run. WebLOAD then starts the first 50 threads, running `InitClient()` and the main script for each thread.
- After 30 minutes, 30 of the threads stop. WebLOAD runs `TerminateClient()` for these 30 threads. The main script of the other 20 threads continues running.
- At 60 minutes, 80 additional threads start. For each of these 80 threads, WebLOAD runs `InitClient()` and the main script.
- At the end of the test, WebLOAD runs `TerminateClient()` for each of the 100 threads currently running, and then runs `TerminateAgenda()`.

Execution Sequence for Mixed Clients

You can configure a single Load Generator to run more than one script. In that case, WebLOAD splits the time on each thread between the scripts. WebLOAD runs the initialization and termination functions of each script at the beginning and end of the threads, respectively. It does not run the functions each time the threads switch between scripts.

For example, suppose you configure a Load Generator to run 100 threads as follows:

Table 4: Load Generator Schedule—Sample 2

Percentage of time	Selected script
50% of the time	`agenda1. wlp`
50% of the time	`agenda2. wlp`

In this case, WebLOAD runs:

- The `InitAgenda()` functions of both scripts when the Load Generator starts.

- The `InitClient()` functions of both scripts in each thread when the thread starts.
- The `TerminateClient()` functions of both scripts, in each thread at the end of the test.
- The `TerminateAgenda()` functions of both scripts when all the threads have stopped.

Editing the JavaScript Code in a script

WebLOAD is a fully automated testing tool. WebLOAD users are able to record scripts, add testing tools, run test sessions, and analyze the results, without any programming skills whatsoever. Nevertheless, there are users who wish to manually edit the JavaScript code of a recorded script to add functionality to test session scripts created with WebLOAD Recorder, creating more complex, sophisticated test sessions.

For example, many users design test sessions around a set of basic scripts created through WebLOAD Recorder and then expand or tailor those scripts to meet a particular testing need. Some of the reasons for editing JavaScript scripts include:

- Recycling and updating a useful library of test scripts from earlier versions of WebLOAD.
- Testing websites that work with Java or COM components.
- Creating advanced, specialized verification functions.
- Adding global variables and messages.
- Debugging the system under test.
- Optimization capabilities, to maximize your application's functionality at minimal cost.

This section describes the tools provided by WebLOAD Recorder to help you access and edit the JavaScript code within your script.

Accessing the JavaScript Code within the Script Tree

WebLOAD Recorder provides a complete graphic user interface for creating and editing script files. Additions or changes to a script are usually made through the WebLOAD Recorder GUI, working with intuitive icons representing user actions in a graphic Script Tree. For greater clarity, the JavaScript code that corresponds to each user action in a script is also visible in the JavaScript View pane on the WebLOAD Recorder desktop.

While most people never really work with the JavaScript code within their script, some users do wish to manually edit the JavaScript code underlying their Script Tree. For example, some test sessions may involve advanced WebLOAD testing features that can not be completely implemented though the GUI, such as Java or XML objects. Editing the JavaScript code in a script does not necessarily mean editing a huge JavaScript file. Most of the time users only wish to add or edit a specific feature or a small section of the code. WebLOAD Recorder provides access to the JavaScript code in a script through JavaScript Object nodes, which are seen on the following levels:

- **JavaScript Object nodes**—individual nodes in the Script Tree. Empty JavaScript Object nodes may be dragged from the WebLOAD Recorder toolbar and dropped onto the Script Tree at any point selected by the user, as described in *Adding JavaScript Object Nodes* (on page 19). Use the IntelliSense Editor, described in *Using the IntelliSense JavaScript Editor* (on page 16), to add lines of code or functions to the JavaScript Object.
- **Imported JavaScript File**—an external JavaScript file that should be incorporated within the body of the current script.
    - While working in JavaScript Editing mode, right-click the JavaScript pane and select **Import JavaScript File** from the WebLOAD Recorder menu.

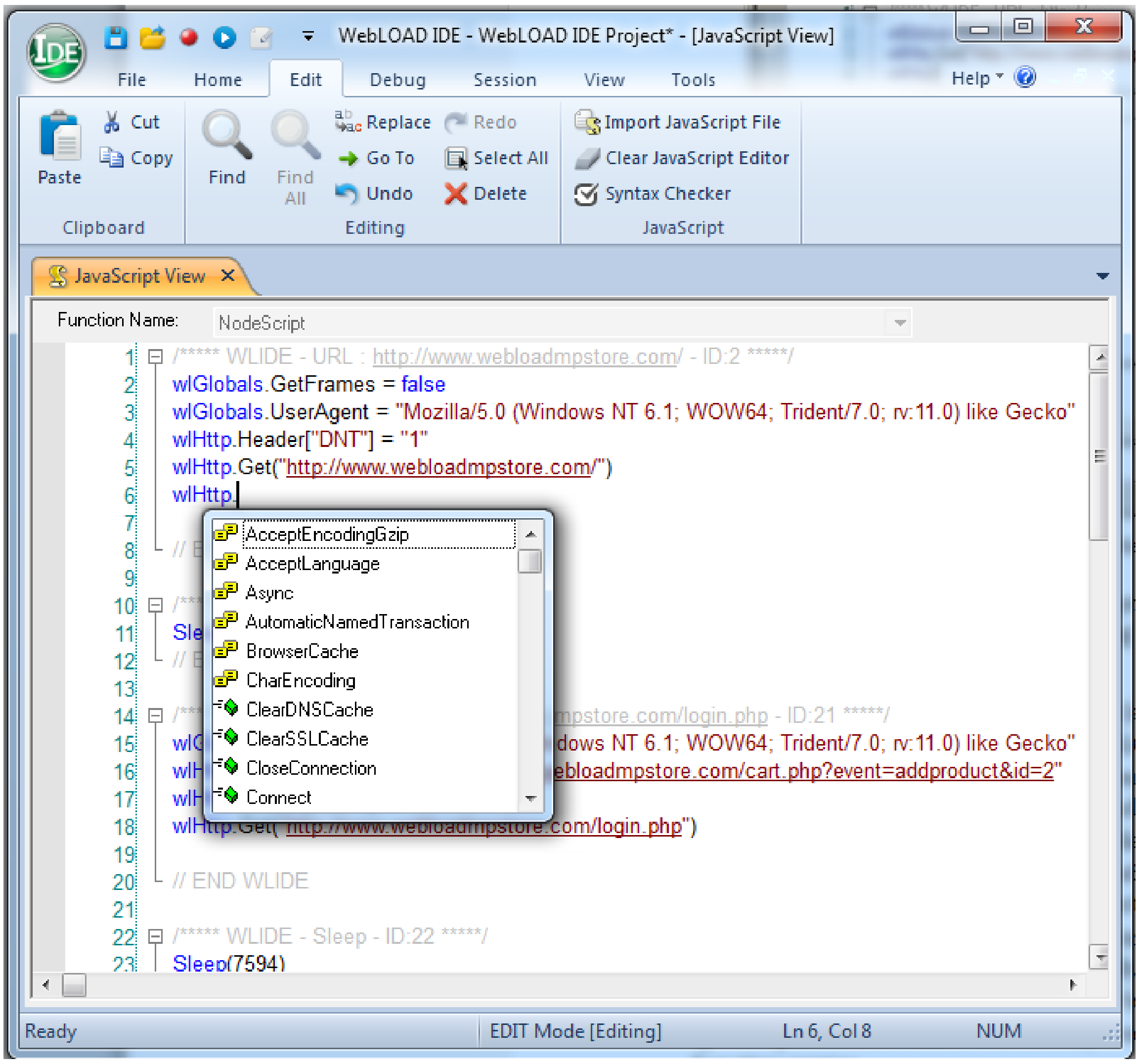
      Often, testers work with a library of pre-existing library files from which they may choose functions that are relevant to the current test session. This modular approach to programming simplifies and speeds up the testing process, and is fully supported and endorsed by WebLOAD.

Using the IntelliSense JavaScript Editor

For those users who wish to manually edit their scripts, WebLOAD Recorder provides three levels of programming assistance:

- An IntelliSense Editor mode for the JavaScript View pane.

  Add new lines of code to your script or edit existing JavaScript functions through the IntelliSense Editor mode of the JavaScript View pane. The IntelliSense Editor helps programmers write the JavaScript code for a new function by formatting new code and prompting with suggestions and descriptions of appropriate code choices and syntax as programs are being written. For example, in the following figure the IntelliSense Editor displays a drop-down list of available properties and objects for the `wlHttp` object being added to the program, with a pop-up box describing the highlighted method in the list.



```
/***** WLIDE - URL : http://www.webloadmpstore.com/ - ID:2 *****/
wlGlobals.GetFrames = false
wlGlobals.UserAgent = "Mozilla/5.0 (Windows NT 6.1; WOW64; Trident/7.0; rv:11.0) like Gecko"
wlHttp.Header["DNT"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/")
wlHttp.

// E

/***
Sle
// E

/***                                 mpstore.com/login.php - ID:21 *****/
wlG                                  dows NT 6.1; WOW64; Trident/7.0; rv:11.0) like Gecko"
wlH                                  ebloadmpstore.com/cart.php?event=addproduct&id=2"
wlH
wlHttp.Get("http://www.webloadmpstore.com/login.php")

// END WLIDE

/***** WLIDE - Sleep - ID:22 *****/
Sleep(7594)
```

Figure 4: wlHttp Drop-Down List of Available Properties and Objects in IntelliSense Editor

- A selection of the most commonly used programming constructs, can be accessed by right-clicking in the JavaScript Editing Pane, and selecting **Insert ➤ Java Objects** from the pop-up menu.

  Users who choose to program their own JavaScript Object code within their script may take advantage of the WebLOAD Recorder GUI to simplify their programming efforts. Manually typing out the code for each command, risks making a mistake, even a trivial typo, and adding invalid code to the script file. Instead, users may bring up a list of available commands and functions for a specific item, by right-clicking in the JavaScript Editing Pane after selecting a specific node from the Script Tree, selecting **Insert** from the pop-up menu, and selecting an item illustrated in the following figure to display the item's available commands. WebLOAD Recorder automatically inserts the correct code for the selected item into the JavaScript Object currently being edited. The user may then change specific parameter values without any worries about accidental mistakes in the function syntax.

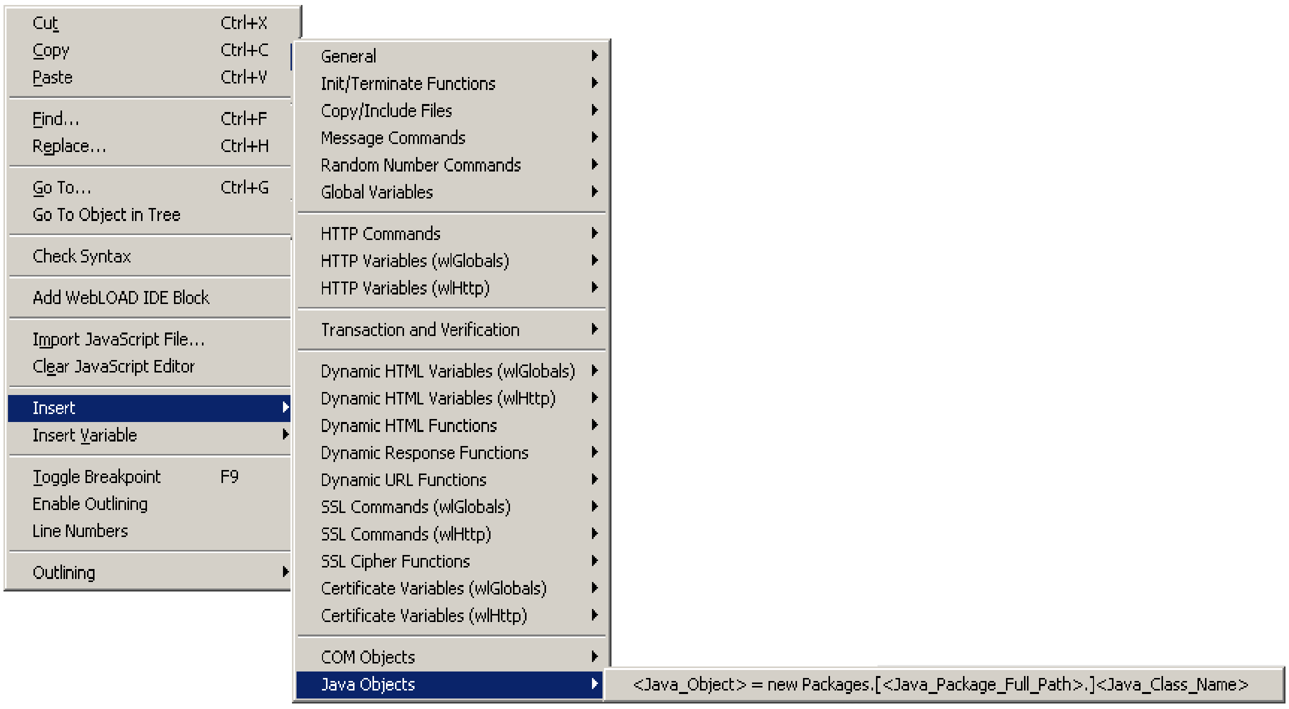


Figure 5: Insert Java Options Menu

In addition to the Insert menu, you may select an item from the Insert Variable menu, to add system and user-defined parameters to the script. This eliminates the need for manual coding.

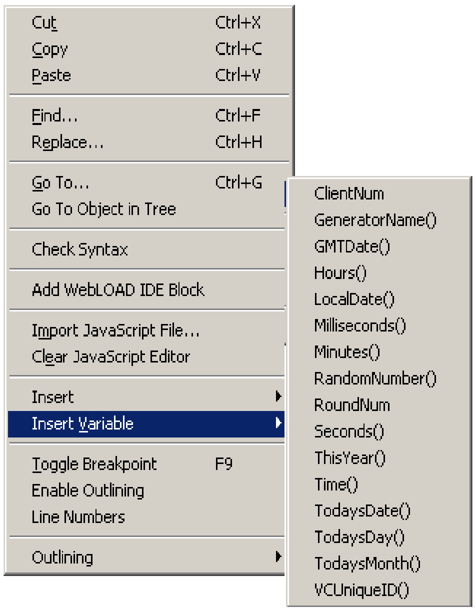


Figure 6: Insert Variable Menu

- A Syntax Checker that checks the syntax of the code in your script file and catches simple syntax errors before you spend any time running a test session. Select **Tools ➤ CheckSyntax** while standing in the JavaScript View pane of the WebLOAD Recorder desktop to check the syntax of the code in your script file.

Script code that you wish to write or edit must be part of a JavaScript Object in the Script Tree. Adding or converting JavaScript Objects in a script Tree is described in *Accessing the JavaScript Code within the* (on page 15).

Notes: If you do decide to edit the JavaScript code in a script, be careful not to damage the script structure by changing the sequence or integrity of the script navigation blocks. A test session script is constructed and based on a specific sequence of user activities at the protocol level, such as URL navigations, form submissions, and others. Changing the sequence of code blocks in effect means changing the sequence of user activities, and may destroy the functionality of the test session script. In addition, you should be careful not to change the automatically generated WebLOAD Recorder comments, since necessary information for running the script may become lost.

If you use an external text editor to modify the JavaScript code in a JavaScript script that was created through WebLOAD Recorder, the changes you made through the external editor will be lost if you open the script in WebLOAD Recorder again. Therefore, be sure to do all JavaScript code editing through the IntelliSense Editor in WebLOAD Recorder only.

For detailed information about the JavaScript language, please refer to the *WebLOAD JavaScript Reference Guide*. This guide is supplied in Adobe Acrobat format with the WebLOAD software. You may also learn the elements of JavaScript programming from many books on Web publishing. Keep in mind that some specific JavaScript objects relating to Web publishing do not exist in the WebLOAD test environment.

Adding JavaScript Object Nodes

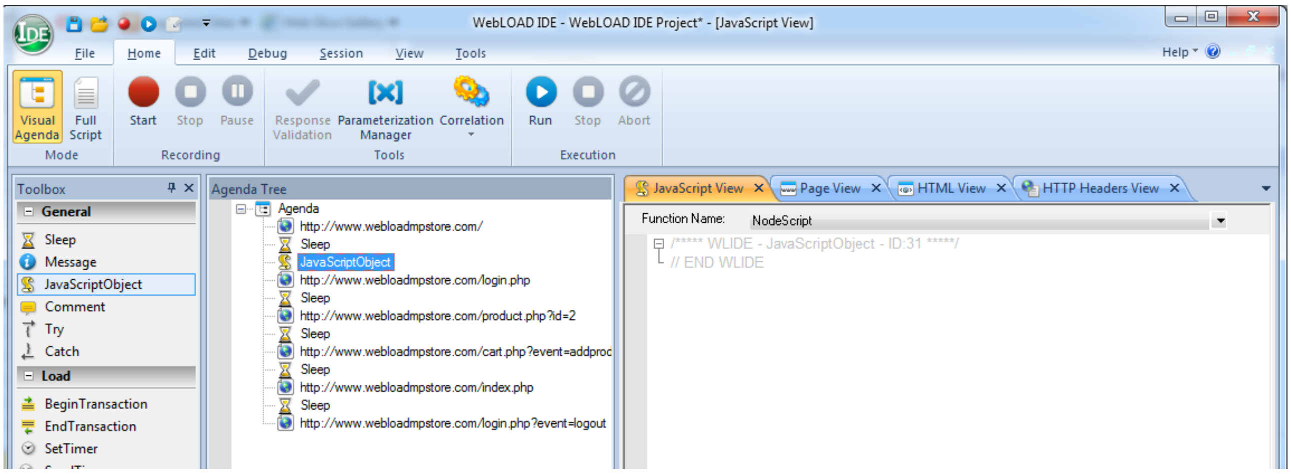
WebLOAD Recorder stores user activities at the protocol level as they are completed during recording sessions. These activities are later recreated during subsequent testing sessions. However, the system being tested may also involve user activities that are significant to the system testers, yet cannot be entirely recorded through WebLOAD Recorder. Or testers may wish to add additional functionality to their tests that require inserting extra JavaScript functions into the body of their script code. WebLOAD Recorder therefore provides a mechanism for including such items within a test session script.

For example, some of the steps involved in access to an external database are executed outside the control of WebLOAD Recorder and therefore cannot be completely recorded through WebLOAD Recorder alone. Users may add these activities to a test script by adding empty JavaScript Object Nodes to the Script Tree and then filling in the code to complete the desired activity. The specific code needed within the JavaScript Object Node will obviously vary from Node to Node depending on the activity, but adding the generic JavaScript Object Nodes themselves is a standard WebLOAD Recorder feature.

To add JavaScript Object Nodes to your test script directly through the WebLOAD Recorder GUI:

- Drag the **JavaScript Object** icon from the toolbox and drop it into the Script Tree at the preferred spot, as described in the *WebLOAD Recorder User Guide*.

  The following figure illustrates a typical JavaScript Object Node highlighted in the Script Tree.



```
/***** WLIDE - JavaScriptObject - ID:31 *****/
// END WLIDE
```

Figure 7: Typical JavaScript Object Node

The specific code needed within the JavaScript Object Node will obviously vary from Node to Node depending on the activity. Some of the activities that may require manual programming within a JavaScript Object Node include:

- Getting data from a database.
- Working with COM, XML, or Java objects.
- Calculating expressions.
- Working with global variables such as a user-defined value to include in messages.
- Working with other protocols.
- Doing specific custom made verifications.

JavaScript syntax specifications for some of these activities are documented in the *WebLOAD JavaScript Reference Guide*.

To add or edit lines of code in a JavaScript Object:

- Click the **JavaScript Object node** in the Script Tree.

  The JavaScript object's code appears in the JavaScript View pane. You can edit the code directly in the JavaScript view or by selecting **Edit ➤ Start Java Script Editing** which opens the full JavaScript view screen. This helps programmers write the JavaScript code for a new function by formatting new code and prompting with suggestions and descriptions of appropriate code choices and syntax as programs are written, as described in *Using the IntelliSense JavaScript Editor* (on page 16).

File Management

JavaScript scripts work with many different types of files. Users may wish to add to their scripts programming elements that include the following file types:

- *Including Files* (on page 21)
- *Copying Files* (on page 25)
- *Output Files* (on page 27)

Including Files

WebLOAD Recorder allows you to include external files within your JavaScript program. This facilitates modular programming, where you may develop different recyclable modules of JavaScript source code to be reused by different test scripts. Rather than inserting the complete original source code text over and over again into the body of each script, use the `IncludeFile()` command to make all functions defined within the included file available to all including scripts.

Adding an IncludeFile() Function

`IncludeFile()` functions can be added directly to a JavaScript Object in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 15).

To insert an IncludeFile function:

- While working in JavaScript Editing mode, right-click the JavaScript Pane and select **Insert ➤ JavaScript ➤ Copy/Include Files** from the pop-up menu that appears. Select the `IncludeFile()` function from the sub-menu.

WebLOAD Recorder automatically inserts the correct code for the selected function into the script file. The user may then edit parameter values without any worries about mistakes in the function syntax.

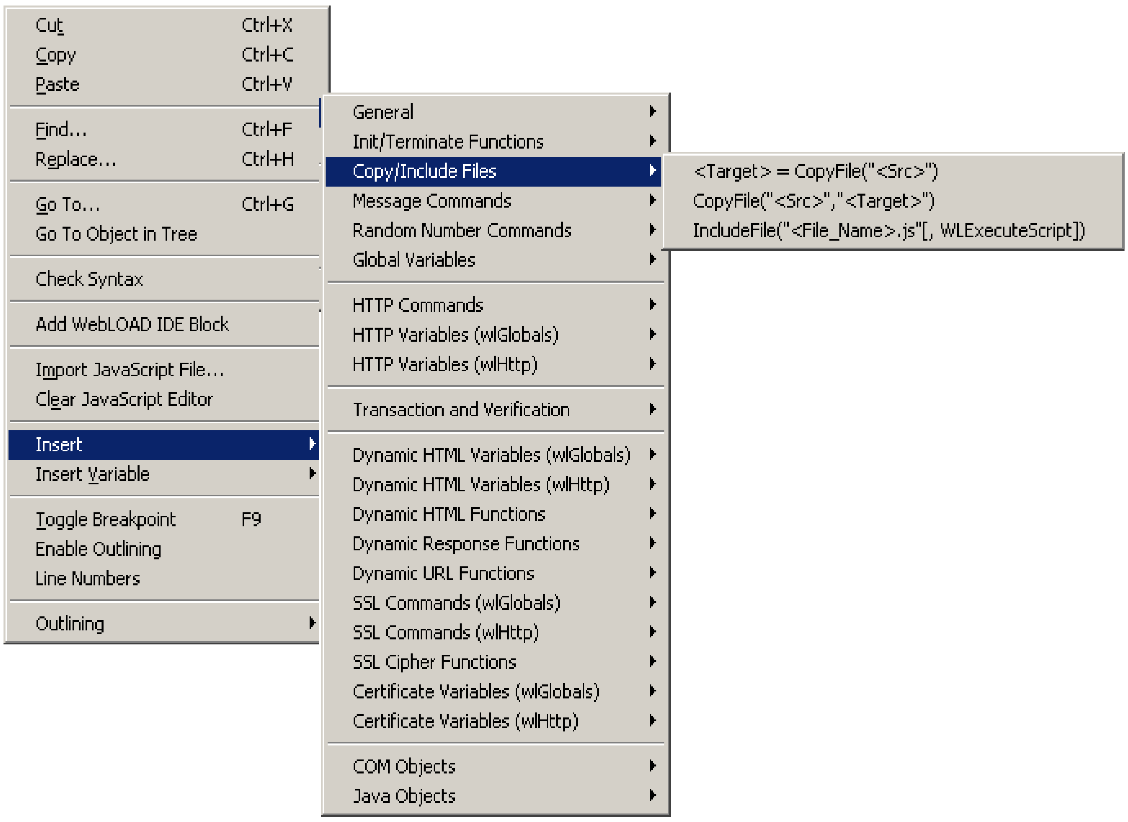


Figure 8: IncludeFile() Function Insertion using Copy/Include Files Menu

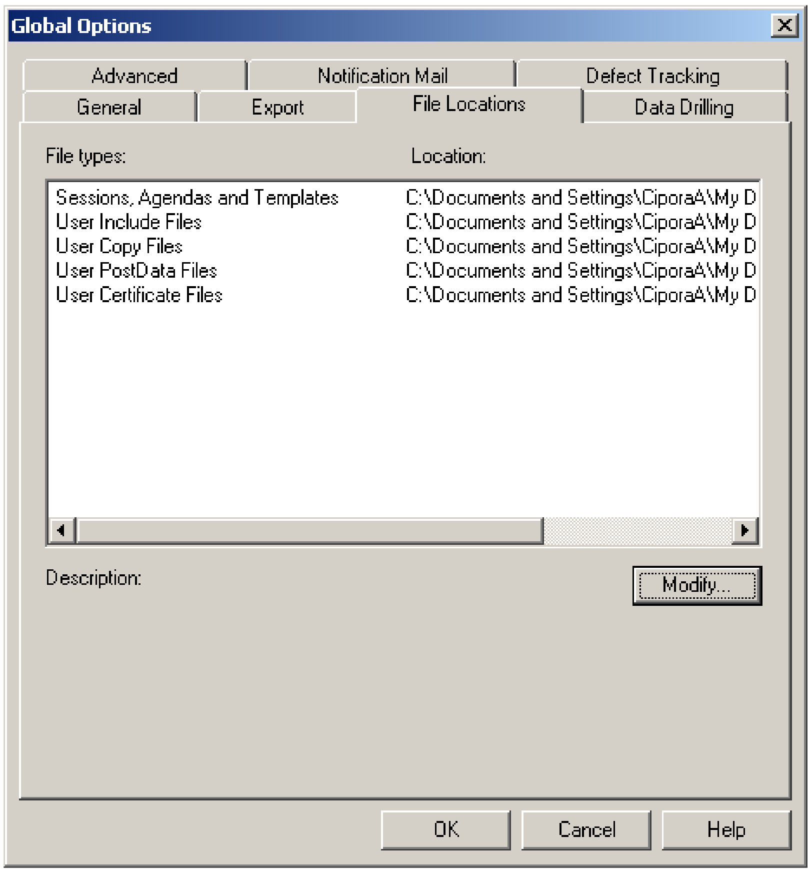
For example, to include the external file `MyFunction.js`, located on the Console during WebLOAD testing, your script file should begin with the following command included in a JavaScript Object node:

```
function InitAgenda() {
   ...
   IncludeFile("MyFunction.js")
}
```

See the *WebLOAD JavaScript Reference Guide* for a complete syntax specification.

Determining the Included File Location

WebLOAD assumes that the source file is located in the default directory specified in the File Locations tab in the **Tools ➤ Global Options** dialog box in the WebLOAD Console desktop, illustrated in the following figure:



File types:	Location:
Sessions, Agendas and Templates	C:\Documents and Settings\CiporaA\My D
User Include Files	C:\Documents and Settings\CiporaA\My D
User Copy Files	C:\Documents and Settings\CiporaA\My D
User PostData Files	C:\Documents and Settings\CiporaA\My D
User Certificate Files	C:\Documents and Settings\CiporaA\My D

Figure 9: File Locations Tab

Included files by default should be in the User Include Files directory specified in the File Locations dialog box. You may reset the default directory location if necessary by selecting the User Include Files entry and clicking **Modify**. You can select a new file location from the pop-up Browse for Folder dialog box and click **OK**. In general, the system searches for the included file using the following search precedence:

- The load engine first looks for the included file in the default User Include Files directory. If the file is not there, the file request is handed over to WebLOAD, which searches for the file using the following search path order:

  a. If a full path name has been hardcoded into the IncludeFile command, the system searches the specified location. If the file is not found in an explicitly coded directory, the system returns an error code of `File Not Found` and will not search in any other locations.

Note: It is not recommended to hardcode a full path name, since the script will then not be portable between different systems. This is especially important for networks that use both UNIX and Windows systems.

b. Assuming no hardcoded full path name in the script code, the system looks for the file in the default User Include Files directory.

c. If the file is not found, the system looks for the file in the current working directory, the directory from which WebLOAD or WebLOAD Recorder was originally executed.

d. Finally, if the file is still not found, the system searches for the file sequentially through all the directories listed in the File Locations tab.

Example: Working with an Included Function

Included files are files whose functions and other contents are included and accessible from the current script file without the file text actually appearing within the script. Use included files to take advantage of an external library of modular functions without adding extra lines of code to your script, improving the clarity of your script code while saving both script space and development time. For example, in the following script fragment, the external file `myjs.js` is included within the `InitAgenda()` initialization function. One of the functions within that included file, `sayHello()`, is later accessed within the main body of the script. The text of the `sayHello()` is embedded in a nearby comment for easy reference.

```
function InitAgenda()
{
   IncludeFile("C:\\Documents and Settings\\uriw\\My
   Documents\\myjs.js")
}
wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/general_sample/include
/form.php")

Sleep(4765)

wlHttp.Header["Referer"] = "http://qa50/form.php"
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["item"] = "Brushes"
wlHttp.FormData["quantity"] = "55"
var item = wlHttp.FormData["quantity"]
wlHttp.Post("http://www.webloadmpstore.com/general_sample/includ
e/process.php")
// here the outside function is being called
sayHello()
```

The `myjs.js` file contains the following `sayHello()` function, which prints the checkout message to the customer:

```
function sayHello()
{
  InfoMessage("you ordered  " +item + " items")
}
```

Copying Files

WebLOAD enables text and binary data file copying from the Console to a Load Generator automatically during a test session. This is an important feature if your test uses a script that references auxiliary files, such as I/O files, that are found only on the Console. The WebLOAD send option in the Console only sends the script itself and will not send auxiliary files together with a script file to a Load Generator. Use the `CopyFile` command instead to copy any necessary files from a source file on the Console to a destination file on the Load Generator before the main body of the script is executed.

Adding a CopyFile() Function

`CopyFile()` functions can be added directly to a JavaScript Object in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 14).

To insert a CopyFile function:

- While working in JavaScript Editing mode, right-click the JavaScript Pane and select **Insert ➤ Copy/Include Files** from the pop-up menu that appears.

  Select the preferred `CopyFile()` function from the sub-menu (see Figure 8).

WebLOAD Recorder automatically inserts the correct code for the selected function into the script file. The user may then edit parameter values without any worries about mistakes in the function syntax.

For example, to copy the auxiliary file `src.txt`, located on the Console, to the destination file `dest.txt` on the current Load Generator, your script file should include the following command:

```
function InitAgenda() {
  ...
  CopyFile("src.txt", "dest.txt")
  ...
}
```

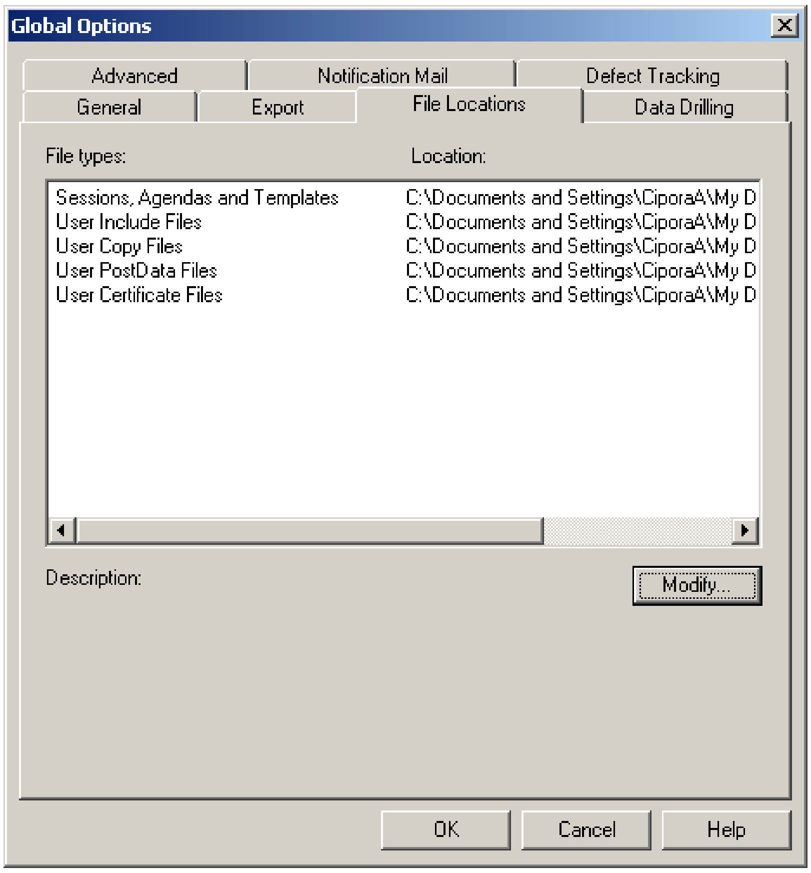
You may then access the file as usual in the main body of the script. For example:

```
DataArr = GetLine("dest.txt")
```

See the *JavaScript Reference Guide* for a complete syntax specification.

Determining the Copied File Location

WebLOAD assumes that the source file is located on the Console in the default directory identified in the **File Locations** tab of the **Tools ➤ Global Options** dialog box in the Console desktop, illustrated in the following figure:



File types:	Location:
Sessions, Agendas and Templates	C:\Documents and Settings\CiporaA\My D
User Include Files	C:\Documents and Settings\CiporaA\My D
User Copy Files	C:\Documents and Settings\CiporaA\My D
User PostData Files	C:\Documents and Settings\CiporaA\My D
User Certificate Files	C:\Documents and Settings\CiporaA\My D

Figure 10: File Locations Dialog Box

Files to be copied by default should be in the User Copy Files directory specified in the File Locations dialog box. You may reset the default directory location if necessary by selecting the User Copy Files entry and clicking **Modify**. You can select a new file location from the pop-up Browse for Folder dialog box and click **OK**. Remember that WebLOAD does not create new directories, so any directories specified as source or target directories must already exist. In general, the system searches for the file using the following search precedence:

- The load engine first looks for the file to be copied in the default User Copy Files directory. If the file is not there, the file request is handed over to WebLOAD, which searches for the file using the following search path order:

a. If a full path name has been hardcoded into the CopyFile command, the system searches the specified location. If the file is not found in an explicitly coded directory, the system returns an error code of File Not Found and will not search in any other locations.

Note: It is not recommended to hardcode a full path name, since the script will then not be portable between different systems. This is especially important for networks that use both UNIX and Windows systems.

b. Assuming no hardcoded full path name in the script code, the system looks for the file in the current working directory, the directory from which WebLOAD was originally executed.

c. Finally, if the file is still not found, the system searches for the file sequentially through all the directories listed in the File Locations tab.

Output Files

Writing script Output Messages to a File

Realistic testing requires multiple testing passes using a variety of realistic scenarios. The resulting output data should be stored in output files for later access, verification, study, and analysis. WebLOAD Recorder provides the `wlOutputFile` object to simplify saving script output. See the *WebLOAD JavaScript Reference Guide* for a complete syntax specification. This section will provide a brief introduction to the `wlOutputFile` object.

The `wlOutputFile` object lets you write script output messages to an output file. Declaring a new `wlOutputFile` object creates a new, empty output file. If a file of that name already exists, the file will be completely overwritten. Information will not be appended to the end of an existing file. Be sure to choose a unique filename for the new output file if you do not want to overwrite previous script data.

Adding the wlOutputFile Object

The `wlOutputFile` object can be added directly to a JavaScript Object in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 14). Users who are programming their own JavaScript Object code within their script may take advantage of the WebLOAD Recorder GUI to simplify their programming efforts. Manually typing out the code to create a `wlOutputFile` object, risks making a mistake, and adding invalid code to the script file. Instead, users may bring up a list of available constructor and methods for the `wlOutputFile` object, by right-clicking in the JavaScript Editing Pane, selecting **Insert** ➤ **General** from the pop-up menu, and selecting one of the available items. WebLOAD Recorder automatically inserts the correct code for the selected command into the JavaScript Object currently being edited. The user may then change the parameters without any worries about mistakes in the object syntax.

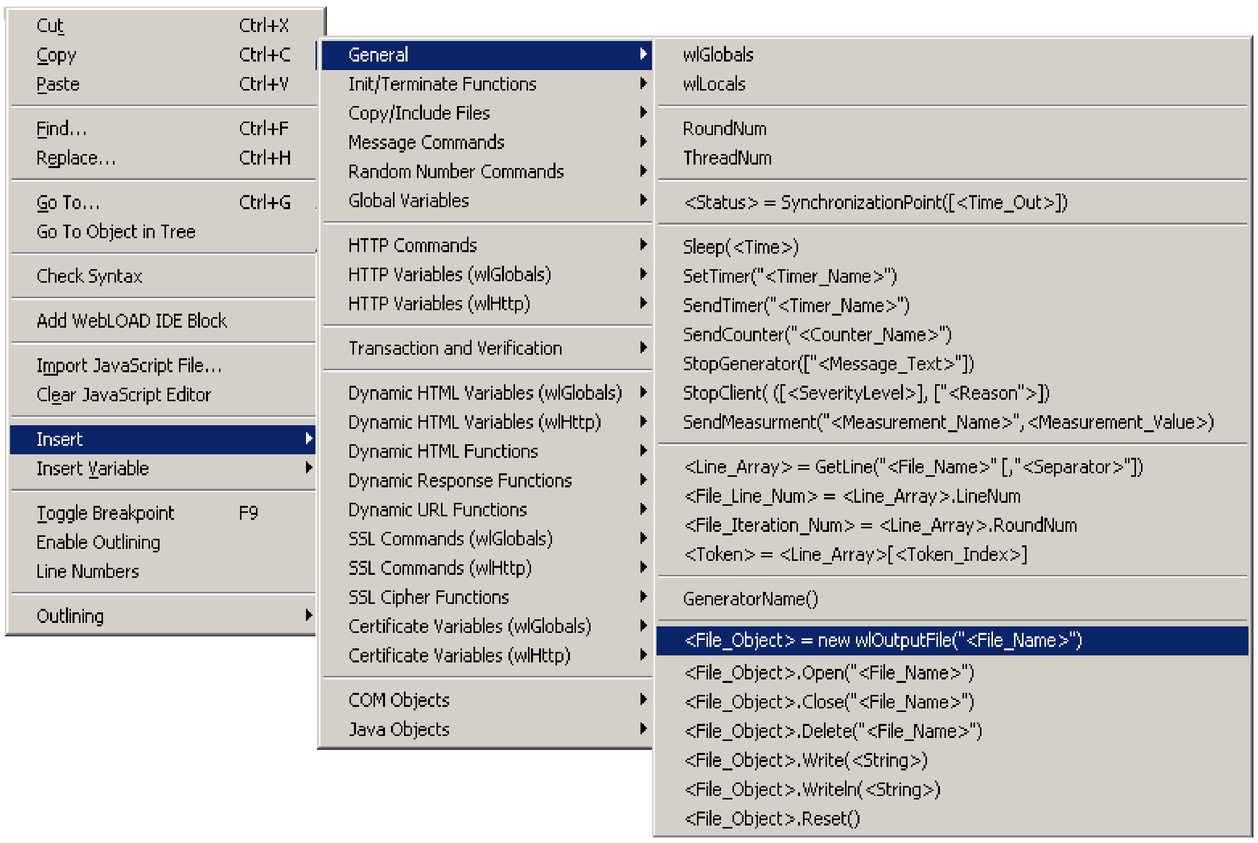

Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Find... Ctrl+F
Replace... Ctrl+H
Go To... Ctrl+G
Go To Object in Tree
Check Syntax
Add WebLOAD IDE Block
Import JavaScript File...
Clear JavaScript Editor
Insert
Insert Variable
Toggle Breakpoint F9
Enable Outlining
Line Numbers
Outlining
General
Init/Terminate Functions
Copy/Include Files
Message Commands
Random Number Commands
Global Variables
HTTP Commands
HTTP Variables (wlGlobals)
HTTP Variables (wlHttp)
Transaction and Verification
Dynamic HTML Variables (wlGlobals)
Dynamic HTML Variables (wlHttp)
Dynamic HTML Functions
Dynamic Response Functions
Dynamic URL Functions
SSL Commands (wlGlobals)
SSL Commands (wlHttp)
SSL Cipher Functions
Certificate Variables (wlGlobals)
Certificate Variables (wlHttp)
COM Objects
Java Objects
wlGlobals
wlLocals
RoundNum
ThreadNum
<Status> = SynchronizationPoint([<Time_Out>])
Sleep(<Time>)
SetTimer("<Timer_Name>")
SendTimer("<Timer_Name>")
SendCounter("<Counter_Name>")
StopGenerator(["<Message_Text>"])
StopClient(([<SeverityLevel>], ["<Reason">])
SendMeasurment("<Measurement_Name>", <Measurement_Value>)
<Line_Array> = GetLine("<File_Name>" [,"<Separator>"])
<File_Line_Num> = <Line_Array>.LineNum
<File_Iteration_Num> = <Line_Array>.RoundNum
<Token> = <Line_Array>[<Token_Index>]
GeneratorName()
<File_Object> = new wlOutputFile("<File_Name>")
<File_Object>.Open("<File_Name>")
<File_Object>.Close("<File_Name>")
<File_Object>.Delete("<File_Name>")
<File_Object>.Write(<String>)
<File_Object>.Writeln(<String>)
<File_Object>.Reset()

Figure 11: wlOutputFile() Insertion using General Menu

The preceding figure highlights the standard JavaScript syntax to create and work with `wlOutputFile` objects.

