

---

GemStone®

*GemBuilder® for Java™*  
*Tools Guide*

Version 3.0

September 2010

GEMSTONE S™  
.....

---

## INTELLECTUAL PROPERTY OWNERSHIP

This documentation is furnished for informational use only and is subject to change without notice. GemStone Systems, Inc. assumes no responsibility or liability for any errors or inaccuracies that may appear in this documentation.

This documentation, or any part of it, may not be reproduced, displayed, photocopied, transmitted, or otherwise copied in any form or by any means now known or later developed, such as electronic, optical, or mechanical means, without express written authorization from GemStone Systems, Inc.

**Warning:** This computer program and its documentation are protected by copyright law and international treaties. Any unauthorized copying or distribution of this program, its documentation, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted under the maximum extent possible under the law.

The software installed in accordance with this documentation is copyrighted and licensed by GemStone Systems, Inc. under separate license agreement. This software may only be used pursuant to the terms and conditions of such license agreement. Any other use may be a violation of law.

Use, duplication, or disclosure by the Government is subject to restrictions set forth in the Commercial Software - Restricted Rights clause at 52.227-19 of the Federal Acquisitions Regulations (48 CFR 52.227-19) except that the government agency shall not have the right to disclose this software to support service contractors or their subcontractors without the prior written consent of GemStone Systems, Inc.

This software is provided by GemStone Systems, Inc. and contributors "as is" and any expressed or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall GemStone Systems, Inc. or any contributors be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.

## COPYRIGHTS

This software product, its documentation, and its user interface © 1986-2010 GemStone Systems, Inc. All rights reserved by GemStone Systems, Inc.

## PATENTS

GemStone is covered by U.S. Patent Number 6,256,637 "Transactional virtual machine architecture", Patent Number 6,360,219 "Object queues with concurrent updating", and Patent Number 6,567,905 "Generational Garbage Collector". GemStone may also be covered by one or more pending United States patent applications.

## TRADEMARKS

**GemStone, GemBuilder, GemConnect,** and the GemStone logos are trademarks or registered trademarks of GemStone Systems, Inc. in the United States and other countries.

**UNIX** is a registered trademark of The Open Group in the United States and other countries.

**Microsoft, MS, Windows, Windows 2000, Windows XP, Windows 2003, and Windows Vista** are registered trademarks of Microsoft Corporation in the United States and other countries.

**Java** and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

Other company or product names mentioned herein may be trademarks or registered trademarks of their respective owners. Trademark specifications are subject to change without notice. All terms mentioned in this documentation that are known to be trademarks or service marks have been appropriately capitalized to the best of our knowledge; however, GemStone cannot attest to the accuracy of all trademark information. Use of a term in this documentation should not be regarded as affecting the validity of any trademark or service mark.

### **GemStone Systems, Inc.**

1260 NW Waterhouse Avenue, Suite 200  
Beaverton, OR 97006

---

## About This Documentation

This documentation describes the tools available for GemBuilder for Java® for Java™ 3.0, an integrated environment for programming GemStone® Smalltalk applications. These tools consist of the following:

- A *GemStone Browser* for examining, creating, and modifying GemStone classes and methods.
- A *Workspace* for running small pieces of GemStone Smalltalk.
- An *Inspector* for examining and modifying the state of GemStone objects.
- A *Debugger* for examining and modifying an execution stack created by GemStone Smalltalk execution.
- A *Class Version Browser* for examining a class history, inspecting instances, migrating instances, deleting versions, and moving versions to another class history.
- A *Breakpoint Browser* for enabling, disabling, and removing breakpoints in methods, as a debugging aid examining a class history, inspecting instances, migrating instances, deleting versions, and moving versions to another class history.

GemBuilder for Java tools may be used against both GemStone/S, the 32-bit server product, and GemStone/S 64 Bit. While the server products are similar, some features differ. GemBuilder for Java behavior that depends on server behavior may therefore vary depending on which server product and version you are running with. In this documentation, the term “GemStone” is used when behavior is common; server specific differences are noted when necessary.

## Assumptions

To make use of the information in this documentation, you need to be familiar with the GemStone server and with the GemStone Smalltalk programming language as described in the *Programming Guide* for your GemStone server product. That book explains the basic concepts behind the language and describes the most important GemStone kernel classes.

This documentation assumes that the GemStone system has been correctly installed on your host computer as described in the GemStone System Administrator’s Guide, and that GemBuilder for Java has been installed and configured according to the *GemBuilder for Java Installation Guide*.

## How This Manual is Organized

**The Launcher** explain how to communicate with the GemStone object server by initiating a GemStone session and use the Launcher tool to access the various tools.

**The Browsers** explains how to use the GemStone browsers and tools to create classes and methods in the GemStone server.

**Related Tools** describes how to use the GemStone workspace, inspectors, and the debugging tool with your GemStone Smalltalk code.

## Other Useful Documents

- The *Javadocs* that are provided with the GemBuilder for Java product distribution are a key source of up-to-date information on GemBuilder for Java functionality.
- The *GemBuilder for Java Programming Guide*, which is provided in .pdf form with your GemBuilder for Java installation.
- The *Programming Guide* for GemStone/S or GemStone/S 64 Bit describes the GemStone System and the GemStone Smalltalk language.

- If you will be acting as a system administrator, or developing software for someone else who must play this role, you should read the *System Administration Guide* for GemStone/S or GemStone/S 64 Bit.

## Technical Support

GemStone's Technical Support website provides a variety of resources to help you use GemStone products.

**GemStone Web Site:** <http://support.gemstone.com>

Use of this site requires an account, but registration is free of charge and provides immediate access.

All GemStone product documentation is provided in PDF form on this website. Documentation is also available at

**<http://www.gemstone.com/documentation>**

In addition to documentation, the [support.gemstone.com](http://support.gemstone.com) website provides:

- Bugnotes, identifying performance issues or error conditions that you may encounter when using a GemStone product.
- TechTips, providing information and instructions that are not otherwise included in the documentation.
- Compatibility matrices, listing supported platforms for GemStone server product versions.

This material is updated regularly; we recommend checking this site on a regular basis.

## Help Requests

You may need to contact Technical Support directly, if your questions are not answered in the documentation or by other material on the Technical Support site.

Requests for technical assistance may be submitted online, or by email or by telephone. We recommend you use telephone contact only for more serious requests that require immediate evaluation, such as a production system down. The support website is the preferred way to contact Technical Support.

**Website:** <http://techsupport.gemstone.com>

**Email:** [support@gemstone.com](mailto:support@gemstone.com)

**Telephone: (800) 243-4772 or (503) 533-3503**

Your GemStone support agreement may identify specific designated contacts who are responsible for submitting all support requests to GemStone. If so, please submit your information through those individuals.

If you are reporting an emergency by telephone, select the option to transfer your call to the Technical Support administrator, who will take down your customer information and immediately contact an engineer. Non-emergency requests received by telephone will be placed in the normal support queue for evaluation and response.

When submitting a request, please include the following information:

- Your name, company name, and GemStone server license number.
- The versions of all related GemStone products, and of any other related products, such as client Smalltalk products.
- The operating system and version you are using.
- A description of the problem or request.
- Exact error message(s) received, if any, including log files if appropriate.

Technical Support is available from 8am to 5pm Pacific Time, Monday through Friday, excluding GemStone holidays.

## 24x7 Emergency Technical Support

GemStone offers, at an additional charge, 24x7 emergency technical support. This support entitles customers to contact us 24 hours a day, 7 days a week, 365 days a year, for issues impacting a production system. For more details, contact your GemStone account manager.

## Training and Consulting

Consulting and training for all GemStone products are available through GemStone's Professional Services organization. GemStone periodically offers training courses at our offices in Beaverton, Oregon, or training can be arranged at your location. Contact your GemStone account representative for more details or to obtain consulting services.

---

<b><i>Chapter 1. The Launcher</i></b>	<b><i>9</i></b>
Overview . . . . .	9
Launching the Tools . . . . .	10
To Start a Standalone Launcher . . . . .	10
Logging in to GemStone. . . . .	11
The Launcher . . . . .	12
The Launcher Buttons . . . . .	13
The Launcher Menus . . . . .	14
The File Menu . . . . .	14
The Edit Menu . . . . .	15
The Session Menu . . . . .	15
The Tools Menu . . . . .	16
The Windows Menu. . . . .	17
 <b><i>Chapter 2. The Browsers</i></b>	 <b><i>19</i></b>
The GemStone Browser . . . . .	19
The Symbol List Pane . . . . .	20

The Classes Pane . . . . .	20
The Protocol Pane . . . . .	21
The Text Pane . . . . .	21
The Browser Menus . . . . .	21
The File Menu . . . . .	21
The Edit Menu . . . . .	21
The Session Menu . . . . .	22
The Dictionary Menu . . . . .	23
The Class Menu . . . . .	23
The Protocol Menu . . . . .	25
The Method Menu . . . . .	25
Specialized Browsers . . . . .	27
The Class Browser . . . . .	27
The Hierarchy Browser . . . . .	28
The Class Version Browser . . . . .	29
The Method Browser . . . . .	30
The Method List Browser . . . . .	30
The Breakpoint Browser . . . . .	31
Breakpoint Browser Buttons . . . . .	32
Breakpoint Menu . . . . .	33
<b><i>Chapter 3. Related Tools</i></b>	<b>35</b>
Overview . . . . .	35
The Workspace . . . . .	36
The Inspector . . . . .	37
Inspecting Dictionaries and Sets . . . . .	39
The Debugger . . . . .	40
Debugger Buttons . . . . .	42
Debugger Menus . . . . .	42
Invoking the Debugger from a Workspace . . . . .	43
Invoking the Debugger from Your Java Client . . . . .	44
Common Menus and Shortcuts . . . . .	47
The Popup Menu . . . . .	47
Keyboard Shortcuts . . . . .	48
<b><i>Index</i></b>	<b>49</b>



---

*Chapter*

**1**

# *The Launcher*

---

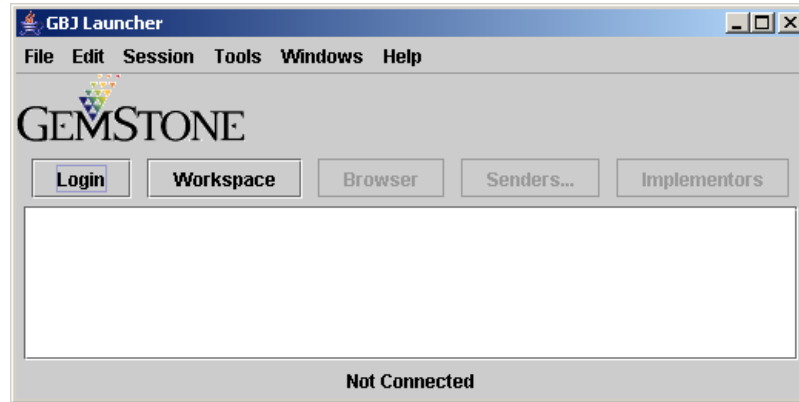
## **Overview**

The GemBuilder for Java Tools are Java applications that make use of the underlying GemBuilder for Java application programming interface. You can use these tools by themselves, or you can integrate them into popular Java development environments like Sun's Java Workshop and Symantec Café.

## Launching the Tools

The GemStone Launcher window lets you log in to a GemStone server, which gives you access to the GemStone Smalltalk compiler and the GemBuilder for Java Tools. Initially, only the **Login...** and **Workspace** buttons are enabled. The lower pane, the text pane, serves as a transcript for system messages.

**Figure 1.1** GemStone Tools Launcher



You can run the Launcher as a stand-alone Java application within a Web browser.

### To Start a Standalone Launcher

To start the Launcher as a standalone application, invoke the Java runtime system from an operating system command prompt.

You must have set up the client environment correctly to ensure access to the correct server shared libraries, and set the CLASSPATH environment variable to include the location of `gbj30.jar`, and `gbjopensrc30.jar`, as described in the documentation for your Java system and the *GemBuilder for Java Installation Guide*.

To invoke the Launcher, for example, on a 32-bit system:

```
prompt> java com.gemstone.tools.GbjLauncher
```

or on a 64-Bit system:

```
prompt> java -d64 com.gemstone.tools.GbjLauncher
```

## Logging in to GemStone

After the Launcher appears, the next step ordinarily is to log in to a GemStone server. Click the **Login...** button in the Launcher, which opens a dialog in which you identify the GemStone server and provide the GemStone userId, password, and other relevant information (the client can provide this information programmatically). Use the mouse or Tab key (not Return) to move between fields.

**Figure 1.2 Login Dialog**

*NOTE:*

*After you log in, all tools you start will run under that GemStone session. To run tools under a different session, start the Launcher again.*

Parameter	Explanation
GemStone Server	The name of the GemStone server, such as "gs64stone". This field can include the name of server's machine using Network Resource String (NRS) syntax; for instance, "!@handel!gs64stone". GemBuilder for Java must be installed on the server.
GemStone User	The GemStone userId under which you want to log in (must already exist in the server)
GemStone Password	The password for the GemStone userId

Gem Service (optional)	The name of the Gem service to be used. By default, you can use “gemnetobject”; users of the UNIX C Shell may prefer “gemnetobjcsh” (not available with GemStone/S 64 Bit).
Host User	An operating system login name on the machine where the Stone is running. This user name and password are required to start a separate Gem process unless your GemStone installation uses another method of providing network authentication, such as a <code>.netrc</code> file or running NetLDIs in guest mode with a captive account.
Host Password	The operating system password for the Host User on the machine where the Stone is running
Transaction Mode	Choose <b>Automatic</b> if you are going to be committing changes to the server. Choose <b>Manual</b> if your primary activity will be reading the committed state; before making a change you want to commit, begin a transaction manually by choosing <b>Session &gt; Begin</b> in the GemStone Browser. (For more information, see the <i>GemBuilder for Java Programming Guide</i> or the <i>Programming Guide</i> for your server product)

For information about Network Resource Syntax and the NetLDI, see the *System Administration Guide* for your server product.

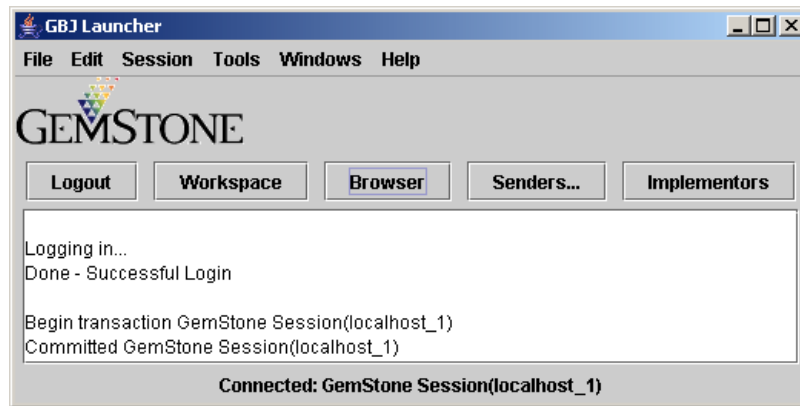
## The Launcher

The Launcher not only lets you log in to a GemStone server, but also gives access to the other Tools:

- GemStone Browsers and specialized browsers derived from it
- Workspaces
- Inspectors

The Launcher contains a text pane that serves as both a session transcript and as a workspace. The transcript records significant events, such as logins, commits, and logouts. Clicking **Help** displays version information in the transcript.

Figure 1.3 Session Transcript in Launcher Text Pane



## The Launcher Buttons

Five Launcher buttons provide convenient access to frequently used functions: Login/Logout, Browser, Workspace, Senders..., and Implementors... .

The **Login** button opens a dialog through which you enter session parameters and log in to the GemStone server, as described in "Logging in to GemStone" on page 11. When the login attempt succeeds, the label on this button changes to **Logout**.

The **Browser** button opens a GemStone Browser through which you can examine, create, or modify Smalltalk classes and methods in the server. For further information, see "The Browsers" on page 2-19. This button is enabled only when you are logged in to the server.

The **Workspace** button opens a text area in which you can evaluate GemStone Smalltalk expressions or edit text. This button is always enabled, but to evaluate expressions, you must be logged in to the server.