For example:

```
MyFileObj = new wlOutputFile(“filename”)
...
MyFileObj.Write(“Happy Birthday”)
...
delete MyFileObj
```

Note: The `wlOutputFile` object saves script output messages. To save server response data, use the `Outfile` property described in *Saving Server Output to a File* (on page 29).

wlOutputFile Object Scope Limitations

If you declare a new `wlOutputFile` object in the `InitAgenda()` function of a script, the output file will be shared by all the script threads. There is no way to specify a specific thread writing sequence—each thread will write to the output file in real time as it reaches that line in the script execution.

If you declare a new `wlOutputFile` object in the `InitClient()` function or main body of a script, use the thread number variable as part of the new filename to be sure that each thread will create a unique output file.

If you declare a new `wlOutputFile` object in the main body of a script, and then run your script for multiple iterations, use the `RoundNum` variable as part of the new filename to be sure that each new round will create a unique output file.

Generally, you should only create new `wlOutputFile` objects in the `InitAgenda()` or `InitClient()` functions of a script, not in the main script. If a statement in the main script creates an object, *a new object is created each time the statement is executed*. If WebLOAD repeats the main script many times, a large number of objects may be created and the system may run out of memory.

Saving Server Output to a File

It is often important to save server response data for later study and analysis. WebLOAD and WebLOAD Recorder provide the `Outfile` property for this purpose. `Outfile` is a property of the `wlGlobals`, `wlLocals`, and `wlHttp` objects. See the *WebLOAD JavaScript Reference Guide*, for a complete syntax specification.

The following script shows a typical entry to a server output file. The `ClientNum` and `RoundNum` global variables are used to distinguish between script instances in the server output file entries.

```
// Main script actions go here
...
// Write the downloaded server output to a unique file
// for each script instance, identified by ClientNum
// and RoundNum. The output file is named
// <fullpath>\SessionOutput.<ClientNum.RoundNum>.html
wlHttp.Outfile = "c:\\webld\\SessionOutput."
ClientNum + "." + RoundNum + ".html"
```

The `Outfile` property can be added directly to a JavaScript Object in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 14).

Security

Security is important for most Web users, whether the access is recreational, personal, or work related. Most Web applications work with some combination of user authentication together with SSL protocol use to ensure application security. Both these security features are handled automatically by WebLOAD. By default, test sessions use the settings that were in effect during the original recording session. Specific security settings may be reset through the WebLOAD Recorder or Console GUI dialog boxes.

Security methods and properties can be edited directly within a JavaScript Object in a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 14). This section provides a general introduction to the internal implementation of the user authentication and SSL security features. See the *WebLOAD JavaScript Reference Guide*, for a complete syntax specification of the security functions introduced here.

Authentication

Users are authenticated through a system of usernames and passwords. Most servers use either a basic user authentication protocol or the Windows NT Challenge Response protocol. WebLOAD supports both protocols, as well as proxy servers that require user authorization. WebLOAD automatically selects the authentication protocol appropriate for the current test session. By default, WebLOAD navigates authorization protocols using the user data saved during the original recording session, but these values may be reset as needed.

For example, many Web applications involve logging in to a site. The original user name and password typed in during a recording session are saved for use during later test sessions.

Testers may reset user authentication values in one of the following ways:

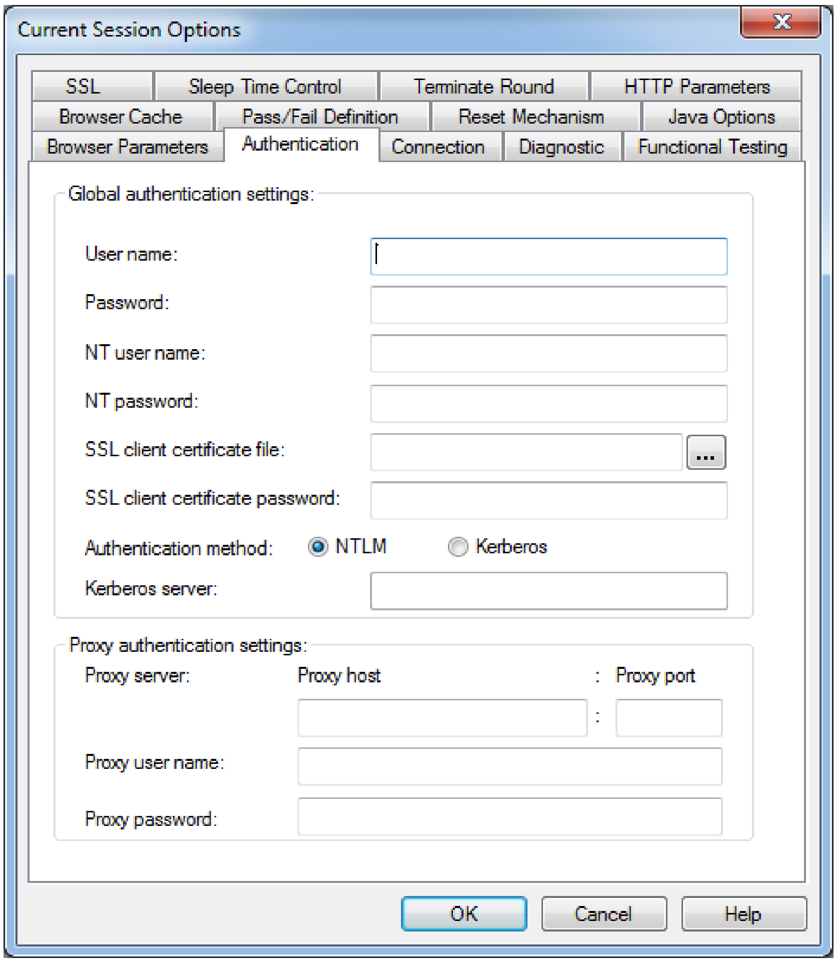
- Through the Authentication tab.
- By manually editing the authentication property set.

These options are described here.

Using the Authentication Tab

Access the Authentication tab by selecting the **Tools ➤ Default Options** menu in the WebLOAD Recorder or Console. Select the Authentication tab in the dialog box that opens. You can simply type the relevant values into the input text fields, as illustrated in the following figure.

Note: Passwords will not appear in readable form.



Global authentication settings:

User name:

Password:

NT user name:

NT password:

SSL client certificate file:

SSL client certificate password:

Authentication method: [✓ NTLM] Kerberos

Kerberos server:

Proxy authentication settings:

Proxy server: Proxy host : Proxy port

Proxy user name:

Proxy password:

Figure 12: Authentication Tab

Setting User Authentication Values Manually

If you are editing the JavaScript code in your script, you may reset user authentication values manually using the `wlGlobals`, `wlLocals`, or `wlHTTP` property set.

There are three approaches to setting these properties, corresponding to the desired authentication scope:

- Set the authentication properties that correspond to the Authentication tab at the script level using wlGlobals.
- Set the authentication properties for a specific HTTP request using wlHTTP.
- Set the authentication properties that correspond to the Authentication tab at the Virtual Client level using wlLocals.

For example, set the user name and password using either of the following approaches:

```
wlGlobals.UserName = "Bill"
wlGlobals.PassWord = "TopSecret"
```

The authentication related properties include the following:

- NTUserName, NTPassWord
- PassWord
- Proxy, ProxyUserName, ProxyPassWord
- SSLClientCertificateFile, SSLClientCertificatePassWord
- UserName

See the *WebLOAD JavaScript Reference Guide*, for a complete syntax specification of the properties used for user authentication.

Secure Data Transmission through SSL

Web and HTTP communications require a practical, reliable, universally recognized protocol to ensure the secrecy, integrity, and authentication of transmitted information. The Internet Engineering Task Force (IETF) has developed such a standard, commonly referred to as SSL/TLS 1.0.

For a basic introduction to SSL, see:

http://www.cisco.com/en/US/netsol/ns340/ns394/ns50/ns140/networking_solutions_white_paper09186a0080136858.shtml

For more information on the new TLS Protocol Version 1.0, see:

http://www.ipa.go.jp/security/rfc/RFC2246-00EN.html

WebLOAD fully supports the SSL/TLS 1.0 standard, including backward compatibility with earlier versions and standards. See *Appendix A* in the *WebLOAD JavaScript Reference Guide*, for a complete list of the supported SSL protocols and ciphers.

By default, WebLOAD enables use of all cipher versions at the maximum cryptographic strength possible, allowing participating clients and servers to determine the most appropriate connection to other clients and servers through negotiation at connect time. These setting may be changed or reset through dialog boxes on the Console.

For example, reset the SSL bit limit through the SSL tab of the **Tools ➤ Default Options** dialog box on the WebLOAD Console, illustrated in the following figure:

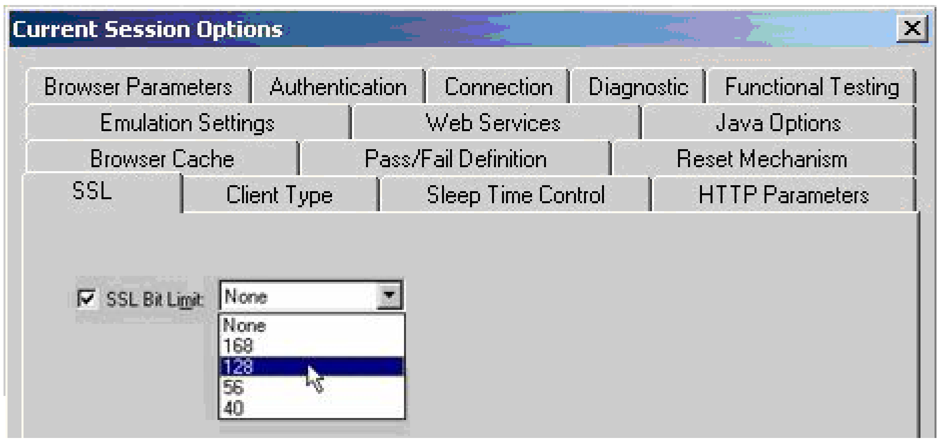


Figure 13: Resetting SSL Bit Limit

By default, WebLOAD handles all SSL activities, setting the appropriate configuration settings automatically. WebLOAD also provides both Cipher Command Suite functions and a complete set of SSL `wlGlobals` properties that allow users to fine-tune their security settings within the script code, identifying, enabling, or disabling specific protocols or cryptography levels, depending on testing preferences.

Note: Changes that are made within script code override anything that has been set through the Console.

These properties and functions work on two levels:

- Higher level functions used for browser emulation.
- Lower level functions for client- or server-specific cipher testing.

See the *WebLOAD JavaScript Reference Guide* for complete syntax specifications for the `wlGlobals` SSL property set and the Cipher Command Suite.

Note: The SSL configuration for your test session is usually set through dialog boxes in the Console. You may change the default session settings within your script, using either the `wlGlobals` properties or the Cipher Command Suite functions. While the SSL property set is also defined for the `wlHttp` and `wlLocals` objects, RadView strongly recommends using these properties with the `wlGlobals` object *only*.

Any changes to a script's SSL property configuration must be made in the script's initialization functions. Configuration changes made in the `InitAgenda()` function will affect all client threads spawned during that script's test session. Configuration changes made in the `InitClient()` function will affect only individual clients. Do not make changes to the SSL property configuration in a script's main body. The results will be undefined for all subsequent transactions.

Browser Emulation

The browser emulation functions emphasize a high-level, categorical approach to cryptographic strength definition. For example, you may wish to test access to foreign browsers who use only earlier versions of SSL, or who are limited to export-only cryptographic strength. This 'smarter' approach of selecting appropriate categories is usually preferable to the low-level approach of enabling or disabling individual protocols.

Browser emulation functionality includes the ability to:

- Enable, disable, and list SSL protocols.
- Define the cryptographic categories to be used in the current test session.
- Limit the strength and complexity of the cipher set in current use by limiting the number of bits used by the cipher.
- Define the SSL version that WebLOAD should use for the current test session.

Server-Specific Cipher Testing

The server-specific cipher testing functions emphasize a low-level, bit-specific approach to cryptographic strength definition. For example, you may wish to enable or disable specific ciphers, to check the limits of certain client site abilities or server configurations.

SSL Cipher Command Suite provides the ability to:

- Enable and disable a specific cipher by name.
- Enable and disable a specific cipher by ID number.
- Obtain a specific cipher's name or ID number.
- Get information about a specific cipher, identified by name or ID number.
- Learn the number of ciphers enabled during the current test session.

The `wlGlobals` SSL property set provides the ability to:

- Support use of SSL client certificates by supplying the certificate filename and password to the SSL server.
- Enable caching of SSL decoding keys received from an SSL (HTTPS) server.

Complete syntax specifications for the SSL Cipher Command Suite and the `wlGlobals` SSL property set are available in the *WebLOAD JavaScript Reference Guide*.

Error Management

Scripts that encounter an error during runtime do not simply fail and die. This would not be helpful to testers who are trying to analyze when, where, and why an error in their application occurs. WebLOAD Recorder scripts incorporate a set of error management routines to provide a robust error logging and recovery mechanism whenever possible.

Error Management Tools

Analyzing Possible Errors

Error management works on multiple levels that must be defined by the testers and tailored to the application being tested. For example, when first designing a test session, testers may wish to ask:

- What is considered an error for my application? How do I define an error? Are there different types of errors for this application that should possibly be handled in different ways?
- How serious a problem is this specific error, or a type of error? When is an error fatal?
- Depending on the source of the error, how do I want to handle this? Do I want to retry the command? Should I simply continue execution? Skip to the next command? Skip to the next navigation block? Stop execution completely?
- How many errors of a specific type are needed to trigger an error condition? Is even one error of this type considered intolerable and fatal to the application? Are up to 10 errors considered reasonable and will not cause damage to the application? Could too many warnings also be a reason to stop the test session?
- Does this application routinely experience a certain error rate that may safely be ignored? Perhaps a rate of up to 5% errors is considered reasonable? Perhaps the application takes a certain amount of time to get started and errors in the first 5 minutes of run time should be ignored?

The answers to these questions should be a part of your test session design. Once you have categorized the various types of errors possible, you should also analyze how you wish to handle these errors, should they occur.

Set the error configuration values through the Pass/Fail Definition and Error Handling tabs of the **Tools ➤ Default or Global Project Options** dialog boxes.

Standard Message Functions

On the most basic level, you may simply insert message functions into your script and have them executed wherever anything unusual or problematic occurs. Insert a message function into your script through the WebLOAD Recorder GUI.

Choose from four possible message levels:

- `InfoMessage()` — prints a simple informative message to the Log window. Has no affect on script execution.
- `WarningMessage()` — prints a warning message to the Log window. Has no affect on script execution.
- `ErrorMessage()` — prints an error message to the Log window. Causes the current test round to abort, but the test session continues with the start of the next round.
- `SevereErrorMessage()` — prints an error message to the Log window and stops the current test session.
- `DebugMessage()` — prints a message to the WebLOAD Recorder Log window. Has no affect on script execution.

Standard Error Constants

You may also manage errors by checking function return codes, both for built-in and user-defined functions. WebLOAD Recorder provides a set of constants that define the error severity level, acting as a useful means for redirecting script behavior. Use the severity level to determine the execution path to be followed in case of error. Less severe errors may be noted and ignored. More severe failures may cause the whole test to be aborted. All failures are logged and displayed in the both the WebLOAD Recorder and Console Log Windows. Refer to Appendix A in the *WebLOAD Recorder User* Guide for more information on return codes and error levels.

WebLOAD and WebLOAD Recorder include the following error levels:

- `WLSuccess` — the activity terminated successfully.
- `WLMinorError` — this specific activity failed, but the test session may continue as usual. The script displays a warning message in the Log window and continues execution from the next statement.
- `WLError` — this specific activity failed and the current test round was aborted. The script displays an error message in the Log window and begins a new round.
- `WLSevereError` — this specific activity failed and the test session must be stopped completely. The script displays an error message in the Log window and the Load Generator on which the error occurred is stopped.

Note: These built-in message functions and error levels provide a single, standard set of error management options. After an error occurs, testers may choose to continue with the current round, stop the current round, or stop the whole test session. But not every error falls into these three broad categories. Sometimes an error is serious enough to invalidate the current activity, yet the current round may still be able to continue execution. Very often the set of activities on a specific Web page is not successful, but that does not have any affect on the activities recorded on subsequent Web pages.

Variable Activity Blocks

WebLOAD Recorder offers an additional level of error management, which can be manually added to a script. This is done by the `try()/catch()` function pair. Users may add `try()/catch()` pairs around their own logical blocks of code, through the IntelliSense Editor.

The `try()/catch()` pair of error handling functions allows users to catch errors, skip a single set of corrupted activities, and still continue with the current round. Use these functions to delimit a specific logical activity unit and define an alternate error-handling routine to be executed in case an error occurs within that block of code. The `try()/catch()` functions limit the scope of an error to individual logical component branches of your script tree.

Limited scope for an error has two advantages:

- Pinpointing the source of the error, enabling easier debugging and recovery.
- Isolating the error to a specific script branch, in many cases allowing test execution to continue with the rest of the Script Tree despite the error.

Navigation blocks and other logical activity blocks are useful for error management, especially when running “hands-free” test sessions. For example, the user can define the default testing behavior to be that if a non-fatal error is encountered during a test session, WebLOAD Recorder should throw the error, skip to the next navigation block, and continue with the test session.

The **Pass/Fail Definition** tab of the **Tools ➤ Default or Global Project Options** dialog box is used to define the default WebLOAD Recorder behavior in case of error.

Note: At each testing level, WebLOAD Recorder provides a choice of error handling options. Depending on the context, you may choose to repeat the action, skip to the next line, skip to the next navigation block, or stop execution completely.

The wlException Object

Scripts that encounter an error during runtime do not simply fail and die. This would not be helpful to testers who are trying to analyze when, where, and why an error in their application occurs. WebLOAD scripts incorporate a set of error management routines to provide a robust error logging and recovery mechanism whenever possible. The `wlException` object is part of the WebLOAD error management protocol.

WebLOAD users have a variety of options for error recovery during a test session. The built-in error flags provide the simplest set of options; an informative message, a simple warning, stop the current round and skip to the beginning of the next round, or stop the test session completely. Users may also use `try()/catch()` commands to enclose logical blocks of code within a round. This provides the option of catching any minor errors that occur within the enclosed block and continuing with the next logical block of code within the current round, rather than skipping the rest of the round completely.

Users may add their own `try()/catch()` pairs to a script, delimiting their own logical code blocks and defining their own alternate set of activities to be executed in case an error occurs within that block. If an error is caught while the script is in the middle of executing the code within a protected logical code block (by `try()`), WebLOAD will detour to a user-defined error function (the `catch()` block) and then continue execution with the next navigation block in the script.

`wlException` objects store information about errors that have occurred, including informative message strings and error severity levels. Users writing error recovery functions to handle the errors caught within a `try()/catch()` pair may utilize the `wlException` object. Use the `wlException` methods to perhaps send error messages to the Log Window or trigger a system error of the specified severity level.

Example

The following code fragment illustrates a typical error-handling routine:

```
try{
   ...
   //do a lot of things
   ...
   //error occurs here
   ...
}

catch(e){
   myException = new wlException(e,“we have a problem”)

   //things to do in case of error
```

```
    if (myException.GetSeverity() == WLError) {
          // Do one set of Error activities
                myException.ReportLog()
                throw myException
    }
    else {
          // Do a different set of Severe Error activities
                throw myException
    }
}
```

Non-Standard script Execution Sequence

script Execution Sequence (on page 11) describes the sequence of activities during a normal, standard test session. However, many test sessions do not simply follow a normal execution sequence. Test sessions are designed to catch application errors, and these errors often interrupt the test session. This section describes what happens within your script if it is interrupted in mid-session.

Minor Error Management—Continue the Test Session as Usual

In the event of a minor error, WebLOAD and WebLOAD Recorder record the error in a log and continues processing. This occurs when you call an `InfoMessage()` or `WarningMessage()` function or use the `WLMinorError` constant.

For example, one of the most common runtime errors is the failure of an HTTP Get, Post, or Head command. This can occur, for example, if the HTTP server is temporarily unavailable. In most cases, an HTTP failure is a minor error and should not stop the test, although it can affect the performance statistics. You may optionally include additional error-handling functions in your script.

Standard Error Management—Stopping a Single Round

In the event of a standard error, WebLOAD records the error in a log and stops the current round. This may occur under the following circumstances:

- If you call an `ErrorMessage()` function or use the `WLError` constant.
- If the user issues a Stop or Pause command in the WebLOAD Console that happens to catch a thread in mid-round.
- If a thread encounters a non-severe error such as a failed HTTP connection.

In these circumstances, WebLOAD does the following:

- Sends an error message to the Log window.

- Stops the main script in the current round.
- Runs the `OnScriptAbort()` function, if it exists in your script, in the thread where the error occurred, to free objects and resources.
- Continues with the next round of the thread, at the beginning of the main script.

Non-severe errors affect only the thread where the error occurred. They have no effect on other threads of the Load Generator, and they do not run the `OnError...` functions.

Severe Error Management—Stopping a Test Session

In the event of a severe runtime error, WebLOAD sends a severe error message to the Log window and stops the whole test session. This may occur under the following circumstances:

- If you call a `SevereErrorMessage()` function or use the `WLSevereError` constant.
- If a thread encounters a severe error such as an overflow or an illegal operation, or any other error that the user has specified should trigger a severe error condition.

When stopping an entire test session, WebLOAD uses the following execution sequence.

- In the thread where the error occurred, WebLOAD runs the `OnScriptAbort()` and `OnErrorTerminateClient()` functions. These functions are used for error handling that is specific to individual threads, such as freeing local objects and resources.
- In the other threads of the Load Generator, WebLOAD runs the `OnScriptAbort()` and `TerminateClient()` functions.
- The separate threads terminate.
- WebLOAD runs the `OnErrorTerminateAgenda()` function instead of `TerminateAgenda()`. This function is used to free global resources, or for other types of error handling at the global level.

Like the other initialization and termination functions, the error-handling functions are optional. Omit them from your script if they are not needed.

In the event of a severe runtime error, WebLOAD Recorder sends a severe error message to the Log window and stops the whole test session. This may occur under the following circumstances:

- If you call a `SevereErrorMessage()` function or use the `WLSevereError` constant.
- If the script encounters a severe error such as an overflow or an illegal operation, or any other error that the user has specified should trigger a severe error

condition. A severe error is also triggered if WebLOAD Recorder cannot find a specified object on the Web page, for example if the object was deleted or the current Web page does not match the expected Web page accessed during the recording session.

When stopping an entire test session, WebLOAD Recorder uses the following execution sequence.

- First WebLOAD Recorder runs the `OnScriptAbort()` function, used for error handling such as freeing local objects and resources.
- Then WebLOAD Recorder runs the `OnErrorTerminateAgenda()` function instead of `TerminateAgenda()`. This function is used to free global resources, or for other types of error handling at the global level.

Like the other initialization and termination functions, the error-handling functions are optional. Omit them from your script if they are not needed.

Defining a Standard or Severe Error

By default, WebLOAD and WebLOAD Recorder only stop a script if a severe error occurs, such as an overflow or an illegal operation. However, users may redefine when exactly WebLOAD should halt a test session through the WebLOAD Recorder GUI through the Pass/Fail Definition tab of the **Tools ➤ Default / Current Options** dialog box. Options include:

- Failing on the first severe error occurrence.
- Specifying an absolute error threshold of failure if more than a specified number of errors or warnings occur.
- Specifying a relative error threshold of failure if more than a specified percentage of errors or warnings occur.
- Tracking numbers of errors only after a certain amount of time has elapsed from the start of the test session. This slight delay allows the test session to establish and stabilize an initial Web connection that may have no connection to the actual application being tested, preventing premature (and meaningless) session failures.

Execution Sequence after Stop and Abort

Stop a script by issuing a Stop command through the Console or WebLOAD Recorder GUI. Abort a script during its debugging by issuing an Abort command through the WebLOAD Recorder. An Abort command cannot be issued through the Console. Stop and Abort commands halt the Load Generator.

After you issue the Stop command in the Console or WebLOAD Recorder, WebLOAD:

- Stops the main script in each thread.

- Runs the `OnScriptAbort()` function in any thread that you happen to stop in mid-round. `OnScriptAbort()` does not run in a thread that you happen to stop at the end of a round.
- Runs the `TerminateClient()` function in each thread.
- Stops the separate threads.
- Runs the `TerminateAgenda()` function of the script.

Note: The script doesn't necessarily stop immediately when you issue the Stop command in the Console. The script checks for the command at the end of each round and during certain operations that may take a long time, such as HTTP Get and Post commands. For this reason, it is recommended that you do not program a very long loop in a script. Depending on the operations in the loop, the WebLOAD Console may have no way to interrupt the loop.

After you issue the Abort command, WebLOAD Recorder:

- Stops the main script in each thread.
- Runs the `OnScriptAbort()` function in any thread that you happen to stop in mid-round. `OnScriptAbort()` does not run in a thread that you happen to stop at the end of a round.

See the *WebLOAD Recorder User Guide* for more information on using these commands.

Note: If you stop or abort WebLOAD Recorder during execution, a message dialog appears, telling the user that WebLOAD Recorder is collecting data in preparation for stopping the test session. While the window pops up immediately, it may stay open for a while if there is extensive clean-up work necessary before the current session may be shut down.

The script doesn't necessarily stop immediately when you issue a Stop or Abort command. The script only checks for the command at the end of each round and during certain operations that may take a long time, such as certain HTTP transactions. For this reason, it is recommended that you do not program a very long loop in a script. Depending on the operations in the loop, WebLOAD Recorder may have no way to interrupt the loop.

Execution Sequence after Stopping a Virtual Client

If an error condition occurs, you can stop a Virtual Client using `StopClient()` in your script. This function stops the execution of the Virtual Client running the script from which `StopClient()` was called. After `StopClient()` is called, this Virtual Client cannot be resumed. This function does not affect any other Virtual Client.

When using `StopClient()`, you can specify the error level to display and a reason why the Virtual Client was terminated.

After you issue the `StopClient()` command, WebLOAD does the following on the current (calling) thread only:

- Stops the main script in the current thread.
- Runs the `OnScriptAbort()` function in case the current thread is stopped in mid-round. `OnScriptAbort()` does not run in a thread that you happen to stop at the end of a round.
- Runs the `TerminateClient()` function in the current thread.

See the *WebLOAD Recorder User Guide* for more information on using these commands.

See the *WebLOAD JavaScript Reference Guide* for more information on using the `StopClient()` function.

Rules of Scope for Local and Global Variables

To maximize testing options, WebLOAD offers the ability to run multiple scripts, in multiple threads, often across multiple Load Generators and machines. This may involve setting variables or flags or accessing data across multiple threads, scripts, Load Generators, or machines. Such multiple accesses must be handled carefully.

This section describes the scope rules for all variables, both built-in configuration properties and user-defined shared variables, explaining how scripts can juggle multiple configuration settings and share data either locally or globally. This information supplements the usual JavaScript scope rules, which apply within a single thread.

To understand the scope rules for user-defined variables, we need to distinguish between the following testing contexts:

- *Limited Context* (on page 44), limited to a specific browser action within a script
- *Local Context* (on page 45), local to a single thread of a single script
- *Global Context* (on page 47), which may be global to the following extent:
  - Shared by all threads of a single script running on a single Load Generator.
  - Shared by all threads of multiple scripts, including a mix of scripts, running on a single Load Generator.
  - Global to all threads of a single script, running on multiple Load Generators, potentially on multiple machines, system-wide.
  - Global to all threads of multiple scripts, including a mix of scripts, running on multiple Load Generators, potentially on multiple machines, system-wide.

Each of these testing contexts is described in the following sections.

Note: The HTTP configuration properties documented in this section may be edited through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 15). However, remember that the majority of application tests rarely require anything more than perhaps a few user-defined global variables or configuration settings, which can be created and set through the WebLOAD Recorder or Console dialog boxes. Manual intervention in individual configuration values within the JavaScript code of a script is not usually recommended.

Limited Context

Limited variables are only visible or accessible within the bounds of a specific function or code block. Users may also define configuration properties that are only applicable to a specific browser action, managed through the `wlHttp` object.

For example, to limit a variable `LimitedX` to a specific function only, use the IntelliSense Editor to create a function within a JavaScript Object and assign a value to a `LimitedX` variable within that function. The `LimitedX` variable will only be meaningful within the context of the function in which it appears.

This is illustrated in the following code fragment:

```
//Context limited to specific function only
function MyFavoriteFunction() {
  var limitedX = 20        //Scope of limitedX is the
       //current function only
}
//Main script Body
y = limitedX + 2      //Error, limitedX is undefined here
```

Working with the wlHttp Object

Configuration properties that are limited to a single transaction are managed through the `wlHttp` object, described in this section.

In WebLOAD scripts, HTTP transactions are performed using `wlHttp` objects. You do not need to declare or create a `wlHttp` object before using it in your script. WebLOAD automatically creates a single `wlHttp` object for each thread of a script.

`wlHttp` objects include a complete set of HTTP configuration properties. HTTP configuration properties are also included with the more general `wlGlobals` and `wlLocals` objects. However, the configuration values assigned in a `wlHttp` object are the definitive configuration values for the transaction immediately following the property value assignment, overriding both the local defaults assigned in `wlLocals` and the global defaults assigned in `wlGlobals`. WebLOAD uses the `wlLocals` or `wlGlobals` defaults only if you do not assign values to the corresponding properties in the `wlHttp` object.

For example, one of the properties of `wlHttp` is the FormData, which stores information that the user entered during the session. In the main body of the following script, the user defines `FormData` value and then completes the browser activity. For the specific command that immediately follows the `wlHttp` property assignment, the `wlHttp FormData` value will override any default local or global `FormData` value.

```
//Main script Body
wlHttp.FormData["login"] = "demo"
wlHttp.FormData["password"] = "demo"
```

Erasing and Preserving the HTTP Configuration

By default, `wlHttp` properties are cleared automatically after every HTTP transaction. This lets you assign different values for each connection (for example, a different URL, user name, or form data), without having to explicitly delete your previous connection data. In general it is better to assign special `wlHttp` properties at the specific point where they are needed, in the main script and not in `InitClient()`, so they will be reassigned as needed in every round.

The decision of whether or not to erase `wlHttp` values is based on the value of the `wlHttp.Erase` property, which by default is set to true. You may optionally set the `Erase` property value to false. If `Erase` is set to false, the `wlHttp` property data will not be deleted automatically. This may be convenient if you know you will always need the same information, and do not wish to reassign the same values over and over again for each transaction. However, it could also leave you with unexpected, unintended `wlHttp` property values. See the *WebLOAD JavaScript Reference Guide*, for a complete syntax specification.

A better way to preserve the HTTP configuration is to define it using the `wlGlobals` and `wlLocals` objects, rather than `wlHttp`. The properties of `wlGlobals` and `wlLocals` are not erased unless you change them yourself. However, the recommended way to set configuration values is through the Default or Current Project Options dialog boxes under the Tools menu in the WebLOAD Recorder or Console desktop.

Local Context

The local script thread context is local to each individual thread of a script. Local objects may not be accessed in the global context. Different threads may not access or alter the value of the same local variable, since it is local to a single thread. Different threads may only share variable values through global variables.

Local configuration properties are managed through the `wlLocals` object. Local values for both user-defined variables and configuration properties are initialized in the `InitClient()` function of a script. Read or assign local values using JavaScript

Object nodes added to the main script, as described in *Editing the JavaScript Code in* (on page 15).

Working with the wlLocals Object

Configuration properties that are local to a single script thread are managed through the `wlLocals` object, described in this section. You do not need to declare or create a `wlLocals` object before using it in your script. WebLOAD automatically creates a single `wlLocals` object for each thread of a script.

`wlLocals` is a WebLOAD-supplied local object, which sets the local default configuration for HTTP commands (overriding any global defaults set in `wlGlobals`, but overridden in turn by any values set in `wlHttp`). For example, one of the properties of `wlLocals` is the URL to which the object connects. If you set a different value of `wlLocals.Url` in each thread of a script, then each thread can connect to a different URL, as the following script illustrates:

```
function InitClient() {//Local context
   //Set the URL for each thread
   if (ClientNum == 0)
          wlLocals.Url = "http://www.ABCDEF.com"
   else
          wlLocals.Url = "http://www.GHIJKL.com"
}
//Thread 0 connects to www.ABCDEF.com
//All other threads connect to www.GHIJKL.com
wlHttp.Get()
```

Working with User-Defined Variables (Local Context)

Within the local context, you can define any variables that you wish. The variables are local to a single thread. By default, the scope of a local variable is the entire local thread context. For example, you can define a variable `localX` in the `InitClient()` function and use it in the main script to store different values depending on the script thread or round number.

The corresponding JavaScript code may look similar to this:

```
//Local context
function InitClient() {
   //Assign a different value to the local copy
   //of localX in thread 0 only
   if (ClientNum == 0)
          {localX = 20}
```

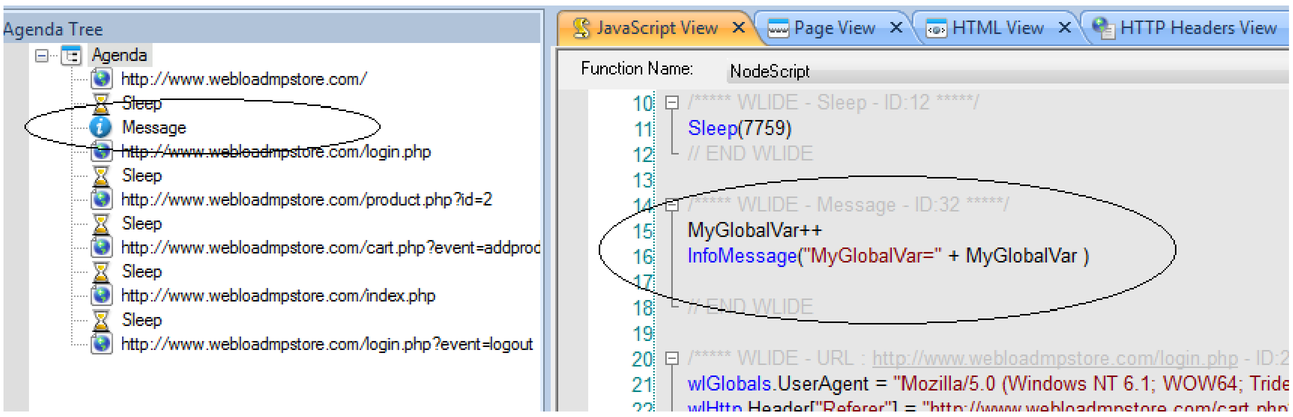
```
    else
          {localX = 10}
  }
  //Main script Body
  //Access the local values of localX & y
  y = localX + 2          //y = 22 in thread 0
    //y = 12 in all other threads
```

You can also limit the scope to a single function by defining the variable using a `var` statement, as described in *Limited Context* (on page 44).

Global Context

Global variables are universally accessible and shared by all script components in all threads of a script, within the initialization and termination functions as well as the main script body. Global variables and configuration properties are defined within the `InitAgenda()` initialization function of a script. Once a global variable has been declared you may read and assign values to that variable at any subsequent point in your script.

For example, it may be convenient to define as a global variable a message text or a URL string that you expect to use and reuse frequently within your script. Or you may need a global counter that should be incremented each time any script thread reaches a certain point in the test session. You could increment the variable value using JavaScript Object nodes added to the main script, as described in *Editing the JavaScript Code in* (on page 15). Add an InfoMessage node to the Script Tree to check on how the global variable value changes over the course of a test session, as illustrated in the following figure:


Agenda Tree
Agenda
http://www.webloadmpstore.com/
Sleep
Message
http://www.webloadmpstore.com/login.php
Sleep
http://www.webloadmpstore.com/product.php?id=2
Sleep
http://www.webloadmpstore.com/cart.php?event=addprod
Sleep
http://www.webloadmpstore.com/index.php
Sleep
http://www.webloadmpstore.com/login.php?event=logout
JavaScript View
Page View
HTML View
HTTP Headers View
Function Name:
NodeScript

```
/***** WLIDE - Sleep - ID:12 *****/
Sleep(7759)
// END WLIDE

/***** WLIDE - Message - ID:32 *****/
MyGlobalVar++
InfoMessage("MyGlobalVar=" + MyGlobalVar )

// END WLIDE

/***** WLIDE - URL : http://www.webloadmpstore.com/login.php - ID:2
wlGlobals.UserAgent = "Mozilla/5.0 (Windows NT 6.1; WOW64; Tride
wlHttp.Header["Referer"] = "http://www.webloadmpstore.com/cart.php
```

Figure 14: InfoMessage Node Addition to Script Tree

In the preceding figure, the script contains nodes for a:

- JavaScript Object

- Short sleep period
- Message to the Log Window

The JavaScript View pane displays the corresponding JavaScript code, beginning with the navigation to the new Web page and a short sleep period. The code that corresponds to the InfoMessage node in the Script Tree is circled. This node is used to increment and then print the value of a user-defined global variable.

Working with the wlGlobals Object

Configuration properties that are global to all threads of a single script are managed through the `wlGlobals` object, described in this section. The global script context includes global variables and settings that are shared by all threads of a single script, running on a single Load Generator.

Globally shared values are managed through the following objects:

- `wlGlobals`
- `wlGeneratorGlobal`
- `wlSystemGlobal`

This section describes the `wlGlobals` object properties used for global HTTP configuration settings, and reviews HTTP command search-order precedence. `wlGlobals` object properties used for user-defined global variables are described in the *WebLOAD Recorder User Guide*.

WebLOAD provides a global object called `wlGlobals`. The `wlGlobals` object stores the default configuration properties for HTTP connections, such as:

- The URL
- user name and password
- proxy server
- HTML parsing behavior

WebLOAD creates exactly one `wlGlobals` object for each script. You can access `wlGlobals` properties and methods anywhere in a script, in both the global and local contexts.

Initialize and set the properties of `wlGlobals` in the `InitAgenda()` function of your script. The values are then set globally and shared by each script's set of threads. For example, set a property such as `wlGlobals.DisableSleep` in `InitAgenda()` for it to automatically have the same value for all rounds. The value may be overridden by resetting the `wlHttp.DisableSleep` value, as illustrated in the following script:

Note: Remember that HTTP configuration settings and sleep configuration preferences are usually set directly through a dialog box in the WebLOAD Recorder or Console desktop, as described in the *WebLOAD Recorder User Guide* and the *WebLOAD Console User Guide*. The JavaScript coding example here is only intended to illustrate the balance between global defaults and local overrides.

```
// Initialization function—wlGlobals context
function InitAgenda() {
  // By default, do not include 'sleep pauses' in this script
  wlGlobals.DisableSleep = true
}
// Main Script Body—wlHttp context
if (RoundNum<20)
  wlHttp.DisableSleep = false
...
```

WebLOAD executes the `InitAgenda()` method when test execution first starts, and decides by default to disable all sleep pauses over the course of script execution:

```
wlGlobals.DisableSleep = true
```

For rounds 0-19, the main script overrides the global default and allows pausing during script execution:

```
wlHttp.DisableSleep = false
```

After the first 20 rounds of execution are completed, there is no local value assigned, so the script will again, by default, no longer allow sleep pauses.

`wlGlobals` object commands may be added directly to the code in a JavaScript Object within a script through the IntelliSense Editor, as described in *Editing the JavaScript Code in* (on page 15). Users who are programming their own JavaScript Object code within their script may take advantage of the WebLOAD Recorder GUI to simplify their programming efforts. Manually typing out the code to create a `wlGlobals` object method or property, risks making a mistake, and adding invalid code to the script file. Instead, users may bring up a list of available objects for the `wlGlobals` object, by right-clicking in the JavaScript Editing Pane, selecting **Insert ➤ General** from the pop-up menu, and selecting one of the available items.