The **Senders...** button prompts for a method name, then opens a Method List Browser showing all visible server methods that send the specified message. For further information, see "The Method Browser" on page 30. This button is enabled only when you are logged in to the server.

The **Senders...** and **Implementors...** buttons search the methods visible in the session's symbol list. For more information about how GemStone uses the symbol list for name resolution, see "The Symbol List Pane" on page 20 and the *GemStone/S Programming Guide*.

You can use wild-card characters in the search dialog associated with **Senders...** and **Implementors...**. A "\*" matches any number of characters, and "?" matches a single character.

## The Launcher Menus

The Launcher menus provide commands for executing GemStone Smalltalk code and accessing the GemStone Tools.

### The File Menu

The File menu contains these items:

<b>Open...</b>	Requests a file name, then copies the contents into the workspace (transcript)
<b>Save As...</b>	Requests a file name, then writes the contents of the workspace (transcript) into the specified file
<b>File In...</b>	Opens a file dialog allowing you to specify a source code file. Treats the selected file as being in GemStone file-in format, and files it in.
<b>Settings</b>	Opens a dialog that allows you to specify a font and font style; and allows you to set verbose client logging <b>On</b> or <b>Off</b> for the client and server. Changes affect the Launcher and any tools you open subsequently.
<b>Exit</b>	Kills the Tools application, closing all open browsers, inspectors, and so forth. The GemStone session is terminated.

## The Edit Menu

The Edit menu contains these items:

<b>Cut</b>	Cuts the currently selected text from the text pane and puts it in the clipboard.
<b>Copy</b>	Copies the currently selected text from the text pane and puts it in the clipboard.
<b>Paste</b>	Pastes the text from the clipboard at the current selection position in the text pane.
<b>Select All</b>	Selects all of the text in the text pane
<b>Do-It</b>	Uses the GemStone compiler to evaluate and execute the currently selected text
<b>Print-It</b>	Performs a <b>Do-It</b> , sends the resulting object the message <code>printString</code> , then places the resulting string after the current text pane selection
<b>Inspect-It</b>	Performs a <b>Do-It</b> , and then opens a GemStone Inspector on the resulting object
<b>File It In</b>	Treats the selected text as being in GemStone file-in format, and files it in.

## The Session Menu

The Session menu contains these items:

<b>Login...</b>	If there is no Launcher session, opens a login dialog and lets you log in to GemStone (same as clicking the <b>Login...</b> button)
<b>Logout</b>	Logs out the Launcher session, if there is one (same as clicking the <b>Logout</b> button)
<b>Commit</b>	Commits the Launcher session
<b>Abort</b>	Aborts (rolls back) the Launcher session
<b>Begin</b>	Begins a new transaction
<b>Manual</b>	Switches the Launcher session to manual transaction mode
<b>Auto</b>	Switches the Launcher session to automatic transaction mode

## The Tools Menu

The Tools menu contains these items:

<b>Browser</b>	Opens a GemStone System Browser (same as clicking the <b>Browser</b> button)
<b>Workspace</b>	Opens a GemStone workspace in which you can execute Smalltalk expressions (same as clicking the <b>Workspace</b> button)
<b>Senders</b>	Requests a selector name, then opens a Method List Browser showing all senders of that message (same as clicking the <b>Senders...</b> button)
<b>Implementors</b>	Requests a selector name, then opens a Method List Browser showing all implementors of that message (same as clicking the <b>Implementors...</b> button)
<b>References</b>	Requests a symbol and then opens a Method List Browser showing all methods that refer to that symbol, including all references to associations with the specified symbol as the key.
<b>Find Substring</b>	Requests a string, and then opens a Method List Browser showing all methods that contain the specified string in their source code. The search is case-sensitive. If no such string is found, opens a notifier instead.
<b>Browse Class</b>	Requests a class name, then opens a Class Browser on the class
<b>Browse Hierarchy</b>	Requests a class name, then opens a Hierarchy Browser on the class
<b>Breakpoints</b>	Opens a Breakpoint Browser.

You can use wild-card characters in the search dialog associated with **Senders**, **Implementors**, **Browse Class**, and **Browse Hierarchy**. A “\*” matches any number of characters, and “?” matches a single character.



## The Windows Menu

The Windows menu contains these items:

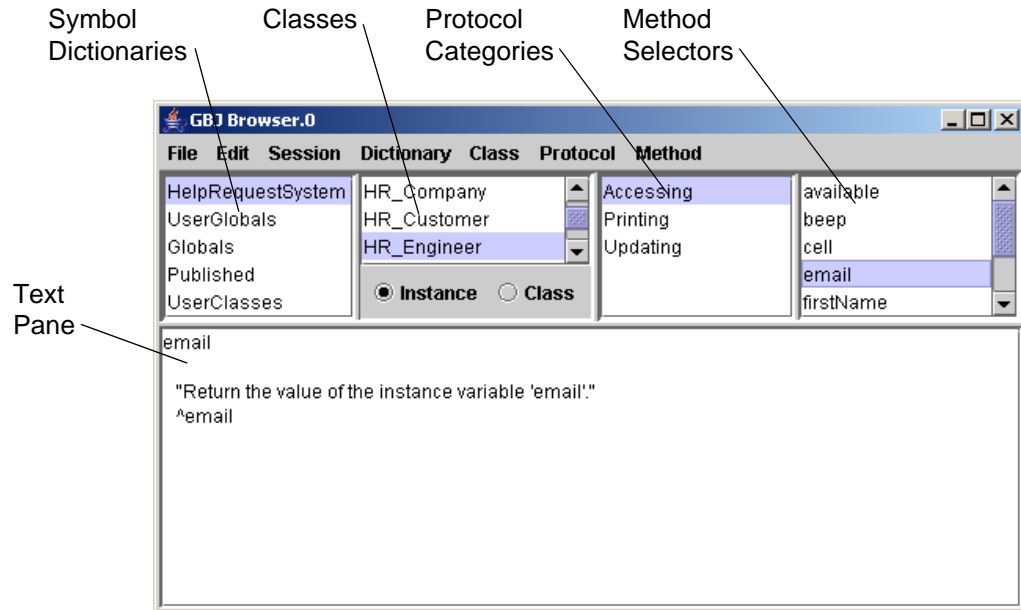
<b>Hide All</b>	Hides all windows.
<b>Show All</b>	Shows all windows.
<name of each open window>	Each open window has an entry in the menu. You can show an individual window by clicking that window in the Windows menu.

—  
|

---

## The GemStone Browser

After you have successfully logged in to GemStone, you can open a GemStone Browser by choosing **Tools > Browser** or by clicking the **Browser** button in the Launcher. The GemStone Browser lets you create classes and methods in the server using GemStone Smalltalk.

**Figure 2.1 GemStone Browser**

## The Symbol List Pane

The upper left pane contains a list of symbol dictionaries. In GemStone, the named objects to which your programs refer (the classes and root or global objects) are listed in symbol dictionaries. This list facilitates finding objects efficiently as well as sharing them among users. All of the symbol dictionaries that you can access in your current session environment are listed in the GemStone Browser's Symbol List pane.

When you select a symbol dictionary, all classes defined in that dictionary appear in the pane to the right of the Symbol List pane. (Symbols other than classes can be viewed by opening an inspector on the symbol dictionary in question.)

For further information about symbol lists, see the *GemStone/S Programming Guide*.

## The Classes Pane

When you select a class from the Classes pane, a list of its protocols appears in the Protocol pane adjacent on the right. In GemStone, methods are categorized by function, or *protocol*, to make them easier to browse.

## The Protocol Pane

When you select a protocol, all the message selectors in that category appear in the Method Selectors pane at the far right.

You can switch the focus of the display between instance methods or class methods by using the radio buttons provided.

## The Text Pane

When you select a method, its source code is displayed in the lower portion of the browser—the text pane. In this pane, you can edit and recompile the text of the displayed method, or execute fragments of GemStone Smalltalk code as in a workspace.

## The Browser Menus

### The File Menu

The following commands are available in the File menu:

<b>Update</b>	Updates the browser to match the current state of the Launcher's session. This action may change the contents of the browser because of changes made in other tools.
<b>Close</b>	Close the browser window.