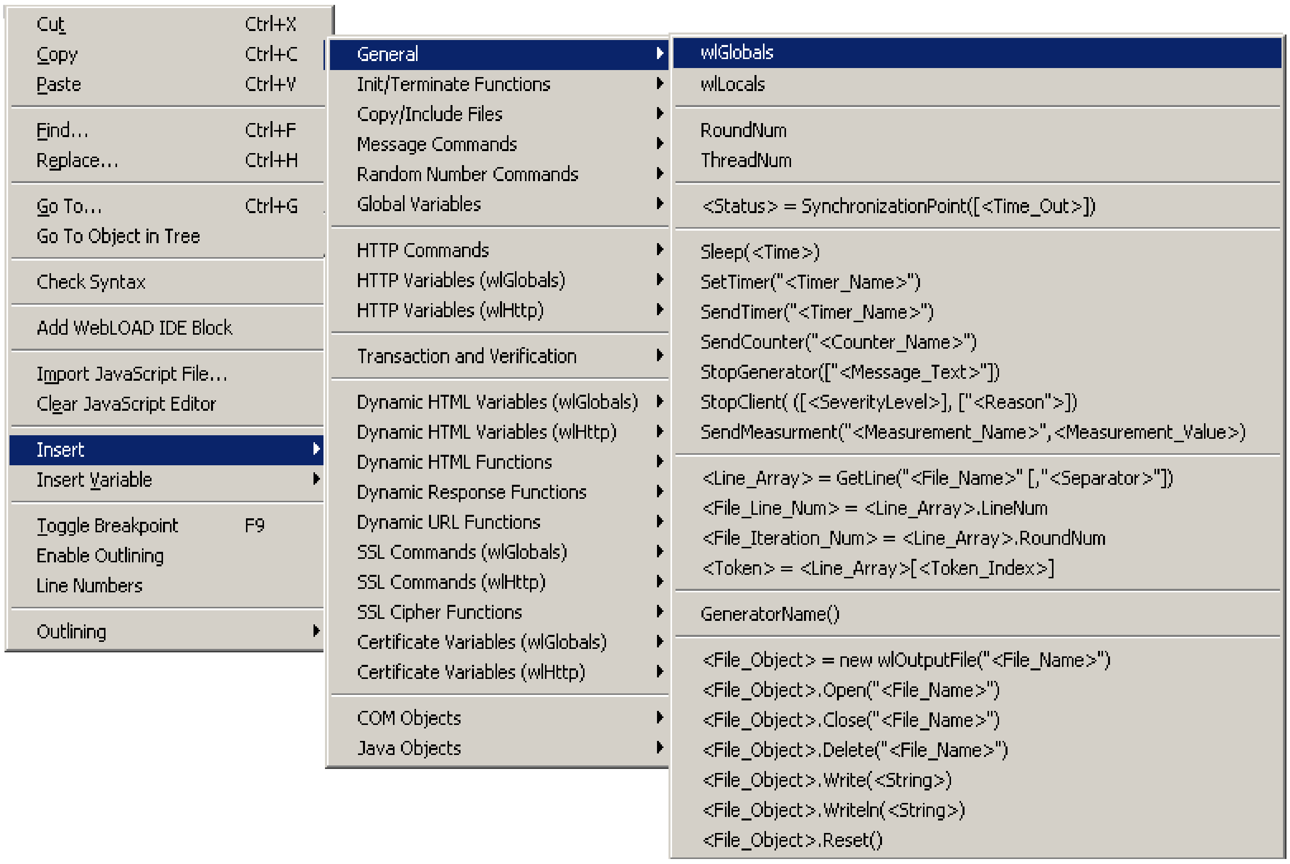
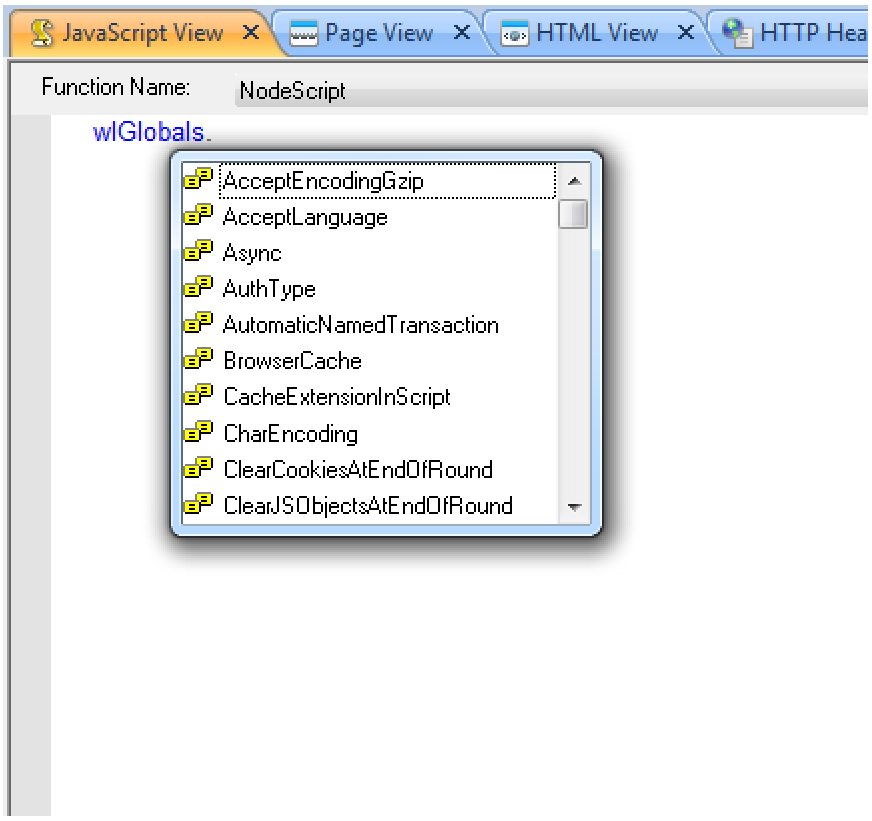

Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Find... Ctrl+F
Replace... Ctrl+H
Go To... Ctrl+G
Go To Object in Tree
Check Syntax
Add WebLOAD IDE Block
Import JavaScript File...
Clear JavaScript Editor
Insert
Insert Variable
Toggle Breakpoint F9
Enable Outlining
Line Numbers
Outlining
General
Init/Terminate Functions
Copy/Include Files
Message Commands
Random Number Commands
Global Variables
HTTP Commands
HTTP Variables (wlGlobals)
HTTP Variables (wlHttp)
Transaction and Verification
Dynamic HTML Variables (wlGlobals)
Dynamic HTML Variables (wlHttp)
Dynamic HTML Functions
Dynamic Response Functions
Dynamic URL Functions
SSL Commands (wlGlobals)
SSL Commands (wlHttp)
SSL Cipher Functions
Certificate Variables (wlGlobals)
Certificate Variables (wlHttp)
COM Objects
Java Objects
wlGlobals
wlLocals
RoundNum
ThreadNum
<Status> = SynchronizationPoint([<Time_Out>])
Sleep(<Time>)
SetTimer("<Timer_Name>")
SendTimer("<Timer_Name>")
SendCounter("<Counter_Name>")
StopGenerator(["<Message_Text>"])
StopClient(([<SeverityLevel>], ["<Reason">])
SendMeasurment("<Measurement_Name>",<Measurement_Value>)
<Line_Array> = GetLine("<File_Name>" [,"<Separator>"])
<File_Line_Num> = <Line_Array>.LineNum
<File_Iteration_Num> = <Line_Array>.RoundNum
<Token> = <Line_Array>[<Token_Index>]
GeneratorName()
<File_Object> = new wlOutputFile("<File_Name>")
<File_Object>.Open("<File_Name>")
<File_Object>.Close("<File_Name>")
<File_Object>.Delete("<File_Name>")
<File_Object>.Write(<String>)
<File_Object>.Writeln(<String>)
<File_Object>.Reset()

Figure 15: wlGlobals Insertion using General Menu

Select `wlGlobals` from the list and WebLOAD Recorder automatically inserts the correct code for a `wlGlobals` object into the script code currently being edited. The IntelliSense Editor then helps programmers write the JavaScript code for `wlGlobals` properties and methods by bringing up a list of appropriate choices together with pop-up boxes that describe each item on the list, as illustrated in the following figure:



Function Name: NodeScript

```
wlGlobals.
```

AcceptEncodingGzip
AcceptLanguage
Async
AuthType
AutomaticNamedTransaction
BrowserCache
CacheExtensionInScript
CharEncoding
ClearCookiesAtEndOfRound
ClearJSObjectsAtEndOfRound

Figure 16: wlGlobals Selection from List

Working with the IntelliSense Editor is described in *Editing the JavaScript Code in* (on page 15). See the description of `wlGlobals` objects in the *WebLOAD JavaScript Reference Guide* for a complete syntax specification.

Variables Defined through the wlGeneratorGlobal Object with WLCurrentAgenda Flag

For users who are comfortable working inside the JavaScript code of their scripts, WebLOAD provides a global object called `wlGeneratorGlobal`. The `wlGeneratorGlobal` object, when used with the `WLCurrentAgenda` scope flag, stores variable values that you wish to share between all threads of a single script, running on a single Load Generator. WebLOAD creates exactly one `wlGeneratorGlobal` object for each script. You can access `wlGeneratorGlobal` properties and methods anywhere in the script, in both the global and local contexts.

`wlGeneratorGlobal` includes the following methods:

- `Set("SharedVarName", value, WLCurrentAgenda)` — assigns a number, Boolean, or string value to the specified shared variable. If the variable does not exist, WebLOAD will create a new variable.

- `Get("SharedVarName", WLCurrentAgenda)` — returns the current value for the specified shared variable. The calling script thread waits for the requested value to be returned before continuing execution.
- `Add("SharedIntVarName", number, WLCurrentAgenda)` — increments the specified shared number variable by the specified amount. If the variable has not been declared or `Set` previously, the `Add` function both declares and sets the variable to the specified value.

Variables Defined through the wlGeneratorGlobal Object with WLAllAgendas Flag

The shared multiple script context includes global variables and settings that are shared by all threads of a multiple scripts. The `wlGeneratorGlobal` object, when used with the `WLAllAgendas` scope flag, stores variable values that you wish to share between all threads of one or more scripts, including a mix of scripts, part of one or more spawned processes, running on a single Load Generator. You can access `wlGeneratorGlobal` properties and methods anywhere in the script, in both the global and local contexts.

`wlGeneratorGlobal` includes the methods with the `WLAllAgendas` scope flag instead of the `WLCurrentAgenda` flag:

- `Set("SharedVarName", value, WLAllAgendas)`
- `Get("SharedVarName", WLAllAgendas)`
- `Add("SharedIntVarName", number, WLAllAgendas)`

wlGeneratorGlobal Example

`wlGeneratorGlobal` properties and methods can be accessed from anywhere within a script. They do not have to be set or initialized in any special place, and are not limited in where they may appear. Simply use the variables as necessary within your script code.

For example:

```
function InitAgenda() {
  B = new Number
  B = 0
  wlGeneratorGlobal.Set("B", 1, WLAllAgendas)
  wlGeneratorGlobal.Set("C", 4, WLCurrentAgenda)
}
function InitClient() {
  wlGeneratorGlobal.Add("B", 2, WLAllAgendas)
  wlGeneratorGlobal.Add("C", 5, WLCurrentAgenda)
  InfoMessage("C—agenda1 = " +
       wlGeneratorGlobal.Get("C", WLCurrentAgenda))
}
// Main script Body
B = wlGeneratorGlobal.Get("B", WLAllAgendas)
if (RoundNum==1){
  InfoMessage("B—agenda1 = " + B)
}
Sleep(1000)
wlGeneratorGlobal.Add("B", 10 , WLAllAgendas)
InfoMessage("B2—agenda2 = " +
  wlGeneratorGlobal.Get("B", WLAllAgendas))
wlGeneratorGlobal.Add("C", 25, WLCurrentAgenda)
InfoMessage("C—agenda1 = " +
  wlGeneratorGlobal.Get("C", WLCurrentAgenda))
...
```

Note: In the preceding example, the globally shared value of "B" is assigned to a local variable B. If you plan to use many InfoMessage commands, it is more efficient to assign the value to a local variable, rather than using a new `wlGeneratorGlobal.Get` call each time.

See *Editing the JavaScript Code in* (on page 15), for an introduction to editing your JavaScript code with the IntelliSense Editor. See the description of the `wlGeneratorGlobal` object in the *WebLOAD JavaScript Reference Guide* for a complete syntax specification.

Variables Defined through the wlSystemGlobal Object with WLCurrentAgenda Flag

The global script context includes global variables and settings that are shared by all threads of a single script, system-wide. The `wlSystemGlobal` object, when used with the `WLCurrentAgenda` scope flag, stores variable values that you wish to share between all threads of a single script, part of one or more spawned processes, potentially running on multiple Load Generators, and multiple machines. You can access `wlSystemGlobal` properties and methods anywhere in the script, in both the global and local contexts.

`wlSystemGlobal` includes essentially the same methods described in *Variables Defined through the wlGeneratorGlobal Object with WLAllAgendas Flag* (on page 51), applied here to global variables:

- `Set("GlobalVarName", value, WLCurrentAgenda)`—assigns a number, Boolean, or string value to the specified global script variable. If the variable does not exist, WebLOAD will create a new variable.

- `Get(“GlobalVarName”, WLCurrentAgenda)`—returns the current value for the specified global variable. The calling script thread waits for the requested value to be returned before continuing execution.
- `Add(“GlobalIntVarName”, number, WLCurrentAgenda)`—increments the specified global number variable by the specified amount. If the variable has not been declared or `Set` previously, the `Add` function declares and sets the variable to the specified value.

Variables Defined through the wlSystemGlobal Object with WLAllAgendas Flag

The global multiple script context provides full, system wide global variables, shared by all elements of a test session. The `wlSystemGlobal` object, when used with the `WLAllAgendas` flag, stores variable values that you wish to share between all threads of all scripts, part of one or more spawned processes, on all Load Generators and machines, system-wide. You can access `wlSystemGlobal` properties and methods anywhere in the script, in both the global and local contexts.

`wlSystemGlobal` includes essentially the same methods described in *Variables Defined through the wlSystemGlobal Object with WLCurrentAgenda Flag* (on page 53), with the `WLAllAgendas` scope flag in stead of the `WLCurrentAgenda` flag:

- `Set(“GlobalVarName”, value, WLAllAgendas)`
- `Get(“GlobalVarName”, WLAllAgendas)`
- `Add(“GlobalIntVarName”, number, WLAllAgendas)`

wlSystemGlobal Example

`wlSystemGlobal` properties and methods can be accessed from anywhere within a script. They do not have to be set or initialized in any special place, and are not limited in where they may appear. Simply use the variables as necessary within your script code.

For example:

```
function InitAgenda() {
<snip>
}
function InitClient() {
  wlSystemGlobal.Set("E", -2, WLCurrentscript)
  wlSystemGlobal.Set("D", 0, WLAllAgendas)
  wlSystemGlobal.Set("S","http://www.yahoo.com",WLAllAgendas)
}
// Main script Body
```

```
wlSystemGlobal.Add("D", 100, WLAllAgendas)
if (RoundNum==1){
  InfoMessage("D—agenda4 = " +
       wlSystemGlobal.Get("D", WLAllAgendas))
wlSystemGlobal.Add("E", 0.5, WLCurrentAgenda)
if (RoundNum==1){
  InfoMessage("E—agenda3 = " +
       wlSystemGlobal.Get("E", WLCurrentAgenda))
}
Sleep(1000)
```

See *Editing the JavaScript Code in* (on page 15), for an introduction to editing your JavaScript code with the IntelliSense Editor. See the description of `wlSystemGlobal` objects in the *WebLOAD JavaScript Reference Guide* for a complete syntax specification.

Example: Using a Combination of Global Variables

The following sample script combines the different global variable options introduced in the previous sections:

```
function InitAgenda() {
  wlGeneratorGlobal.Set("C", 4, WLCurrentAgenda)
  wlGeneratorGlobal.Set("B", 1, WLAllAgendas)
  <snip>
}
function InitClient() {
  wlGeneratorGlobal.Add("C", 5, WLCurrentAgenda)
  InfoMessage("C - agenda1 = " +
       wlGeneratorGlobal.Get("C", WLCurrentAgenda))
  wlGeneratorGlobal.Add("B", -2, WLAllAgendas)
  wlSystemGlobal.Set("E", +1, WLCurrentAgenda)
  wlSystemGlobal.Set("D", 0, WLAllAgendas)
  wlSystemGlobal.Set("S","http://www.yahoo.com",WLAllAgendas)
}
// Main script Body
B = wlGeneratorGlobal.Get( "B", WLAllAgendas)
wlSystemGlobal.Add("E", -1, WLCurrentAgenda)
wlSystemGlobal.Add("D", 100, WLAllAgendas)
if (RoundNum==1){
  InfoMessage("B - agenda1 = " + B)
  InfoMessage("E - agenda1 = " +
       wlSystemGlobal.Get( "E", WLCurrentAgenda))
     InfoMessage("D - agenda1 = " +
            wlSystemGlobal.Get( "D", WLAllAgendas))
}
wlHttp.Get(wlSystemGlobal.Get("S", WLAllAgendas))
Sleep(1000)
```

Search Order Precedence

Before WebLOAD begins a browser action, it searches for configuration parameters in the following order of precedence:

1. `wlHttp` properties (configuration property values limited to a specific browser object)
2. `wlLocals` properties (configuration property values that are local to a specific script thread)
3. `wlGlobals` properties (configuration property values that are global defaults, set at script initialization)

For example:

1. WebLOAD decides whether or not it will use recorded sleep times based on the value of `wlHttp.DisableSleep.`
2. If `wlHttp.DisableSleep` is not set, WebLOAD then searches for a value in the local default `wlLocals.DisableSleep.`
3. Finally, if both `wlHttp.DisableSleep` and `wlLocals.DisableSleep` are both not set, WebLOAD will use the global default value found in `wlGlobals.DisableSleep`, set at script initialization.

The same order of precedence applies to all the `wlGlobals`, `wlLocals`, and `wlHttp` properties. You can set global and local defaults for the `UserName`, `Url`, or other configuration properties. When WebLOAD executes a transaction, it uses any configuration property values that you have specified for that specific connection. If you have not assigned a value for the connection, WebLOAD searches for the local and global defaults, in that order.

Note: The recommended way to set configuration values is through the Default or Current Project Options dialog boxes under the Tools menu in the WebLOAD Recorder or Console desktop. Explicitly setting these values for a specific browser action, which is possible only if you set these properties within your script code, does give you a much more focused and sophisticated power, but it is also more risky, triggering unexpected side effects or complications. Configuration property settings within a script will *always* override the configuration property values set globally through the WebLOAD GUI. Keep these points in mind when deciding how to set your system configuration to get the most out of your script test session.

Global Sharing Considerations

A WebLOAD test session measures an application's performance. The testing tool, your script, must consume minimal system resources to have as small an impact as possible on the performance of the application being tested. To minimize system overhead when running your test script, WebLOAD recommends using the minimal level of global sharing required to run your test correctly.

Variables that are accessible within a single script only have the smallest impact on system performance, as noted in *wlGeneratorGlobal Example* (on page 52). For maximum efficiency and simplicity, WebLOAD strongly recommends creating and managing user-defined variables through the WebLOAD Recorder GUI, as described in the *WebLOAD Recorder User Guide*.

Values shared between multiple scripts, but within a single Load Generator, are the next most efficient choice. Global values shared system wide should only be included in your script if it is truly necessary to check values or synchronize data shared across multiple Load Generators or machines.

To optimize performance times during a test, multiple access requests from multiple sources are accommodated sequentially. Script execution is not held for the `Set()` or `Add()` methods, which are queued and processed sequentially. Only the `Get()` method actually holds a script while waiting for the requested value to be returned.

Over the course of a typical test session, multiple script threads may all be accessing, and potentially changing, the values of the same global variables. For example, two threads may each get `GlobalVarX`, currently set to 10. The two threads may then wish to increment `GlobalVarX` by 1, setting it to a new value of 11. These two `Get()` and two `Set()` commands are processed sequentially, independent of each other. Since each script got an initial value of 10, each script will independently set the value to 11. The final value will be set to 11, even though the variable was actually incremented twice, and should now equal 12. To avoid this potential inconsistency, WebLOAD recommends using the `Add()` command, which gets, changes, and resets a global value in a single action, ensuring /that each thread always accesses the most current value for a global variable and avoiding potential conflicts between threads.

Identification Variables and Functions

For performance statistics to be meaningful, testers must be able to identify the exact point being measured. WebLOAD therefore provides the following identification variables and functions:

- Two variables, `ClientNum` and `RoundNum`, identify the client and round number of the current script instance.

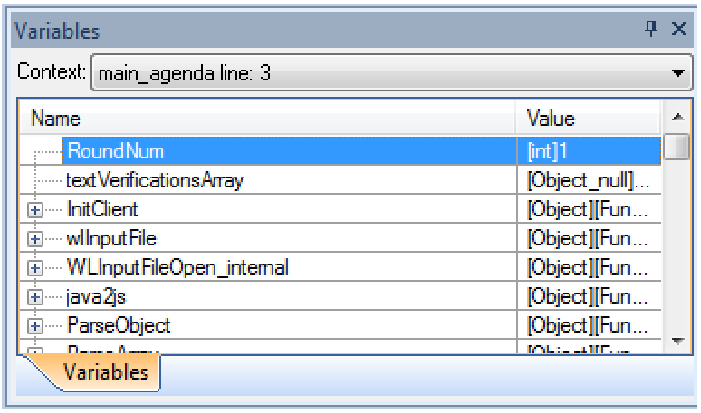
- The `GeneratorName()` function identifies the current Load Generator.
- The `GetOperatingSystem()` function identifies the operating system of the current Load Generator.
- The `VCUniqueID()` function identifies the current Virtual Client instance.

An example is provided at the end of this section to illustrate common use of these variables and functions. Use these variables and function to support the WebLOAD measurement features and obtain meaningful performance statistics.

These identification variables and functions are usually accessed and inserted into script files directly through the WebLOAD Recorder GUI.

To open the Variables Window:

1. Start debugging. Click **Run** or **Step Into** .
2. Check the **Variables Window** checkbox in the **Debug** tab of the ribbon



Name	Value
RoundNum	[int]1
textVerificationsArray	[Object_null]...
InitClient	[Object][Fun...
wlInputFile	[Object][Fun...
WLInputFileOpen_internal	[Object][Fun...
java2js	[Object][Fun...
ParseObject	[Object][Fun...

Figure 17: Variables Window

The Variables window contains a grid with fields for the variable name and value. The debugger automatically fills in these fields. You cannot add variables or expressions to the Variables window (you must use the Watch window), but you can expand or collapse the variables shown. You can expand an array, object, or structure variable in the Variables window if it has a plus sign (+) box in the Name field. If an array, object, or structure variable has a minus sign (-) box in the Name field, the variable is already fully expanded.

The Variables window has a **Context** box that displays the current scope of the variables displayed. To view variables in a different scope, select the scope from the drop-down list box.

Viewing the Value of a Variable

You can view the value of a variable in the Variables window.

To view a variable in the Variables window:

1. Start debugging. Click **Run** or **Step Into**.
2. Check the **Variables Window** checkbox in the **Debug** tab of the ribbon

ClientNum

This is the serial number of the client in the WebLOAD test configuration. `ClientNum` is a read-only local variable. Each client in a Load Generator has a unique `ClientNum`. However, two clients in two different Load Generators may have the same `ClientNum`.

Note: `ClientNum` is not unique system wide. Use *VCUniqueID()* (on page 62), to obtain an ID number which is unique system-wide.

Add `RoundNum` directly to the code in any JavaScript Object in your script. Work through the IntelliSense Editor, described in *Using the IntelliSense JavaScript Editor* (on page 16).

For example, if there are N clients in a Load Generator, the clients are numbered `0, 1, 2, ..., N-1`. You can access `ClientNum` anywhere in the local context of the script `(InitClient(),` main script, `TerminateClient(),` etc.). `ClientNum` does not exist in the global context `(InitAgenda(), TerminateAgenda(),` etc.).

If you mix scripts within a single Load Generator, instances of two or more scripts may run simultaneously on each client. Instances on the same client have the same `ClientNum` value.

`ClientNum` reports only the main client number. It does not report any extra threads spawned by a client to download nested images and frames. See WebLOAD Actions, Objects, and Functions in the *WebLoad JavaScript Reference Guide* for more information about spawning threads.

Note: Earlier versions of WebLOAD referred to this value as `ClientNum`. The variable name `ClientNum` will still be recognized for backward compatibility.

RoundNum

The number of times that WebLOAD has executed the main script of a client during the WebLOAD test, including the current execution. `RoundNum` is a read-only local variable, reporting the number of rounds for the specific WebLOAD client, no matter how many other clients may be running the same script.

`RoundNum` does not exist in the global context of a script `(InitAgenda(),` etc.). In the local context:

- In `InitClient()`, RoundNum = `0`.
- In the main script, `RoundNum` = `1, 2, 3,` ....
- In `TerminateClient()`, `OnScriptAbort()`, or `OnErrorTerminateClient()`, `RoundNum` keeps its value from the final round.

The WebLOAD clients do not necessarily remain in synchronization. The `RoundNum` may differ for different clients running the same script.

If a thread stops and restarts for any reason, the `RoundNum` continues from its value before the interruption. This can occur, for example, after you issue a Pause command from the WebLOAD Console.

If you mix scripts in a single Load Generator, WebLOAD maintains an independent round counter for each script. For example, if `agenda1` has executed twice and `agenda2` has executed three times on a particular thread, the `RoundNum` of `agenda1` is `2` and the `RoundNum` of `agenda2` is `3`.

Add `RoundNum` directly to the code in a script through the IntelliSense Editor, described in *Editing the JavaScript Code in* (on page 15). Select a function by right-clicking the JavaScript Editing Pane, and selecting **Insert** ➤ **General** from the pop-up menu. WebLOAD Recorder automatically inserts the correct code for the selected function into the script file. The user may then edit parameter values without any worries about mistakes in the function syntax.

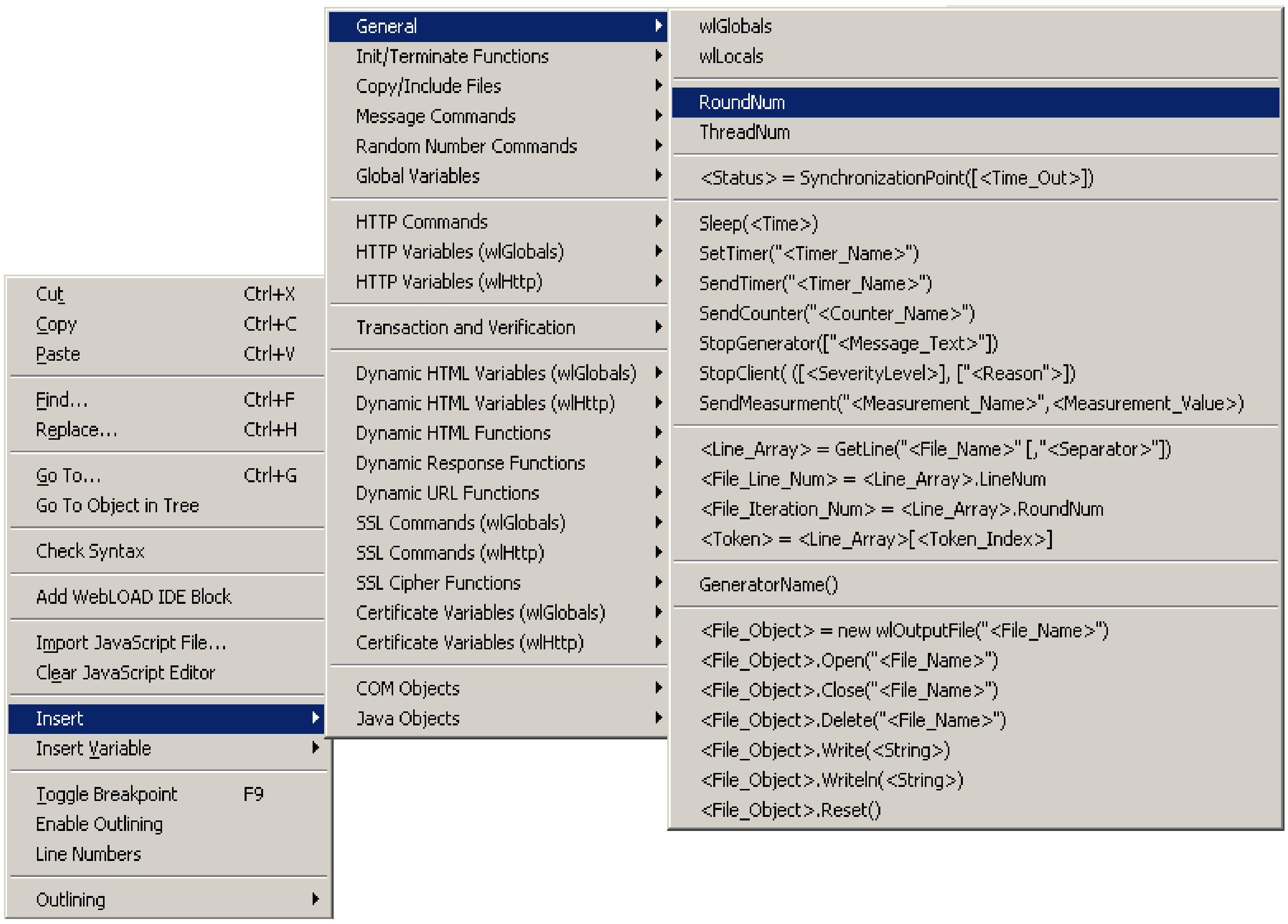

Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Find... Ctrl+F
Replace... Ctrl+H
Go To... Ctrl+G
Go To Object in Tree
Check Syntax
Add WebLOAD IDE Block
Import JavaScript File...
Clear JavaScript Editor
Insert
Insert Variable
Toggle Breakpoint F9
Enable Outlining
Line Numbers
Outlining
General
Init/Terminate Functions
Copy/Include Files
Message Commands
Random Number Commands
Global Variables
HTTP Commands
HTTP Variables (wlGlobals)
HTTP Variables (wlHttp)
Transaction and Verification
Dynamic HTML Variables (wlGlobals)
Dynamic HTML Variables (wlHttp)
Dynamic HTML Functions
Dynamic Response Functions
Dynamic URL Functions
SSL Commands (wlGlobals)
SSL Commands (wlHttp)
SSL Cipher Functions
Certificate Variables (wlGlobals)
Certificate Variables (wlHttp)
COM Objects
Java Objects
wlGlobals
wlLocals
RoundNum
ThreadNum
<Status> = SynchronizationPoint([<Time_Out>])
Sleep(<Time>)
SetTimer("<Timer_Name>")
SendTimer("<Timer_Name>")
SendCounter("<Counter_Name>")
StopGenerator(["<Message_Text>"])
StopClient(([<SeverityLevel>], ["<Reason>"])
SendMeasurment("<Measurement_Name>", <Measurement_Value>)
<Line_Array> = GetLine("<File_Name>" [,"<Separator>"])
<File_Line_Num> = <Line_Array>.LineNum
<File_Iteration_Num> = <Line_Array>.RoundNum
<Token> = <Line_Array>[<Token_Index>]
GeneratorName()
<File_Object> = new wlOutputFile("<File_Name>")
<File_Object>.Open("<File_Name>")
<File_Object>.Close("<File_Name>")
<File_Object>.Delete("<File_Name>")
<File_Object>.Write(<String>)
<File_Object>.Writeln(<String>)
<File_Object>.Reset()

Figure 18: Adding RoundNum using the Copy/Include Files Menu

Example: identifying a client and round

For example, suppose your script submits data to a server on an HTML form. You want to label one of the form fields so you can tell which WebLOAD client submitted the data, and in which round of the main script.

You can do this using a combination of the `ClientNum` and `RoundNum` variables. Together, these variables uniquely identify the WebLOAD client and round. For example, you can submit a string such as the following in a form field:

```
"C" + ClientNum.toString() + "R" + RoundNum.toString()
```

GeneratorName()

This returns a unique identification string for the current Load Generator. `GeneratorName()` provides a unique identification for the current Load Generator instance, even with multiple spawned processes running simultaneously. The identification string is composed of a combination of the current Load Generator name, computer name, and other internal markers.

GetOperatingSystem()

This returns a string that identifies the operating system running on the current Load Generator. If an operating system is available in more than one version, returns the name of the operating system followed by an identifying version number.

For example:

- If the Load Generator is working with a Windows platform, possible return values include:
    - Windows 95
    - Windows 98
    - Windows NT/2000
    - Windows XP
    - Windows OtherVersionNumber
- If the Load Generator is working with a Solaris platform, this function would return the string '`Solaris`' followed by the version name and release number, such as `SunOS2`.
- If the Load Generator is working with a Linux platform, this function would return the string '`Linux`' followed by the version name and release number, such as `RedHat1`.

VCUniqueID()

This returns a unique identification string for the current Virtual Client instance.

`VCUniqueID()` provides an identification for the current Virtual Client instance which is unique system-wide, across multiple Load Generators, even with multiple spawned processes running simultaneously. Compare this to *ClientNum* (on page 59), which provides an identification number that is only unique within a single Load Generator. The identification string is composed of a combination of the current thread number, round number, and other internal markers.

Chapter 3

Advanced JavaScript script Features

Previous chapters discussed the basic set of script tools used to test typical Internet applications. However, to evaluate and test your Internet application most effectively, it is not enough to measure the total transaction turn-around time or throughput of the website. A website is often only the front-end for applications that reside behind the scenes, for back-end components that do the actual work for an application. Testing the components that stand behind your Internet application is essential for comprehensive Internet application testing. A detailed breakdown and analysis of the results of each user activity helps pinpoint the source of any potential bottlenecks or other problems, and expedites the work required for any corrections or improvements.

WebLOAD fully supports component based testing. WebLOAD Recorder scripts do not simply measure the time required for transactions to a website to be completed. WebLOAD JavaScript script objects can also directly access the back-end applications that compose your Internet application.

WebLOAD provides a single, uniform environment for all your testing needs. WebLOAD JavaScript is the single scripting language that is able to work seamlessly with COM, Java, and XML DOM, accessing the applications that use these technologies through a variety of protocols, or your own proprietary protocol, in addition to standard Web-site testing, adding power to and increasing the universal applicability of your testing scripts.

This chapter introduces various component-based testing features.

Syntax specifications for the WebLOAD objects that appear in the examples in this chapter are provided in the *WebLOAD JavaScript Reference Guide*.

Working with the XML DOM

XML is a meta-language developed by W3C to organize and transfer data in a generic, universally recognized manner. XML relies on a simple, logical structure that is both easy to learn and works quickly and reliably, focusing on transferring hard data only, with no formatting or presentation information. XML acts as a gateway between autonomous, heterogeneous, component-based systems. This allows users to connect or link to any platform. XML provides an elegant solution for Web masters who wish to reach a wide range of clients, working on any number of diverse systems.

WebLOAD provides full support for work with the XML Document Object Model. Using XML DOM objects, WebLOAD scripts are able to both *access* XML site information, and *generate new XML data* to send back to the server for processing, taking advantage of all the additional benefits that XML provides.

WebLOAD supports:

- Working with existing XML Data Islands. Data Islands are XML documents embedded within HTML documents. WebLOAD Recorder, like the IE Browser, produces an XML DOM object for each Data Island.
- Creating new XML DOM objects via the XML Object Constructor. WebLOAD supports XML Native Browsing through use of the XML Object Constructor.
- Parsing and manipulating any XML data, using the XML Parser Object.

Both WebLOAD and the IE Browser use the MSXML parser to create XML DOM objects. Since WebLOAD XML DOM objects and Browser XML DOM objects are created by the same MSXML parser, the XML DOM objects that are produced for both WebLOAD and the IE Browser are identical.

When working through the IE Browser, XML DOM objects are accessed through the `all` collection. When working through WebLOAD, XML DOM objects are accessed through the `wlXmls` collection. Since a WebLOAD XML DOM object is identical to an IE Browser XML DOM object, the WebLOAD XML DOM uses the same Document Interface (programming methods and properties) found in the IE Browser XML DOM.

The next few sections of this guide explain basic XML concepts and usage. Look in the *WebLOAD JavaScript Reference Guide* for a description of the WebLOAD `wlXmls` collection syntax and for a complete list of the WebLOAD-supported XML DOM Interfaces.

For more general XML support and cross platform capabilities, WebLOAD offers the XMLParserObject as another alternative for accessing XML data. The XMLParserObject is based on the open source Xerces XML parser. In addition to the multi-platform support, using this object will result in lower memory consumption and increased performance during load testing.

The following sections contain examples using the XMLParserObject. For more information about the XMLParserObject please refer to the *WebLOAD JavaScript Reference Guide.* Additional information about the XMLParserObject's underlying Xerces component can be found at http://xml.apache.org/xerces-c/.

WebLOAD XML DOM Objects

WebLOAD XML DOM objects produced from HTML documents may be used on two different levels:

- The simplest approach is to use the XML DOM object to work directly with text strings through the standard HTML properties id, src, and innerHTML. These properties refer to the text strings found within an HTML document.
- On a more sophisticated level, programmers may use the same XML DOM object to work with a full set of XML DOM Document Interface properties and methods, as listed in *Appendix B* of the *WebLOAD JavaScript Reference Guide*. The following figure illustrates these options:

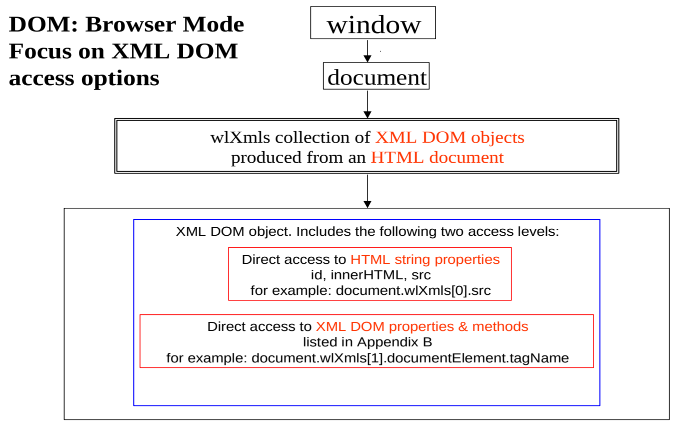

DOM: Browser Mode
Focus on XML DOM
access options
window
document
wlXmls collection of XML DOM objects
produced from an HTML document
XML DOM object. Includes the following two access levels:
Direct access to HTML string properties
id, innerHTML, src
for example: document.wlXmls[0].src
Direct access to XML DOM properties & methods
listed in Appendix B
for example: document.wlXmls[1].documentElement.tagName

Figure 19: XML DOM Object Options

See the *WebLOAD JavaScript Reference Guide* for a complete description of the `wlXmls` collection.

Data Islands

Data Islands are XML documents embedded within HTML documents. Data Islands found on HTML documents are located either between a set of `<xml>` and `</xml>` tags or between a set of `<script>` and `</script>` tags. Data Islands consist of either a complete body of in-line XML code or a reference to XML code found in another location, with the location specified in a `src=location` statement.

WebLOAD, like the Internet Explorer browser, produces an XML DOM object for each Data Island. No matter how a Data Island is specified, either within a set of `<xml>` tags or a set of `<script>` tags, either as in-line XML code or through a reference to another location, WebLOAD produces a full XML DOM object for each Data Island. These XML DOM objects are accessible through the `wlXmls` collection.

Data Island XML DOM objects expose both aspects of each XML DOM object, (as described in *WebLOAD XML DOM Objects* (on page 65)):

- The standard HTML properties id, src, and innerHTML. These properties refer to text strings found within the HTML document.
- The XML Document Interface. The interface provides access to the properties and methods of the XML DOM object.

The following figure illustrates the various Data Islands options.

Note: Not all these Data Islands would be found in a single `wlXmls` collection if they have been taken from different sources. They appear here in a single figure to illustrate the various Data Island possibilities.

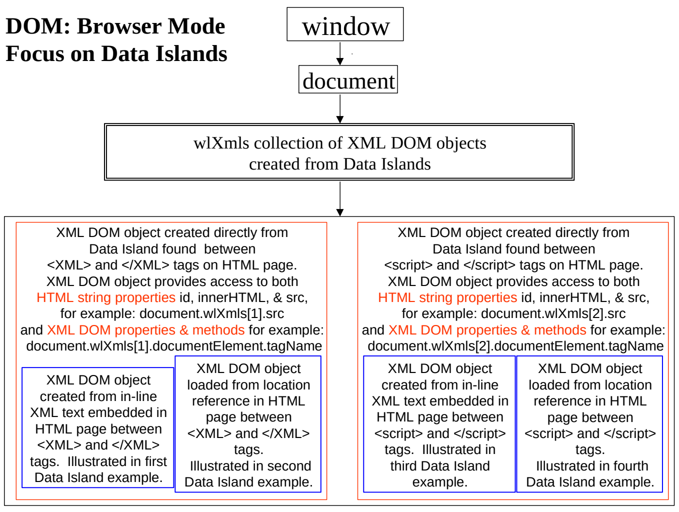

DOM: Browser Mode
Focus on Data Islands
window
document
wlXmls collection of XML DOM objects created from Data Islands
XML DOM object created directly from Data Island found between <XML> and </XML> tags on HTML page. XML DOM object provides access to both HTML string properties id, innerHTML, & src, for example: document.wlXmls[1].src and XML DOM properties & methods for example: document.wlXmls[1].documentElement.tagName
XML DOM object created from in-line XML text embedded in HTML page between <XML> and </XML> tags. Illustrated in first Data Island example.
XML DOM object loaded from location reference in HTML page between <XML> and </XML> tags. Illustrated in second Data Island example.
XML DOM object created directly from Data Island found between <script> and </script> tags on HTML page. XML DOM object provides access to both HTML string properties id, innerHTML, & src, for example: document.wlXmls[2].src and XML DOM properties & methods for example: document.wlXmls[2].documentElement.tagName
XML DOM object created from in-line XML text embedded in HTML page between <script> and </script> tags. Illustrated in third Data Island example.
XML DOM object loaded from location reference in HTML page between <script> and </script> tags. Illustrated in fourth Data Island example.

Figure 20: Data Island Possibilities

Data Islands are accessible through WebLOAD scripts using the `wlXmls` collection of XML DOM objects corresponding to all the Data Islands found in an HTML document. Each Data Island produces a different XML DOM object.

For example, when working with an HTML document that includes two Data Islands, use the following code to assign the XML object that references the first Data Island to another object:

```
XMLDataIsland1 = document.wlXmls[0]
To access the second Data Island use:
XMLDataIsland2 = document.wlXmls[1]
```

If a Data Island is identified by name through an ID, you could also access the Data Island through the id property. For example, if the first Data Island begins:

```
<xml id="xmlBookstoreDatabase">
```

Then you could access the Data Island using any of the following:

```
MyBookstore = document.wlXmls.xmlBookstoreDatabase
MyBookstore = document.wlXmls["xmlBookstoreDatabase"]
MyBookstore = document.wlXmls[0]
```

The following HTML code fragments illustrate these Data Islands options.