### The Edit Menu

The Edit menu contains these items:

<b>Cut</b>	Cuts the currently selected text from the text pane and puts it in the clipboard.
<b>Copy</b>	Copies the currently selected text from the text pane and puts it in the clipboard.
<b>Paste</b>	Pastes the text from the clipboard at the current selection position in the text pane.
<b>Select All</b>	Selects all of the text in the text pane
<b>Do-It</b>	Uses the GemStone compiler to evaluate the currently selected text

<b>Print-It</b>	Performs a <b>Do-It</b> , sends the resulting object the message <code>printString</code> , then places the resulting string after the current text pane selection
<b>Inspect-It</b>	Performs a <b>Do-It</b> , then opens a GemStone Inspector on the resulting object
<b>Compile</b>	Compiles the current text in the text pane. Use this choice to create a new class or method, or to modify existing definitions.
<b>Cancel</b>	Cancels any text entry done in the text pane, and returns the method definition, class definition, and so forth, to its unmodified form
<b>Set Break</b>	Sets a breakpoint at the current insertion point in the current method.

## The Session Menu

The Session menu contains these items:

<b>Commit</b>	Commits the Launcher session
<b>Abort</b>	Aborts (rolls back) the Launcher session
<b>Begin</b>	Begins a new transaction

If an attempted commit fails, choose **Report** in the resulting dialog to open a GemStone Inspector through which you can determine the cause of the failure. The inspector is on the result of invoking `System Class >> transactionConflicts` in the server.

## The Dictionary Menu

The Dictionary menu contains these items:

<b>File Out As</b>	Requests a file name, then creates a fileout (.gs file) containing the classes and methods in the selected symbol dictionary.
<b>Inspect</b>	Opens a GemStone Inspector on the currently selected symbol dictionary.
<b>Add</b>	Requests a new dictionary name, then adds a new symbol dictionary by that name to your symbol list.
<b>Rename As</b>	Requests a new dictionary name, then renames the selected symbol dictionary to that name.
<b>Remove</b>	After confirmation, removes the selected symbol dictionary from your symbol list. <i>WARNING: Do not try to remove the Globals dictionary. The Globals dictionary defines the GemStone kernel classes.</i>
<b>Find Class</b>	Requests a class name, then selects the matching symbol dictionary and class entry in the class list.

## The Class Menu

The Class menu is active only when a class has been selected. The following commands are available from the Class menu.)

<b>File Out As...</b>	Requests a file name, then creates a fileout (.gs file) containing the selected class and its methods
<b>Browse &gt; Class</b>	Opens a Class Browser on the selected class
<b>Browse &gt; Hierarchy</b>	Opens a Class Hierarchy Browser on the selected class.
<b>Browse &gt; Versions</b>	Opens a Class Version Browser on the selected class. The browser shows how many versions of that class exist.
<b>References To &gt; Instance Variable</b>	Opens a selection dialog allowing you to choose from a list of instance variables of the selected class. Choose one and click <b>OK</b> or press Return, and a Method List Browser opens showing all methods that refer to the selected instance variable.

<b>References To &gt; Class Variable</b>	Opens a selection dialog allowing you to choose from a list of class variables of the selected class. Choose one and click <b>OK</b> or press Return, and a Method List Browser opens showing all methods that refer to the selected class variable.
<b>References To &gt; Class</b>	Opens a Method List Browser showing all methods that refer to the selected class.
<b>Show &gt; Hierarchy</b>	
<b>Show &gt; Definition</b>	Displays the class definition of the selected class in the text pane.
<b>Show &gt; Comment</b>	Displays the class comment of the currently selected GemStone-supplied class
<b>Move to</b>	Lets you choose another symbol dictionary, then moves the selected class to that dictionary.
<b>Remove</b>	After confirmation, removes the selected class from its associated symbol dictionary <i>CAUTION: To avoid inadvertently removing or modifying a GemStone kernel class, use the DataCurator account for all administrative tasks except those that require SystemUser privileges, such as upgrading the repository.</i>
<b>New Template</b>	Presents a class definition template in the text pane.



## The Protocol Menu

To help you organize your work, GemStone Smalltalk methods that are functionally similar are grouped together into protocol categories with descriptive names, such as *initializing*, *accessing*, or *updating*. These categories are descriptive only; they do not affect the operation of GemStone Smalltalk in any way.

The following items are available in the Protocol menu. (Until you've selected a method category, Add is the only menu item enabled.)

<b>Add</b>	Requests a protocol name, then adds the protocol to the selected class.
<b>Rename As</b>	Requests a protocol name, then renames the selected protocol to that name.
<b>Remove</b>	Removes the selected protocol (after confirmation, if it contains any methods).
<b>Find Method</b>	Provides a list of all method names in the selected class, then updates the protocol and method panes to show the selected protocol and method.

## The Method Menu

The Method menu allows you to file out a single method, reorganize methods into different categories, and remove a method. Items in the Method menu are available only when a method has been selected.

<b>File Out As</b>	Requests a file name, then creates a fileout (.gs file) containing the selected method.
<b>Browse Method</b>	Opens a GemStone Method Browser on the selected method.
<b>Senders</b>	Opens a GemStone Method List Browser showing all senders of the selected method (same as clicking the <b>Senders...</b> button in the Launcher and entering the name of the method).
<b>Implementors</b>	Opens a GemStone Method List Browser showing all implementors of the selected method (same as clicking the <b>Implementors...</b> button in the Launcher and entering the name of the method).

<b>Messages</b>	After you choose one of the messages sent by the selected method, opens a GemStone Method List Browser showing all implementors.
<b>Move to</b>	Requests the name of a protocol to which the selected method should be moved, then moves the method. If no protocol exists by the name supplied, this menu item adds the protocol and then does the move.
<b>Remove</b>	After confirmation, removes the selected method.
<b>View &gt; Class Only</b>	Displays protocols and methods for the selected class only. The selected view persists when you select a new class.
<b>View &gt; Up To Root</b>	Displays protocols and methods for the selected class and all superclasses up to, but not including, the class at the root of the hierarchy (typically Object). The selected view persists when you select a new class.
<b>View &gt; Including Root</b>	Displays protocols and methods for the selected class and all superclasses, including the class at the root of the hierarchy (typically Object). The selected view persists when you select a new class.
<b>New Template</b>	Presents a new method template in the text pane.

## Specialized Browsers

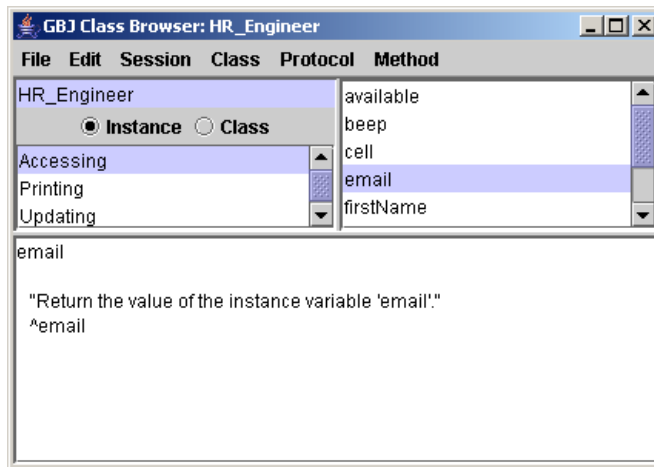
GemBuilder for Java Tools implement several specialized browsers based on the GemStone Browser: the Class Browser, Hierarchy Browser, Class Version Browser, Method Browser, Method List Browser, and Breakpoint Browser.

### The Class Browser

The GemStone Class Browser displays a single GemStone class. The menu items supported by the browser are the same as those supported by the System Browser except the Dictionary menu is not available. Open this browser by choosing **Class > Browse > Class** in the GemStone Browser or by choosing **Tools > Browse Class** in the GemStone Launcher.

You can use wild-card characters in searches, with "\*" matching any number of characters, and "?" matching a single character.