Data Island—In-Line Code

In this code fragment, in-line XML data is embedded in the HTML page. WebLOAD uses this data to create the XML DOM object.

```
<html>
   <head>
          ...
   </head>
   <body>
          ...
          <!—in-line XML data>
          <xml id="xmldoc_1">
                 <?xml version="1.0" standalone = true?>
                 Programmer's Guide
                        <author>Mark Twain</author>
                        <title>Tom Sawyer</title>
                        <price>$11.00</price>
                 </book>
                 <foo>
                        ...
                 </foo>
          </xml>
          ...
   </body>
</html>
```

Data Island—Reference to Another Source

In this code fragment, a reference to XML data found at another location is found in the HTML page. WebLOAD creates an XML DOM object from the source found at that location *only*.

Note: If a Data Island includes an `src=location` statement, then any additional XML data found embedded within the Data Island on the HTML page will be ignored.

```
<html>
   <head>
```

```
          ...
     </head>
     <body>
          ...
          <!—reference to another source>
          <xml id="xmldoc_2" src="http://demo/bookstore.xml">
          </xml>
          ...
     </body>
</html>
```

Data Island—Scripted In-Line

XML DOM objects created from scripts within HTML documents may also be based on either in-line XML data or references to other sources.

For example:

```
<SCRIPT language="xml" id="xmlscript">
     <?xml version="1.0"?>
     <!—XML data in-line within a script element.>
     <bookstore>
          Programmer's Guide
               <author>Mark Twain</author>
               <title>Tom Sawyer</title>
               <price>$11.00</price>
          </book>
          Programmer's Guide
               <author>Oscar Wilde</author>
               <title>The Giant And His Garden</title>
               <price>$8.00</price>
          </book>
     </bookstore>
</SCRIPT>
```

Data Island—Scripted Reference to Another Source

The preceding code illustrates XML data embedded in a script. Scripts may also include references to other sources:

```
<SCRIPT language="xml" id="xmlscript" src="book.xml">
</SCRIPT>
```

Example: Using Data Islands in a script

The following example illustrates Data Island usage. Assume you are working with a Web Bookstore site that includes the following inventory database code fragment:

```
<HTML>
  <HEAD>
       <TITLE> </TITLE>
  </HEAD>
  <BODY>
       <h3>Html file with embedded XML</h3>
       <P>Here begins the XML Data Island</P>
            <xml id="WebStudents">
       <wclass>
       <!-- My students who attended my web programming class -
       ->
       <student id="1">
            <name>Linda Jones</name>
            <legacySkill>Access, VB5.0</legacySkill>
       </student>
       <student id="2">
            <name>Adam Davidson</name>
            <legacySkill>Cobol, MainFrame</legacySkill>
       </student>
       <student id="3">
            <name>Charles Boyer</name>
            <legacySkill>HTML, Photoshop</legacySkill>
       </student>
       <student id="4">
            <name>Charles Mann</name>
            <legacySkill>Cobol, MainFrame</legacySkill>
       </student>
       </wclass>
       </xml>  <P>Here ends the XML Data Island</P>
  </BODY>
</HTML>
```

Working with HTML Properties

When accessing this website, your script may use the standard HTML properties `id` and `innerHTML` to print out text strings showing the information found within the XML tags, as follows:

JavaScript script Code:

```
function InitAgenda()
{
  wlGlobals.Parse = true
  wlGlobals.ParseXML = true
}

wlHttp.SaveSource = true

wlHttp.Get("http://www.webloadmpstore.com/xmlsamples/sample2.htm
l")

var XMLstudents = document.wlXmls[0]
InfoMessage("ID : " +XMLstudents.id)
InfoMessage("HTML text : " +XMLstudents.innerHTML)
```

Output Text:

Running this script produces the following output, essentially a text copy of the Data Island fields:

```
ID : WebStudents
HTML text :
  <wclass>
  <!-- My students who attended my web programming class -->
       <student id="1">
            <name>Linda Jones</name>
            <legacySkill>Access, VB5.0</legacySkill>
       </student>
       <student id="2">
            <name>Adam Davidson</name>
            <legacySkill>Cobol, MainFrame</legacySkill>
       </student>
       <student id="3">
            <name>Charles Boyer</name>
            <legacySkill>HTML, Photoshop</legacySkill>
       </student>
       <student id="4">
            <name>Charles Mann</name>
            <legacySkill>Cobol, MainFrame</legacySkill>
       </student>
  </wclass>
```

Working with XML DOM Properties

Your script may also access the complete XML DOM Document Interface for the XML DOM object created from this Data Island. For example, to see a printout of the complete XML DOM structure for the `xmlBookSite` Data Island described on the preceding pages, use the following recursive function. See *Appendix B* in the *WebLOAD JavaScript Reference Guide*, for a description of the XML DOM properties used in this script fragment.

JavaScript script Code:

```
function InitAgenda()
{
  wlGlobals.Parse = true
  wlGlobals.ParseXML = true
}

wlHttp.SaveSource = true

wlHttp.Get("http://www.webloadmpstore.com/xmlsamples/sample2.htm
l")

var XMLstudents = document.wlXmls[0]
var XMLstudentDoc =  XMLstudents.XMLDocument
var XMLstudentElement = XMLstudentDoc.documentElement

InfoMessage("Printing XML under the root")
InfoMessage(XMLstudentElement.xml)
InfoMessage("Element structure of the DOM")
printChildren(XMLstudentElement)

// function that will print all the fields and their attributes
function printChildren(element)
{
  switch(element.nodeTypeString)
  {
        case "element":
              InfoMessage(element.nodeName)
              for(var i=0; i<element.childNodes.length; i++)
              {
                    printChildren(element.childNodes.item(i))
              }
```

```
                break
           case "text":
                InfoMessage("\"" + element.nodeValue + "\"")
                break
     }
}

InfoMessage("End of test")
```

Output Text:

Running this script produces the following output:

```
Printing XML under the root
<wclass>
  <!-- My students who attended my web programming class -->
  <student id="1">
       <name>Linda Jones</name>
       <legacySkill>Access, VB5.0</legacySkill>
  </student>

  <student id="2">
       <name>Adam Davidson</name>
       <legacySkill>Cobol, MainFrame</legacySkill>
  </student>

  <student id="3">
       <name>Charles Boyer</name>
       <legacySkill>HTML, Photoshop</legacySkill>
  </student>

     <student id="4">
       <name>Charles Mann</name>
       <legacySkill>Cobol, MainFrame</legacySkill>
  </student>
</wclass>

Element structure of the DOM
  wclass
  student
  name
  "Linda Jones"
  legacySkill
  "Access, VB5.0"
  student
  name
  "Adam Davidson"
  legacySkill
  "Cobol, MainFrame"
  student
  name
  "Charles Boyer"
  legacySkill
  "HTML, Photoshop"
  student
  name
  "Charles Mann"
  legacySkill
  "Cobol, MainFrame"
End of test
```

JavaScript script Code Using the XMLParser Object:

A similar script, with the same functionality, can be written using the XMLParserObject, as shown in the code snippet below:

```
xmlObject = new XMLParserObject();
doc = xmlObject.
parseURI("http://www.webloadmpstore.com/xmlsamples/sample2.html"
)
doc1 = doc.getDocumentElement()
//used to present only the xml
domNode = doc1.getElementsByTagName("xml").item(0);
InfoMessage("Printing XML under the root")
printChildren(domNode)
function printChildren(element)
{
  switch(element.nodeTypeString)
  {
       case "element":
            InfoMessage(element.nodeName)
            for(var i=0; i<element.childNodes.length; i++)
            {
                 printChildren(element.childNodes.item(i))
            }
```

```
                    break
              case "text":
                    InfoMessage("\"" + element.nodeValue + "\"")
                    break
        }
   }

InfoMessage("End of test")
```

Changing Bookstore Data

After you have accessed the website and created an XML DOM object from the XML data found on the site, you may wish to change some of the data and post the new version back to the website. To change the author of the first book to 'S. B. David Lee Eddings':

```
function InitAgenda()
{
   wlGlobals.Parse = true
   wlGlobals.ParseXML = true
}

wlHttp.SaveSource = true
wlHttp.Get
("http://www.webloadmpstore.com/xmlsamples/sample1.xml")
//Getting the XML file
var xmlBookListDoc = document.wlXmls[0]
var xmlBookListIsland = xmlBookListDoc.XMLDocument
var xmlBookListElement = xmlBookListIsland.documentElement
InfoMessage("Printing xml under the root: " +
xmlBookListElement.xml)

//First access the node of the first book
var FirstBook = xmlBookListElement.childNodes.item(0)

//Next access the node of the author of the first book
var AuthorFirstBook = FirstBook.childNodes.item(1)

//Finally access the node of the text of the author of the first
book
var TextAuthorFirstBook = AuthorFirstBook.childNodes.item(0)

//In other words, the node in the XML database tree
```

```
//that actually stores the author name value is located at:
//      document.wlXmls[0].XMLDocument.
//      documentElement.childNodes.item(0).childNodes.
//      item(1).childNodes.item(0)
//Now assign a new value
TextAuthorFirstBook.nodeValue = "S. B. David Lee Eddings"

InfoMessage("The changed author value, from J.R.R. Tolkein, to:
"
+ TextAuthorFirstBook.nodeValue)
InfoMessage("Print xml under the root: " +
xmlBookListElement.xml)
```

The changed bookstore database will look as follows:

```
<bookstore name="NODE1NAME">
  <book>
        <title lang="en">Everyday Italian</title>
        <author>David Eddings</author>
        <year>2005</year>
        <price>30.00</price>
  </book>
  <book category="CHILDREN">
        <title lang="en">Harry Potter</title>
        <author>J K. Rowling</author>
        <year>2005</year>
        <price>29.99</price>
  </book>
  <book category="WEB">
        <title lang="en">XQuery Kick Start</title>
        <author>James McGovern</author>
        <author>Per Bothner</author>
        <author>Kurt Cagle</author>
        <author>James Linn</author>
        <author>Vaidyanathan Nagarajan</author>
        <year>2003</year>
        <price>49.99</price>
  </book>
  <book category="WEB">
        <title lang="en">Learning XML</title>
        <author>Erik T. Ray</author>
        <year>2003</year>
        <price>39.95</price>
  </book>
</bookstore>
```

You can change the bookstore data in the same way by using the XMLParserObject. The script code is even shorter:

```
xmlObject = new XMLParserObject();
doc = xmlObject.
parseURI("http://www.webloadmpstore.com/xmlsamples/sample1.xml")
;
InfoMessage("The xml under the root : " + doc.xml)
doc1 = doc.getDocumentElement()

FirstBook =  doc1.getElementsByTagName("book").item(0);
AuthorFirstBook  = FirstBook.childNodes.item(1) ;
TextAuthorFirstBook  = AuthorFirstBook.childNodes.item(0)
TextAuthorFirstBook.nodeValue = "S. B. David Lee Eddings"
InfoMessage("The changed author value, from J.R.R. Tolkein,
to: " + TextAuthorFirstBook.nodeValue)
InfoMessage("The xml under the root : " + doc.xml)
```

Adding New Bookstore Data

The following script fragment illustrates adding a new 'book element' to the `xmlBooksite` database. See Appendix B in the *WebLOAD JavaScript Reference Guide,* for a description of the XML DOM properties used here.

```
var xmlBookListDoc = document.wlXmls[0]
var xmlBookListIsland = xmlBookListDoc.XMLDocument

//STEP 1, create the new book element
//      and append it to the tree
newBook = xmlBookListIsland.createElement("book")
xmlBookListIsland.documentElement.appendChild(newBook)

//STEP 2, create and name the new book's title element
title1 = xmlBookListIsland.createElement("title")
name = xmlBookListIsland.createTextNode("River God")
//append the new name node to the title node
title1.appendChild(name)
//append the new title node to the book node
newBook.appendChild(title1)
```

```
//STEP 3, create and name the new book’s author element
author = xmlBookListIsland.createElement("author")
name = xmlBookListIsland.createTextNode("Wilbur Smith")
author.appendChild(name)
newBook.appendChild(author)

//STEP 4, create and name the new book’s year element
year = xmlBookListIsland.createElement("year")
name = xmlBookListIsland.createTextNode("1975")
year.appendChild(name)
newBook.appendChild(year)

//STEP 4, create and name the new book’s price element
price = xmlBookListIsland.createElement("price")
amount = xmlBookListIsland.createTextNode("40.55")
price.appendChild(amount)
newBook.appendChild(price)
```

The newly expanded bookstore database will look as follows:

```
<bookstore name="NODE1NAME">
  <book>
       <title lang="en">Everyday Italian</title>
       <author>S. B. David Lee Eddings</author>
       <year>2005</year>
       <price>30.00</price>
  </book>
  <book category="CHILDREN">
       <title lang="en">Harry Potter</title>
       <author>J K. Rowling</author>
       <year>2005</year>
       <price>29.99</price>
  </book>
  <book category="WEB">
       <title lang="en">XQuery Kick Start</title>
       <author>James McGovern</author>
       <author>Per Bothner</author>
       <author>Kurt Cagle</author>
       <author>James Linn</author>
       <author>Vaidyanathan Nagarajan</author>
       <year>2003</year>
```

```
        <price>49.99</price>
    </book>
    <book category="WEB">
        <title lang="en">Learning XML</title>
        <author>Erik T. Ray</author>
        <year>2003</year>
        <price>39.95</price>
    </book>
    <book>
        <title>River God</title>
        <author>Wilbur Smith</author>
        <year>1975</year>
        <price>40.55</price>
    </book></
    </bookstore>
```

You can achieve the same result using XMLParserObject. The script Code is as follows:

```
xmlObject = new XMLParserObject();
doc = xmlObject.
parseURI("http://www.webloadmpstore.com/xmlsamples/sample1.xml")
;
doc1 = doc.getDocumentElement()

newNode1 = doc.createElement("book");
doc1.appendChild(newNode1);

title1 = doc.createElement("title") ;
titleText = doc.createTextNode("River God");
newNode1.appendChild(title1)
title1.appendChild(titleText )

author = doc.createElement("author") ;
authorName =  doc.createTextNode("Wilbur Smith");
newNode1.appendChild(author)
author.appendChild(authorName )

year = doc.createElement("year") ;
yearInd =  doc.createTextNode("1975");
newNode1.appendChild(year )
year.appendChild(yearInd )
```

```
price = doc.createElement("price") ;
priceAmount =  doc.createTextNode("40.55");
newNode1.appendChild(price)
price.appendChild(priceAmount )
```

Creating and Filling New XML DOM Objects

WebLOAD supports the creation of new XML DOM objects through the `WLXmlDocument()` constructor. New XML DOM objects may either be created:

- Empty, with the user adding data as needed.
- Already loaded with data found in existing XML files or text strings.

New XML DOM objects created by the `WLXmlDocument()` constructor are not produced from HTML documents, so they do not include the HTML property set (`id`, `innerHTML`, and `src`). HTML properties have no meaning for XML DOM objects created without any connection to an HTML document.

XML DOM objects created with the `WLXmlDocument()` constructor include the complete XML DOM Document Interface described in *Appendix B* in the *WebLOAD JavaScript Reference Guide*. Users may also load and reload XML data into XML DOM objects through the `load()` and `loadXML()` methods. This section describes the different methods of creating and filling data into XML DOM objects.

WLXmlDocument(xmlStr)—Creating XML DOM Object from XML String

The `WLXmlDocument(xmlStr)` constructor accepts an optional parameter, an XML string that includes the entire XML document data. For example:

```
NewXMLObj = new WLXmlDocument(xmlStr)
```

Use this form of the `WLXmlDocument()` constructor to create new XML DOM objects from an XML string parameter rather than relying on Data Islands from an HTML page.

Working with XML in Native (Direct) Browsing Mode

WebLOAD automatically processes Data Islands found on HTML documents. WebLOAD also provides access to pure XML documents. For example, assume a website uses Native Browsing rather than having XML data explicitly embedded in Data Islands. If you wish to work with this website you could issue a Get transaction to access the XML page after enabling the `SaveSource` property to save the page source to a file. Once the XML string has been saved in the data file produced by the Get transaction, you may then use `WLXmlDocument()` to create a new XML DOM object from that XML data string. You now have a fully functional XML DOM object, with a

Document Interface identical to that of XML DOM objects created from Data Islands. You may use this XML DOM object to manipulate the data, assign or change data values, and post the changed data back to the server, exactly as you would when working with a Data Island.

The following script fragments illustrates this sequence:

1. Set `SaveSource` so that the downloaded XML data will be saved to a file that can later be passed to the `WLXmlDocument()` constructor:

    ```
    wlHttp.SaveSource=true
    ```
2. Get the XML page, either as a static page from the server:

    ```
    wlHttp.Get("http://demosite/bookstore.xml")
    ```
    Or through a database query to the bookstore:

    ```
    wlHttp.Get("http://demosite/bookstore.exe?
         author=Mark Twain&MaxPrice=$20.00")
    ```
3. Create a new XML DOM object using the saved page source, which happens to include the XML string:

    ```
    newXmlObj = new WLXmlDocument(document.wlSource)
    ```
4. At this point you have an XML DOM object which may be manipulated in any way just as you would manipulate XML DOM objects produced by Data Islands. You may make any changes or additions you wish to the XML DOM object data, as described in previous examples illustrating changing or adding bookstore data.

    For example, you may post the new XML DOM data back to the server:

    ```
    wlHttp.Data.Type="text/xml"
    wlHttp.Data.Value=xmlobj.xml
    wlHttp.Post("Http://demosite/bookstore.exe?operation=upd
    ate")
    ```

Note: The WLXmlDocument(xmlStr) constructor must be passed complete, self-contained XML strings *only*. The DTD section must not contain any external references when using this form of the constructor. See *Document Type Definition (DTD)* (on page 86), for more information.

WLXmlDocument()—Creating a New, Blank XML DOM Object

The `WLXmlDocument()` constructor may be used without any parameters. In this case, a new, blank XML DOM object will be created. For example:

```
NewBlankXMLObj = new WLXmlDocument()
```
You may now use the `loadXML()` method to add XML data to your new blank XML DOM object.

```
NewBlankXMLObj = loadXML("<?xml version='1.0'?>
```

```
  <bookstore></bookstore>")
```

To add more content to the document, create elements and add them as child nodes as described in the example in the previous section.

Loading XML Files into XML Objects

The MSXML Document Interface provides two methods for loading XML documents into XML DOM objects:

- `loadXML("XMLdocumentstring")`
- `load("URL")`

This section describes the advantages and limitations of the `loadXML()` and `load()` methods when used in WebLOAD Recorder scripts, and discusses how to select the method that will be most effective in your scripts.

Note: You may use `loadXML()` and `load()` repeatedly to load and reload XML data into XML DOM objects. Remember that each new 'load' into an XML DOM object will overwrite any earlier data stored in that object.

Using loadXML(XMLDocString)

The `loadXML(XMLDocString)` method accepts a literal XML document in string format as its only parameter. This allows users to work with XML documents and data that did not originate in HTML Data Islands, such as with Native Browsing. In a typical scenario, a user downloads an XML document. WebLOAD saves the document contents in string form. The string is then used as the parameter for `loadXML()`. The information is loaded automatically into an XML object.

For example:

```
// Create a new XML document object
NewXMLObj = new WLXmlDocument()
wlHttp.SaveSource = true
wlHttp.Get(http://www.server.com/xmls/doc.xml)
XMLDocStr = document.wlSource
// Load the new object with XML data from the saved source.
// We are assuming no external references, as explained below
NewXMLObj.loadXML(XMLDocStr)
```

Note: Creating a new, blank XML DOM object with `WLXmlDocument()` and then loading it with an XML string using `loadXML()` is essentially equivalent to creating a new XML DOM object and loading it immediately using `WLXmlDocument(xmlStr)`. As with the `WLXmlDocument(xmlStr)` constructor, only standalone, self-contained DTD strings may be used for the `loadXML()` parameter. External references in the DTD section are not allowed.

Using load("URL")

The `load("URL")` method accepts a URL or filename where the XML document may be found as its only parameter. `load()` relies on the MSXML parser to handle any Get transactions needed to download the XML document. The XML data is then loaded automatically into the XML object.

For example:

```
myXMLDoc = document.wlXmls[0]
myXMLdoc.load(http://server/xmls/file.xml”)
```

When you use the `load()` method in your script, the MSXML module performs all the underlying HTTP transactions. External references in the DTD section are not allowed when using `load()`. However, the MSXML module accesses external servers and completes all necessary transactions without any control or even knowledge on the part of the WebLOAD system tester. From WebLOAD’s perspective, these transactions are never performed in the context of the test session. For this reason, any settings that the user enters through the WebLOAD Recorder or Console will not be relayed to the MSXML module and will have no effect on the document ‘load’. For the same reason, the results of any transactions completed this way will not be included in the WebLOAD statistics reports.

Comparing loadXML() and load()

WebLOAD supports both the `load()` and the `loadXML()` methods to provide the user with maximum flexibility. The following table summarizes the advantages and disadvantages of each method:

Table 5: load() and loadXML() comparison

	Advantages	Disadvantages
loadXML()	Parameters that the user has defined through WebLOAD for the testing session will be applied to this transaction.	The method fails if the DTD section of the XML document string includes any external references.
load()	The user may load XML files that include external references in the DTD section.	Parameters that the user has defined through WebLOAD for the testing session will not be applied to this transaction. WebLOAD does not record the HTTP Get operation. (See note below.) The transaction results are not included in the session statistics report. Using this method may adversely affect the test session results.

Note: If you wish to measure the time it took to load the XML document using the `load()` method, create a timer whose results will appear in the WebLOAD Recorder statistics. For example:

```
myXMLDoc = document.wlXmls[0]
SetTimer("GetXML")
myXMLdoc.load("http://server/xmls/file.xml")
SendTimer("GetXML")
```

Example: Building an XML Database from Scratch

The next example will put together some of the pieces from the previous sections. Here we will create a new, skeletal XML DOM object for a bookstore database, build new book elements, and add each new book to our bookstore database.

```
// 1. CREATE AN EMPTY XML OBJECT with a skeleton:
xmlBookstoreDoc = new WLXmlDocument
  ("<?xml version='1.0'?><bookstore></bookstore>")
// 2. ADD CONTENT TO THE DOCUMENT:
//create the first book element
newBook = xmlBookstoreDoc.createElement("book")
//append the new book to the bookstore tree
xmlBookstoreDoc.documentElement.appendChild(newBook)
//create, name, and append the new book's author element
author = xmlBookstoreDoc.createElement("author")
name = xmlBookstoreDoc.createTextNode("Mark Twain")
author.appendChild(name)
newBook.appendChild(author)
//create, name, and append the new book's title element
title = xmlBookstoreDoc.createElement("title")
name = xmlBookstoreDoc.createTextNode("Tom Sawyer")
title.appendChild(name)
newBook.appendChild(title)
//create, name, and append the new book's price element
price = xmlBookstoreDoc.createElement("price")
amount = xmlBookstoreDoc.createTextNode("$12.00")
price.appendChild(amount)
newBook.appendChild(price)
// 3. CONTINUE TO ADD CONTENT TO THE DOCUMENT:
//create the second element and append it to the tree
newBook = xmlBookstoreDoc.createElement("book")
xmlBookstoreDoc.documentElement.appendChild(newBook)
```

```
//create, name, and append author, title, and price elements
author = xmlBookstoreDoc.createElement("author")
name = xmlBookstoreDoc.createTextNode("Leo Tolstoy")
author.appendChild(name)
newBook.appendChild(author)
title = xmlBookstoreDoc.createElement("title")
name = xmlBookstoreDoc.createTextNode("War and Peace")
title.appendChild(name)
newBook.appendChild(title)
price = xmlBookstoreDoc.createElement("price"
amount = xmlBookstoreDoc.createTextNode("$20.00")
price.appendChild(amount)
newBook.appendChild(price)
```

A new XML DOM bookstore database object has now been created and filled with information about two books. The product of the `xmlBookstoreDoc.documentElement.xml` property would be:

```
<?xml version="1.0"?>
<bookstore>
  <book>
        <author>Mark Twain</author>
        <title>Tom Sawyer</title>
        <price>$12.00</price>
  </book>
  <book>
        <author>Leo Tolstoy</author>
        <title>War and Peace</title>
        <price>$20.00</price>
  </book>
</bookstore>
```

Handling Web Service Transactions

WebLOAD supports working with Web services, including manipulating the Web service's responses.

A Web service response is a soap-formatted XML message. Accessing this XML message becomes possible, after parsing the response using WebLOAD's XMLParserObject. This enables you to locate the node containing the desired part of the web service response.

The following sample script demonstrates how WebLOAD handles web service transactions by extracting the dynamic XML from the web service response and parsing it using the XMLParserObject. The desired return value is then located by searching through the parsed XML.

```
xmlObject = new XMLParserObject()


wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/ajaxsample")


wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/ajaxsample/"
wlHttp.FormData["wsdl"] = "$WL$VOID$STRING$"
wlHttp.Get("http://www.webloadmpstore.com/ajaxsample/serveradd1.
php")


wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/ajaxsample/"
wlHttp.Data["Type"] = "text/xml; charset=utf-8"
wlHttp.Data["Value"] = "<?xml version=\"1.0\" encoding=\"utf-
8\"?><soap:Envelope
xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\"
xmlns:xsd=\"http://www.w3.org/2001/XMLSchema\"
xmlns:soap=\"http://schemas.xmlsoap.org/soap/envelope/\"><soap:B
ody><add
xmlns=\"urn:addwsdl\"><a>20</a><b>30</b></add></soap:Body></soap
:Envelope>"


wlHttp.Post("http://www.webloadmpstore.com/ajaxsample/serveradd1
.php")


//Extract the XML part from the response
doc = document.wlXmls[0]
InfoMessage (doc.xml)


//Load the extracted XML into the XMLParserObject
xo = xmlObject.loadXML(doc.xml)


//Locate the node containing the Web Service result according to
the name of the node: "return"
node = xo.getElementsByTagName("return").item(0)
InfoMessage(node.xml)
```

Document Type Definition (DTD)

The term DTD is an acronym for Document Type Definition. The Document Type Definition is a set of rules that describes the grammar of a particular XML document. The DTD is used to validate an XML document.

For example, the DTD for a bookstore database would do the following:

1. *Define the structure* and attributes of that database.

   Based on the rules found in the DTD, you might have a database that requires every book entry to include information on the book's title, author, and price. Information on publishers and reprint requests may be declared optional.

2. After the DTD defines the structure and attributes of the database, the XML Data Island *assigns values* to the attributes listed in the DTD.
3. Once an XML document has been downloaded, the Browser *validates the document* by checking that the XML data follows the rules set by the DTD.

   If the price is missing from a certain book item, for example, and a price is required by the DTD, then the Browser will not be able to validate that XML document.

Note: For the Browser to parse and validate an XML document according to a particular DTD, the author must include a `<DOCTYPE>` section in the XML document. WebLOAD Recorder supports DTD verification only if the DTD is completely included in the Data Island and there are *no external references* in the DTD.

The following code illustrates a self contained DTD for the bookstore example used throughout this section of the manual:

```
<!-DOCUMENT STARTS HERE->
<?xml version="1.0"?>
<!-THE DTD STARTS HERE -->
<!DOCTYPE
[
  <!ELEMENT books-table (book)+>
  <!ELEMENT book (title,author+,isbn,publication-date,book-
  type,book-family+)>
  <!ELEMENT title (#PCDATA)>
  <!ELEMENT author (#PCDATA)>
  <!ELEMENT isbn (#PCDATA)>
  <!ELEMENT publication-date (#PCDATA)>
  <!ELEMENT book-type (#PCDATA)>
  <!ELEMENT book-family (#PCDATA)>
  <!--attribute list-->
        <!ATTLIST book id ID #REQUIRED>
        <!ATTLIST author rank CDATA #IMPLIED>
]>
<!--THE DTD ENDS HERE-->
<!--DATA PART OF THE DOCUMENT->
  <books-table>
        <book id="thisbook">
              <title></title>
              <author rank=""></author>
              <isbn></isbn>
              <publication-date></publication-date>
              <book-type></book-type>
              <book-family></book-family>
        </book>
  </books-table>
<!-DOCUMENT ENDS HERE->
```

Working with Java

Java is an object-oriented, dynamic, platform-independent programming language developed by Sun Microsystems in the mid-1990s. Java provides its users with a complete run-time environment, a Virtual Machine (VM). With the Java VM sitting in your Web browser, any HTML document can include embedded Java, adding active content to your Web page. Java includes a variety of useful features, such as Remote Method Invocation (RMI), which allows local developers to seamlessly access distributed application functions and procedures, and Java Database Connectivity (JDBC), which allows Java clients to interact with any ODBC- or JDBC-compliant database, whether it resides locally or on a remote server. By utilizing Java tools and classes, user applications are able to offer far greater power and capabilities than when working with simple HTML code alone. For this reason, over the past few years, Java has become one of the most popular development mediums for large-scale Internet applications.

WebLOAD supports full Java access from your JavaScript scripts. Full Java support means that your WebLOAD scripts will not only test access time to an HTML page. WebLOAD scripts can also invoke and run local Java classes used by the Java applications embedded within an HTML page. The Java components that stand behind that Web page need no longer be considered ‘black boxes’. Your JavaScript script can directly access and test the classes of each locally residing Java component, allowing you to test each aspect of your application.

WebLOAD uses LiveConnect3, developed by Netscape Communications Corporation and maintained and supported by the Mozilla Foundation, to allow your JavaScript scripts to communicate with Java classes. LiveConnect is an invisible architecture that runs in the background. Your JavaScript code may work directly with Java. Your WebLOAD script can even include both JavaScript code that calls Java code and Java code that calls JavaScript code. The interface between Java and JavaScript is managed for you, allowing you to create the Java/JavaScript testing scenario that best meets your needs.

Requirements

This section provides a brief explanation of how to work with Java components directly from your JavaScript script. Sample scripts illustrate typical usage.

JDK/JRE 1.5 (or Higher)

Install the standard Sun Microsystems Java Virtual Machine (JVM), version 1.5 or higher, on your system.

To verify that you are working with version 1.5 or higher:

1. Select **Control Panel** from the Windows **Start** ➤ **Settings** menu and double click the **Add/Remove Programs** icon.
2. Check the items listed in the dialog box. Entries that reference Java should be labeled version 1.5 or higher.
3. If you wish to update your version of Java, download the latest version from http://java.sun.com (http://java.sun.com).

   Follow the standard Sun installation instructions. It makes no difference if you install the JVM before or after installing WebLOAD.

If you are doing any development work that may require application compilation, you must install the complete Java Developer's Kit (JDK). If your application is complete and you will only be running it, without making any changes or corrections that may require compilation, then the Java Runtime Environment (JRE) will be enough to simply run a test session. The decision to install only the JRE, or the complete JDK, depends on your own application's requirements. WebLOAD Recorder provides full Java support in both cases.

PATH Environment Variable

Your command path must include both the Java bin and Java classic directories. The Java bin directory is where the Java programs and compiler are located. The Java classic directory is where the `jvm.dll` file is located.

For example, after a typical installation of JDK version 1.5, your PATH should include something similar to this:

```
PATH=%PATH%;C:\Program Files\jdk1.5\bin;
  C:\Program Files\jdk1.5\jre\bin\classic
```

CLASSPATH Environment Variable

Your CLASSPATH environment variable must point to the following:

- JVM class libraries
- LiveConnect class libraries
- Your application's class libraries (a series of `*.class` and `*.jar` files)

For example, assuming your Java class libraries are located in the `Java\lib` directory, the LiveConnect class libraries are located in `LiveConnect\classes`, and your application class libraries are located in the `AppDev\lib` directory, your CLASSPATH should include the following:

```
CLASSPATH=%CLASSPATH%;C:\Java\lib\rt.jar;
  C:\LiveConnect\classes;C:\AppDev\lib
```

In general, following a WebLOAD Recorder installation, the LiveConnect class libraries are located in:

```
C:\Program Files\RadView\WebLOAD\LiveConnect\classes
```

Setting PATH and CLASSPATH Environment Variables

Set the PATH and CLASSPATH environment variables to include the necessary directories. The settings can be modified through Windows or a DOS command window.

To verify that both your PATH and CLASSPATH environment variables include the necessary directories:

1. From the Windows taskbar, select **Start ➤ Settings ➤ Control Panel**.
2. Double click the **System** icon and select the **Environment** tab.
3. Check the Environment Variables to confirm that your environment variables are set correctly.

Alternatively, you could open a DOS command window:

- Type `path`, and press <Enter>.

  Your current PATH setting will appear in the window.

  If you type `set classpath` and press <Enter>, your current CLASSPATH setting will appear in the window.

Remember that the exact full directory path name will differ from system to system. Check with your system administrator to verify the correct Java directory path names for your system.

Alternatively, you could do the following:

1. Right-click the **My Computer** icon on your desktop.
2. Select **find…**, and search for `jvm.dll`.

This file is usually found in a directory path that ends with …`\bin\classic`. This directory, and the same directory without the `\classic` ending, should both appear in the PATH environment variable.

If your PATH or CLASSPATH environment variables do not include the necessary directories do the following:

1. Add the correct directory names for your system to the PATH or CLASSPATH environment variable definitions in the Environment tab of the System dialog box.
2. Click **Set**.
3. Click **Apply**, to reset the variables to the new settings.

   You do not have to reboot your system. But you do have to restart TestTalk for WebLOAD to recognize the new PATH environment variable definition.

Public Methods

JavaScript scripts adhere to the same rules of object-oriented programming (OOP) as any other program. All programs must respect the OOP concepts of public and private. As in any OOP language, Java class methods may be either public or private. Public methods are functions that are externally visible and can be called by other Java classes and by JavaScript. For JavaScript to be able to control a Java class, the Java class must provide public methods.

Identifying Java Objects in JavaScript scripts

Java uses its own specific terminology. Java objects are referred to as *classes*. These classes are organized hierarchically within *packages*. To access Java objects, specify the full path to that class, using the format:

```
<java package full path>.<java class>
```

For example, to reference the Java class `Lassie` contained in the package `dogs`, which is contained within the package `animals`, write `animals.dogs.Lassie`.

Accessing Java Objects from JavaScript scripts

Java objects found in JavaScript scripts are accessed according to the rules listed here. Detailed explanations and examples illustrating these rules are provided in the Netscape websites listed in *Working with Java* (on page 87).

- To access a built-in Java object, use the package `java`. This package acts as a flag, informing the compiler that it is about to start work with a built-in Java object. You may then continue to work directly with that object, its properties, and methods.

  For example:

  ```
  var myJavaString = new java.lang.String("Hello world")
  ...
  stringlen = myJavaString.length()
  ...
  ```

  -Or-

  ```
  s = new java.net.Socket ("12.3.5.56",23)
  ...
  s.getInputStream
  ...
  ```

  In these examples, `java.lang` and `java.net` are the full package names and `String` and `Socket` are the class names.

- To access a *locally defined* or third party Java object that is not part of the Java, Sun, or Netscape packages, use the reserved Java keyword `Packages`. This keyword acts as a flag, informing the compiler that it is about to start work with a locally-defined Java object. You may then continue to work directly with that object, its properties, and methods.

  For example:

  ```
  var myJavaDog = new Packages.JavaDog(Lassie)
  ...
  dogbreed = myJavaDog.dogBreed
  ...
  ```

Use the `Packages` keyword to access any user-defined class whose definition is included in the CLASSPATH library list, described in *Requirements* (on page 88).

Forestalling Errors

Most common compilation and runtime errors can be prevented if you follow the instructions in this guide. Usually, you won't have any problems as long as you verify that Java was installed correctly and specify Java objects with the correct full path and argument list. This section lists the most common potential pitfalls, in an effort to prevent problems before they occur.

- You must have Java version 1.2 installed on your system. Working with earlier versions of Java will cause your scripts to fail with the following WebLOAD Recorder error message:

  ```
  WebLOAD can't find jvm.dll
  ```

  If you receive this error message, you may have an older version of the JVM, or you may not have Java installed at all on your system. If this is the problem, download and install the newer version of Java from http://java.sun.com.

- Java version 1.2 or higher must be installed and environment variables defined on each Load Generator included in your test session. Test sessions that involve multiple Load Generators require a resident JVM with the correct environment variable settings on each Load Generator.
- Whether to install only the JRE or the complete JDK depends on your application's requirements. If you will be doing any development or compilation, install the complete JDK. Trying to compile Java class files (such as `JavaClass.java`) on a computer that does not have the JDK installed will trigger an error. The JDK must be installed on *each* computer on which Java files will be compiled. The JRE can not handle any compilation requests.
- Each system environment is slightly different. When setting the PATH or CLASSPATH environment variables for your system, substitute the actual path to the required Java directories and libraries on your system. Use the Environment tab in the System dialog box from the Windows Control Panel to set the environment variables.
- Environment variables must be set with the correct values before starting TestTalk or running any Load Generators. Make sure you first verify and set the environment variables through the Windows Control Panel and only then start TestTalk.
- If you do not have the correct Java class directories included in your PATH, your scripts may fail with the following WebLOAD error message:

  ```
  WebLOAD can't find jvm.dll
  ```

  If you receive this error message and your version of the JVM is 1.2 or higher, check your system PATH (through the Windows Control Panel) to be sure it points to the `jvm.dll` library. Make sure the directories listed are in fact the correct directories, and verify the correct path name in your script code.

- The class path and name in your script files must be specified absolutely correctly, with all elements spelled correctly and with the correct case. For example, the class name `MyJavaClass` is not the same as **`my`**`JavaClass`.

- The directories included in the CLASSPATH environment variable must also be specified absolutely correctly, with all elements spelled correctly, to exactly match the class path and names that appear in your JavaScript scripts.

  For example, assume you are working with an application that includes the Java class `MyJavaClass`, whose constructor expects a single string argument, located in the directory `I:\AppFiles\libs`.

  Your CLASSPATH environment variable should include:

  ```
  CLASSPATH=%CLASSPATH%;I:\AppFiles\libs
  ```

  Your script should reference this class as follows:

  ```
  var myJavaObj = new Packages.MyJavaClass("stringArg")
  ```

  If you were not careful, you could accidentally define CLASSPATH to include the wrong directory, such as:

  ```
  CLASSPATH=%CLASSPATH%;I:\AppFiles\orig-libs
  ```

  Or you could accidentally include an incorrect package path in the script file, such as:

  ```
  var myJavaObj = new
  Packages.Jlib.MyJavaClass("stringArg")
  ```

  In either of these cases the constructor call would fail and WebLOAD would return the following error message:

  ```
  TypeError: <classname> is not a constructor
  ```

- Make sure to pass the correct number and types of arguments to Java class constructors or methods.

Realize that working with Java from your JavaScript script is really very simple and intuitive, as illustrated in the simple examples found in the remainder of this section. You simply must take care to specify objects correctly. Careless spelling mistakes will trigger errors, as they would in most programming languages.

Example: passing simple variables between Java and JavaScript

You may pass any legal JavaScript variable or object as a parameter to a Java object or method. Conversions between basic variable types, such as integer, string, or Boolean, will be completed automatically. Return values will also convert correctly. Conversions between Java and JavaScript types are based on the conversion tables listed in *Data Type Conversions* (on page 185).

The following example illustrates passing basic values between Java and JavaScript objects. The Java class method expects two parameters, a string and an integer, and returns the concatenation of both parameters into a single string. Conversions between Java and JavaScript strings and integers are completed automatically.

Java side:

```
public class SimpleExample
{
  public String Concat(String a, int b)
  {
       return a + " : " + b;
  }
}
```

JavaScript side:

```
a = new Packages.SimpleExample()
InfoMessage(a.Concat("RoundNum",RoundNum))
```

Passing Objects Between Java and JavaScript

LiveConnect uses the reserved Java class `JSObject` to pass a JavaScript object to Java objects. `JSObject` tells the Java side that it is being sent a JavaScript object. To pass a JavaScript object as a parameter to a Java method, your Java file must include the following:

- Import the `netscape.javascript` package.
- Define the corresponding formal parameter of the method to be of type `JSObject`.

You may set and change a JavaScript object property value, and even add a new member to a JavaScript object, while working from the Java side.

For example, the following code illustrates passing values between parallel Java and JavaScript objects.

Java Side:

```
import netscape.javascript.JSObject;
public class JavaDog
{
  public String dogBreed;
  public String dogColor;
  public String dogSex;
  public JavaDog(JSObject jsDog)
  {
       this.dogBreed = (String)jsdog.getMember("breed");
       this.dogColor = (String)jsdog.getMember("color");
       this.dogSex = (String)jsdog.getMember("sex");
```

```
    }
}
```

Note: The `getMember` method of `JSObject` is used to access the properties of the JavaScript object. This example uses `getMember` to assign the value of the JavaScript property `jsDog.breed` to the Java data member `JavaDog.dogBreed`.

JavaScript Side:

To continue with this example, look at the following definition of the JavaScript object `Dog`:

```
function Dog(breed, color, sex)
{
   this.breed = breed
   this.color = color
   this.sex = sex
}
```

Create an instance of the **JavaScript object Dog** as follows:

```
Lassie = new Dog("collie", "chocolate", "female")
```

The JavaScript property `Lassie.color` here has been assigned the value `chocolate`.