**Figure 2.2** Class Browser

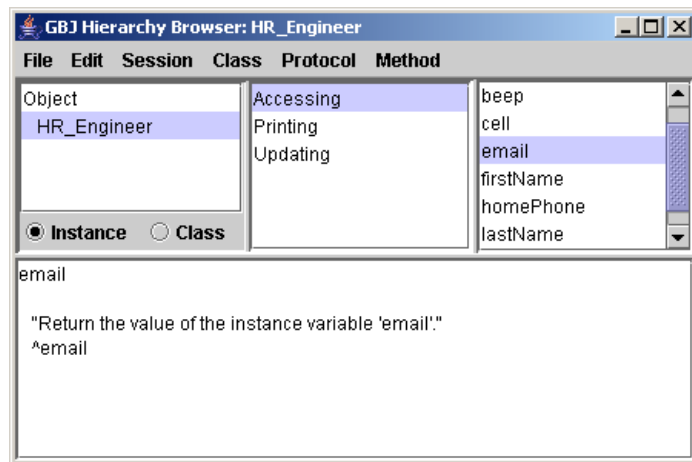


## The Hierarchy Browser

The GemStone Hierarchy Browser displays the superclass chain of a target class plus all subclasses of the target class. For example, choosing **Class > Browse > Hierarchy** when class `HR_Engineer` is selected allows you to browse the hierarchy for that class, which happens to be a direct subclass of `Object`. The menu items supported by the browser are the same as those supported by the System Browser, except the Dictionary menu is not available.

You can use wild-card characters in searches, with “\*” matching any number of characters, and “?” matching a single character.

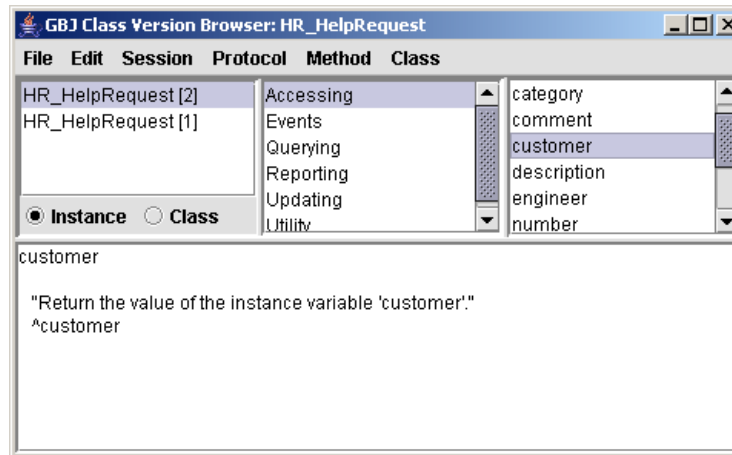
**Figure 2.3** Class Hierarchy Browser



## The Class Version Browser

The GemStone Class Version Browser displays the versions of a class in the class history of the target class. For example, doing **Class > Browse Versions** when class `HR_HelpRequest` is selected in the GemStone Browser shows two versions exist. You can select either version in the left pane. The browser displays the definition of the selected version in the text pane.

**Figure 2.4** Class Version Browser



The menu items supported by the Class Version Browser are generally the same as those supported by the System Browser. The Class menu has been extended, and several of the menu items have slightly different semantics. The additional and altered items in the Class menu are these:

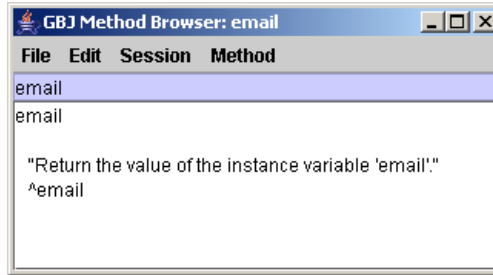
<b>Class &gt; Move to</b>	Requests the name of a target class, then moves the selected class version to the class history of the target class.
<b>Class &gt; Remove</b>	After confirmation, removes the selected class version from its class history.
<b>Class &gt; Inspect Instances</b>	Opens a GemStone Inspector on all instances of the currently selected class version. Because this operation can be lengthy, you are asked to confirm your intent.

<b>Class &gt; Migrate Instances</b>	After you choose a target class version, migrates all instances of the selected version to the target version.
-------------------------------------	--

## The Method Browser

The Method Browser displays an individual method. For example, invoking the Method browser on `HR_Engineer > email` shows its definition.

**Figure 2.5 Method Browser**

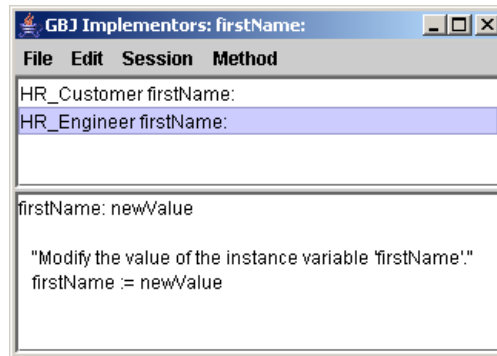


The supported menu items are the same as those for the other browsers except the Dictionary, Class and Protocol menus are not available.

## The Method List Browser

The Method List Browser displays a list of methods defined in various classes. The browser is used to display senders and implementors of various messages. For example, invoking the menu item Implementors on `firstName:` lets you browse each implementation of that message. The same list can be obtained by clicking the Implementors... button in the GemStone Launcher.

You can use wild-card characters in searches, with "\*" matching any number of characters, and "?" matching a single character.

**Figure 2.6 Implementors of a Particular Method**

## The Breakpoint Browser

The Breakpoint Browser displays a list of methods for which breakpoints have been specified. Open it using the **Tools > Breakpoints** menu item in the GemStone Launcher. You can then select a breakpoint and enable, disable, or remove it.

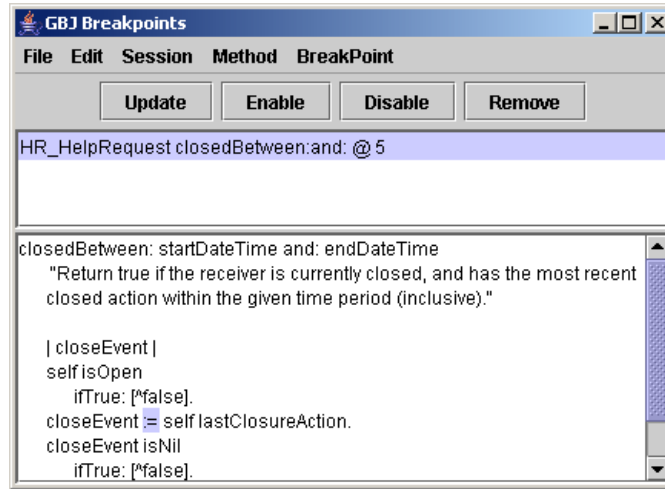
To set a breakpoint:

1. Open any tool that allows you to browse method source code.
2. Place the insertion point before the point at which you wish execution to halt.
3. Select **Edit > Set Break**.

When a breakpoint is encountered, a notifier allows you to open a debugger. See "The Debugger" on page 40.

The Breakpoint Browser appears as shown below:

**Figure 2.7 Viewing Breakpoints**



The top pane contains a list of all breakpoints set in GemStone Smalltalk code. The bottom pane shows the source for the selected breakpoint, highlighting the message-send at which execution will stop when the breakpoint is encountered.

### Breakpoint Browser Buttons

Four buttons provide convenient access to the main functions of the Breakpoint Browser.

The **Update** button updates the Breakpoint Browser in case breakpoints have been set in another tool since the browser was opened.

The **Remove** button removes the selected breakpoint.

The **Enable** button enables the selected breakpoint, causing execution to stop when it is reached.

The **Disable** button disables the selected breakpoint without removing it.



## Breakpoint Menu

The Breakpoint Browser offers one new menu, the Breakpoint menu. It contains these items:

<b>Remove Break</b>	Removes the currently selected breakpoint from the browser and the system. This is the same as clicking the <b>Remove</b> button.
<b>Enable Break</b>	Enables the currently selected breakpoint, causing execution to halt when it is reached. This is the same as clicking the <b>Enable</b> button.
<b>Disable Break</b>	Disables the currently selected breakpoint, causing execution to continue uninterrupted when it is reached, but leaving the breakpoint in both the system and the browser for possible future use. This is the same as clicking the <b>Disable</b> button.
<b>Remove All Breaks</b>	Removes all breakpoints from the browser and the system.
<b>Enable All Breaks</b>	Enables all breakpoints, causing execution to halt when they are reached.
<b>Disable All Breaks</b>	Disables all breakpoints, causing execution to continue uninterrupted when they are reached, but leaving them in both the system and the browser for possible future use.