Now create an instance of the **Java object JavaDog** in the JavaScript code by passing the JavaScript `Lassie` object to the `JavaDog` constructor as follows:

```
JavaDog = new Packages.JavaDog(Lassie)
```

Note: The JavaScript code uses the `Packages` class to identify `JavaDog` as a locally defined Java object, as described in *Identifying Java Objects in JavaScript scripts* (on page 90).

The Java property `javaDog.dogColor` has the value `chocolate` because the `getMember` method in the Java constructor assigns the value of `Lassie.color to dogColor`.

Detailed explanations of the `JSObject` class are provided in http://developer.netscape.com/docs/manuals/js/core/jsref/lcjsobj.htm.

A sample script illustrating joint Java and JavaScript activity is found in *Calling a WebLOAD API from a Java Application* (on page 98).

Automatic Timers And Counters For Java Objects

WebLOAD provides automatic timers and counters that wrap around every Java class method invocation found in your script. Automatic timers and counters allow you to effortlessly measure and quantify the behavior and response time of each specific Java component individually, enabling the most comprehensive testing of your Java-based application.

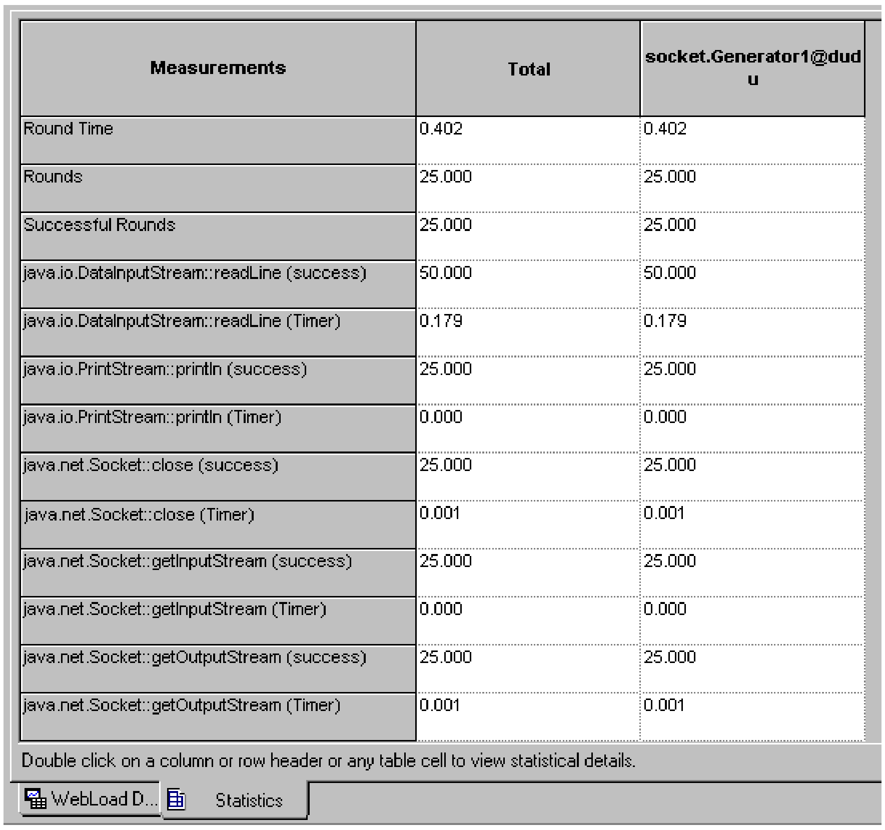
Every time your JavaScript script calls a Java class method, a timer and a counter are automatically created for that method. The results are included in the Statistics Report for that test session. These automatic Java timers are in addition to the standard WebLOAD Timer functions, which may be called from the Java side of your script as well as the standard JavaScript side. An example illustrating JavaScript Timer calls from Java code appears in *Calling a WebLOAD API from a Java Application* (on page 98).

For example, assume you are communicating with a server using the Java socket class:

```
try
{
  // Connect to a server through Java socket
  s = new java.net.Socket ("12.3.5.56",23)

  // Create Java I/O streams
  from_server = new java.io.DataInputStream(s.getInputStream())

  to_server = new java.io.PrintStream(s.getOutputStream())

  //Read line from Input stream to JavaScript string value
  line = from_server.readLine()
  InfoMessage("" + line)

  // Write JavaScript string value to the Output stream
  to_server.println ("Client " + ClientNum + "-" + RoundNum )

  // Get answer from the server via the Input stream
  line = from_server.readLine()
  InfoMessage("" + line)

}

catch (Exception) {
  ErrorMessage ("Server is not connected")
}
```

```
finally
{
  try {
        if (s != null)
        s.close();
  }
  catch(Exception) {}
}
```

Each time you call any of the Java class methods, a timer and counter for that method is automatically incremented. The results appear in the Statistics Report. Each timer and counter is uniquely identified with the Java class, object, and method name, as illustrated in the following figure:



Measurements	Total	socket.Generator1@dudu
Round Time	0.402	0.402
Rounds	25.000	25.000
Successful Rounds	25.000	25.000
java.io.DataInputStream::readLine (success)	50.000	50.000
java.io.DataInputStream::readLine (Timer)	0.179	0.179
java.io.PrintStream::println (success)	25.000	25.000
java.io.PrintStream::println (Timer)	0.000	0.000
java.net.Socket::close (success)	25.000	25.000
java.net.Socket::close (Timer)	0.001	0.001
java.net.Socket::getInputStream (success)	25.000	25.000
java.net.Socket::getInputStream (Timer)	0.000	0.000
java.net.Socket::getOutputStream (success)	25.000	25.000
java.net.Socket::getOutputStream (Timer)	0.001	0.001

Double click on a column or row header or any table cell to view statistical details.

Figure 21: Timer and Counter Identification with Java Class, Object, and Method Name

The counter and timer information is collected and displayed automatically, every time you call a Java class method from your script. You do not have to add anything to your script code to take advantage of this feature.

Calling a WebLOAD API from a Java Application

This section describes two methods for calling WebLOAD JavaScript functions from the java code:

- *Using the WebLoadWrapper to call WebLOAD API from a Java Application*
- *Legacy method of calling WebLOAD API from a Java Application*

Using the WebLoadWrapper to call WebLOAD API from a Java Application

The WebLoadWrapper simplifies the method of calling WebLOAD functions from the Java code.

Functions supported by WebLoadWrapper

It can be used to call the following WebLOAD functions from within Java:

- `Void beginTransaction(String name)` – Calls `BeginTransaction`
- `Void debugMessage(String msg)` – Prints `DebugMessage` only in WebLOAD Recorder
- `Void endTransaction(String name)` – Calls `EndTransaction`
- `String getValue(String parameterName, String defaultValue)` – Gets a parameterization manager parameter value
- `Void infoMessage(String msg)` – Prints `InfoMessage` in WebLOAD
- `Void sendMeasurement(String name, Number value)` – Calls `SendMeasurement` in WebLOAD
- `Object getWebLoadRootObject()` – Returns the JSObject. This can be used, for example, for direct calls to any WebLOAD's JavaScript method.

Coding with WebLoadWrapper

To use the WebLoadWrapper in your code:

1. In your java class, import `com.radview.webload.WebLoadWrapper`.
2. To hook the Java class into the WebLOAD context, in the WebLOAD Recorder run the following command in the javascript code, either once at the beginning of the script or once in the `InitClient()` method:

   ```
   Packages.com.radview.webload.WebLoadWrapper.setThreadWebLoadRootOb
   ject(this);
   ```

If you would like to call any JavaScript method directly from your Java code WITHOUT using the WebLoadWrapper methods, or you need to use a method that WebLoadWrapper does not wrap (see *Functions supported by WebLoadWrapper*), you can use the following method which is part of WebLoadWrapper:

`Object getWebLoadRootObject()` – Returns the JSObject of the calling JavaScript

You can then use the returned JSObject to call the method you'd like. For example

```
  getWebLoadRootObject().eval("InfoMessage('test')");
```

Once you get the JSObject, use it as described in *Legacy method of calling WebLOAD API from a Java Application* on page 99.

Example: using WebLoadWrapper

The following example shows how to use WebLoadWrapper in the Java code.

```
package com.example;
import com.radview.webload.WebLoadWrapper;
public class MyClass {
  private WebLoadWrapper wlWrapper;
  public void myExampleFunc() {
      wlWrapper = new WebLoadWrapper();
      wlWrapper.beginTransaction("transaction 1");
      <do any other work> …;
      wlWrapper.endTransaction("transaction 1");
 }
}
```

Legacy method of calling WebLOAD API from a Java Application

WebLOAD utilizes the locally understood, generic `'this'` object, passing the current `'this'` object as a parameter to a Java method. The JavaScript concept of `'this'` object as your current working object is preserved even while working with that object's properties and methods from the Java side.

Using `'this'` object, WebLOAD is able to call WebLOAD functions directly from within Java method code, passing to the Java functions the default `'this'` object that is expected by the function.

For example:

- Use the WebLOAD `SetTimer` and `SendTimer` functions to time Java activities.
- Use `InfoMessage` to print messages to the log window.

The following script illustrates calling WebLOAD functions from Java code.

Java side:

```
import netscape.javascript.JSObject;
// The JSObject class must be imported for the
// code to successfully compile
public class MyJClass
{
  public void TimersFromJava(JSObject myJavaScriptObj)
  {
        String args[] = {"Timer1"};
        myJavaScriptObj.call("SetTimer",args);
        …<do any other work> …;
        myJavaScriptObj.call("SendTimer",args);
  }
}
```

Note: You can call the JavaScript `SetTimer` and `SendTimer` functions directly from the Java class using the `JSObject.call()` method. Pass parameters to the functions being called (in this case the timer name expected by the timer functions), using the `args` array.

JavaScript side:

```
// The following JavaScript code uses the Java class
// defined in the preceding Java section.
myJavaObject = new Packages.MyJClass()
// The JavaScript code uses the Packages class to
// identify MyJClass as a locally defined Java object
try
{
  myJavaObject.TimersFromJava(this)
}
catch (e)
{
  SevereErrorMessage("Error : " + e);
}
```

Note: You work with `myJavaObject` as you would with any JavaScript object. `TimersFromJava` is called as a simple object method, passing the locally understood `'this'` object as the parameter to the Java method.

The `try...catch` statement in the JavaScript code marks a block of statements to try. The `catch` block specifies the response the program should supply should an exception be thrown. If an exception is thrown, the `try...catch` statement catches it. WebLOAD recommends wrapping the JavaScript calls to Java functions within `try...catch` statements, to add robustness and error recovery to your code.

Example: reading data from a JDBC database

The following example illustrates a very common website activity—accessing a database. The Java side of the example is a straightforward Java program to access a JDBC, including methods to:

- Load a driver
- Open a connection
- Create and execute SQL queries

The JavaScript side of the example illustrates exactly how simple it is to work with the Java program from a JavaScript script.

Java side:

```
import java.sql.*;
public class jdbcExample
{
   Connection conn;
   Statement st1;
   ResultSet rs;
   public static void loadDriver(String js_driver)
                 throws ClassNotFoundException
   {
         Class.forName(js_driver);
   }

   public void getConnection(String js_url,
         String js_login, String js_pswd)
         throws SQLException
   {
         //get the connection & also create a statement:
         conn = DriverManager.getConnection
               (js_url, js_login, js_pswd);
         st1 = conn.createStatement();
   }

   public String executeQuery(String js_query)
         throws SQLException
   {
         //execute sql statement:
         rs = st1.executeQuery(js_query);
         // loop over the result set.
```

```
          String strOnSuccess = "3. Result Set is:";
          while (rs.next())
          {
          strOnSuccess = strOnSuccess + "\n" +
               rs.getString("ReportName");
          }
          // return the data
          return strOnSuccess;
     }
}
```

JavaScript side:

The JavaScript side of this test session script runs a JDBC load test which checks the ability of the database to handle a large number of SQL queries.

Note: The following is the sequence of JDBC activity in this script:
1. The JDBC driver is loaded only once for the test session, in the `InitAgenda()` function.
2. A JDBC connection is created once for each thread, in the `InitClient()` function.
3. Queries are created in the main body of the script. Answers are sent to the Console.

```
function InitAgenda()
{
  try
  {
          // load the JDBC driver once per session
          jdbcDriver = "<driver class name>"
          Packages.jdbcExample.loadDriver(jdbcDriver);
  }
  catch (e)
  {
          SevereErrorMessage("Error : " + e);
  }
}
function InitClient()
{
  // create a separate jdbcObj object and connection
  // for each thread
  jdbcObj = new Packages.jdbcExample()
  // connect to the database
  url = "<jdbc:driver-name:host>"
  login = "<username>"
  password = "<password>"
```

```
    try
    {
         jdbcObj.getConnection(url, login, password)
    }
    catch (e)
    {
         SevereErrorMessage("Error : " + e);
    }
}
//Main body of script
try
{
    // create query and send the results to the Console
    query = "SELECT * FROM Reports WHERE ReportId < 10 "
    query_result = jdbcObj.executeQuery(query)
    InfoMessage(""+ query_result)
}
catch (e)
{
    WarningMessage("Error : " + e);
}
```

Working with Java Selenium Scripts

Prerequisite: Adding custom Java classes to WebLOAD

As a prerequisite to working with Java Selenium scripts, you need to configure the Selenium Java classes in WebLOAD. Use one of the two following methods.

Method #1: Include the Selenium jar and its dependencies in WebLOAD

In order for your code to work, you need to include it and all its dependencies (other jars it needs in order to run) in WebLOAD.

To include the Selenium jars in WebLOAD:

1. Copy the `selenium-java-x.x.jar` and all the jars in the `libs` folder to the WebLOAD Java extensions folder:
   `c:\ProgramData\RadView\WebLOAD\extensions\java`

2. If there are duplicate jars (having the same base name but a different number), delete the older versions.

   Note that version numbers are not given in decimal notation. Thus, 1.11 is more recent than 1.9.

Method #2:

Specify any additional classpath needed to run external classes by setting the following in the `C:\Program Files (x86)\RadView\WebLOAD\bin\webload.ini` file:

```
USER_CLASSPATH="path\to\classes"
```

Note for Maven users: When using Maven, you can use the following command to ind the target/dependencies folder filled with all the dependencies, including transitive: `mvn dependency:copy-dependencies`

Working with Selenium Scripts

Note: Creating a Java Selenium project is outside the scope of this document. For information, refer to the Selenium website at http://www.seleniumhq.org/.

A Java class that calls Selenium is still a Java class and can be called directly from a WebLOAD agenda using the Java integration capability described in *Working with Java* (on page 87). For example, if you have the following Selenium Java code:

```
// This is an example of a Selenium script in Java code. It does
not relate to WebLOAD
package com.example;
import org.openqa.selenium.firefox.FirefoxDriver;
public class MyClass {
   private WebDriver driver;
   public void seleniumFunc() {
      driver = new FireFoxDriver();
      driver.get("http://www.google.com");
   }
}
```

You can call that code from WebLOAD, as described in *Working with Java* (on page 8798), using:

```
obj = new Packages.com.example.MyClass();
obj.seleniumFunc();
```

However, WebLOAD will not have visibility into the activity occurring within the function call seleniumFunc; for example, if several pages are being downloaded, WebLOAD will not be able to time this activity for each page. The WebLoadDriver object enables adding timers, transactions and other WebLOAD methods directly inside the Java code.

Working with WebLoadDriver

WebLoadDriver is a Selenium WebDriver wrapper that supports WebLOAD interaction. WebLoadDriver inherits WebLoadWrapper, which is described in *Using the WebLoadWrapper* (on page 98).

WebLoadDriver provides the following:

- Supports all the WebLoadWrapper functionality described in *Using the WebLoadWrapper* (on page 98)
- Implements the Selenium WebDriver interface
- Adds ‘reportStatistics’ functionality that sends timers from the browsers to WebLOAD. Refer to the *Selenium Report Statistics* section in the *WebLOAD Recorder User Guide*.

To work with WebLoadDriver in the Java code:

1. Add the following jar to your Java project:

   `C:\ProgramData\RadView\WebLOAD\extensions\java\rvselenium.jar`
2. In your Java class, import `com.radview.webload.selenium.WebLoadDriver`.

Keep in mind that WebLoadDriver is a Selenium WebDriver wrapper that supports WebLOAD interaction. When not running in WebLOAD context, it ignores WebLOAD, allowing your class to be executed as usual.

Example of working with WebLoadDriver

On the Java side:

```
package com.example;
import com.radview.webload.selenium.WebLoadDriver;
public class MyClass {
   private WebLoadDriver driver;
   public void seleniumFunc() {
     driver = new WebLoadDriver(new FireFoxDriver());
// The beginTransaction method is a regular WebLOAD method,
called from the Java code
     driver.beginTransaction("transaction 1");
// The following method is a Selenium method
     driver.get("http://www.google.com");
// The reportStatistics method is a WebLOAD addition for sending
to WebLOAD the browser navigation statistics that the browser
collected from the latest navigation
   driver.reportStatistics("google");
// The endTransaction method is a regular WebLOAD method, called
from the Java code
     driver.endTransaction("transaction 1");
   }
}
```

On the Javascript side:

```
// Bind the JavaScript context to java
Packages.com.radview.webload.WebLoadWrapper.setThreadWebLoadRoot
Object(this);
// Instantiate and use your Selenium java class in the script
obj = new Packages.com.example.MyClass();
obj.seleniumFunc();
```

For an explanation of how to instantiate and use your Selenium Java class, see *LiveConnect Overview* (on page 177).

For more information on working with Selenium

For more information on working with Selenium, see:

- Appendix G in the *WebLOAD Recorder User* Guide for more information on Selenium integration.
- The *Selenium Building Blocks* section in Chapter 10 *Configuring the WebLOAD Recorder Options* of the *WebLOAD Recorder User* Guide for more information on Selenium building blocks that can be dragged and dropped directly into the Script Tree.

Working with the Component Object Model (COM)

What is COM

Microsoft's Component Object Model (COM) provides a way for distinct software components to communicate with each other. COM technology provides universally reusable binary components. These components can be mixed and matched over versions and years, accessed by applications written in any of a variety of languages, running on any of a variety of platforms, located either locally or over a network. COM automation simplifies application development by maximizing component reusability while increasing the application's universality. Today, most Windows users rely on

COM technology, often without even realizing it. For example, suppose you wish to work with a restricted website. Access to the application behind that website is controlled by a security database. To work with that application, you must first enter your name and password. A COM component will automatically access the database and verify your permission status.

COM components are objects that consist of a combination of properties, methods, and interfaces. An object's interface is simply a set of methods together with a defined set of standards for what those methods do and how they are accessed, their parameters and return values. WebLOAD JavaScript provides direct object access to any component that has a COM wrapping and an `IDispatch` interface. These are known as ActiveX objects. See *ActiveX Object Interfaces* (on page 107), for more information.

An ActiveX object is viewed and manipulated exactly as any other JavaScript object within the script. WebLOAD encapsulates COM automation functionality, providing an interface between JavaScript scripts and ActiveX objects. For example, a WebLOAD JavaScript script is able to fully test an ASP Web page or a Web page that manipulates an ADO database. In both of these technologies, ActiveX objects are widely used.

This section of the guide explains how to work with ActiveX objects within your JavaScript script. For a detailed explanation of COM programming, see the Microsoft MSDN Online Library at http://msdn.microsoft.com (http://msdn.microsoft.com).

Note: If you are working with COM objects that are not thread-safe and can not handle multi-threading, you must set the multithreading to one thread per process (this is WebLOAD's default setting).

To set the multithreading:

1. In the WebLOAD Console, open the **Tools ➤ Default/Current Session/script Options** dialog box.
2. Select the **Browser Parameters** tab.
3. In the Multi-thread Virtual Clients->Load Generator field, enter or scroll to 1, which sets one thread per process.

ActiveX Object Interfaces

ActiveX objects usually include the following interfaces:

- `IUnknown`—the core interface. Defines the ActiveX object. Includes the definitive ActiveX object methods QueryInterface, AddRef, and Release.
- `IDispatch`—the access interface. Enables ActiveX object automation, allowing the WebLOAD Recorder JavaScript script to manipulate the ActiveX object's properties and methods.

- Custom Interfaces—additional, specialized interfaces. Created by the user, specific to each ActiveX object.

  JavaScript scripts access the methods and properties of the object interface exposed by the IDispatch interface.

- `ITypeInfo`—the index interface. Includes a list of all objects, properties, and methods for each interface included in the ActiveX object (optional).

The `ITypeInfo` interface of an ActiveX object provides access to the `TypeInfo` library for that object.

Note: The `ITypeInfo` interface is optional. WebLOAD is able to work with ActiveX objects whether or not they supply a `TypeInfo` library file. However, access to the `TypeInfo` library for an object saves overhead. Programs that can take information from the `TypeInfo` library do not have to spend time and energy analyzing an object to identify a specific item's characteristics. For example, access to the `TypeInfo` library eliminates the need to figure out a variable's data type or insert casting functions into your scripts for greater security.

Activating ActiveX Objects from a JavaScript script

A typical website is often the front end of an application that includes many ActiveX components. WebLOAD scripts enable thorough testing of both the website and the applications that are accessed via that website by allowing you to activate an application's ActiveX object from your script. For example, to use your WebLOAD script to directly test access time to an ADO database, you would activate the ActiveX objects for that database.

To use ActiveX objects in your script do the following(as you would with any JavaScript object):

1. Create a reference to a new object instance.
2. Assign and get values for the object's properties.
3. Execute the object's methods.

This section describes how to activate ActiveX objects from your WebLOAD JavaScript script.

Note: The object you are accessing must already exist and be registered. When working with a remote server, through DCOM over HTTP, the object you are accessing should reside on the remote server. (This is described in *DCOM over HTTP* (on page 115)). When working locally, the COM object you are accessing should reside on the Load Generator.

The following section describes the `ActiveXObject` function syntax.

ActiveXObject() (constructor)

Method of Object

- ActiveX

Description

Creates a new ActiveX object. The new object is simply a local JavaScript object, and may be handled and manipulated like any other JavaScript object.

Syntax

```
my_ActiveXobject = new
  ActiveXObject("ApplicationName.ObjectName" [, "rServer"])
```

In VBScript terminology, the syntax appears as follows:

```
my_ActiveXobject = new ActiveXObject("ServerName.TypeName")
```

Parameters

`ApplicationName`—The name of the application providing the object.

`ObjectName`—The type or class of the object being created. When working with local COM objects, the object resides on the local Load Generator.

`rServer`—The name of the remote server being accessed. Optional, used when working through DCOM, to access objects residing on the remote server.

Return Value

A pointer to the new ActiveX object. The new object is simply a local JavaScript object, and may be handled and manipulated like any other JavaScript object.

Example

To create a new Excel spreadsheet:

```
ExcelSheet = new ActiveXObject ("Excel.Sheet")
```

Assigning Values to ActiveX Objects

At this point, now that you have created a reference to an ActiveX object, the fact that it refers to an ActiveX object does not affect usage and syntax within your JavaScript script. Once the new object has been activated, `my_ActiveXobject` is simply a local JavaScript object that is used to communicate with a COM object. Your script works with this object exactly as it would work with any other JavaScript object. You do not have to deal with any COM overhead or syntax issues. You access the new object's properties and methods as you would access any other JavaScript object.

This section describes how to work with local ActiveX objects in your WebLOAD JavaScript script. For an example illustrating working with ActiveX objects on a remote server, see *DCOM over HTTP* (on page 115).

Work with your ActiveX objects properties and methods as you would with any JavaScript object's properties and methods, using the following syntax:

```
my_ActiveXobject.method(method-parameters)
orig_property_value = my_ActiveXobject.property
my_ActiveXobject.property = new_property_value
index_property_value =
  my_ActiveXobject.indexproperty(indexvalue)
```

The following JavaScript examples illustrate this use:

```
// To explicitly create two new object instances
mother = new ActiveXObject ("Family.MotherObject")
father = new ActiveXObject ("Family.FatherObject")
//mother and father are local JavaScript objects
// To assign values directly to my object’s 4 properties
mother.Name = "Jane"
mother.Age = 21
mother.BirthDate = "Jan 20, 1978"
mother.Smoke = false
// To assign values to my object’s 4 properties through an
// object passed as a parameter to my object’s SetInfo method
father_birthday = new Date("Mar 20,1975")
father.SetInfo("John",25,father_birthday,true)
// To implicitly create a new child object
child = mother.MakeChild(father)
// To assign values to my child object’s 4 properties through
// a combination of direct property assignment and
// method execution
child.Name = "Patrick"
color = child.GetEyesColor()
child.DemandCare(mother,father)
```

Timers and Counters for ActiveX Objects

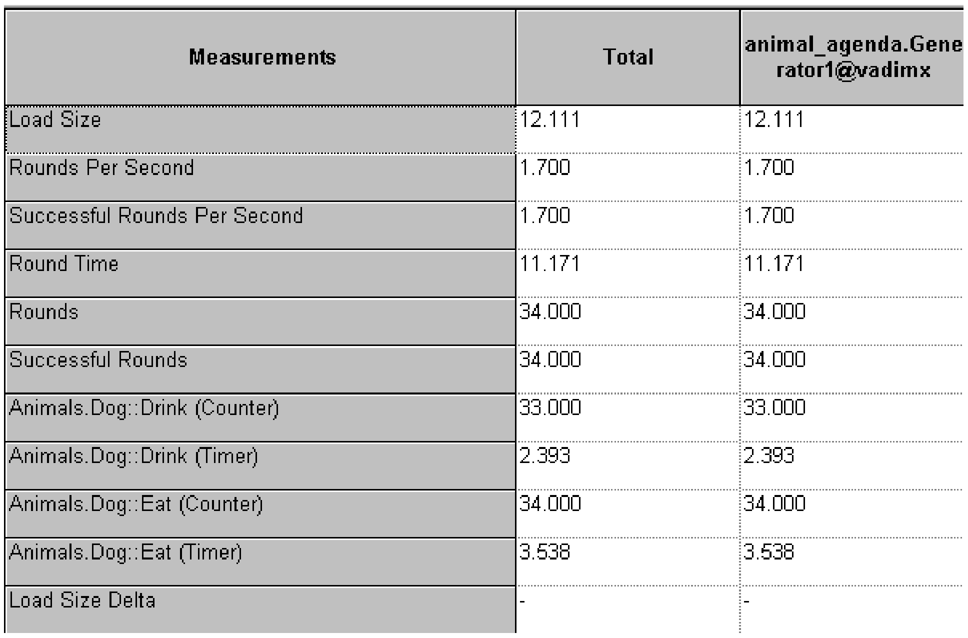
WebLOAD provides automatic timers and counters for ActiveX objects. Automatic timers and counters allow you to effortlessly measure and quantify the behavior and response time of each specific ActiveX component individually, enabling the most comprehensive testing of your COM-based application.

Every time your script calls an ActiveX method, a timer and a counter are automatically created for that method. The results are included in the Statistics Report for that test session.

For example, assume you are working on a project about animal behavior, using the following ActiveX object:

```
animal = new ActiveXObject ("Animals.Dog")
animal.Name = "Bingo"
animal.Drink("Water")
animal.Eat("Meat","Fish")
```

Each time you call any of the animal object's methods, a timer and counter for that method is automatically incremented. The results appear in the Statistics Report. Each timer and counter is uniquely identified with the ActiveX application, object, and method name, as illustrated in the following figure:



Measurements	Total	animal_agenda.Generator1@vadimx
Load Size	12.111	12.111
Rounds Per Second	1.700	1.700
Successful Rounds Per Second	1.700	1.700
Round Time	11.171	11.171
Rounds	34.000	34.000
Successful Rounds	34.000	34.000
Animals.Dog::Drink (Counter)	33.000	33.000
Animals.Dog::Drink (Timer)	2.393	2.393
Animals.Dog::Eat (Counter)	34.000	34.000
Animals.Dog::Eat (Timer)	3.538	3.538
Load Size Delta	-	-

Figure 22: Timer and Counter Identification with ActiveX Application, Object and Method Name

The counter and timer information is collected and displayed automatically, every time you call an ActiveX method from your script. You do not have to add anything to your script code to take advantage of this feature.

Note: There are no counters for calls to ActiveX object constructors.

Automatic Conversion between JavaScript and COM Data Types

The examples found in the preceding section illustrate how simple it is to refer to ActiveX objects within your JavaScript script. You do not need to know or declare anything special about an object's definition or typing when working within your script. The fact that JavaScript and COM use slightly different data types is not an issue. WebLOAD simply supports all standard JavaScript and COM data types.

WebLOAD JavaScript scripts automatically convert between JavaScript and the corresponding COM data types. The table below illustrates the data type conversions that are supported. The default choices used if no data type information is available are marked in **bold** in the table.

Working with JavaScript and COM data types within a JavaScript script is simple. Passing values from JavaScript scripts as parameters to COM objects can be more complicated. COM does not expect, nor does COM know how to convert from, a JavaScript data type. WebLOAD is responsible for smoothing the interface between JavaScript and COM, converting between JavaScript and the corresponding COM data types when necessary.

When the data type is known, WebLOAD automatically converts between JavaScript data types and the corresponding COM data type. If the data type is unknown, WebLOAD checks to see if a `TypeInfo` library is available for the object. (`TypeInfo` is usually available.) When available, WebLOAD takes the data type information from the `TypeInfo` library and completes the conversion as usual.

If `TypeInfo` information is not accessible, WebLOAD uses a basic common-sense heuristic to determine the data type and select the appropriate conversion, based on the preceding default conversion table. For example, if a variable `A` has been assigned a value of `5`, WebLOAD assumes that the variable should be of type `Integer`.

However, relying on sensible assumptions may inadvertently lead to complications. For example, the user may actually intend to pass that variable `A` as a parameter to a method that expects a `String "5"`. Or you may be working with an array containing a whole set of variables of unknown data types, a more complicated situation. For these reasons, WebLOAD recommends using casting functions when the data type is unknown, to ensure that the variables are converted to the correct data type before being passed as parameters to an ActiveX object method. The WebLOAD casting functions are described in the following section, *Using Casting Functions for JavaScript and COM Data Types* (on page 113).

Table 6: JavaScript-COM supported data type conversions

JavaScript Data Type ®	**Integer**	**Double**	**Boolean**	**String**	**Date**	**ActiveX Object**	**Array**
COM Data Type							
Byte	Yes	Yes	Yes	-	-	-	-
Short	Yes	Yes	Yes	-	-	-	-
Long	Yes	Yes	Yes	-	-	-	-
Float	Yes	Yes	Yes	-	-	-	-
Double	Yes	Yes	Yes	-	-	-	-
VARIANT_ BOOL	Yes	Yes	Yes	-	-	-	-
Date	-	-	-	-	Yes	-	-
BSTR	Yes	Yes	Yes	Yes	-	-	-
IUnknown	-	-	-	-	-	Yes	-
IDispatch	-	-	-	-	-	Yes	-
SAFEARRAY	-	-	-	-	-	-	Yes
(Arrays of a specific type. See discussion of array data types in *Using Casting Functions for JavaScript and COM Data Types* on page 113.)							
VARIANT	Yes	Yes	Yes	Yes	Yes	Yes	-

Using Casting Functions for JavaScript and COM Data Types

WebLOAD recommends using casting functions under the following circumstances:

- When no `TypeInfo` library is available.
- When you know you are passing mismatched data types.
- If you receive a `TypeError` message from COM.

Casting functions ensure that JavaScript variables are converted to the correct data type before being passed as parameters to an ActiveX object method. To explain why casting functions are recommended, this section focuses on how JavaScript and COM work with arrays.

Arrays are collections or sets of variables. The values stored within a JavaScript array may either all be of the same data type, (i.e., all integers or all strings), or they may consist of a variety of different data types. COM includes a `SafeArray` option, asserting that all the items within the array are of the same type. For maximum flexibility, `SafeArrays` also provide the option of all items being of type `Variant`.

While each item is officially of the 'same type', this actually means that each item may be of *any* `Variant`– compatible data type.

While there are very few restrictions on the kinds of data types acceptable by ActiveX objects for array parameters, the one requirement is that whatever is passed must be of the correct (expected) data type. If an ActiveX object method expects to receive an array of type `Integer`, it must be passed an array of type `Integer` and not an array of type `Variant`, even if all the array elements do happen to be integers. When passing a JavaScript array object as a parameter to an ActiveX object method, the items of that array must be converted correctly to the corresponding ActiveX object data types or the method will fail.

If nothing is known about the data type of an array's elements, WebLOAD tries to choose the most logical data type for that array. For example, if all the values in the array appear to be of the same data type, WebLOAD will pass an array of that data type. If the values in the array appear to be of different data types, WebLOAD will pass an array of type `Variant`. While this approach will almost always work, it may occasionally fail. For example, in the rare event that an array of type `Variant` coincidentally contains only items that happen to all be of the same `Integer` data type, WebLOAD will analyze the elements of that array, conclude that it must be of type `Integer`, and convert it accordingly to an ActiveX array object of type `Integer`. This may be a logical decision, but the method will fail.

To avoid this small possibility of failure during your testing session, WebLOAD provides a complete set of casting functions. While casting functions may be used at any time, explicitly setting a data type is usually recommended only when no `TypeInfo` library is available, when you know you are passing mismatched data types, or if you receive a `TypeError` message from COM. (COM errors, which appear as standard error messages on the WebLOAD Console, are usually triggered by an error in the application being tested, for example, by an error in the ActiveX object's `TypeInfo` library.)

WebLOAD provides the following casting functions:

- `CByte()`
- `CInt()`
- `CLng()`
- `CDbl()`
- `CFlt()`
- `CBool()`
- `CVARIANT()`

These functions take a variable as a parameter and return that value cast to the specified data type. Only legal data type conversions, as listed the table in *Automatic Conversion between JavaScript and COM Data Types* (on page 112), are allowed.

For example, assume you had an array that should be passed as data type Variant, but it only holds items with integer values. To prevent problems, use the `CVARIANT()` function to explicitly cast the array elements to the `Variant` data type, as follows:

```
My_variant_arr = new Array()
My_variant_arr[0] = CVARIANT(1)
My_variant_arr[1] = CVARIANT(21)
My_variant_arr[2] = CVARIANT(32)
My_variant_arr[4] = CVARIANT(44)
Result = RemoteCOMobject.Add(My_variant_arr)
```

Remember, if your array contains elements with a variety of data types, you don't have to explicitly cast the array elements to force the array to be converted to data type `Variant.` WebLOAD will understand that this is a `Variant` array based on the variety of data types found. However, you may always use a casting function if you wish:

```
My_variant_arr = new Array()
My_variant_arr[0] = CVARIANT(1)
My_variant_arr[1] = CVARIANT(21.1)
My_variant_arr[2] = CVARIANT("John")
My_variant_arr[4] = CVARIANT(new Date(1999,1,1))
Result = RemoteCOMobject.Concat(My_variant_arr)
```

In another example, assume you had an array that should be passed as data type `Double`. The elements were assigned a variety of `Integer` and `Double` data type values. There is no `TypeInfo` library available. WebLOAD, seeing a combination of integer and double values, will assume that this is an array of data type `Variant`. However, the method is expecting an array of data type `Double. To` prevent problems, use the `CDbl()` function to explicitly cast the integer array elements to the `Double` data type, as follows:

```
My_double_arr = new Array()
My_double_arr[0] = 100.1
My_double_arr[1] = CDbl(21)
My_double_arr[2] = 22.2
Result = RemoteCOMobject.AddDoubles(My_double_arr)
```

DCOM over HTTP

In today's work environment, applications are often distributed over a network. In the course of your testing session, you may need to activate an ActiveX object that is located on a remote server and accessed through a network. For this reason, WebLOAD supports ActiveX object access through Remote Data Service (RDS).

Remote object access is accomplished in two steps: First, declare a new **RDS object**. That RDS object is used as a bridge, pointing to the ActiveX object residing on the remote server. Then, activate an **ActiveX object** located on a remote server, use the **initial instantiation syntax** described in *Remote ActiveXObject() Constructor* (on page 116).

Note: WebLOAD assumes a basic familiarity with RDS use, including object declaration and initialization, and system configuration. For more information about Microsoft's Remote Data Services of ADO (RDS), go to the following websites:

For a general overview, see the Microsoft MSDN Online Library at http://msdn.microsoft.com.

For a more complete example that illustrates RDS use, see http://support.microsoft.com/kb/q184630/.

To learn how to configure `RDS.DataSpace` to create a Custom Business Object (ActiveX DLL) on either NT or Win2000, see http://support.microsoft.com/kb/q185169/.

To learn how to configure RDS for Windows 2003, see http://support.microsoft.com/kb/837981/en-us.

Remote ActiveXObject() Constructor

Method of Object

- ActiveX

Description

Creates a new remote ActiveX object. The new object is simply a local JavaScript object, and may be handled and manipulated like any other JavaScript object.

Syntax

```
RDS_object = new ActiveXObject ("RDS.DataSpace")
my_RemoteActiveXobject =
   RDS_object.CreateObject("AppName.ObjName", "http://rServer")
```

Parameters

`RDS.DataSpace`—Creates an RDS object to act as a 'bridge' to an ActiveX object residing on the remote server.

`ApplicationName`—The name of the application providing the object.

`ObjectName`—The type or class of the object being created.

`rServer`—The name of the remote server being accessed.

Return Value

A pointer to the new ActiveX object. The new object is simply a local JavaScript object, and may be handled and manipulated like any other JavaScript object.

Comments

When working with a remote server, the object you are accessing must reside on the Web server computer (in this example: http://rserver).

Once your new object is instantiated, it is simply a local JavaScript object, just like any other JavaScript object. You may manipulate the object as you would any other JavaScript object. An example of remote ActiveX object instantiation and use is illustrated in the next section.

Example: Remote ActiveX Object Access

The following script fragment illustrates ActiveX object access from a WebLOAD JavaScript script. This example retrieves a recordset from a database, updates the recordset, and then makes the necessary changes to the database.

```
// Instantiate a new ActiveX object
DataSpace = new ActiveXObject(“RDS.Dataspace”)
// Invoke server object. localhost is the server here
svrObject = DataSpace.CreateObject
   ("RDSServer.DataFactory", "http://localhost")
// svrObject is now a local JavaScript object used to
// access the remote ActiveX object. svrObject is
// manipulated exactly as any other JavaScript object.
// Create output file with the unique ClientNum included
// as part of the name for identification purposes
wlLocals.MyFileObj = new wlOutputFile
         (“C:\\OutputFile” + ClientNum + “.txt”)
// svrObject.Query returns a recordset
strRecord = svrObject.Query
         ("DSN=AdvWorks2", "Select* from Customers")
// Initialize database record counter
n_recordCounter = 0
// The objField2 variable is used for debugging,
// to verify the correct field and check its value.
objField2 = strRecord.Fields("Threads")
```

```
// Notice that it is not necessary to explicitly state:
// objField2 = strRecord.Fields.item("Threads")
// because WebLOAD supports default fields
// The script works in a While-loop that
// verifies that I am not at the last record.
// If I am, then the update code does not run
while(strRecord.EOF == false)
{
  // Access the current field value
  strCurrentFieldValue = strRecord.Fields(0).Value
  // Add five to current record value and
  // verify that I am talking to the dataSource
  // so I can keep track of where I am in the field
  if (strCurrentFieldValue == 5)
       strCurrentFieldValue += 5
  // Update just saves the field.dot value
  objField2.Value = strCurrentFieldValue
  objField2.Value.Update
  // More debug coded when necessary.
  txtCurrent = strRecord.Fields(0).Value
  // Submit changes to the record source and
  // move to the next record
  svrObject.SubmitChanges("DSN=AdvWorks2", strRecord)
  strRecord.MoveNext()
}
// End of While-loop
```

COM Error Management

Failure of a COM function call always triggers a WebLOAD error message, whether or not the COM call was enclosed in a `try...catch` block. This gives the script programmer an opportunity to handle application errors within the context of the WebLOAD test session script.

ActiveX Object Limitations

Due to the nature of ActiveX object implementation, WebLOAD ActiveX support is subject to certain limitations. The following items are not supported:

- Events. The ActiveX object is not able to make a call to the client.

For example, work with the `IConnectionPoint` interface is not supported.

- Setting a property value within a function parameter.

  For example, you cannot write:

  ```
  ReturnValue = FunctionCall((My_Object.Property=5))
  ```

- Passing method calls that return values as parameters to another method call of the same object.

  For example, the following method call will fail:

  ```
  AU = new ActiveXObject ("Persits.AspUser")
  CurrentUser = AU.GetUser(AU.GetUserName())
  ```

  Instead, either call the method using a second, temporary object, such as this:

  ```
  AU = new ActiveXObject ("Persits.AspUser")
  AUTemp = new ActiveXObject ("Persits.AspUser")
  CurrentUser = AU.GetUser(AUTemp.GetUserName())
  ```

  Or use a method and a property rather than two methods, such as this:

  ```
  AU = new ActiveXObject ("Persits.AspUser")
  CurrentUser = AU.GetUser(AU.UserNameProp)
  ```

- Assigning values to indexed properties.

  For example, you cannot assign a value as follows:

  ```
  My_object.property(1) = 5
  ```

- Calling an indexed property without parentheses.