—  
|

---

## Overview

Three additional tools provide assistance in working with GemStone Smalltalk:

- *Workspaces* are text areas in which Smalltalk expressions can be evaluated. You can also use a workspace to file in code previously saved from GemStone.
- *Inspectors* let you examine GemStone objects, including the result of evaluating an expression in a workspace.
- The *Debugger* lets you inspect the state of Smalltalk execution at the time of an error.

In addition, certain menus and keyboard shortcuts are common to all the tools.

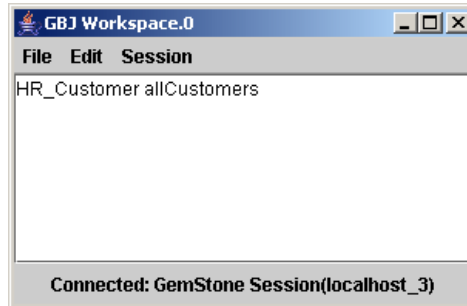
## The Workspace

The GemStone Workspace provides a text area in which expressions can be evaluated. For example, you can evaluate the expression

```
HR_Customer allCustomers
```

by highlighting the expression and then choosing **Edit > Print-It** or a similar menu item.

**Figure 3.1** A Workspace



The menu items available in the Workspace menu are similar to those in the Browser and Launcher:

<b>File &gt; Open</b>	Requests a file name, then copies the contents into the workspace.
<b>File &gt; Save As</b>	Requests a file name, then writes the contents of the workspace into the specified file.
<b>File &gt; File In</b>	Opens a file dialog allowing you to specify a source code file. Treats the selected file as being in GemStone file-in format, and files it in.
<b>File &gt; Close</b>	Closes the workspace.
<b>Edit &gt; Cut</b>	Cuts the currently selected text from the text pane and puts it in the clipboard.
<b>Edit &gt; Copy</b>	Copies the currently selected text from the text pane and puts it in the clipboard.
<b>Edit &gt; Paste</b>	Pastes the text from the clipboard at the currently selected position in the text pane.
<b>Edit &gt; Select All</b>	Selects all of the text in the text pane.

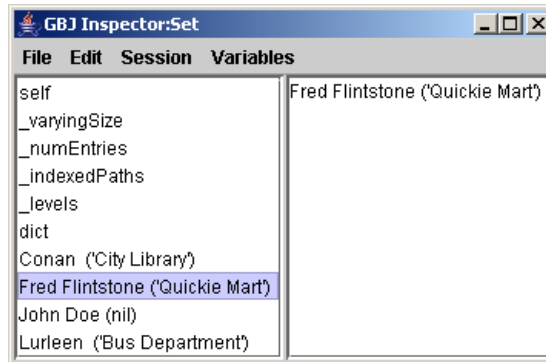
<b>Edit &gt; Do-It</b>	Uses the GemStone compiler to evaluate the currently selected text.
<b>Edit &gt; Print-It</b>	Performs a <b>Do-It</b> , sends the resulting object the message <code>printString</code> , and then places the resulting string after the current text pane selection.
<b>Edit &gt; Inspect-It</b>	Performs a <b>Do-It</b> , then opens a GemStone Inspector on the resulting object.
<b>Edit &gt; File-It In</b>	Treats the selected text as though it is in GemStone file-in format, and tries to file it in to the GemStone server.
<b>Session &gt; Commit</b>	Commits the Launcher's session.
<b>Session &gt; Abort</b>	Aborts the Launcher's session.
<b>Session &gt; Begin</b>	Begins a new transaction.

## The Inspector

When you select a GemStone Smalltalk expression and execute **Inspect-It** from the **Edit** menu, a GemStone Inspector opens. This inspector contains two panes, which enable you to examine and modify the values of instance variables in the GemStone server object returned as the result of the expression.

The left pane lists `self`, which refers to the inspected object, together with the names or indexes of the object's instance variables. (If the object is an instance of a Dictionary, the left pane lists the keys). When you select an item in the left pane, the right pane shows the value of that item. For example, invoking an Inspector on the expression `HR_Customer allCustomers` produces this inspector:

Figure 3.2 An Inspector



You can use the right pane to execute GemStone Smalltalk expressions that contain names appearing in the left pane. For example, if the inspected object had an instance variable named *count* whose value was 5, then executing the expression `count * 5` in the right pane returns the value 25.

The menu items supported by the GemStone Inspector are shown below.

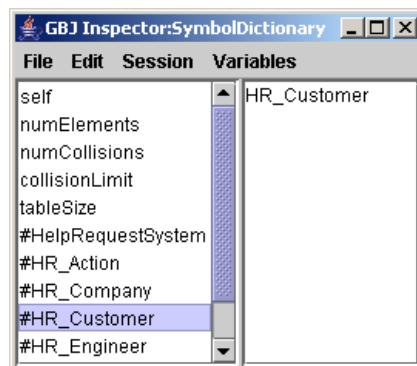
<b>File &gt; Update</b>	Updates the inspector to match the current state of the Launcher's session.
<b>File &gt; Close</b>	Closes the inspector window.
<b>Edit &gt; Cut</b>	Cuts the currently selected text from the text pane and puts it in the clipboard.
<b>Edit &gt; Copy</b>	Copies the currently selected text from the text pane and puts it in the clipboard.
<b>Edit &gt; Paste</b>	Pastes the text from the clipboard at the current selection position in the text pane.
<b>Edit &gt; Select All</b>	Selects all of the text in the text pane.
<b>Edit &gt; Do-It</b>	Uses the GemStone compiler to evaluate the currently selected text.
<b>Edit &gt; Print-It</b>	Performs a <b>Do-It</b> , sends the resulting object the message <code>printString</code> , and then places the resulting string after the current text pane selection.
<b>Edit &gt; Inspect-It</b>	Performs a <b>Do-It</b> , then opens a GemStone Inspector on the resulting object.

<b>Edit &gt; Compile</b>	Compiles the current text in the text pane. The text in the text pane is evaluated, and the resulting object is assigned to the selected slot of the object being inspected.
<b>Edit &gt; Cancel</b>	Cancel any text entry done by the user in the text pane, and return the inspector text pane to its unmodified form (which may be to show the <code>printString</code> of the selected slot).
<b>Session &gt; Commit</b>	Commits the Launcher's session.
<b>Session &gt; Abort</b>	Aborts the Launcher's session.
<b>Session &gt; Begin</b>	Begins a new transaction.
<b>Variables &gt; Inspect</b>	Opens a new inspector on the selected item from the inspector list pane.
<b>Variables &gt; More</b>	Retrieves more of the object's indexable fields. By default, the first 100 are retrieved. Each pick of this menu item doubles the number of fields that are retrieved.

## Inspecting Dictionaries and Sets

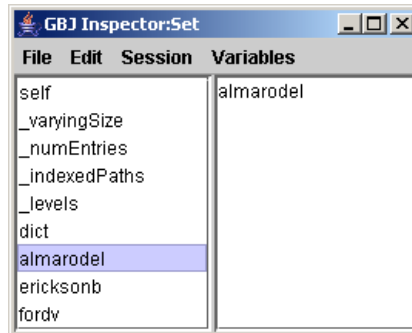
When you inspect a Dictionary and select an association in the left pane, its value is shown in the right pane. For example, opening the inspector on the `HelpRequestSystem SymbolDictionary` and selecting `#HR_Customer` shows the value, the `HR_Customer` class.

**Figure 3.3** Inspecting a Dictionary



When you inspect the Set returned by evaluating `HR_Engineer allEngineers`, the elements (the engineers' login names) are shown in the left pane.

**Figure 3.4** Inspecting a Set



## The Debugger

The Debugger can be invoked either from an error notifier or by encountering a breakpoint while running code from a workspace.

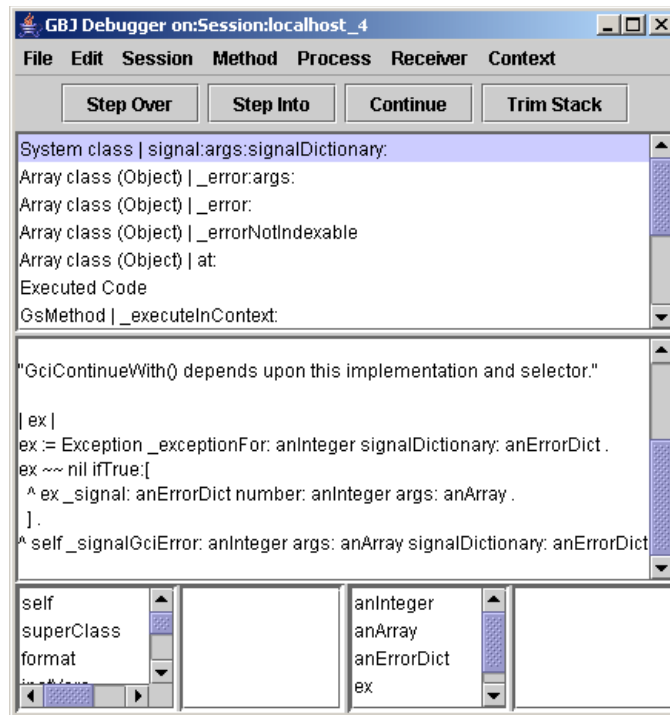
For example, the following sequence results from evaluating the expression

```
Array new at: 1
```

with **Do-It** in a workspace. When the error notifier appears, clicking the **Debug** button brings up a Debugger.



Figure 3.5 Debugger



The debugger consists of six panes. At the top is the *stack pane*, which shows the stack as it was when execution halted do to an error or breakpoint. Select a specific message in the stack, and the *source pane* below shows the source code associated with it.

The bottom four panes are actually two inspectors. The inspector on the left lists the receiver and instance variables of the selected message. Selecting one causes its value to appear in the pane directly to the right. The inspector on the right lists the variables referred to in the selected message. Selecting one causes its value to appear in the rightmost pane.

## Debugger Buttons

Four debugger buttons provide convenient access to common debugging functions.

**Step Over** steps process execution over the next message-send highlighted in the source pane. Control then returns to the debugger with the next step point highlighted.

**Step Into** steps process execution into the next message-send highlighted in the stack pane. Control typically returns to the debugger with a new message on top of the stack. Execution is halted at the beginning of the new method in the source pane.

**Continue** continues executing the process and closes the debugger.

**Trim Stack** trims messages from the stack, starting at the top and trimming until the selected message is reached. The next step point is at the beginning of the new top of the stack.

## Debugger Menus

The debugger File, Edit, Session, and Method menus are all similar to those in other tools. The Process menu contains these items:

<b>Step Over</b>	Steps process execution over the next message-send highlighted in the source pane. Control then returns to the debugger with the next step point highlighted. This is the same as clicking the <b>Step Over</b> button.
<b>Step Into</b>	Steps process execution into the next message-send highlighted in the stack pane. Control typically returns to the debugger with a new message on top of the stack. Execution is halted at the beginning of the new method in the source pane. This is the same as clicking the <b>Step Into</b> button.
<b>Explain</b>	Prints the original descriptive error text in the source pane.
<b>Continue</b>	Continues executing the process and closes the debugger. This is the same as clicking the <b>Continue</b> button.

<b>Trim Stack</b>	Trims messages from the stack, starting at the top and trimming until the selected message is reached. The next step point is at the beginning of the new top of the stack. This is the same as clicking the <b>Trim Stack</b> button.
<b>Copy Stack</b>	Creates a text representation of the stack, as seen in the stack pane, and places it in the clipboard.

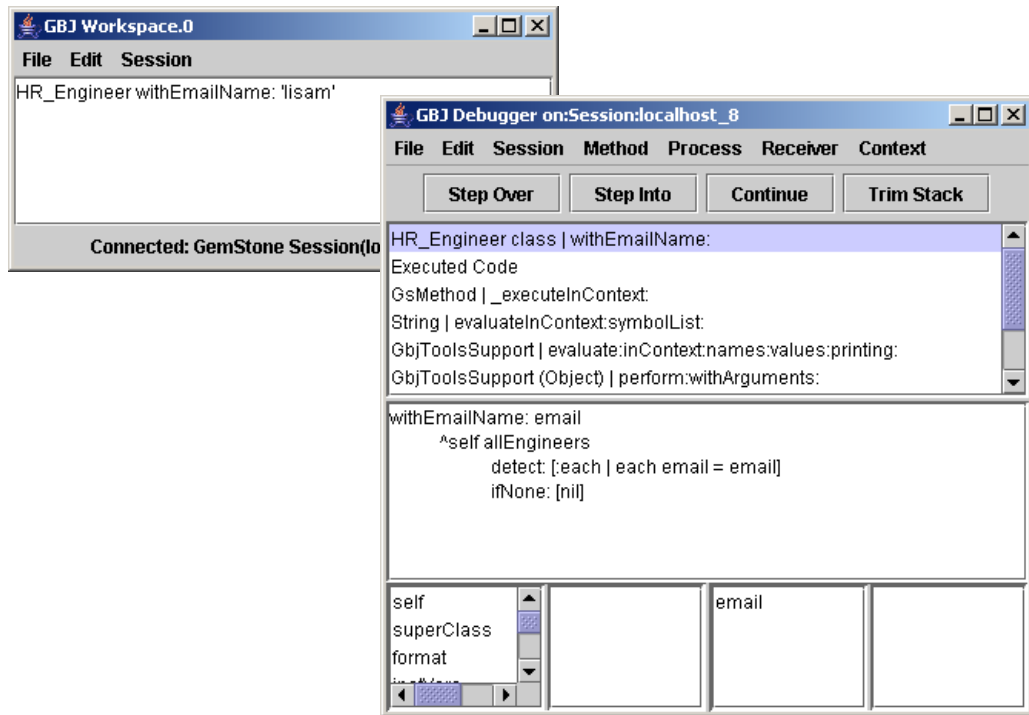
The Receiver and Context menus have one item each:

<b>Inspect</b>	Opens an Inspector on the value selected in the leftmost bottom pane, in the case of the Receiver menu, or the bottom pane second from the right, in the case of the Context menu.
----------------	--

## Invoking the Debugger from a Workspace

The ordinary way to invoke the debugger is to set a breakpoint in your Smalltalk code, then invoke that code by evaluating an expression in the workspace. For example:

1. Set the breakpoint:
  - a. Open any source code browser on the appropriate class, such as `HR_Engineer`.
  - b. Select the desired protocol and method.
  - c. Place the insertion point before the place where you want execution to halt, then choose **Edit > Set Break**. (To view existing breakpoints, see page 31.)
2. Open a workspace and enter an expression that invokes code where the breakpoint is set. Select the expression and choose **Edit > Do-It**.
3. When the breakpoint notifier appears, click **Debug**. (**Continue** continues the current process without opening the debugger. **Terminate** ends the current process.

**Figure 3.6 Debugging Engineer | withEmailName:**

## Invoking the Debugger from Your Java Client

To invoke the debugger from your running application, you must set a breakpoint within Smalltalk code that is called within a Java `try` block. When the GemStone server encounters the breakpoint, it returns an exception to the client. The catch block uses the exception as an argument to open an instance of `GbjDebugger`. For example, this sequence stops at a breakpoint in `HR_Engineer | email:firstName:lastName:phone:`

1. Find the Java code that calls the Smalltalk code in which the breakpoint will be set. Open a `GbjDebugger` in the catch block for that code.

```

try {
    eng = (HR_Engineer) engClass.perform(
        "email:firstName:lastName:phone:", args, 4);
} catch (GbjEventException e) {
    new com.gemstone.tools.GbjDebugger(e);
}

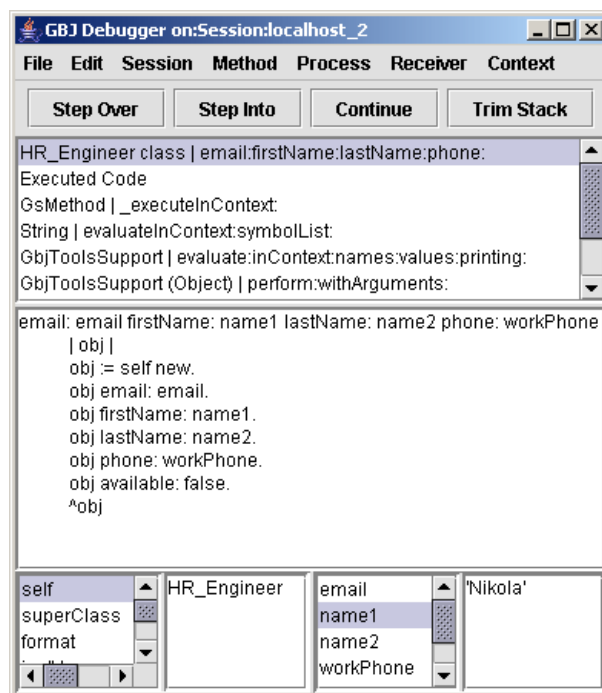
```