  For example, the following call to the indexed property `Environment` will fail:

  ```
  WshShell = new ActiveXObject("WScript.Shell")
  env = WshShell.Environment
  ```

  Instead, use the following syntax:

  ```
  WshShell = new ActiveXObject("WScript.Shell")
  env = WshShell.Environment("System")
  ```

Chapter 4

Working with HTTP Protocol

Website load testing usually means testing how typical user activities are handled by the system under test not in a single-user scenario but rather under heavy usage load. Using load testing, we can test the system's performance, scalability and reliability, all in real-life simulated usage scenarios and patterns. A system's performance is all about how fast it functions; its reliability is about how often it's available (where a system might be unavailable due to a lack of a certain resource or because of a bug); and a system's scalability is about how these two factors (performance and reliability) change as the usage of the system increases.

WebLOAD was designed as a protocol-level load testing tool, enabling the QA professional to "bombard" the system under test with protocol-level commands and transactions, simulating real usage of a large amount of users. The main and most important protocol for load testing Internet applications is the HTTP protocol. WebLOAD supports the common HTTP methods and headers, as defined in the HTTP RFCs, most notably RFC 2616 (1999), that was defined by the W3C and the IETF.The WebLOAD DOM extension set includes objects, methods, properties, and functions that support designing tests at the HTTP protocol level. Using the DOM, functional and verification tests can be done, to check the system's reliability under load.

This chapter documents the features that apply to QA professionals creating scripts based on the HTTP Protocol, where HTTP transactions and the responses they trigger are the focus of the test session. This chapter includes a few sample scripts that you can study to help learn the HTTP Protocol testing technique. The examples are fictitious, but you can copy the scripts and edit them for use in real WebLOAD tests. More sample scripts may be found on the WebLOAD Script Libraries, at http://www.webload.org/index.php?option=com_wrapper&Itemid=160.

Understanding the WebLOAD DOM Structure

For optimum website testing, WebLOAD extended the standard browser DOM with many features and functions that are critical to site testing and evaluation. The following figure, an extended version of the basic DOM hierarchy tree, highlights many of the added elements of the WebLOAD DOM hierarchy. The remainder of this chapter provides more detailed information about some of the special elements and features that WebLOAD added to the basic DOM model that are used when working in HTTP Protocol mode.

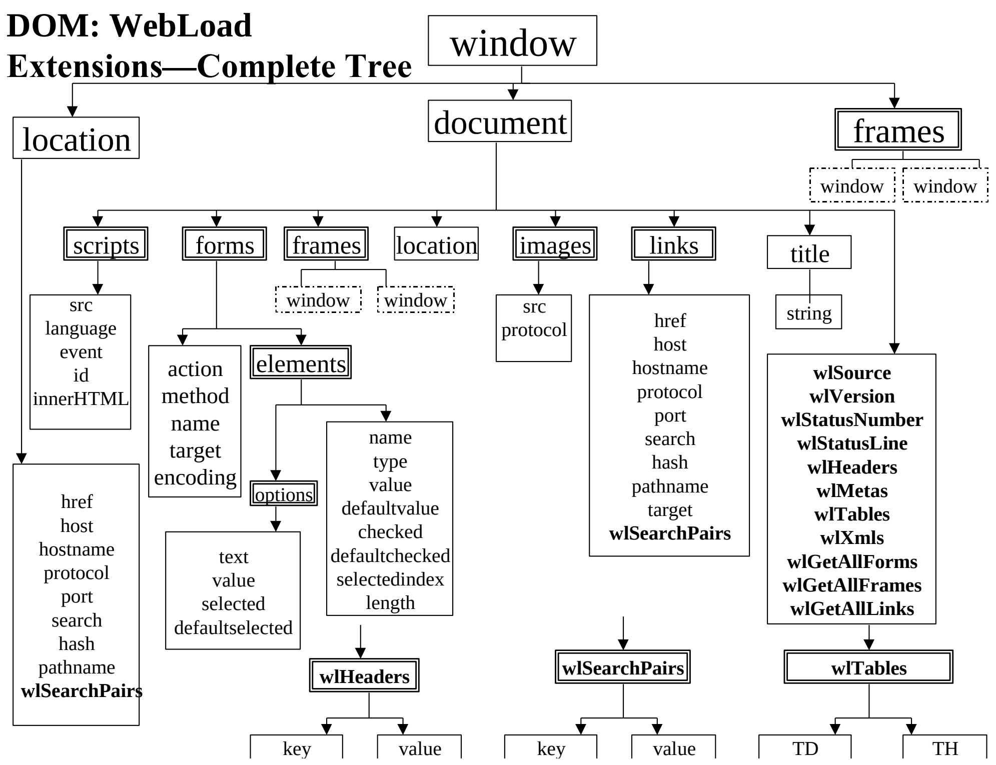

DOM: WebLoad Extensions—Complete Tree
window
location
document
frames
window
window
scripts
forms
frames
location
images
links
title
src language event id innerHTML
window
window
src protocol
string
action method name target encoding
elements
href host hostname protocol port search hash pathname target wlSearchPairs
wlSource wlVersion wlStatusNumber wlStatusLine wlHeaders wlMetas wlTables wlXmls wlGetAllForms wlGetAllFrames wlGetAllLinks
options
name type value defaultvalue checked defaultchecked selectedindex length
href host hostname protocol port search hash pathname wlSearchPairs
text value selected defaultselected
wlHeaders
wlSearchPairs
wlTables
key
value
key
value
TD
TH

Figure 23: WebLOAD DOM Hierarchy

The preceding illustration highlights in bold the WebLOAD extensions used by WebLOAD when working with the Document Object Model.

Note: WebLOAD-specific objects are identified by the `wl` prefix.

The following table lists some of the extensions that WebLOAD has added to the standard DOM objects, properties, and methods.

Table 7: WebLOAD DOM Extension Set Highlights

WebLOAD extensions	Description
Objects	
`wlCookie`	Sets and deletes cookies.
`wlException`	WebLOAD error management object.
`wlGeneratorGlobal and wlSystemGlobal objects`	Handles global values shared between script threads or Load Generators.
`wlGlobals`	Manages global system and configuration values.
`wlHeader`	Contains the key/value pairs in the HTTP command headers that brought the document. (Get, Post, etc.)
`wlHtml`	Retrieves parsed elements of HTTP header fields.
`wlHttp`	Performs HTTP transactions and stores configuration property values for individual transactions.
`wlLocals`	Stores local configuration property values.
`wlMeta`	Stores the parsed data for an HTML meta object.
`wlOutputFile`	Writes script output messages to a global output file.
`wlRand`	Generates random numbers.
`wlSearchPair`	Contains the key/value pairs in a document's URL search strings.
`wlTable, row, and cell objects`	Contains the parsed data from an HTML table.
`XML DOM objects`	XML DOM object set that both accesses XML site information *and* generates new XML data to send back to the server for processing.
Properties	
`wlSource`	Contains the complete HTML source code of the frame, in a read-only string.
`wlStatusLine`	Contains the status line of the HTTP header, in a read-only string.
`wlStatusNumber`	Contains the HTTP status value, which WebLOAD retrieves from the HTTP header, in a read-only integer.
`wlVersion`	Contains the HTTP protocol version, which WebLOAD retrieves from the HTTP header, in a read-only string.
Methods	
`wlGetAllForms`	Retrieves a collection of all forms (<`FORM`> elements) in an HTML page and its nested frames.
`wlGetAllFrames`	Retrieves a collection of all frames in an HTML page, at any level of nesting.
`wlGetAllLinks`	Retrieves a collection of all links (<`A`> elements) in an HTML page and its nested frames.

Using Multiple IP Addresses

WebLOAD enables the creation of a single test script that includes multiple IP addresses, simulating the behavior of actual users.

Note: Before you enable support of multiple IP addresses, you must first generate additional IP addresses on your machine to use when testing. For more information, see *Generating IP Addresses in the* on page 124.

Enable the use of all available IP addresses through the property `wlGlobals.MultiIPSupport`. The values of `MultiIPSupport` are:

- false – Use only one IP address. (default)
- true – Use all available IP addresses.

Indicate whether WebLOAD should use the same IP or a different IP for every round, by setting the value of the `wlGlobals.MultiIPSupportType` property which supports the following values:

- PerClient – WebLOAD preserves the current behavior, meaning that there are different IPs per client but the same IP is used for all rounds. This is the default setting.
- PerRound – WebLOAD supports the use of a different IP from the pool per client, per round, until the pool is exhausted, after which it returns to the beginning.

The exact number of IPs that WebLOAD supports depends on the operating system being used:

- With Unix, WebLOAD uses the `gethostbyname()` function to access the IP address. There is no limit to the number of IP addresses that WebLOAD supports.
- With Windows, WebLOAD loads an SNMP agent dll file, through which WebLOAD accesses the IP information. The SNMP agent exists on all Windows versions since Win95 and NT, even if an SNMP agent is not installed. This method queries all of the IPs, one at a time, and places the result in a list maintained in the WebLOAD's engine code. WebLOAD continues to go over the entire IP list, until it reaches the engine code's limit of 100,000 IPs.

  If for some reason the SNMP does not work, WebLOAD uses another method whose limitation is 35 IPs.

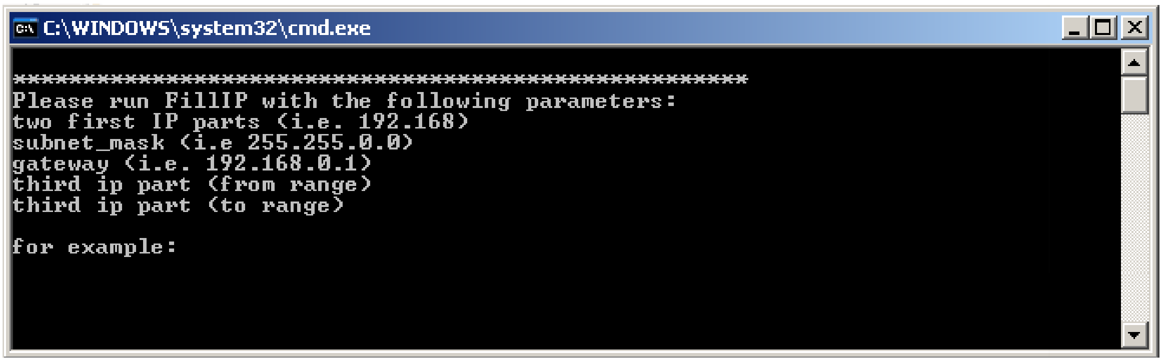
Generating IP Addresses in the script

After enabling the use of all available IP addresses, you can generate additional IP addresses on your machine by setting the TCP/IP properties through the Windows UI. For further instructions consult your system administrator. Alternatively, you can use the `FillIP.bat` file provided with WebLOAD, as described below.

To generate IP addresses in the script:

1. Locate the `FillIP.bat` file in `<WebLOAD directory>\bin`.
2. Run the batch file by entering the file name in the command line or double-clicking the file.

   The command line window appears.



```
*****************************************************
Please run FillIP with the following parameters:
two first IP parts (i.e. 192.168)
subnet_mask (i.e 255.255.0.0)
gateway (i.e. 192.168.0.1)
third ip part (from range)
third ip part (to range)

for example:
```

Figure 24: Command Line Window

3. Enter the `netsh` command to generate the list of IP addresses.

   ```
   FillIP IP_prefix subnet_mask gateway from to
   ```

   The `netsh` command parameters are described in the following table:

Table 8: FillIP Command Parameters

Parameter	Description
`IP_prefix`	The prefix used for all of the generated IP addresses. For example, if `IP_prefix` is `192.168` then the generated IP address structure is `192.168.xxx.xxx`.
`subnet_mask`	The `subnet_mask` is matched with the IP address to determine the fourth section of the generated IP address, along with the `gateway` value. For example `255.255.0.0`.
`gateway`	The `gateway` used for all of the generated IP addresses to determine the fourth section of the generated IP address, along with the `subnet_mask` value. For example, `192.168.0.1`.
`from to`	Used to generate the third section in the IP address. For example, if `from to` is `1 24`, then the generated IP addresses are all from `xxx.xxx.1.xxx` to `xxx.xxx.24.xxx`.

Upon successful completion, the Command Line window returns `OK`. If an error is encountered (for example, an illegal IP address), the Command Line window returns details about the error.

For example, to generate approximately 6000 IP addresses, use the following command in the script:

```
    FillIP 192.168 255.255.0.0 192.168.0.1 1 24
```

The following IP addresses are generated:

```
192.168.1.1    192.168.2.1    ...    192.168.24.1
192.168.1.2    192.168.2.2    ...    192.168.24.2
...
192.168.1.255  192.168.2.255  ...    192.168.24.255
```

Parsing Web Pages

Web testing sessions work with Web pages, by accessing a specified page and verifying that all operations are completed correctly. As part of the Web page access, downloaded Web pages are parsed and the data from each page stored in a logical structure. This section gives a brief overview of the parsing approach to a Web page.

A Typical Web Page and the Corresponding Parse Tree

The following is an example of a typical Web page, including three child windows with their own nested frames, forms, and links:

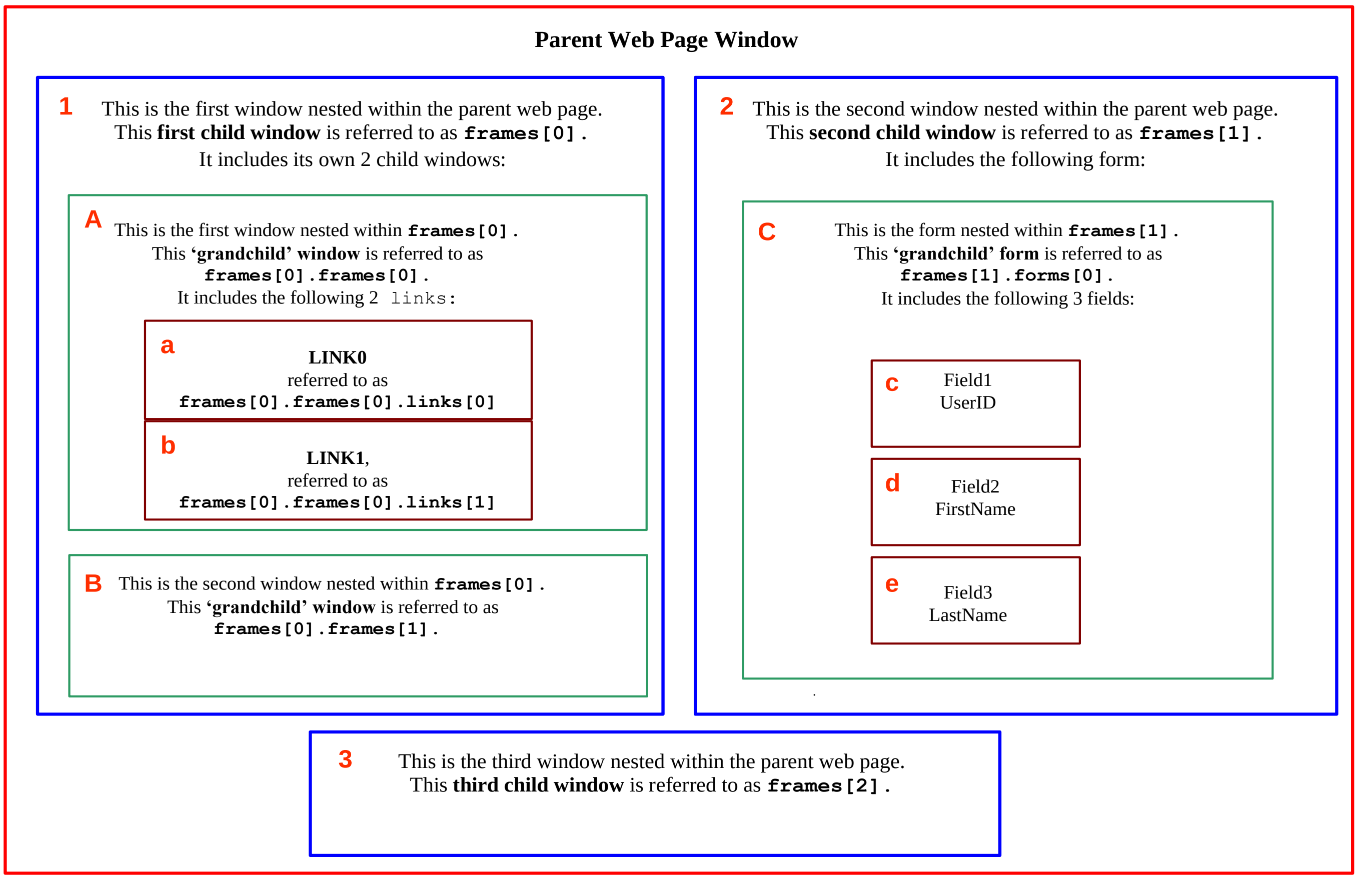

Parent Web Page Window
1 This is the first window nested within the parent web page. This first child window is referred to as frames[0]. It includes its own 2 child windows:
A This is the first window nested within frames[0]. This 'grandchild' window is referred to as frames[0].frames[0]. It includes the following 2 links:
a LINK0 referred to as frames[0].frames[0].links[0]
b LINK1, referred to as frames[0].frames[0].links[1]
B This is the second window nested within frames[0]. This 'grandchild' window is referred to as frames[0].frames[1].
2 This is the second window nested within the parent web page. This second child window is referred to as frames[1]. It includes the following form:
C This is the form nested within frames[1]. This 'grandchild' form is referred to as frames[1].forms[0]. It includes the following 3 fields:
c Field1 UserID
d Field2 FirstName
e Field3 LastName
3 This is the third window nested within the parent web page. This third child window is referred to as frames[2].

Figure 25: Typical Web Page

The figure above illustrates a URL that includes a single document with three child windows (**1**, **2**, and **3**).

The *first child window* (**1**) includes two children of its own, here referred to as 'grandchildren' (**A** and **B**).

The *first 'grandchild window'* (**A**) includes two links (**a** and **b**).

The *second child window* (**2**) contains a single form, here referred to as a 'grandchild form' (**C**). This *grandchild form* includes three element fields (**c**, **d**, and **e**).

The frames and links are identified by index numbers (0, 1, 2, 3,...). The form fields are identified by name (`"UserId", "FirstName"`, etc.).

The preceding Web page relies on a hierarchical window structure that corresponds to the following virtual tree:

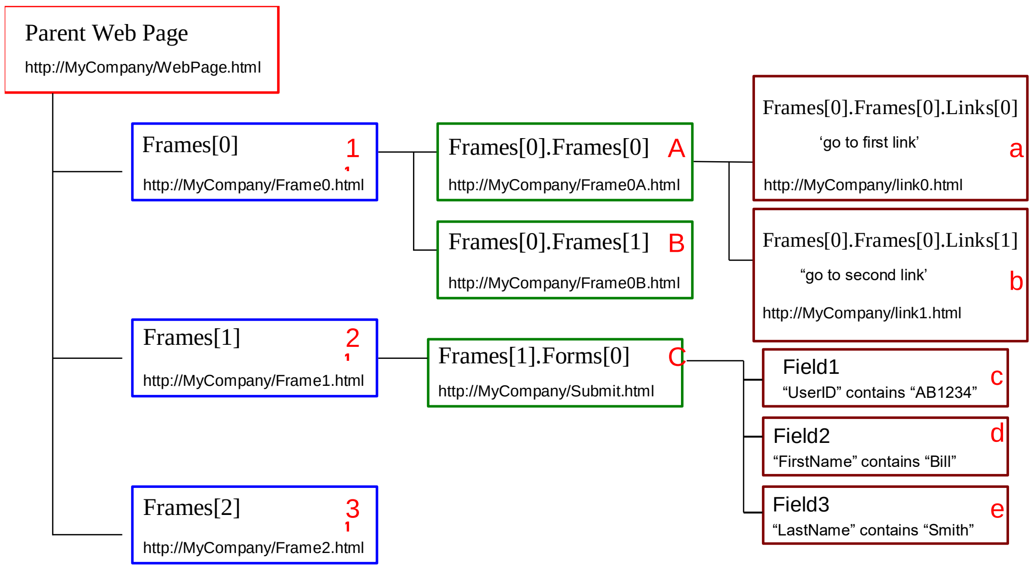

Parent Web Page
http://MyCompany/WebPage.html
Frames[0]
1
http://MyCompany/Frame0.html
Frames[0].Frames[0]
A
http://MyCompany/Frame0A.html
Frames[0].Frames[1]
B
http://MyCompany/Frame0B.html
Frames[0].Frames[0].Links[0]
'go to first link'
a
http://MyCompany/link0.html
Frames[0].Frames[0].Links[1]
"go to second link'
b
http://MyCompany/link1.html
Frames[1]
2
http://MyCompany/Frame1.html
Frames[1].Forms[0]
C
http://MyCompany/Submit.html
Field1
"UserID" contains "AB1234"
c
Field2
"FirstName" contains "Bill"
d
Field3
"LastName" contains "Smith"
e
Frames[2]
3
http://MyCompany/Frame2.html

Figure 26: Web Page Virtual Hierarchy Tree

In the `document` object property description, the examples given will refer to the Web page illustrated here.

Parsing and Navigating Nested Frames on a Dynamic HTML Page

The following script downloads a dynamic HTML page belonging to a retailer that advertises on the Internet. The second frame on the page offers bargain prices on three different items each hour. The script performs the following operations, some of which are marked in bold in the script code:

- Downloads the page including the nested frames.
- Retrieves the second frame.
- Searches the HTML source code of the second frame to find the <TITLE> element.
- Confirms that the title is "Offer of the Hour". (If it is not, the script displays an error message and stops the current round of the thread where the error occurred. The thread continues with the next round.)
- Randomly selects one of the first three links in the second frame.
- Follows the link.

Note: This script includes DOM objects that are not explained in this section. For more information about a specific object or usage, (such as `wlGlobals`, `wlRand`, or `wlHttp`), see that object's section in the *WebLOAD JavaScript Reference Guide*.

```
function InitAgenda()
{
//Enable parsing of all links
  wlGlobals.ParseLinks = true
  //Enable downloading nested frames
  wlGlobals.GetFrames =  true
}
function InitClient()
{
//Initialize the random number generator with a
  //different seed for each thread (ensures that each
  //thread follows a different sequence of links)
  wlRand.Seed(ClientNum)
}
//Main script Body
//Store the most recent download in document.wlSource
wlHttp.SaveSource = true
//Download the dynamic HTML page
wlHttp.Get("http://www.webloadmpstore.com/general_sample/frames/
frames.htm")
//Retrieve the second frame
MyFrame = document.frames[1]
InfoMessage(MyFrame)
InfoMessage(MyFrame.document.wlSource)

//Confirm that the <TITLE> element of the frame is
//"Offer of the Hour". If it is not, display an error
//message and abort the current round.
//Remember to escape the slash in <\/TITLE>

// Using extractValue to catch the title
myTitle = extractValue( "<title>", "<\/title>",
MyFrame.document.wlSource)

// will print the content of the title
InfoMessage (myTitle )

if (myTitle  != "offer of the hour")
{
  ErrorMessage("Thread " + ClientNum.toString() + ", Round " +
  RoundNum.toString() + ": Title is not 'Offer of the Hour' but
  is " + myTitle )
}
//Retrieve the URL of a randomly selected link
SelectedItem = wlRand.Select(0, 1, 2)
LinkUrl = MyFrame.document.links[SelectedItem].href
InfoMessage(LinkUrl )
//Follow the link
wlHttp.Get(LinkUrl)
```

Using wlHtml to Follow a Dynamic Link

The third link on a company's home page is an advertisement that links to one of several products. On successive accesses, the advertisement switches dynamically among the products.

The following WebLOAD script tests the time that a user would need to follow the link.

The script:

- Links to the home page and parses the HTML code.
- Retrieves the URL of the third link.
- Measures the time it takes WebLOAD to:
  - Download the main page and, depending on the parameters, do any of the following:
    - Download frames, images, tables, or whatever else has been specified.
    - Download nested subframes, images, etc.
    - Parse the document.

In this script, WebLOAD displays two time statistics:

- The Round Time.
- The Link Time.

```
function InitAgenda()
   //Set the default URL to the dynamic HTML home page
   wlGlobals.Url = "http://www.ABCDEF.com"
   //Parse links. Forms are not needed.
   wlGlobals.ParseLinks = true
   wlGlobals.ParseForms = false
}
//Main script
//Connect to the home page
wlHttp.Get()
```

```
// Retrieve the third link on the home page using the manual
// GetLinkByIndex() method.
// See IdentifyObject() for the dynamic ASM alternative
Link3 = wlHtml.GetLinkByIndex(3)
//Measure the time to connect to the link
SetTimer("Link Time")
wlHttp.Get(Link3.href)
SendTimer("Link Time")
```

Data Submission Properties

You may submit many types of data to an HTTP server in a Get, Post, or Head command. For example, you can submit a search string, the results of form fields, or a file. You may assign values to variable data stored in these collections using the `wlSet` method.

The `wlHttp` object provides the following collections to store the data that you want to submit:

- `FormData`
- `Data`
- `DataFile`
- `Header`

At the time you first create your test script, you should decide which collection is most appropriate for your test session activities.

- `FormData` is the standard collection of field values, common to all HTML forms.
- `Header` is the collection of header field values only.
- `Data` and `DataFile` are both collections that hold sets of data.
  - `Data` collections are stored within the script itself, and are useful when you prefer to see the data directly.
  - `DataFile` collections store the data in local text files, writing only the name of the data file within the script itself, and are useful when you are working with large amounts of data, which would be too cumbersome to store within the script code itself.

Your script can work with both `Data` and `DataFile` collections. Do not use both properties on the same object (a single HTTP request can use either Data or DataFile collections, but not both).

FormData

`FormData` is a collection containing form field values. WebLOAD submits the field values to the HTTP server when you call one of the following methods of the `wlHttp` object:

- `Get()`
- `Post()`
- `Head()`

The collection indices are the field names (HTML name attributes). Before you call `wlHttp.Post()`, set the value of each element to the data that you want to submit in the HTML field. The fields can be any HTML controls, such as:

- buttons
- text areas
- hidden controls

Generally, when an HTTP client (Microsoft Internet Explorer/Firefox or WebLOAD) sends a URL-encoded request to the server, the data is HTTP encoded. Different clients – browsers or JavaScript functions such as Ajax – perform encoding with slight differences. Encoding form data replaces special characters such as blanks, “>“ signs, and so on, with “%xx” (an ASCII hexa number). For example, a space is encoded as “%20” or as a “+”.

The `Get()` method converts a URL address to contain only allowed URL characters. The `Post()` method converts the content of forms to contain only allowed URL characters. Forms contain one of the following content types:

- `FormData [“key”]` – a value
- `Data []` – raw information
- `DataFile []` – both a value and raw information

Turn off the encoding when the script sends large requests that have no data that needs to be encoded. This improves performance as it bypasses the scanning and reformatting of the request buffer. You can enable or disable encoding, by accessing the HTTP Parameters tab in the Current or Default Project Options dialog box, in WebLOAD Recorder. Check or uncheck Encode Form Data to enable or disable encoding.

Getting FormData Using Get()

You can get form data using a `Get()` call.

For example:

```
wlHttp.FormData["FirstName"] = "Bill"
wlHttp.FormData["LastName"] = "Smith"
wlHttp.FormData["EmailAddress"] = "bsmith@ABCDEF.com"
wlHttp.Get("http://www.ABCDEF.com/submit.cgi")
```

WebLOAD appends the form data to the URL as a query statement, using the following syntax:

```
http://www.ABCDEF.com/submit.cgi
   ?FirstName=Bill&LastName=Smith
   &EmailAddress=bsmith@ABCDEF.com
```

Submitting FormData Using Post()

Suppose you are testing an HTML form that requires name and email address data. You need to submit the form to the `submit.cgi` program, which processes the data.

You can code this in the following way:

```
wlHttp.FormData["FirstName"] = "Bill"
wlHttp.FormData["LastName"] = "Smith"
wlHttp.FormData["EmailAddress"] = "bsmith@ABCDEF.com"
wlHttp.Post("http://www.ABCDEF.com/submit.cgi")
```

The `Post()` call connects to `submit.cgi` and sends the `FormData` fields. In the above example, WebLOAD would post the following fields:

```
FirstName=Bill
LastName=Smith
EmailAddress=bsmith@ABCDEF.com
```

Submitting FormData with Missing Fields

You can use the string `"$WL$EMPTY$STRING$"` to represent a missing name or value (an empty string) in a `FormData` field. You can use the string `"$WL$VOID$STRING$"` to represent a token that is posted alone, without even an equal sign.

The following lines illustrate the syntax:

```
wlHttp.FormData["FirstName"] = "$WL$EMPTY$STRING$"
wlHttp.FormData["$WL$EMPTY$STRING$"] = "Smith"
wlHttp.FormData["EmailAddress"] = "$WL$VOID$STRING$"
wlHttp.Post("http://www.ABCDEF.com/submit.cgi")
```

In this example, the `Post()` call sends the following data:

```
FirstName=
=Smith
EmailAddress
```

A `Get()` call using the same form data would send:

```
http://www.ABCDEF.com/submit.cgi?FirstName=&=Smith&EmailAddress
```

Note: JavaScript supports two equivalent notations for named collection elements:

```
FormData.FirstName
FormData["FirstName"]
```

The latter notation also supports spaces in the name, for example, `FormData["First Name"]`.

Using FormData with Data Files

You can coordinate the `FormData` property with input data files. In this case, one of the `FormData` fields stores identifying information about the data file, including the name of the file and the type of data in the file (text, binary, bmp, etc.).

The following lines illustrate the syntax:

```
wlHttp.FormData[“InputFile.wlFile-Name”] = ”myFavoritePicture”
wlHttp.FormData[“InputFile.wlContent-Type] = ”bmp”
```

The following script fragment illustrates the `FormData` properties documented in this section. The input file lines are marked in bold.

```
...
/***** WLIDE - URL : http://ws3/webft/fullform.asp - ID:4 *****/
wlGlobals.UserAgent = "Mozilla/4.0 (compatible; MSIE 7.0;
Windows NT 5.1; Trident/4.0; .NET CLR 2.0.50727; .NET CLR
3.0.4506.2152; .NET CLR 3.5.30729; .NET CLR 1.1.4322)"
wlHttp.Header["Referer"] = "http://ws3/webft/index.asp"
wlHttp.Get("http://ws3/webft/fullform.asp")
 // END WLIDE

/***** WLIDE - Sleep - ID:5 *****/
Sleep(18890)
 // END WLIDE

/***** WLIDE - URL : http://ws3/webft/fullform.asp - ID:6 *****/
wlGlobals.UserAgent = "Mozilla/4.0 (compatible; MSIE 7.0;
Windows NT 5.1; Trident/4.0; .NET CLR 2.0.50727; .NET CLR
3.0.4506.2152; .NET CLR 3.5.30729; .NET CLR 1.1.4322)"
wlHttp.Header["Referer"] = "http://ws3/webft/fullform.asp"
wlHttp.FormdataEncodingType = 1
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["text1"] = "user1"
wlHttp.FormData["password1"] = "password1"
wlHttp.FormData["textarea1"] = "some text"
wlHttp.FormData["checkbox1"] = "second value"
wlHttp.FormData["select1"] = "first select value"
wlHttp.FormData["submit2"] = "Submit2"
wlHttp.Post("http://ws3/webft/fullform.asp")
 // END WLIDE
...
/***** WLIDE - URL : http://ws3/upload/ssl-upload.html - ID:16
*****/
wlGlobals.UserAgent = "Mozilla/4.0 (compatible; MSIE 7.0;
Windows NT 5.1; Trident/4.0; .NET CLR 2.0.50727; .NET CLR
3.0.4506.2152; .NET CLR 3.5.30729; .NET CLR 1.1.4322)"
wlHttp.Get("http://ws3/upload/ssl-upload.html")
 // END WLIDE

/***** WLIDE - Sleep - ID:17 *****/
Sleep(22999)
 // END WLIDE

/***** WLIDE - URL : http://ws3/upload/ssl-upload-handler.php -
ID:18 *****/
wlGlobals.UserAgent = "Mozilla/4.0 (compatible; MSIE 7.0;
Windows NT 5.1; Trident/4.0; .NET CLR 2.0.50727; .NET CLR
3.0.4506.2152; .NET CLR 3.5.30729; .NET CLR 1.1.4322)"
wlHttp.Header["Referer"] = "http://ws3/upload/ssl-upload.html"
wlHttp.EncodeFormdata = false;
wlHttp.ContentType = "multipart/form-data"
wlHttp.FormData["text"] = "abcd"
wlHttp.FormData["uploadFile[].wlFile-Name"] = "a.txt"
wlHttp.FormData["uploadFile[].wlContent-Type"] = "text/plain"
wlHttp.FormData["uploadFile[].wlFile-Name"] =
"$WL$EMPTY$STRING$"
wlHttp.FormData["uploadFile[].wlContent-Type"] =
"application/octet-stream"
wlHttp.FormData["uploadFile[].wlFile-Name"] =
"$WL$EMPTY$STRING$"
wlHttp.FormData["uploadFile[].wlContent-Type"] =
"application/octet-stream"
wlHttp.FormData["submit"] = "Submit Query"
wlHttp.Post("http://ws3/upload/ssl-upload-handler.php")

 // END WLIDE
```

Data

Data is a string to be submitted in an HTTP Post command.

The Data property has two subfields:

- Data.Type—the MIME type for the submission
- Data.Value—the string to submit

You can use Data in two ways:

- As an alternative to FormData if you know the syntax of the form submission.
- To submit a string that is not a standard HTML form and cannot be represented by FormData.

Thus the following three code samples are equivalent:

```
//Sample 1
wlHttp.Data.Type =
  "application/x-www-form-urlencoded"
wlHttp.Data.Value =
  "SearchFor=icebergs&SearchType=ExactTerm"
wlHttp.Post("http://www.ABCDEF.com/query.exe")
//Sample 2
wlHttp.FormData.SearchFor = "icebergs"
wlHttp.FormData.SearchType = "ExactTerm"
wlHttp.Post("http://www.ABCDEF.com/query.exe")
//Sample 3
wlHttp.Post
("http://www.ABCDEF.com/query.exe" +
  "?SearchFor=icebergs&SearchType=ExactTerm")
```

Note: Data and DataFile are both collections that hold sets of data.
Data collections are stored within the script itself, and are useful when you prefer to see the data directly.
DataFile collections store the data in local text files, and are useful when you are working with large amounts of data, which would be too cumbersome to store within the script code itself. When working with DataFile collections, only the name of the text file is stored in the script itself.

Your script can work with both Data and DataFile collections. Do not use both properties for the same lHTTP object (a single HTTP request can use either Data or DataFile properties, but not both). When you record your script with the WebLOAD Recorder, use the Post Data tab in the Recording and Script Generation Options dialog box to define the default behavior for submitting content types. The default behaviors are Data and DataFile, although you can edit these definitions and add additional predefined behaviors for other content types as well.

DataFile

`DataFile` is a file to be submitted in an HTTP Post command. WebLOAD sends the file using a MIME protocol.

`DataFile` has two subfields:

- `DataFile.Type`—the MIME type
- `DataFile.Filename`—the name of the file, for example:

```
"c:\\MyWebloadData\\BigFile.doc"
```

WebLOAD sends the contents of the file stored in <`filename`> in the Post command.

Header

A collection of HTTP header fields that you want to send in a `Get()`, `Post()`, or `Head()` call.

By default, WebLOAD sends the following header in any HTTP command:

```
Accept: */*
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)
Host: <host>
Connection:Keep-Alive
```

Here, `<host>` is the host name to which you are connecting, for example:

`www.ABCDEF.com:81.`

By default, the Referer header is also recorded and sent, where it is being used by the Web server.

You may reset these properties, for example, as follows:

```
wlHttp.UserAgent = "Mozilla/4.03 [en] (WinNT; I)"
```

Note: The user-agent header is defined in WebLOAD Recorder. Access **Tools ➤ Default or Current Project Options**, select the Browser Parameters tab, and edit the user-agent field.

Alternatively, you can use the `Header` property to override one of the default header fields. For example, you can redefine the following header field:

```
wlHttp.Header["user-agent"] =
  "Mozilla/4.03 [en] (WinNT; I)"
```

Additional header fields are recorded and sent according to the checked Record Headers options in the Script Content tab of the Recording and Script Generation Options dialog box (in WebLOAD Recorder):

```
Accept-Language: en-us
UA-CPU: x86
Pragma: no-cache
```

Note: The headers `If-Modified-Since` and `If-None-Matched` will be commented out to overcome the situation where recorded links were fetched from the browser's cache during the recording. The request header `Accept-Encode: gzip` will also be commented out, to ensure correct behavior.

When the Record Custom Headers option is enabled, WebLOAD records any headers that are not explicitly defined in the RFC, such as the SOAP Action header. This option is not selected by default.

Note: Any information set using the `wlHttp.Header` property *takes priority* over any defaults set using the global, local, or other `wlHttp` properties. If there is any discrepancy between the document header information and the HTTP values, WebLOAD will work with the information found in the `wlHttp.Header` property while also issuing a warning to the user.

WebLOAD offers a simple way to reset configuration properties using the Options tab of the Session Control menu. Resetting configuration properties as you run and rerun various testing scenarios allows you to fine tune your tests to match your exact needs at that moment. However, that this real-time configuration setting will be overruled by any configuration properties that are explicitly set by `wlHttp.Header` within your test scripts. For greatest reliability and flexibility, WebLOAD recommends that you set header properties using the more general `wlGlobals, wlLocals`, and `wlHttp` object properties, fine-tuning your test sessions using the WebLOAD Session menu. See *Rules of Scope for Local and Global Variables* (on page 43), for more information on precedence and priority in script variables. Remember that you cannot override the host header or set a cookie header using the `Header` property. To set a cookie, see *How WebLOAD Works with Cookies* (on page 142).

Erase

Clear the WebLOAD properties of a `wlHttp` object after each `Get()`, `Post()`, or `Head()` call.

`WlHttp.Erase` is a read/write property. The default value is `true`. This section will describe the implications of each setting.

Erase=true (default)

When `Erase` is set to `true`, WebLOAD automatically erases all `wlHttp` property values after each HTTP access. You must reassign any properties you need before the next HTTP access. For this reason, assign the properties of `wlHttp` only in the *main script*, not in `InitClient()`, so they will be reassigned in every round.

Thus if `Erase` is set to `true` the following script is incorrect. In this script, the `wlHttp` properties are assigned values in `InitClient()`. The script would connect to the `Url` and submit the `FormData` only in the first round. After the first `Post()` call, the `Url` and `FormData` property values are erased, so WebLOAD cannot use them in subsequent rounds.

The following script displays the incorrect method of assigning the `wlHttp` properties:

```
function InitClient() {    //Wrong!
wlHttp.Url =
  "http://www.ABCDEF.com/products.exe"
wlHttp.FormData["Name"] = "John Smith"
wlHttp.FormData["Product Interest"] = "Modems"
}
//Main script
wlHttp.Post()
```

To solve the problem, assign the `wlHttp` property values in the main script, so that the assignments are executed before each `Get()`, `Post()`, or `Head()` call:

```
//Main script            //OK
wlHttp.Url =
  "http://www.ABCDEF.com/products.exe"
wlHttp.FormData["Name"] = "John Smith"
wlHttp.FormData["Product Interest"] = "Modems"
wlHttp.Post()
```

Alternatively, you could assign values to `wlLocals` properties, which are not erased:

```
function InitClient() {    //OK
wlLocals.Url =
  "http://www.ABCDEF.com/products.exe"
wlLocals.FormData["Name"] = "John Smith"
wlLocals.FormData["Product Interest"] =
  "Modems"
}
//Main script
wlHttp.Post()
```

Erase=false

You may set `Erase` to `false` to prevent erasure. For example, if for some reason you absolutely had to assign values to the `wlHttp` properties in the `InitClient()` function of the script, change the value of the `Erase` property to `false`. If `Erase` is `false`, the properties retain their values through subsequent rounds.

Thus another way to correct the preceding example is to write:

```
function InitClient() {    //OK
wlHttp.Erase = false
wlHttp.Url = "http://www.ABCDEF.com/products.exe"
wlHttp.FormData["Name"] = "John Smith"
wlHttp.FormData["Product Interest"] = "Modems"
}
//Main script
wlHttp.Post()
```

User-defined properties are not linked to the `wlHttp.Erase` property and will not be erased automatically by WebLOAD. The only way to reset or erase user-defined properties is for the user to set the new values explicitly.

Posting form Data Using Elements

Note: This script includes DOM objects that are not explained in this section. For more information about a specific object or usage, (such as `wlGlobals` or `wlHttp`), see that object's section in the *WebLOAD JavaScript Reference Guide*.

The home page of a company displays the following form, where a user can specify interest in different products.

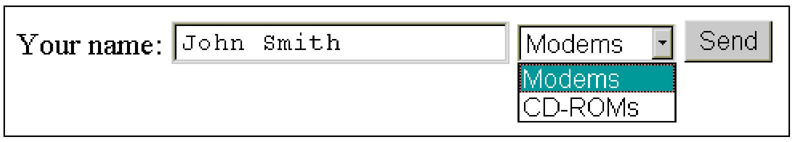


Figure 27: Home Page Form Example

The HTML code for the form is:

```
<FORM
  action="http://www.ABCDEF.com/FormProcessor.exe"
  method="post">
  <P>Your name: <INPUT type="text" name="yourname">
  <SELECT name="interest">
       <OPTION selected>Modems</OPTION>
```

```
        <OPTION>CD-ROMs</OPTION>
   </SELECT>
   <INPUT type="submit" value="Send">
</FORM>
```

A script can download the form as follows:

```
function InitAgenda() {
   wlGlobals.Url = "http://www.ABCDEF.com"
   wlGlobals.ParseForms = true
}
wlHttp.Get()
```

WebLOAD parses the HTML code and creates an `elements` collection containing the first two form elements (the text box and the drop-down list). WebLOAD does not include the third element (the Send button) in the collection because it does not have a name attribute.