2. Have the application open a `GbjLauncher` so you can set the breakpoint, which must be set within the session in which the application is running. This example opens the Launcher only when the system property `mydebug` is true. The object `session` is an instance of `GbjSession`.

```
if (Boolean.getBoolean("mydebug"))
    new GbjLauncher(session);
```

3. Start the application. When the Launcher appears, open a source code browser and set the breakpoint as explained in the previous topic. For our example, the command line is
4. Run the part of the application that calls the Smalltalk code where the breakpoint is set. When the breakpoint is encountered, the debugger will open.

**Figure 3.7 Debugger Invoked from a Running Application**



You can step through the Smalltalk execution as desired. Because the client Java thread is not suspended, however, it continues execution and may encounter a

`NullPointerException` on a object that was not returned from the GemStone server.

—  
|

## Common Menus and Shortcuts

All text panes in all GemBuilder for Java tools have a popup menu allowing you to perform common operations. The popup menu differs slightly, depending on which tool the text pane belongs to.

To access the popup menu, place the cursor in a text pane and click the right mouse button. To dismiss the popup menu without selecting an item, move the cursor off the menu and click the left mouse button.

### The Popup Menu

The popup menu items are:

<b>Cut</b>	Cuts the selected text and places it in the clipboard.
<b>Copy</b>	Copies the selected text and places it in the clipboard.
<b>Paste</b>	Pastes the text from the clipboard at the current insertion point.
<b>Select All</b>	Selects all the text in the pane.
<b>Do-It</b>	Uses the GemStone compiler to evaluate the currently selected text.
<b>Print-It</b>	Performs a <b>Do-It</b> , sends the resulting object the message <code>printString</code> , and then places the resulting string after the current text pane selection.
<b>Inspect-It</b>	Performs a <b>Do-It</b> , then opens a GemStone Inspector on the resulting object.
<b>Compile</b>	Compiles the selected source code. This menu item is available only in those tools for which it is relevant.
<b>Cancel</b>	Cancels any text you entered in the text pane, returning it to its unmodified form. This menu item is available only in those tools for which it is relevant.
<b>Set Break</b>	Sets a breakpoint at the current insertion point in the current method. This menu item is available only in those tools for which it is relevant.

## Keyboard Shortcuts

The following keyboard shortcuts are available:

<b>Edit &gt; Cut</b>	Control-X
<b>Edit &gt; Copy</b>	Control-C
<b>Edit &gt; Paste</b>	Control-V
<b>Edit &gt; Select All</b>	Control-A
<b>Edit &gt; Do-It</b>	Control-D
<b>Edit &gt; Print-It</b>	Control-P
<b>Edit &gt; Inspect-It</b>	Control-I
<b>Edit &gt; Compile</b>	Control-S
<b>Session &gt; Commit</b>	Control-Shift-S



---

**A**

Abort (menu item) 15, 22, 37, 39  
Add (menu item) 23, 25

**B**

Begin (menu item) 22, 37, 39  
Breakpoint Browser 31  
    opening 16  
breakpoints 31, 40  
    buttons 32  
Breakpoints (menu item) 16  
Browse Class (menu item) 16, 23  
Browse Hierarchy (menu item) 16, 23  
Browse Method (menu item) 25  
Browse Versions (menu item) 23  
Browser (menu item) 16  
Browser button 13, 19  
browsers, specialized 27

browsing

    classes 16  
    hierarchy 16  
    references 16

buttons

    Browser 13, 19  
    Implementors 13  
    in Debugger 42  
    Login 13  
    Logout 13  
    Senders 13  
    Workspace 13

**C**

Cancel (menu item) 22, 39, 47  
Class Browser 16, 23, 27  
    description 27  
Class menu 23  
Class Version Browser 23, 29  
    description 27  
CLASSPATH 10

- Close (File menu item) 21, 36, 38
- Comment (menu item) 24
- Commit
  - keyboard shortcut 48
- Commit (menu item) 15, 22, 37, 39
- Compile
  - keyboard shortcut 48
- Compile (menu item) 22, 39, 47
- Continue (button) 42
- Continue (menu item) 42
- Copy
  - keyboard shortcut 48
- Copy (menu item) 15, 21, 36, 38, 47
- Copy Stack (menu item) 43
- Cut
  - keyboard shortcut 48
  - menu item 15, 21, 36, 38, 47

## D

- Debugger 35, 40–46
  - invoking from java client 44
  - invoking from workspace 43
  - menu items 42–43
- Definition (menu item) 24
- Dictionary menu 23, 27
- Dictionary, inspecting 39
- Do-It
  - keyboard shortcut 48
- Do-It (menu item) 15, 21, 37, 38, 47

## E

- Edit menu 15, 21
- environment variables 10
- executing code 15
- Exit (menu item) 14
- Explain (menu item) 42

## F

- File In (File menu item) 14, 36
- File It In (menu item) 15, 37

- File menu 14, 21
- File Out As (menu item) 23, 25
- filing in code 15, 37
- Find Class (menu item) 23
- Find Method (menu item) 25
- Find Substring (menu item) 16

## G

- Gem Service 12
- GemStone Browser 13, 27
  - description 19

## H

- Hierarchy (menu item) 24
- Hierarchy Browser 16, 23, 27
  - description 28

## I

- Implementors (menu item) 16, 25
- Implementors button 13
- Inspect (menu item) 23, 39, 43
- inspecting objects 15
- Inspect-It
  - keyboard shortcut 48
  - menu item 15, 22, 37, 47
- Inspector 15, 20, 37–40
  - description 37
  - menu items 38–39
- instance variables
  - inspecting 38

## K

- keyboard shortcuts 48

## L

- Launcher 19, 27
  - description 12
  - using 10

Login (menu item) 15  
Login button 13  
Logout  
  button 13  
Logout (menu item) 15

## M

Method Browser 25  
  description 30  
Method List Browser 13, 16, 25, 27  
  description 30  
Method menu 25  
More (menu item) 39  
Move to (menu item) 24

## N

NetLDI 12  
New Template (menu item) 24

## O

Open (File menu item) 14, 36

## P

Paste  
  keyboard shortcut 48  
Paste (menu item) 15, 21, 36, 38, 47  
popup menu 47  
Print-It  
  keyboard shortcut 48  
Print-It (menu item) 15, 22, 37, 38, 47  
Process menu 42  
Protocol menu 25

## R

References (menu item) 16  
References To > Class (menu item) 24  
References To > Instance Variable  
  (menu item) 23

Remove (menu item) 23, 24, 25  
Rename As (menu item) 23, 25

## S

Save As (File menu item) 14, 36  
Select All  
  keyboard shortcut 48  
Select All (menu item) 15, 21, 36, 38, 47  
Senders (menu item) 16, 25  
Senders button 13  
Session menu 15, 22  
Set Break (menu item) 22, 47  
set, inspecting 40  
Settings (menu item) 14  
shortcuts, keyboard 48  
Step Into (menu item) 42  
Step Over (menu item) 42  
string, searching for 16  
symbol dictionaries 20  
System Browser (GemStone Browser)  
  19

## T

Tools menu 16  
Transaction Mode 12, 15  
  automatic 15  
  manual 15  
transaction, beginning 15  
Trim Stack (menu item) 43  
Trim Stack button 42

## U

Update (menu item) 21, 38

## W

wildcards 14, 16, 27, 30  
Workspace 12, 35, 36–37  
  button 13  
  launcher menu item 16  
  menu items 36–37

—  
|