This is a listing of the `elements` collection:

```
document.forms[0].elements[0].name = "yourname"
document.forms[0].elements[0].type = "text"
document.forms[0].elements[0].value = ""
document.forms[0].elements[1].name = "interest"
document.forms[0].elements[1].type = "SELECT"
document.forms[0].elements[1].selectedindex = 0
document.forms[0].elements[1].options[0].text = "Modems"
document.forms[0].elements[1].options[0].value = "Modems"
document.forms[0].elements[1].options[0].selected = true
document.forms[0].elements[1].options[1].text = "CD-ROMs"
document.forms[0].elements[1].options[1].value = "CD-ROMs"
document.forms[0].elements[1].options[1].selected = false
```

The script can use the above data to post the form back to the server. The following code illustrates how the script might do this.

```
MyArray = document.forms[0].elements
i = 0
while (i < MyArray.length) {
   switch MyArray[i].type {
        case "text" :
        //Retrieve the default value of a text box
        wlHttp.FormData[MyArray[i].name] = MyArray[i].value]
        break
        case "SELECT"
        //Retrieve the first option in a drop-down list
```

```
            wlHttp.FormData[MyArray[i].name]=MyArray[i].options[0].v
            alue
            break
      }
    i++
    }
    //Post the data to the form server
    wlHttp.Post(document.forms[0].action)
```

Managing Cookies through the wlCookie Object

The wlCookie Object

The `wlCookie` object sets and deletes cookies. These activities may be required by an HTTP server.

Note: You may use the methods of `wlCookie` to create as many cookies as needed. For example, each WebLOAD client running a script can set its own cookie identified by a unique name.

`wlCookie` is a local object. WebLOAD automatically creates an independent `wlCookie` object for each thread of a script. You cannot manually declare `wlCookie` objects yourself. See the *WebLOAD JavaScript Reference Guide* for a complete syntax specification for the `wlCookie` object and its methods.

How WebLOAD Works with Cookies

WebLOAD always accepts cookies that are sent from a server. When WebLOAD connects to a server, it automatically submits any cookies in the server's domain that it has stored. By default, WebLOAD clears the cookie cache after every round.

The `wlCookie` object lets you supplement or override this behavior in the following ways:

- A thread can create its own cookies.
- A thread can delete cookies that it created.

Except for the above, WebLOAD does not distinguish in any way between cookies that it receives from a server and those that you create yourself. For example, if a thread creates a cookie in a particular domain, it automatically submits the cookie when it connects to any server in the domain.

wlCookie Methods

The `wlCookie` object works with the following methods:

- `ClearAll()`—Delete all cookies set by `wlCookie` in the current thread.
- `Delete()`—Delete the cookie identified by the method parameters.

  The cookie must have been previously created by `wlCookie`.
- `Get()`—Returns the cookie value. If there is more than one cookie with the same parameters it returns the first cookie.
- `Set()`—Creates a cookie. You can set an arbitrary number of cookies in any thread. If you set more than one cookie applying to a particular domain, WebLOAD submits them all when it connects to the domain.

Note: Set cookies within the main script of the script. WebLOAD deletes all the cookies at the end of each round. If you wish to delete cookies in the middle of a round, use the `Delete()` or `ClearAll()` method.

Example: using a cookie

Cookies are used by applications to store the application requests on the client side. This enables the client to perform a one-time application request and from then on the request information is retrieved from the client's cookies.

```
//Request information entered into the application
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["username"] = "zadp10"
wlHttp.FormData["password"] = "Start100"
wlHttp.FormData["submit1"] = "Login"

//Setting the cookie
wlCookie.Set("UserID", "zapd10", "www.abcdef.net,", "/", "Sun, 19-
Jun-2011 17:29:00 GMT")

//WebLOAD submits the cookie
wlHttp.Post("https://www.abcdef.net/default.aspx")

//Getting the cookie
CookieValue = wlCookie.Get("UserID")
//The value returned in CookieValue is "zapd10"
```

In some cases it is also necessary to delete the cookie settings. You can do this by entering:

```
//Delete the cookie
wlCookie.ClearAll()
```

Handling Binary Data

WebLOAD supports the simulation of binary data sent from the browser to the server. Binary data is handled specially, since it cannot be displayed as JavaScript literals in the script, unlike other types of data that can be displayed, such as numbers or text.

Recording Binary Data

WebLOAD supports recording binary data in a script in one of the following ways:

- Recording binary data as a data file, which is external to the script.
- Encoding binary data in the script, so that you can view and edit the data.

Recording Binary Data as a Data File

Modifying the script Options settings in the WebLOAD Recorder enables writing binary data into a data file, which is stored locally. When working with data files, only the name of the file is stored in the script itself.

Recording binary data as a data file, enables WebLOAD to simulate sending binary data to the application, although the data itself cannot be edited in the script.

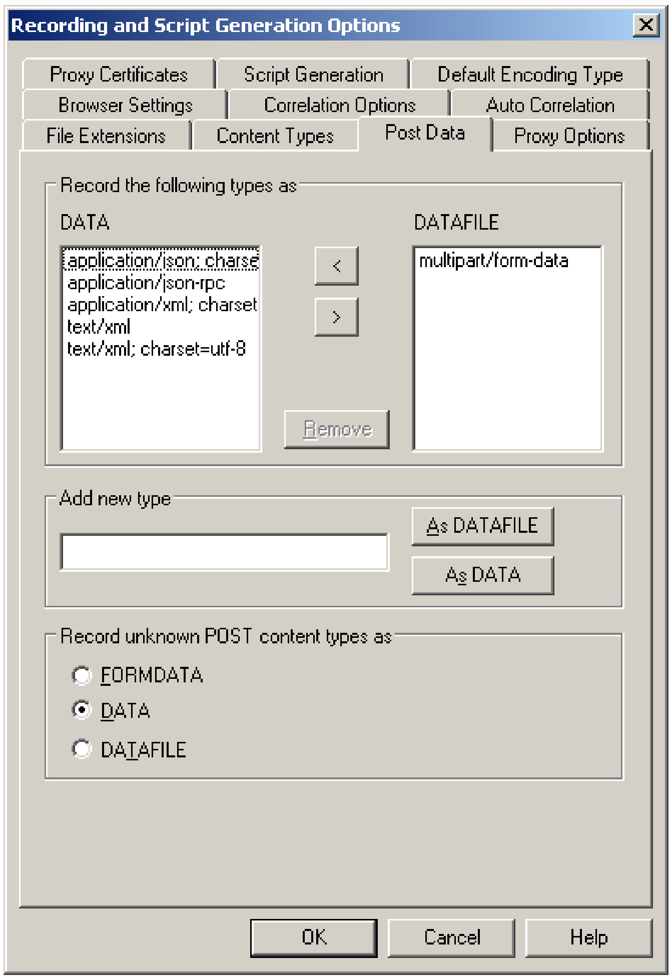
To record binary data as a data file:

1. In WebLOAD Recorder, select **Tools Recording and Script Generation Options**.

   The Recording and Script Generation Options dialog box appears.

2. In the Recording and Script Generation Options dialog box select the **Post Data** tab.

   The Post Data tab appears.



Record the following types as

DATA: application/json; charse, application/json-rpc, application/xml; charset, text/xml, text/xml; charset=utf-8

DATAFILE: multipart/form-data

Add new type

Record unknown POST content types as

( ) FORMDATA
(●) DATA
( ) DATAFILE

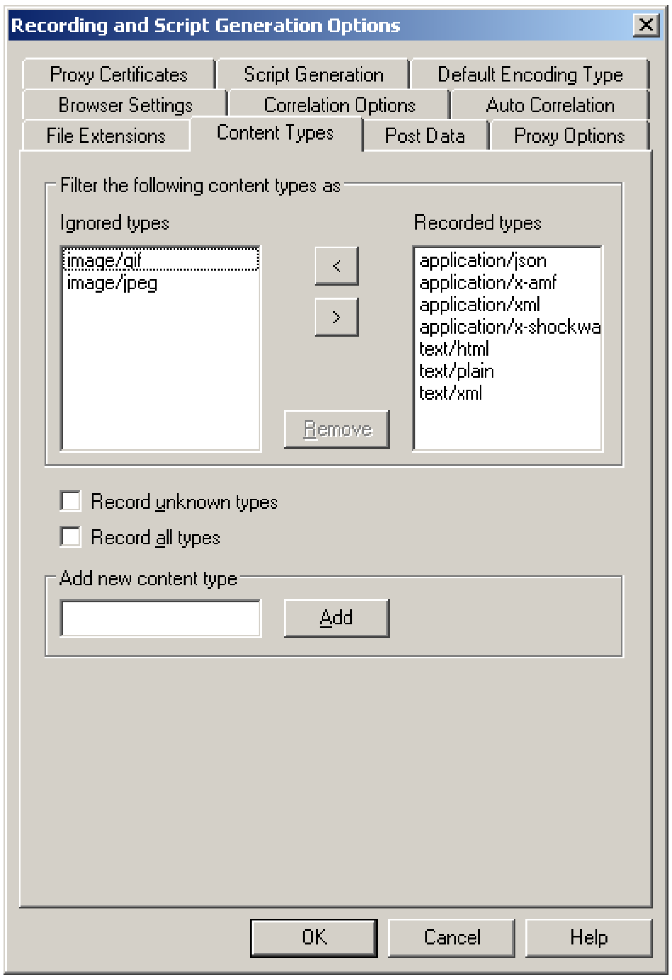
Figure 28: Recording and Script Generation Options – Post Data Tab

3. In the Add New Type field, enter the binary content-type, such as `application/x-amf`, which is used for binary content generated by a Flash application.
4. Click **As DATAFILE**.

   The binary content-type is added to the DATAFILE block list.

5. In the Recording and Script Generation Options dialog box, select the **Content Types** tab.

   The Content Types tab appears.


Recording and Script Generation Options

Tabs: Proxy Certificates | Script Generation | Default Encoding Type | Browser Settings | Correlation Options | Auto Correlation | File Extensions | Content Types | Post Data | Proxy Options

Filter the following content types as

Ignored types:
image/gif
image/jpeg

Recorded types:
application/json
application/x-amf
application/xml
application/x-shockwa
text/html
text/plain
text/xml

☐ Record unknown types
☐ Record all types

Add new content type

Figure 29: Recording and Script Generation Options – Content Types Tab

6. Ensure that the appropriate binary content-type appears in the Recorded Types area. If the content does not appear, add the binary content type in the Add new content type field and click **Add**.

   After setting the Record Option settings, binary data is stored in a local data file and the name of the file appears in the script.

The following sample script demonstrates how WebLOAD records binary data as a data file:

```
function InitAgenda()
{
CopyFile("wl2288601006.dat","wl2288601006.dat")
}
wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/flex/bin/Sample.html")

Sleep(9056)
```

```
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/flex/bin/Shop.swf"
wlHttp.Header["Content-type"] = "application/x-amf"
wlHttp.Header["Content-length"] = "58"
wlHttp.DataFile["Type"] = "application/x-amf"
wlHttp.DataFile["Filename"] = "wl2288601006.dat"
wlHttp.Post("http://www.webloadmpstore.com/flashservices/gateway
.php")
```

Encoding Binary Data in the script

Modifying the script Options settings in the WebLOAD Recorder enables the encoding of binary data in the script during the recording. Once recorded, the script can be edited, parameterized, and load tested as a regular script.

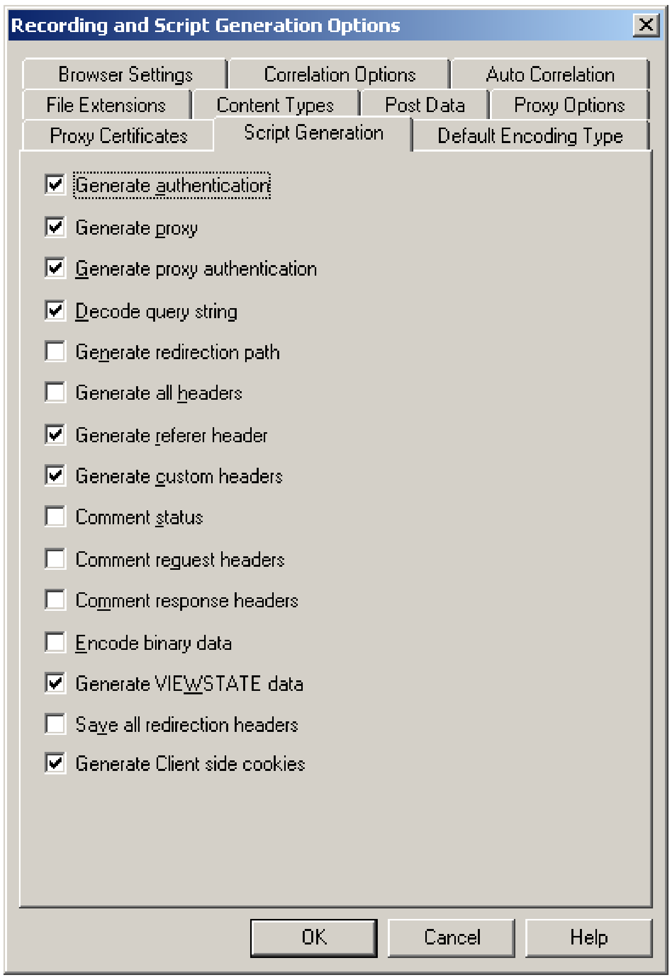
To enable encoding binary data in the script:

1. In WebLOAD Recorder, select the **Tools** ➤ **Recording and Script Generation Options** dialog box.

   The Recording and Script Generation Options dialog box appears.

2. In the Recording and Script Generation Options dialog box select the **Script Generation** tab.

   The Script Generation tab appears.


Recording and Script Generation Options

Browser Settings | Correlation Options | Auto Correlation | File Extensions | Content Types | Post Data | Proxy Options | Proxy Certificates | Script Generation | Default Encoding Type

- [✓] Generate authentication
- [✓] Generate proxy
- [✓] Generate proxy authentication
- [✓] Decode query string
- [ ] Generate redirection path
- [ ] Generate all headers
- [✓] Generate referer header
- [✓] Generate custom headers
- [ ] Comment status
- [ ] Comment request headers
- [ ] Comment response headers
- [ ] Encode binary data
- [✓] Generate VIEWSTATE data
- [ ] Save all redirection headers
- [✓] Generate Client side cookies

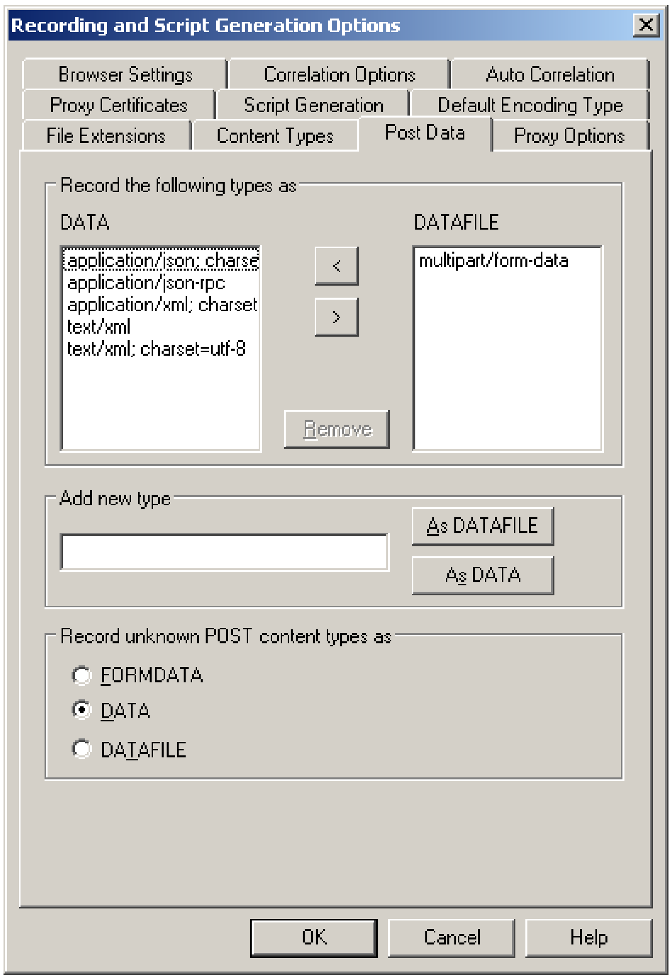
Figure 30: Recording and Script Generation Options - Script Generation Tab

3. Select the **Encode binary data** checkbox.

   This enables the user to view and parameterize the binary content.

4. In the Recording and Script Generation Options dialog box, select the **Post Data** tab.

   The Post Data tab appears.



Record the following types as

DATA: application/json; charse, application/json-rpc, application/xml; charset, text/xml, text/xml; charset=utf-8

DATAFILE: multipart/form-data

Add new type

Record unknown POST content types as: FORMDATA [✓ DATA] DATAFILE

Figure 31: Recording and Script Generation Options – Post Data Tab

5. In the Add New Type field, enter the binary content-type, such as `application/x-amf`, which is used for binary text generated by a Flash application.
6. Click **As DATA**.

   The binary content-type is added to the DATA block list.

7. In the Recording and Script Generation Options dialog box, select the **Content Types** tab.

   The Content Types tab appears (see Figure 29).

8. Ensure that the appropriate binary content-type appears in the Recorded Types area. If the content does not appear, add the binary content type in the Add new content type field and click **Add**.

After setting the Record Option settings, when binary data is recorded and encoded in a script, `wlHttp.EncodeRequestBinaryData = true` is automatically added to the script. This encodes the binary data into the following usable format:

```
wlHttp.Data["Value"] =
"%00%00%00%00%00%01%00/com.oreilly.frdg.SearchProducts.getSearch
Result%00%02/1%00%00%00%18%0a%00%00%00%01%03%00%06search%02%00%0
4wood%00%00%09"
```

The following sample script demonstrates how WebLOAD handles binary data encoded in the script:

```
function InitAgenda()
{

IncludeFile("wlamf.js",WLExecuteScript);
}
wlGlobals.GetFrames = false
wlHttp.EncodeRequestBinaryData = true
wlGlobals.UserAgent = "Mozilla/4.0 (compatible; MSIE 8.0;
Windows NT 5.1; Trident/4.0; .NET CLR 2.0.50727; .NET CLR
3.0.4506.2152; .NET CLR 3.5.30729; .NET CLR 1.1.4322)"
wlHttp.Get("http://www.webloadmpstore.com/flex/bin/Sample.html")

wlHttp.EncodeRequestBinaryData = true
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/flex/bin/Sample.html"
wlHttp.Get("http://www.webloadmpstore.com/flex/bin/history.htm")

wlHttp.EncodeRequestBinaryData = true
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/flex/bin/history.htm"
wlHttp.Get("http://www.webloadmpstore.com/flex/bin/history.swf")

wlHttp.EncodeRequestBinaryData = true
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/flex/bin/Sample.html"
wlHttp.Get("http://www.webloadmpstore.com/flex/bin/Shop.swf")

wlHttp.EncodeRequestBinaryData = true
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/flex/bin/Shop.swf"
wlHttp.Data["Type"] = "application/x-amf"
wlHttp.Data["Value"] =
"%00%03%00%00%00%01%00%15talkback.returnString%00%02/1%00%00%00%
15%0a%00%00%00%02%02%00%06George%02%00%04Bush"
wlHttp.Post("http://www.webloadmpstore.com/flashservices/gateway
.php")
```

Handling Authentication in the Script

WebLOAD supports working with scripts containing Basic, NTLM, and Kerberos user authentication methods.

WebLOAD handles authentication in playback in the following way:

1. WebLOAD sends a regular request with no request for authentication, to which the server responds with an "unauthorized" error (401), and a prompt to enter a username and password.
2. If WebLOAD is using:
   - **Basic authentication**, WebLOAD encrypts the username and password in `wlHttp.Username` and `wlHttp.Password`, and makes a request.
   - **NTLM authentication**, WebLOAD sets the following:

     `wlGlobals.AuthType = "NTLM"`, where `NTLM` is the default value if no authentication type is specified.
   - **Kerberos authentication**, WebLOAD sets the following:

     `wlGlobals.AuthType = "Kerberos"`.

     `wlGlobals.KDCServer = <server name>`. If no value is specified for `KDCServer`, the authentication type is automatically assumed to be `NTLM`, even if the `AuthType` is `Kerberos`.

The following examples demonstrate the authentication processes in WebLOAD.

Kerberos authentication:

```
wlGlobals.AuthType = "Kerberos"
wlGlobals.KDCServer = "mulier.qalab.internal"
wlHttp.NTPassWord = "Buga859"
wlHttp.NTUserName = "qalab.internal\\test"
wlHttp.Get("http://mulier.qalab.internal/")
```

NTLM authentication:

```
wlGlobals.AuthType = "NTLM"
wlHttp.NTPassWord = "Buga859"
wlHttp.NTUserName = "qalab.internal\\test"
wlHttp.Get("http://mulier.qalab.internal/")
```

OR

```
wlHttp.NTPassWord = "Buga859"
wlHttp.NTUserName = "qalab.internal\\test"
wlHttp.Get("http://mulier.qalab.internal/")
```

Basic authentication:

```
wlHttp.PassWord = "Buga859"
wlHttp.UserName = "test"
wlHttp.Get("http://mulier.qalab.internal/")
```

Chapter 5

Using Asynchronous Requests

Asynchronous HTTP Requests in WebLOAD

Regular HTTP requests in WebLOAD are synchronous, meaning that script execution is blocked whenever an HTTP request (such as wlHttp.Get, wlHttp.Post, etc.) is made, and continues once the request data is fully received. The response is then made available in the 'document' object. For example:

```
wlHttp.SaveSource=true;
wlHttp.Get("http://make/sync/request");
//execution blocked here until the full request is retrieved
InfoMessage(document.wlSource);
```

However in asynchronous requests, execution is not blocked, rather it immediately continues. Asynchronous requests are executed by calling the 'wlHttp.Async' property.

Using wlHttp.Async to Execute Requests Asynchronously

'wlHttp.Async' makes HTTP requests asynchronous. When using asynchronous requests, the script does not wait for the request to complete before moving on to the next statement. In order to work with the response, you can use the asynchronous callback functions:

- *onDocumentComplete* – Defines a callback function to be called after the asynchronous request has been completed. For example, it validates the response and makes a further request.
- *onDataReceived* – Defines a callback function to be called every time more data is received for the request. This is useful for working with asynchronous requests that need to be inspected before they are completed, for example in an HTTP streaming push scenario.

Using onDocumentComplete in Asynchronous Execution

In the regular HTTP request example shown above, the document cannot be accessed after the request is made because it is not yet available. In order to access the response document, you need to register a function that will be called when the response is available, using the 'onDocumentComplete' property. For example:

```
wlHttp.Async = true;
wlHttp.onDocumentComplete = function(document){
  InfoMessage("full response:" +
document.wlSource);
}
wlHttp.Get("http://make/async/request");
//document.wlSource is not available here.
Sleep(1000);
```

Using onDataReceived in Asynchronous Execution

To inspect the partial response as it is being received, use the 'onDataReceived' property. For example:

```
wlHttp.Async = true;
wlHttp.onDataReceived = function(document){
  InfoMessage("response so far:" + document.wlSource);
}
wlHttp.Get("http://make/async/request");
```

Push Protocols

The HTTP protocol is a request/response protocol, meaning that the server can respond to client requests, but cannot initiate unsolicited responses. Yet there are scenarios when the server is required to 'push' data to the client, for example, chat applications, user notifications, etc.

There are several techniques that can be used to achieve server push:

- **Polling**: the client (browser) sends a request to the server at regular intervals.
  For more information refer to *Using Polling Protocol in WebLOAD* (on page 155).
- **Long polling**: the client request is kept on hold until the server can deliver a valid response. When data from the server needs to be pushed, the server responds and closes the connection. The client is then expected to start a new connection and wait for the server's next message (response).
  For more information refer to *Using Long Polling in WebLOAD* (on page 155).
- **Streaming**: the client make a request. The server builds the response progressively as more data is available (for example, using 'chunked data'). The client reads and handles this data but keeps the connection open, waiting for more data to arrive.
  For more information refer to *Using HTTP Streaming in WebLOAD* (on page 156).

Using Polling Protocol in WebLOAD

Polling requests are regular, short requests, so there is no need for asynchronous code to implement them. Because the message sequence in playback can be different from the recorded one, it is useful to convert the polling requests to a loop.

For example, if the recorded agenda was:

```
wlHttp.Get("http://get-update");
Sleep(2000);
wlHttp.Get("http://get-update");
Sleep(2000);
wlHttp.Get("http://get-update");
Sleep(2000);
...
```

It can be converted to the following loop:

```
keepUpdating=true;
while(keepUpdating) {
  wlHttp.Get("http://get-update");
  if (document.wlSource=="LAST_MESSAGE") {
    keepUpdating=false;
  }
  Sleep(2000);
}
```

Using Long Polling in WebLOAD

Long polling is similar to polling, but the requests are blocked for longer.

Long polling can be implemented like polling above, but because it blocks script execution, other tasks cannot be performed, such as polling on two different URLs or running the polling in the background while performing other HTTP requests.

To run long polling alongside other tasks, asynchronous requests must be used. For example:

```
function getUpdates() {
 wlHttp.Async=true;
 wlHttp.onDocumentComplete=function(document){
   if (document.wlSource=="LAST_MESSAGE") {
     return;
   } else { //keep polling recursively:
     setTimeout(getUpdates,0);
   }
 }
 wlHttp.Get("http://get-update");
}
getUpdates();
//execution continues here...
wlHttp.Get("http://other-thing");
```

Using HTTP Streaming in WebLOAD

In HTTP streaming, the server response is never ending (or very long), and each new response data is considered a new 'message' (or it can be delimited with some delimiter).

To handle the server partial responses, the '*onDataReceived*' callback function should be used.

For example:

```
var prevIdx  = 0; //data seen so far
wlHttp.onDataReceived= function(document) {
  var currIdx = document.wlSource.length;
  if (currIdx <= prevIdx ) { //no new data
    return;
  }
  var msg = document.wlSource.substr(prevIdx, currIdx);
  prevIdx = currIdx;
  InfoMessage(msg );
}
```

Using setTimeout for Delayed Function Execution

The setTimeout() function is used to execute a callback function after a specified number of milliseconds, in a non-blocking manner. That is, script execution continues immediately, not waiting for the specified time or the function to execute.

The following example shows how setTimeout () is used when executing synchronous requests. In the example, a function is starting a long request that is waiting for a message to be sent two seconds after the request started. :

```
function sendMessage(){
  wlHttp.Post("http://send-some-message");
}
setTimeout(sendMessage, 2000);     //2 - after 2 seconds,
send.
```

```
wlHttp.Get("http://long-request"); //1 - start the long
request
```

Callback functions are expected to run in a timely manner, because a callback blocks the execution of other callback functions. Therefore Sleep() should not be used inside a callback function (for example, the functions used in onDocumentComplete, onDataReceived and setTimeout itself). Instead, use setTimeout() inside a callback function. For example:

```
wlHttp.Async=true;
wlHttp.onDocumentComplete=function(document){
  InfoMessage("got response, now send a reply after
3 seconds…");
  setTimeout(function(){
    wlHttp.Async=true;
    wlHttp.Get("http://send-reply-message");
  }, 3000);
}
wlHttp.Get("http://send-first-message");
```

Appendix A

Scripting Samples

This chapter provides sample scripts which you can adapt to your own scripts. Each scripting sample demonstrates different features that can be performed by editing your script's script.

The following scripting samples are provided:

- Basic Recording
- Correlation
- Parameterizing a script
- Using AJAX and Web services
- Using AJAX and JSON

Scripting Sample of a Basic Recording

The sample script in this section demonstrates how a basic script is recorded. This script is used as a basis for the scripts that appear in the following sections.

What the Script Does

- Records user actions in the website. This is done by recording the HTTP traffic between the browser and the Web server.
- Records Html form data sent from the browser.
- Records the `Get()` and `Post()` methods.

How to Create the Script

The basic script is created by starting to record in the WebLOAD Recorder, browsing through the www.webloadmpstore.com website, stopping the recording, and saving the script.

Step 1 – Starting to Record the script

1. In WebLOAD Recorder open a new script.
2. Click ● to start recording.
3. Browse to www.webloadmpstore.com in the browser that opens.

   The following script describing your action appears in the script.

```
wlGlobals.GetFrames = false
wlGlobals.UserAgent = "Mozilla/5.0 (Windows NT 6.1; WOW64;
Trident/7.0; rv:11.0) like Gecko"
wlHttp.Header["DNT"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/")
Sleep(9094)
```

Step 2 – Logging in to the Site

1. Click **Login** in the webloadmpstore website and the Login page appears. The script for this action is as follows:

```
wlHttp.Header["Referer"] = "http://www.webloadmpstore.com/"
wlHttp.Get("http://www.webloadmpstore.com/login.php")

Sleep(7704)
```

2. In the username and password fields, enter `demo-username` and `demo-password` to log in to the website.

   WebLOAD Recorder records the login action and simulates a script containing the username and password that you entered in the login page.

```
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/login.php"
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["login"] = "demo"
wlHttp.FormData["password"] = "demo"
wlHttp.FormData["sessionID"] =
"webloadmpstore.62.90.23.122.ae97bc7877d7bd4ebcb64c4c0e21ba1c"
wlHttp.FormData["event"] = "login"
wlHttp.FormData["Submit"] = "Login"
wlHttp.Post("http://www.webloadmpstore.com/login.php")

Sleep(3015)
```

   The site approves your login information and the WebLOAD MP Store home page appears.

```
wlHttp.Get("http://www.webloadmpstore.com/index.php")
Sleep(5282)
```

Step 3 – Purchasing a Product

1. From the product page, click **Debugging and Handling Dynamic Data** to view the product's additional details.

   A page with the product description for Debugging and Handling Dynamic Data appears.

```
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/index.php"
wlHttp.FormData["id"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/product.php")

Sleep(4984)
```

2. Click **Add to Cart** to purchase the product.

```
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/product.php?id=1"
wlHttp.FormData["event"] = "addproduct"
wlHttp.FormData["id"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/cart.php")
```

Step 4 – Saving the script

1. In WebLOAD Recorder, click 🟥 to stop recording the script.
2. Select **File ➤ Save As** to save the script.

   The Save As dialog box appears.

3. In the Save As dialog box browse to the following location: `D:\\Radview\\<Sample scripts folder>\\ script 1-Basic Recording script.wlp`
4. Click **Save**.

The Full script: script 1-Basic Recording script

Note: The WLIDE – URL comments throughout the script are modified to give the Agenda nodes meaningful names.

```
/***** WLIDE - URL : Open webloadmpstore home page - ID:2 *****/
wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/")
// END WLIDE
```

```
/***** WLIDE - Sleep - ID:3 *****/
Sleep(9094)
// END WLIDE

/***** WLIDE - URL : Open login page - ID:4 *****/
wlHttp.Header["Referer"] = "http://www.webloadmpstore.com/"
wlHttp.Get("http://www.webloadmpstore.com/login.php")
// END WLIDE

/***** WLIDE - Sleep - ID:5 *****/
Sleep(7704)
// END WLIDE

/***** WLIDE - URL :Insert login and password - ID:6 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/login.php"
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["login"] = "demo"
wlHttp.FormData["password"] = "demo"
wlHttp.FormData["sessionID"] =
"webloadmpstore.62.90.23.122.ae97bc7877d7bd4ebcb64c4c0e21ba1c"
wlHttp.FormData["event"] = "login"
wlHttp.FormData["Submit"] = "Login"
wlHttp.Post("http://www.webloadmpstore.com/login.php")
// END WLIDE

/***** WLIDE - Sleep - ID:7 *****/
Sleep(3015)
// END WLIDE

/***** WLIDE - URL : http://www.webloadmpstore.com/index.php -
ID:8 *****/
wlHttp.Get("http://www.webloadmpstore.com/index.php")
// END WLIDE

/***** WLIDE - Sleep - ID:9 *****/
Sleep(5282)
// END WLIDE

/***** WLIDE - URL : Select show product details - ID:10 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/index.php"
```

```
wlHttp.FormData["id"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/product.php")
// END WLIDE

/***** WLIDE - Sleep - ID:11 *****/
Sleep(4984)
// END WLIDE

/***** WLIDE - URL : Add to cart - ID:12 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/product.php?id=1"
wlHttp.FormData["event"] = "addproduct"
wlHttp.FormData["id"] = "1"
wlHttp.Get("http://www.webloadmpstore.com/cart.php")
// END WLIDE
```

Scripting Sample Using AJAX and Web Services

WebLOAD supports automatic recording of AJAX calls into the test script, enabling debugging and full access to all request data (headers and body), both in the script and during runtime. WebLOAD supports various formats for the AJAX payload: XML, JSON, other text-based formats, and binary data.

Besides demonstrating the use of AJAX calls, this script demonstrates the use of functions and external files in the script.

Storing sections of the logic in a function enables you to reuse the same lines of code without duplications, making the script more modular. A function can be part of your main script file or can be stored in a separate, external JavaScript file. When storing the function in a separate file, the main script file includes the function so that it can be used within the script.

One of the main benefits of including files in the script, is to reduce the maintenance needed for the scripts. The same included file can be used in a number of scripts simply by adding the include command and calling the function in the script.

Using included files is also more efficient. When the information in the included file needs to be updated, the included file is the only place that needs to be modified and the whole script will be affected. Without using an included file, you would need to search for every place that the information is used and update the information manually.

What the Script Does

- Demonstrates how to record user actions in a website that is accessed on a secure server.
- Demonstrates how WebLOAD supports AJAX and Web services.
- Demonstrate how to validate a Web Service reply by parsing the XML content of its SOAP message.
- Demonstrates how to modify a recorded script where a specific option is selected, so that the script can accept additional options during runtime.
- Demonstrates adding a function to the script.
- Demonstrates how to extract a login script to an external JavaScript file and then reuse the code in the script.

How to Create the Script

In this script, you will record a webpage that is accessed on a secure server. Once the script is recorded, you will modify the script so that during runtime, an InfoMessage notifies you whether your credit card information has been validated. This is done by adding a function that uses a Web Service to check the validation of the credit card and a parameter to store the result of the function.

You will create a function to store the script of the login process. Then, you can extract the function to an external file, which enables you to create a generic scenario, instead of a specific case. The function checks the login information received from the site and determines whether the user's login information is accurate. Although the login information was correct when the script was recorded, by modifying the script you can add additional scenarios to be accepted during runtime, such as, when the login information is incorrect.

This script also demonstrates WebLOAD's support of AJAX and Web services. During the recording, when the credit card information is being validated, the WebLOAD Recorder records the Web service transactions that take place within the application.

Step 1 – Entering Credit Card Information and Checking Out

1. Open the script3-Parametrizing a script.
2. Open a browser, navigate to the Cart page, and copy the URL of the page.
3. In the WebLOAD Recorder, click ● or select **Record ➤ Start Record** to start recording.
4. Paste the URL of the cart page in the browser that opens.

   The new script is appended to the end of the existing script.

5. In the cart page, click **Checkout**.

   The credit card information page appears. This page is an HTTPS page and is appended to the script as follows:

```
wlGlobals.GetFrames = false
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/cart.php?event=update&id=
2&quantity=3"
wlHttp.Get("https://www.webloadmpstore.com/checkout.php"
)
```

6. In the credit card information page, enter your credit card information and click **Done**. The script is recorded as follows:

```
wlGlobals.GetFrames = false
wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.FormData["wsdl"] = "$WL$VOID$STRING$"
wlHttp.Get("https://www.webloadmpstore.com/soap/server.p
hp")

wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.Data["Type"] = "text/xml; charset=utf-8"
wlHttp.Data["Value"] = "<?xml version=\"1.0\"
encoding=\"utf-8\"?><soap:Envelope
xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\"
xmlns:xsd=\"http://www.w3.org/2001/XMLSchema\"
xmlns:soap=\"http://schemas.xmlsoap.org/soap/envelope/\"
><soap:Body><checkValidity
xmlns=\"http://example.org/CreditCardProcess\"><strCardN
umber>ABCD</strCardNumber><strHolderID>AB1234</strHolder
ID></checkValidity></soap:Body></soap:Envelope>"

wlHttp.Post("https://www.webloadmpstore.com/soap/server.
php")

wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["name"] = "Radview"
wlHttp.FormData["address"] = "Hamelacha 14"
wlHttp.FormData["shippingAddress"] = "Park Afek"
wlHttp.FormData["cardNumber"] = "ABCD"
wlHttp.FormData["idNumber"] = "AB1234"
wlHttp.FormData["event"] = "process"
wlHttp.Post("https://www.webloadmpstore.com/checkout.php
")
```

7. In WebLOAD Recorder, click ■ to stop recording the script.

Step 2 – Adding the Results Parameter and ResultParser Function

1. Add a `results` parameter to the Validate Cred – Pass Node of the script.

   The `results` parameter stores a value received from the `resultParser` function, which checks whether your credit card information is valid. The HTTP response containing the result of the credit card validation Web Service (`document.wlXmls[0]`) that is extracted from the script, is sent to the `resultParser` function.

   The `results` parameter appears in the Validate Cred – Pass Node of the script as follows:

```
wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.Data["Type"] = "text/xml; charset=utf-8"
wlHttp.Data["Value"] = "<?xml version=\"1.0\"
encoding=\"utf-8\"?><soap:Envelope
xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\"
xmlns:xsd=\"http://www.w3.org/2001/XMLSchema\"
xmlns:soap=\"http://schemas.xmlsoap.org/soap/envelope/\"
><soap:Body><checkValidity
xmlns=\"http://example.org/CreditCardProcess\"><strCardN
umber>ABCD</strCardNumber><strHolderID>AB1234</strHolder
ID></checkValidity></soap:Body></soap:Envelope>"

wlHttp.Post("https://www.webloadmpstore.com/soap/server.
php")

results = resultParser( document.wlXmls[0] )
```

2. Create an infoMessage to notify you whether your credit card has been validated or not according to the `result` parameter value.

```
wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.Data["Type"] = "text/xml; charset=utf-8"
wlHttp.Data["Value"] = "<?xml version=\"1.0\"
encoding=\"utf-8\"?><soap:Envelope
xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\"
xmlns:xsd=\"http://www.w3.org/2001/XMLSchema\"
xmlns:soap=\"http://schemas.xmlsoap.org/soap/envelope/\"
><soap:Body><checkValidity
xmlns=\"http://example.org/CreditCardProcess\"><strCardN
umber>ABCD</strCardNumber><strHolderID>AB1234</strHolder
ID></checkValidity></soap:Body></soap:Envelope>"
```

```
wlHttp.Post("https://www.webloadmpstore.com/soap/server.
php")

results = resultParser( document.wlXmls[0] )
if (results == "1")
InfoMessage("Validation check return 'Check OK' like it
should")
else
InfoMessage("Validation check is not working correctly")
```

3. Add the `resultParser` function to the script, which checks whether your credit card information is valid. The function retrieves the information from `document.wlXmls[0]` in the `results` parameter and uses the built-in WebLOAD XML DOM to parse and return XML data to the parameter.

```
function resultParser (doc)
{
        //get 'Result' tags, we expect exactly one result:
        ResultsElements =
        doc.getElementsByTagName("Result")

        if ( ResultsElements.length != 1 )
        // Verify only one element with that name exists
        throw "Expecting a single Result tag. received " +
        ResultsElements.length + "elements"

        ResultElm = ResultsElements.item(0)

        if ( ResultElm.childNodes.length == 0 )
                return null
        else
        {
                Result = ResultElm.firstChild
                return Result.nodeValue
        }
}
```

Step 3 – Creating the External Login JavaScript File

1. Select the section of the script that is responsible for the login process.
2. Copy the script to a separate JavaScript file and save the file as `login_js.js`.

   The script in the `login_js.js` file is as follows:

```
function Login() {
strGlobalInputFileLine = GetLine(InFile1,",")
user_name = strGlobalInputFileLine[1]
password = strGlobalInputFileLine[2]

wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/")

Sleep(9094)

wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/"
wlHttp.Get("http://www.webloadmpstore.com/login.php")

Sleep(7704)

session_id = document.forms[1].elements[2].value

wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/login.php"
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["login"] = user_name
wlHttp.FormData["password"] = password
wlHttp.FormData["sessionID"] = session_id
wlHttp.FormData["event"] = "login"
wlHttp.FormData["Submit"] = "Login"
wlHttp.Post("http://www.webloadmpstore.com/login.php")
}
```

Step 4 – Including and Using the External File in the script

1. Include the external JavaScript file in the script by copying the following into the `InitAgenda()` function of the script:

   ```
   IncludeFile("login_js.js")
   ```
2. Drag the JavaScript object Building Block into the script.
3. Add the `rs` parameter that calls the login function from the included `login_js.js` file.

   ```
   rs = Login()
   ```
4. Save the script as script 4–Ajax and Web services.

The Full script: script 4-AJAX and Web Services

```
function InitAgenda()
{
InFile1 = CopyFile("P:\\Supporting Tools\\Sample
Scripts\\New\\InFile1.txt")
Open(InFile1)
IncludeFile("login_js.js")
}
/***** WLIDE -function resultParser - ID:33 *****/
function resultParser (doc)
{
  //get 'Result' tags, we expect exactly one result:
  ResultsElements = doc.getElementsByTagName("Result")

  if ( ResultsElements.length != 1 )
  // Verify only one element with that name exist
        throw "Expecting a single Result tag. received " +
        ResultsElements.length + "elements"

  ResultElm = ResultsElements.item(0)

  if ( ResultElm.childNodes.length == 0 )
        return null
  else
  {
        Result = ResultElm.firstChild
        return Result.nodeValue
  }
}
 // END WLIDE

/***** WLIDE - Login Function - ID:19 *****/
rs = Login()
 // END WLIDE

/***** WLIDE - Sleep - ID:7 *****/
Sleep(3015)
 // END WLIDE
```

```
/***** WLIDE - URL : http://www.webloadmpstore.com/index.php -
ID:8 *****/
wlHttp.Get("http://www.webloadmpstore.com/index.php")
 // END WLIDE

/***** WLIDE - Sleep - ID:9 *****/
Sleep(5282)
 // END WLIDE

/***** WLIDE - Parameterizing product ID and category number  -
ID:28 *****/
product_id = wlRand.Range(1,9)
quantity = wlRand.Range(1,12)
 // END WLIDE

/***** WLIDE - URL : Select show product details - ID:10 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/index.php"
wlHttp.FormData["id"] = product_id
wlHttp.Get("http://www.webloadmpstore.com/product.php")
 // END WLIDE

/***** WLIDE - Sleep - ID:11 *****/
Sleep(4984)
 // END WLIDE

/***** WLIDE - URL : Add to cart - ID:12 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/product.php?id=product_id"
wlHttp.FormData["event"] = "addproduct"
wlHttp.FormData["id"] = product_id
wlHttp.Get("http://www.webloadmpstore.com/cart.php")
 // END WLIDE

/***** WLIDE - URL : Product quantity - ID:17 *****/
wlGlobals.GetFrames = false
wlHttp.FormData["event"] = "update"
wlHttp.FormData["id"] = product_id
wlHttp.FormData["quantity"] = quantity
wlHttp.Get("http://www.webloadmpstore.com/cart.php")
 // END WLIDE
```

```
/***** WLIDE - URL : HTTPS - ID:22 *****/
wlGlobals.GetFrames = false
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/cart.php?event=update&id=2&quanti
ty=3"
wlHttp.Get("https://www.webloadmpstore.com/checkout.php")
 // END WLIDE

/***** WLIDE - URL :
https://www.webloadmpstore.com/soap/server.php?wsdl - ID:23
*****/
wlGlobals.GetFrames = false
wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.FormData["wsdl"] = "$WL$VOID$STRING$"
wlHttp.Get("https://www.webloadmpstore.com/soap/server.php")
 // END WLIDE

/***** WLIDE - URL : Validate Cred - Pass - ID:26 *****/
wlHttp.Header["Referer"] =
"https://www.webloadmpstore.com/checkout.php"
wlHttp.Data["Type"] = "text/xml; charset=utf-8"
wlHttp.Data["Value"] = "<?xml version=\"1.0\" encoding=\"utf-
8\"?><soap:Envelope
xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\"
xmlns:xsd=\"http://www.w3.org/2001/XMLSchema\"
xmlns:soap=\"http://schemas.xmlsoap.org/soap/envelope/\"><soap:B
ody><checkValidity
xmlns=\"http://example.org/CreditCardProcess\"><strCardNumber>AB
CD</strCardNumber><strHolderID>AB1234</strHolderID></checkValidi
ty></soap:Body></soap:Envelope>"

wlHttp.Post("https://www.webloadmpstore.com/soap/server.php")

results = resultParser( document.wlXmls[0] )
if (results == "1")
   InfoMessage("Validation check return 'Check OK' like it
   should")
else
   InfoMessage("Validation check is not working correctly")
 // END WLIDE

/***** WLIDE - URL : Confirm Order - ID:27 *****/
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["name"] = "Radview"
wlHttp.FormData["address"] = "Hamelacha 14"
wlHttp.FormData["shippingAddress"] = "Park Afek"
wlHttp.FormData["cardNumber"] = "ABCD"
wlHttp.FormData["idNumber"] = "AB1234"
wlHttp.FormData["event"] = "process"
wlHttp.Post("https://www.webloadmpstore.com/checkout.php")
 // END WLIDE
```

Scripting Sample Using AJAX and JSON to Validate a Web Server Response

WebLOAD supports automatic recording of AJAX calls into the test script using JSON, enabling debugging and full access to all request data (headers and body), both in the script and during runtime.

What the Script Does

- Demonstrates how WebLOAD supports AJAX and JSON.
- Demonstrates how to validate a Web service response.

How the Script Works

In this script, you will search for a product in the webloadmpstore site and in the search results page, you will request to see the site's statistics. The statistics displayed include the number of users online and the date and time. These statistics are updated every ten seconds to ensure their accuracy by using an asynchronous AJAX call. Each time the information is updated, the AJAX script is recorded in the script by WebLOAD Recorder.

The following steps demonstrate how to modify the AJAX script so that the WebLOAD Recorder displays the JSON information in the log view during runtime. This is done by adding an InfoMessage to the script, which displays the information based on the JSON response.

Step 1 – Recording AJAX Calls in the script

1. Start recording a new script and browse to www.webloadmpstore.com.

   The script is recorded as follows:

   ```
   wlGlobals.GetFrames = false
   wlHttp.Get("http://www.webloadmpstore.com/index.php")
   ```

2. In the webloadmpstore website, enter `WebLOAD` in the Search field and click **SEARCH**.

   The search results for WebLOAD appear. In the IDE the following script is recorded:

   ```
   wlHttp.Header["Referer"] =
   "http://www.webloadmpstore.com/index.php"
   wlHttp.ContentType = "application/x-www-form-urlencoded"
   wlHttp.FormData["event"] = "search"
   wlHttp.FormData["searchTerm"] = "webload"
   wlHttp.Post("http://www.webloadmpstore.com/search.php")
   ```

3. Check the **Show statistics** checkbox. The script in the script appears as follows:

   ```
   wlHttp.Header["Referer"] =
   "http://www.webloadmpstore.com/search.php"
   wlHttp.Get("http://www.webloadmpstore.com/usersonlinecou
   nter.php")
   ```

   New nodes are recorded repeatedly and added to the script as the site automatically refreshes itself every ten seconds.

4. After a few nodes have been added to the script, click 🟥 in WebLOAD Recorder to stop recording the script.

Step 2 – Parsing the JSON Response

1. In the `InitAgenda()` function in the script, define the global variable values of the `SaveSource` property as follows:

   ```
   function InitAgenda()
   {
   wlGlobals.SaveSource = true
   }
   ```

   This instructs WebLOAD to store the complete HTML source code downloaded in the `document.wlSource` object.

2. Drag the JavaScript object Building Block from the Toolbox to the Script Tree. In the Building Block, add a function that receives the `document.wlSource` object and manipulates it to retrieve the statistics. The script is as follows:

   ```
   function evalResponse (source) {
   json_response = eval("(" + source + ")")
   }
   ```

3. Create an `InfoMessage` to notify you of the statistic values during runtime. The edited script is as follows:

```
function evalResponse (source) {
     json_response = eval("(" + source + ")")
InfoMessage ( "The number of online users is: " +
json_response.usersOnline + " and The current time is: "
+ json_response.time)
}
```

4. In each of the AJAX calls recorded in the script, add a call to the newly created function:

```
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/search.php"
wlHttp.Get("http://www.webloadmpstore.com/usersonlinecou
nter.php")
evalResponse(document.wlSource)
```

5. Save the script as script 5-AJAX and JSON.

Step 3 – Displaying JSON Information During Runtime

- Run the script. Each time the browser refreshes itself, a message in the log view is displayed. The message contains the statistics recorded in the browser, including the time and number of users online:

```
The number of online users is: 1 and The current time
is: 11:23:11am
```

The Full script: script 5-AJAX and JSON

```
function InitAgenda()
{
wlGlobals.SaveSource = true
 // END WLIDE
}
/***** WLIDE - URL : Home Page  - ID:20 *****/
wlGlobals.GetFrames = false
wlHttp.Get("http://www.webloadmpstore.com/index.php")
 // END WLIDE

/***** WLIDE - Sleep - ID:22 *****/
Sleep(8371)
 // END WLIDE

/***** WLIDE -Search page - ID:23 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/index.php"
wlHttp.ContentType = "application/x-www-form-urlencoded"
wlHttp.FormData["event"] = "search"
wlHttp.FormData["searchTerm"] = "webload"
wlHttp.Post("http://www.webloadmpstore.com/search.php")
 // END WLIDE

/***** WLIDE - Sleep - ID:24 *****/
Sleep(8542)
 // END WLIDE

/***** WLIDE - JavaScriptObject - ID:27 *****/
function evalResponse (source) {
  json_response = eval("(" + source + ")")
  InfoMessage ( "The number of online users is: " +
  json_response.usersOnline + " and The current time is: " +
  json_response.time)
 }
 // END WLIDE

/***** WLIDE - URL : Ajax - ID:7 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/search.php"
wlHttp.Get("http://www.webloadmpstore.com/usersonlinecounter.php
")

evalResponse(document.wlSource)
 // END WLIDE

/***** WLIDE - Sleep - ID:8 *****/
Sleep(10811)
 // END WLIDE

/***** WLIDE - URL : Ajax - ID:9 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/search.php"
wlHttp.Get("http://www.webloadmpstore.com/usersonlinecounter.php
")

evalResponse(document.wlSource)
 // END WLIDE

/***** WLIDE - Sleep - ID:10 *****/
Sleep(10640)
 // END WLIDE
```

```
/***** WLIDE - URL : Ajax - ID:11 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/search.php"
wlHttp.Get("http://www.webloadmpstore.com/usersonlinecounter.php
")

evalResponse(document.wlSource)
 // END WLIDE

/***** WLIDE - Sleep - ID:12 *****/
Sleep(10655)
 // END WLIDE

/***** WLIDE - URL : Ajax - ID:13 *****/
wlHttp.Header["Referer"] =
"http://www.webloadmpstore.com/search.php"
wlHttp.Get("http://www.webloadmpstore.com/usersonlinecounter.php
")

evalResponse(document.wlSource)
 // END WLIDE
```

Appendix B

LiveConnect Overview

This appendix describes using LiveConnect technology to let Java and JavaScript code communicate with each other. LiveConnect is a registered trademark of Netscape Communications Corporation. This information is provided by Netscape, and can be found in the JavaScript Reference site at http://www.js-examples.com/page/reference__partjava.html).

This appendix assumes you are familiar with Java programming. For additional information on LiveConnect, see the LiveConnect information on the Mozilla Developer Center (http://developer.mozilla.org/en/docs/LiveConnect).

Working with Wrappers

In JavaScript, a *wrapper* is an object of the target language data type that encloses an object of the source language. On the JavaScript side, you can use a wrapper object to access methods and fields of the Java object; calling a method or accessing a property on the wrapper results in a call on the Java object. On the Java side, JavaScript objects are wrapped in an instance of the class netscape.javascript.JSObject and passed to Java.

When a JavaScript object is sent to Java, the runtime engine creates a Java wrapper of type JSObject. When a JSObject is sent from Java to JavaScript, the runtime engine unwraps the JSObject revealing the original JavaScript object type. The JSObject class provides an interface for invoking JavaScript methods and examining JavaScript properties.

JavaScript to Java Communication

When you refer to a Java package or class, or work with a Java object or array, you use one of the special LiveConnect objects. All JavaScript access to Java takes place with these objects, which are summarized in the following table.

Table 9: The LiveConnect object set

Object	Description
`JavaArray`	A wrapped Java array, accessed from within JavaScript code.
`JavaClass`	A JavaScript reference to a Java class.
`JavaObject`	A wrapped Java object, accessed from within JavaScript code.
`JavaPackage`	A JavaScript reference to a Java package.

Note: Because Java is a strongly typed language and JavaScript is weakly typed, the JavaScript runtime engine converts argument values into the appropriate data types for the other language when you use LiveConnect. See *Data Type Conversions* (on page 185), for more information.

In some ways, the existence of the LiveConnect objects is transparent, because you interact with Java in a fairly intuitive way. For example, you can create a Java String object and assign it to the JavaScript variable `myString` by using the new operator with the Java constructor, as follows:

```
var myString = new java.lang.String("Hello world")
```

In the previous example, the variable myString is a JavaObject because it holds an instance of the Java object String. As a JavaObject, `myString` has access to the public instance methods of `java.lang.String` and its superclass, `java.lang.Object`. These Java methods are available in JavaScript as methods of the JavaObject, and you can call them as follows:

```
myString.length() // returns 11
```

The Packages Object

If a Java class is not part of the java, sun, or netscape packages, you access it with the Packages object. For example, suppose the Redwood Corporation uses a Java package called redwood to contain various Java classes that it implements.

To create an instance of the HelloWorld class in redwood, you access the constructor of the class as follows:

```
var red = new Packages.redwood.HelloWorld()
```

You can also access classes in the default package (that is, classes that don't explicitly name a package). For example, if the HelloWorld class is directly in the CLASSPATH and not in a package, you can access it as follows:

```
var red = new Packages.HelloWorld()
```

The LiveConnect java, sun, and netscape objects provide shortcuts for commonly used Java packages. For example, you can use the following:

```
var myString = new java.lang.String("Hello world")
```

instead of the longer version:

```
var myString = new Packages.java.lang.String("Hello world")
```

Working with Java Arrays

When any Java method creates an array and you reference that array in JavaScript, you are working with a JavaArray. For example, the following code creates the JavaArray x with ten elements of type int:

```
x = java.lang.reflect.Array.newInstance(java.lang.Integer, 10)
```

Like the JavaScript Array object, JavaArray has a length property that returns the number of elements in the array. Unlike Array.length, JavaArray.length is a read-only property, because the number of elements in a Java array are fixed at the time of creation.

Package and Class References

Simple references to Java packages and classes from JavaScript create the JavaPackage and JavaClass objects. In the earlier example about the Redwood corporation, for example, the reference Packages.redwood is a JavaPackage object. Similarly, a reference such as java.lang.String is a JavaClass object.

Most of the time, you don't have to worry about the JavaPackage and JavaClass objects—you just work with Java packages and classes, and LiveConnect creates these objects transparently.

In JavaScript 1.3 and earlier, JavaClass objects are not automatically converted to instances of java.lang.Class when you pass them as parameters to Java methods--you must create a wrapper around an instance of java.lang.Class. In the following example, the forName method creates a wrapper object theClass, which is then passed to the newInstance method to create an array.

```
// JavaScript 1.3
theClass = java.lang.Class.forName("java.lang.String")
theArray = java.lang.reflect.Array.newInstance(theClass, 5)
```

In JavaScript 1.4 and later, you can pass a JavaClass object directly to a method, as shown in the following example:

```
// JavaScript 1.4
theArray =
  java.lang.reflect.Array.newInstance(java.lang.String, 5)
```

Arguments of Type Char

In JavaScript 1.4 and later, you can pass a one-character string to a Java method that requires an argument of type char. For example, you can pass the string "`H`" to the Character constructor as follows:

```
c = new java.lang.Character("H")
```

In JavaScript 1.3 and earlier, you must pass such methods an integer that corresponds to the Unicode value of the character. For example, the following code also assigns the value "H" to the variable c:

```
c = new java.lang.Character(72)
```

Handling Java Exceptions in JavaScript

When Java code fails at run time, it throws an exception. If your JavaScript code accesses a Java data member or method and fails, the Java exception is passed on to JavaScript for you to handle. Beginning with JavaScript 1.4, you can catch this exception in a `try...catch` statement.

For example, suppose you are using the Java `forName` method to assign the name of a Java class to a variable called `theClass`. The `forName` method throws an exception if the value you pass it does not evaluate to the name of a Java class. Place the `forName` assignment statement in a try block to handle the exception, as follows:

```
function getClass(javaClassName) {
  try {
       var theClass = java.lang.Class.forName(javaClassName);
  } catch (e) {
       return ("The Java exception is " + e);
  }
  return theClass
}
```

In this example, if javaClassName evaluates to a legal class name, such as "java.lang.String", the assignment succeeds. If javaClassName evaluates to an invalid class name, such as "String", the getClass function catches the exception and returns something similar to the following:

```
The Java exception is java.lang.ClassNotFoundException: String
```

See *Exception Handling Statements* (on page 193), for more information about JavaScript exceptions.

Java to JavaScript Communication

If you want to use JavaScript objects in Java, you must import the netscape.javascript package into your Java file. This package defines the following classes:

- netscape.javascript.JSObject allows Java code to access JavaScript methods and properties.
- netscape.javascript.JSException allows Java code to handle JavaScript errors.

Starting with JavaScript 1.2, these classes are delivered in a `.jar` file; in previous versions of JavaScript, these classes are delivered in a `.zip` file. See *JSException and JSObject Classes* (on page 196), for more information about these classes.

To access the LiveConnect classes, place the `.jar` or `.zip` file in the CLASSPATH of the JDK compiler in either of the following ways:

- Create a CLASSPATH environment variable to specify the path and name of `.jar` or `.zip` file.
- Specify the location of `.jar` or `.zip` file when you compile by using the -classpath command line parameter.

For example, in Navigator 4.0 for Windows NT, the classes are delivered in the `java40.jar` file in the Program\Java\Classes directory beneath the Navigator directory.

To specify an environment variable in Windows NT:

1. Double-click the **System** icon in the Control Panel.
2. Create a user environment variable called CLASSPATH with a value similar to the following:

```
        D:\Navigator\Program\Java\Classes\java40.jar
```

See the Sun JDK documentation for more information about CLASSPATH.

Note: Because Java is a strongly typed language and JavaScript is weakly typed, the JavaScript runtime engine converts argument values into the appropriate data types for the other language when you use LiveConnect. See *Data Type Conversions* (on page 185), for complete information.

Using the LiveConnect Classes

All JavaScript objects appear within Java code as instances of netscape.javascript.JSObject. When you call a method in your Java code, you can pass it a JavaScript object as one of its argument. To do so, you must define the corresponding formal parameter of the method to be of type JSObject.

Also, any time you use JavaScript objects in your Java code, you should put the call to the JavaScript object inside a `try...catch` statement that handles exceptions of type netscape.javascript.JSException. This allows your Java code to handle errors in JavaScript code execution that appear in Java as exceptions of type JSException.

Accessing JavaScript with JSObject

For example, suppose you are working with the Java class called JavaDog. As shown in the following code, the JavaDog constructor takes the JavaScript object jsDog, which is defined as type JSObject, as an argument:

```
import netscape.javascript.*;
public class JavaDog
{
  public String dogBreed;
  public String dogColor;
  public String dogSex;

  // define the class constructor
  public JavaDog(JSObject jsDog)
  {
       // use try...catch to handle JSExceptions here
       this.dogBreed = (String)jsDog.getMember("breed");
       this.dogColor = (String)jsDog.getMember("color");
       this.dogSex = (String)jsDog.getMember("sex");
  }
}
```

Note: The getMember method of JSObject is used to access the properties of the JavaScript object. The previous example uses getMember to assign the value of the JavaScript property jsDog.breed to the Java data member JavaDog.dogBreed.

A more realistic example would place the call to getMember inside a `try...catch` statement to handle errors of type JSException. See *Handling JavaScript Exceptions in Java* (on page 183), for more information.

To get a better sense of how getMember works, look at the definition of the custom JavaScript object Dog:

```
function Dog(breed,color,sex) {
  this.breed = breed
  this.color = color
  this.sex = sex
}
```

You can create a JavaScript instance of Dog called gabby as follows:

```
gabby = new Dog("lab","chocolate","female")
```

If you evaluate gabby.color, you can see that it has the value "chocolate". Now suppose you create an instance of JavaDog in your JavaScript code by passing the gabby object to the constructor as follows:

```
javaDog = new Packages.JavaDog(gabby)
```

If you evaluate javaDog.dogColor, you can see that it also has the value "chocolate", because the getMember method in the Java constructor assigns dogColor the value of gabby.color.

Handling JavaScript Exceptions in Java

When JavaScript code called from Java fails at run time, it throws an exception. If you are calling the JavaScript code from Java, you can catch this exception in a `try...catch` statement. The JavaScript exception is available to your Java code as an instance of netscape.javascript.JSException.

JSException is a Java wrapper around any exception type thrown by JavaScript, similar to the way that instances of JSObject are wrappers for JavaScript objects. Use JSException when you are evaluating JavaScript code in Java.

When you are evaluating JavaScript code in Java, the following situations can cause run-time errors:

- The JavaScript code is not evaluated, either due to a JavaScript compilation error or to some other error that occurred at run time.

  The JavaScript interpreter generates an error message that is converted into an instance of JSException.

- Java successfully evaluates the JavaScript code, but the JavaScript code executes an unhandled throw statement.

  JavaScript throws an exception that is wrapped as an instance of `JSException`. Use the `getWrappedException` method of `JSException` to unwrap this exception in Java.

For example, suppose the Java object eTest evaluates the string jsCode that you pass to it. You can respond to either type of run-time error the evaluation causes by implementing an exception handler such as the following:

```
import netscape.javascript.JSObject;
import netscape.javascript.JSException;

public class eTest {
  public static Object doit(JSObject obj, String jsCode) {
        try {
             obj.eval(jsCode);
        } catch (JSException e) {
             if (e.getWrappedException()==null)
             return e;
             return e.getWrappedException();
        }
        return null;
   }
}
```

In this example, the code in the try block attempts to evaluate the string jsCode that you pass to it. Let's say you pass the string "`myFunction()`" as the value of jsCode. If myFunction is not defined as a JavaScript function, the JavaScript interpreter cannot evaluate jsCode. The interpreter generates an error message, the Java handler catches the message, and the doit method returns an instance of netscape.javascript.JSException.

However, suppose myFunction is defined in JavaScript as follows:

```
function myFunction() {
   try {
          if (theCondition == true) {
               return "Everything's ok";
          } else {
               throw "JavaScript error occurred" ;
          }
   } catch (e) {
          if (canHandle == true) {
               handleIt();
          } else {
               throw e;
          }
   }
}
```

If theCondition is false, the function throws an exception. The exception is caught in the JavaScript code, and if canHandle is true, JavaScript handles it. If canHandle is false, the exception is rethrown, the Java handler catches it, and the doit method returns a Java string:

```
JavaScript error occurred
```

See *Exception Handling Statements* (on page 193), for complete information about JavaScript exceptions.

Backward Compatibility

In JavaScript 1.3 and earlier versions, the JSException class had three public constructors that optionally took a string argument, specifying the detail message or other information for the exception. The getWrappedException method was not available.

Use a `try...catch` statement such as the following to handle LiveConnect exceptions in JavaScript 1.3 and earlier versions:

```
try {
  global.eval("foo.bar = 999;");
} catch (Exception e) {
  if (e instanceof JSException) {
        jsCodeFailed()";
  } else {
        otherCodeFailed();
  }
}
```

In this example, the eval statement fails if foo is not defined. The catch block executes the jsCodeFailed method if the eval statement in the try block throws a JSException; the otherCodeFailed method executes if the try block throws any other error.

Data Type Conversions

Because Java is a strongly typed language and JavaScript is weakly typed, the JavaScript runtime engine converts argument values into the appropriate data types for the other language when you use LiveConnect.

JavaScript to Java Conversions

When you call a Java method and pass it parameters from JavaScript, the data types of the parameters you pass in are converted according to the rules described in the following sections:

- *Number Values* (on page 186)
- *Boolean Values* (on page 187)
- *String Values* (on page 187)
- *Undefined Values* (on page 188)
- *Null Values* (on page 189)
- *JavaArray and JavaObject Objects* (on page 189)

- *JavaClass Objects* (on page 190)
- *Other JavaScript Objects* (on page 191)

The return values of methods of netscape.javascript.JSObject are always converted to instances of java.lang.Object. The rules for converting these return values are also described in these sections.

For example, if JSObject.eval returns a JavaScript number, you can find the rules for converting this number to an instance of java.lang.Object in *Number Values* (on page 186).

Number Values

When you pass JavaScript number types as parameters to Java methods, Java converts the values according to the rules described in the following table:

Table 10: Number type conversion rules

Java parameter type	Conversion rules
`double`	The exact value is transferred to Java without rounding and without a loss of magnitude or sign.
`lava.lang.Double` `java.lang.Object`	A new instance of java.lang.Double is created, and the exact value is transferred to Java without rounding and without a loss of magnitude or sign.
`float`	Values are rounded to float precision. Values that are unrepresentably large or small are rounded to +infinity or -infinity.

`byte` `char`
`int` `long`
`short`
	Values are rounded using round-to-negative-infinity mode.
	Values that are unrepresentably large or small result in a run-time error.
	NaN values are converted to zero.

`java.lang.String`	Values are converted to strings. For example: 237 becomes "237"
`boolean`	0 and NaN values are converted to false. Other values are converted to true.

When a JavaScript number is passed as a parameter to a Java method that expects an instance of java.lang.String, the number is converted to a string. Use the == operator to compare the result of this conversion with other string values.

Boolean Values

When you pass JavaScript Boolean types as parameters to Java methods, Java converts the values according to the rules described in the following table:

Table 11: Boolean type conversion rules

Java parameter type	Conversion rules
`boolean`	All values are converted directly to the Java equivalents.
lava.lang.Boolean java.lang.Object	A new instance of java.lang.Boolean is created. Each parameter creates a new instance, not one instance with the same primitive value.
java.lang.String	Values are converted to strings. For example: true becomes "true" false becomes "false"

`byte` `char`
`double` `float`
`int` `long`
`short`
	true becomes 1
	false becomes 0

When a JavaScript Boolean is passed as a parameter to a Java method that expects an instance of java.lang.String, the Boolean is converted to a string. Use the == operator to compare the result of this conversion with other string values.

String Values

When you pass JavaScript string types as parameters to Java methods, Java converts the values according to the rules described in the following table:

Table 12: String type conversion rules

Java parameter type	Conversion rules
`lava.lang.String` `java.lang.Object`	JavaScript 1.4: A JavaScript string is converted to an instance of java.lang.String with a Unicode value. JavaScript 1.3 and earlier: A JavaScript string is converted to an instance of java.lang.String with an ASCII value.

Java parameter type	Conversion rules
`byte` `double` `float` `int` `long` `short`	All values are converted to the appropriate numbers.
`char`	JavaScript 1.4: One-character strings are converted to Unicode characters. All other values are converted to numbers. JavaScript 1.3 and earlier: All values are converted to numbers.
`boolean`	The empty string becomes false. All other values become true.

Undefined Values

When you pass undefined JavaScript values as parameters to Java methods, Java converts the values according to the rules described in the following table:

Table 13: Undefined type conversion rules

Java parameter type	Conversion rules
`lava.lang.String` `java.lang.Object`	The value is converted to an instance of java.lang.String whose value is the string "undefined".
`boolean`	The value becomes false.
`double` `float`	The value becomes NaN.
`byte` `char` `int` `long` `Short`	The value becomes 0.

The undefined value conversion is possible in JavaScript 1.3 and later versions only. Earlier versions of JavaScript do not support undefined values.

When a JavaScript undefined value is passed as a parameter to a Java method that expects an instance of java.lang.String, the undefined value is converted to a string. Use the == operator to compare the result of this conversion with other string values.

Null Values

When you pass null JavaScript values as parameters to Java methods, Java converts the values according to the rules described in the following table:

Table 14: Null value conversion rules

Java parameter type	Conversion rules
Any class, any interface type	The value becomes null.
`byte` `char` `double` `float` `int` `long` `short`	The value becomes 0.
`boolean`	The value becomes false.

JavaArray and JavaObject Objects

In most situations, when you pass a JavaScript JavaArray or JavaObject as a parameter to a Java method, Java simply unwraps the object; in a few situations, the object is coerced into another data type according to the rules described in the following table:

Table 15: JavaArray and JavaObject type conversion rules

Java parameter type	Conversion rules
Any interface or class that is assignment-compatible with the unwrapped object.	The object is unwrapped.
`java.lang.String`	The object is unwrapped, the `toString` method of the unwrapped Java object is called, and the result is returned as a new instance of `java.lang.String`.
`byte` `char` `double` `float` `int` `long` `short`	The object is unwrapped, and either of the following situations occur: • If the unwrapped Java object has a `doubleValue` method, the `JavaArray` or JavaObject is converted to the value returned by this method. • If the unwrapped Java object does not have a `doubleValue` method, an error occurs.

Java parameter type	Conversion rules
`boolean`	In JavaScript 1.3 and later versions, the object is unwrapped and either of the following situations occur: • If the object is null, it is converted to false. • If the object has any other value, it is converted to true. In JavaScript 1.2 and earlier versions, the object is unwrapped and either of the following situations occur: • If the unwrapped object has a `booleanValue` method, the source object is converted to the return value. • If the object does not have a `booleanValue` method, the conversion fails.

An interface or class is assignment-compatible with an unwrapped object if the unwrapped object is an instance of the Java parameter type. That is, the following statement must return true:

```
unwrappedObject instanceof parameterType
```

JavaClass Objects

When you pass a JavaScript JavaClass object as a parameter to a Java method, Java converts the object according to the rules described in the following table:

Table 16: JavaClass object conversion rules

Java parameter type	Conversion rules
`java.lang.Class`	The object is unwrapped.
`java.lang.JSObject` `java.lang.Object`	The JavaClass object is wrapped in a new instance of java.lang.JSObject.
`java.lang.String`	The object is unwrapped, the toString method of the unwrapped Java object is called, and the result is returned as a new instance of java.lang.String.

Java parameter type	Conversion rules
`boolean`	In JavaScript 1.3 and later versions, the object is unwrapped and either of the following situations occur: • If the object is null, it is converted to false. • If the object has any other value, it is converted to true. In JavaScript 1.2 and earlier versions, the object is unwrapped and either of the following situations occur: • If the unwrapped object has a booleanValue method, the source object is converted to the return value. • If the object does not have a booleanValue method, the conversion fails.

Other JavaScript Objects

When you pass any other JavaScript object as a parameter to a Java method, Java converts the object according to the rules described in the following table:

Table 17: Other JavaScript Object Conversion Rules

Java parameter type	Conversion rules
`java.lang.JSObject` `java.lang.Object`	The object is wrapped in a new instance of java.lang.JSObject.
`java.lang.String`	The object is unwrapped, the toString method of the unwrapped Java object is called, and the result is returned as a new instance of java.lang.String.

`byte` `char`
`Double` `float`
`int` `long`
`short`
	The object is converted to an appropriate value using the logic of the ToPrimitive operator. The *PreferredType* hint used with this operator is Number.

Java parameter type	Conversion rules
`boolean`	In JavaScript 1.3 and later versions, the object is unwrapped and either of the following situations occur: • If the object is null, it is converted to false. • If the object has any other value, it is converted to true. In JavaScript 1.2 and earlier versions, the object is unwrapped and either of the following situations occur: • If the unwrapped object has a `booleanValue` method, the source object is converted to the return value. • If the object does not have a `booleanValue` method, the conversion fails.

Java to JavaScript Conversions

Values passed from Java to JavaScript are converted as follows:

- Java byte, char, short, int, long, float, and double are converted to JavaScript numbers.
- A Java Boolean is converted to a JavaScript Boolean.
- An object of class `netscape.javascript.JSObject` is converted to the original JavaScript object.
- Java arrays are converted to a JavaScript pseudo-Array object; this object behaves just like a JavaScript Array object: you can access it with the syntax `arrayName[index]` (where index is an integer), and determine its length with `arrayName.length`.
- A Java object of any other class is converted to a JavaScript wrapper, which can be used to access methods and fields of the Java object:
  - Converting this wrapper to a string calls the toString method on the original object.
  - Converting to a number calls the doubleValue method, if possible, and fails otherwise.
  - Converting to a Boolean in JavaScript 1.3 and later versions returns false if the object is null, and true otherwise.
  - Converting to a Boolean in JavaScript 1.2 and earlier versions calls the booleanValue method, if possible, and fails otherwise.

Note: Instances of `java.lang.Double` and `java.lang.Integer` are converted to JavaScript objects, not to JavaScript numbers. Similarly, instances of `java.lang.String` are also converted to JavaScript objects, not to JavaScript strings.

Java String objects also correspond to JavaScript wrappers. If you call a JavaScript method that requires a JavaScript string and pass it this wrapper, you'll get an error. Instead, convert the wrapper to a JavaScript string by appending the empty string to it, as shown here:

```
var JavaString = JavaObj.methodThatReturnsAString();
var JavaScriptString = JavaString + "";
```

Exception Handling Statements

You can throw and catch exceptions using the `throw` and `try...catch` statements. You also use the `try...catch` statement to handle Java exceptions. See *Handling Java Exceptions in JavaScript* (on page 180), and *Handling JavaScript Exceptions in Java* (on page 183), for information.

The Throw Statement

Use the `throw` statement to throw an exception. When you throw an exception, you specify an expression containing the value of the exception:

```
throw expression
```

The following code throws several exceptions.

```
throw "Error2"  // generates an exception with a string value
throw 42        // generates an exception with the value 42
throw true      // generates an exception with the value true
```

You can specify an object when you throw an exception. You can then reference the object's properties in the `catch` block. The following example creates an object `myUserException` of type `UserException` and uses it in a `throw` statement.

```
// Create an object type UserException
function UserException (message) {
  this.message=message
  this.name="UserException"
}
// Create an instance of the object type and throw it
myUserException=new UserException("Value too high")
throw myUserException
```

The Try...Catch Statement

The `try...catch` statement marks a block of statements to try, and specifies a response should an exception be thrown. If an exception is thrown, the `try...catch` statement catches it.

Note: There are some exceptions that are not caught with the `try...catch` statement. This includes the HTTP errors, which are thrown by the HTTP server.

The `try...catch` statement consists of the following:

- A `try` block, which contains one or more statements.
- A `catch` block, containing statements that specify what to do if an exception is thrown in the `try` block.

  That is, you want the `try` block to succeed, and if it does not succeed, you want control to pass to the `catch` block.

  If any statement within the `try` block (or in a function called from within the `try` block) throws an exception, control immediately shifts to the `catch` block. If no exception is thrown in the `try` block, the `catch` block is skipped.
- The `finally` block executes after the `try` and `catch` blocks execute but before the statements following the `try...catch` statement.

The following example uses a `try...catch` statement. The example calls a function that retrieves a month name from an array based on the value passed to the function. If the value does not correspond to a month number (1-12), an exception is thrown with the value `"InvalidMonthNo"` and the statements in the `catch` block set the `monthName` variable to `"unknown"`.

```
function getMonthName (mo) {
   // Adjust month number for array index (1=Jan, 12=Dec)
   mo=mo-1
   var months=new Array ("Jan","Feb","Mar","Apr","May",
          "Jun","Jul","Aug","Sep","Oct","Nov","Dec")
   if (months[mo] != null) {
          return months[mo]
   } else {
          throw "InvalidMonthNo"
   }
}
try {
   // statements to try
   monthName=getMonthName(myMonth)
   // function could throw exception
}
catch (e) {
   monthName="unknown"
   logMyErrors(e)
   // pass exception object to error handler
}
```

The Catch Block

Use the `try...catch` statement's `catch` block (*recovery* block) to execute error-handling code. A `catch` block looks as follows:

```
catch (catchID) {
   statements
}
```

Every `catch` block specifies an identifier (`catchID` in the preceding syntax) that holds the value specified by the `throw` statement; you can use this identifier to get information about the exception that was thrown. JavaScript creates this identifier when the `catch` block is entered; the identifier lasts only for the duration of the `catch block`; after the `catch` block finishes executing, the identifier is no longer available.

For example, the following code throws an exception. When the exception occurs, control transfers to the `catch` block.

```
try {
   throw "myException" // generates an exception
}
catch (e) {
   // statements to handle any exceptions
   logMyErrors(e) // pass exception object to error handler
}
```

The Finally Block

The `finally` block contains statements to execute after the `try` and `catch` blocks execute but before the statements following the `try...catch` statement. The `finally` block executes whether or not an exception is thrown. If an exception is thrown, the statements in the `finally` block execute even if no `catch` block handles the exception.

You can use the `finally` block to make your script fail gracefully when an exception occurs; for example, you may need to release a resource that your script has tied up. The following example opens a file and then executes statements that use the file (server-side JavaScript allows you to access files). If an exception is thrown while the file is open, the `finally` block closes the file before the script fails.

```
try {
   openMyFile()   // tie up a resource
   writeMyFile(theData)
}
finally {
   closeMyFile() // always close the resource
}
```

Nesting Try...Catch Statements

You can nest one or more `try...catch` statements. If an inner `try...catch` statement does not have a `catch` block, the enclosing `try...catch` statement's `catch` block is checked for a match.

JSException and JSObject Classes

This section describes the JSException and JSObject Classes.

JSException Class

The public class JSException extends RuntimeException.

```
java.lang.Object
   |
   +---java.lang.Throwable
          |
          +---java.lang.Exception
                 |
                 +---java.lang.RuntimeException
                        |
                        +----netscape.javascript.JSException
```

Description

JSException is an exception that is thrown when JavaScript code returns an error.

Constructor Summary

The netscape.javascript.JSException class has the following constructors:

Table 18: JSException constructors

Constructor	Description
`JSException`	Deprecated constructors optionally let you specify a detail message and other information.

Method Summary

The netscape.javascript.JSException class has the following method:

Table 19: JSException methods

Method	Description
`GetWrappedException`	Instance method getWrappedException.

The following sections show the declaration and usage of the constructors and method.

Backward Compatibility

JavaScript 1.1 through 1.3. JSException had three public constructors that optionally took a string argument, specifying the detail message or other information for the exception. The getWrappedException method was not available.

JSException Constructor

Constructors, deprecated in JavaScript 1.4. Construct a JSException with an optional detail message.

Declaration

```
1. public JSException()
2. public JSException(String s)
3. public JSException(String s,
        String filename,
        int lineno,
        String source,
        int tokenIndex)
```

Arguments

Table 20: JSException arguments

Argument Name	Description
`s`	The detail message.
`filename`	The URL of the file where the error occurred, if possible.
`lineno`	The line number if the file, if possible.
`source`	The string containing the JavaScript code being evaluated.
`tokenIndex`	The index into the source string where the error occurred.

GetWrappedException

Instance method getWrappedException.

Declaration

```
public Object getWrappedException()
```

JSObject Class

The public final class netscape.javascript.JSObject extends Object.

```
java.lang.Object
   |
   +----netscape.javascript.JSObject
```

Description

JavaScript objects are wrapped in an instance of the class netscape.javascript.JSObject and passed to Java. JSObject allows Java to manipulate JavaScript objects.

When a JavaScript object is sent to Java, the runtime engine creates a Java wrapper of type JSObject; when a JSObject is sent from Java to JavaScript, the runtime engine unwraps it to its original JavaScript object type. The JSObject class provides a way to invoke JavaScript methods and examine JavaScript properties.

Any JavaScript data brought into Java is converted to Java data types. When the JSObject is passed back to JavaScript, the object is unwrapped and can be used by JavaScript code. See *Data Type Conversions* (on page 185), for more information about data type conversions.

Method Summary

The netscape.javascript.JSObject class has the following methods:

Table 21: JSObject methods

Method	Description
`call`	Calls a JavaScript method.
`equals`	Determines if two JSObject objects refer to the same instance.
`eval`	Evaluates a JavaScript expression.
`getMember`	Retrieves the value of a property of a JavaScript object.
`getSlot`	Retrieves the value of an array element of a JavaScript object.
`removeMember`	Removes a property of a JavaScript object.
`setMember`	Sets the value of a property of a JavaScript object.
`setSlot`	Sets the value of an array element of a JavaScript object.
`toString`	Converts a JSObject to a string.
Static Method	
getWindow	Gets a JSObject for the window containing the given applet.

The following sections describe the declaration and usage of these methods.

call

Method. Calls a JavaScript method. Equivalent to

`"this.methodName(args[0], args[1], ...)" in JavaScript.`

Declaration

```
public Object call(String methodName, Object args[])
```

equals

Method. Determines if two JSObject objects refer to the same instance.

Overrides: equals in class java.lang.Object

Declaration

```
public boolean equals(Object obj)
```

Backward compatibility

JavaScript 1.3. In JavaScript 1.3 and earlier versions, you can use either the equals method of java.lang.Object or the == operator to evaluate two JSObject objects.

eval

Method. Evaluates a JavaScript expression. The expression is a string of JavaScript source code that will be evaluated in the context given by "this".

Declaration

```
public Object eval(String s)
```

getMember

Method. Retrieves the value of a property of a JavaScript object. Equivalent to "this.name" in JavaScript.

Declaration

```
public Object getMember(String name)
```

getSlot

Method. Retrieves the value of an array element of a JavaScript object. Equivalent to "this[index]" in JavaScript.

Declaration

```
public Object getSlot(int index)
```

getWindow

Static method. Returns a JSObject for the window containing the given applet. This method is useful in client-side JavaScript only.

Declaration

```
public static JSObject getWindow(Applet applet)
```

removeMember

Method. Removes a property of a JavaScript object.

Declaration

```
public void removeMember(String name)
```

setMember

Method. Sets the value of a property of a JavaScript object. Equivalent to "this.name = value" in JavaScript.

Declaration

```
public void setMember(String name, Object value)
```

setSlot

Method. Sets the value of an array element of a JavaScript object. Equivalent to "this[index] = value" in JavaScript.

Declaration

```
public void setSlot(int index, Object value)
```

toString

Method. Converts a JSObject to a String.

Overrides: toString in class java.lang.Object

Declaration

```
public String toString()
```

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