TIBCO Spotfire S+® 8.2 Workbench User's Guide

November 2010

TIBCO Software Inc.

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software may be available on multiple operating systems. However, not all operating system platforms for a specific software version are released at the same time. Please see the readme.txt file for the availability of this software version on a specific operating system platform.

Reference

The correct bibliographic reference for this document is as follows:

TIBCO Spotfire S+® 8.2 Workbench User’s Guide TIBCO Software Inc.

TIBCO SPOTFIRE S+ BOOKS

Note about Naming
Throughout the documentation, we have attempted to distinguish between the language (S-PLUS) and the product (Spotfire S+). • "S-PLUS" refers to the engine, the language, and its constituents (that is objects, functions, expressions, and so forth). • "Spotfire S+" refers to all and any parts of the product beyond the language, including the product user interfaces, libraries, and documentation, as well as general product and language behavior.

The TIBCO Spotfire S+® documentation includes books to address your focus and knowledge level. Review the following table to help you choose the Spotfire S+ book that meets your needs. These books are available in PDF format in the following locations:

- In your Spotfire S+ installation directory (**SHOME\help** on Windows, **SHOME/doc** on UNIX/Linux).
- In the Spotfire S+ Workbench, from the **Help ► Spotfire S+ Manuals** menu item.
- In Microsoft® Windows®, in the Spotfire S+ GUI, from the **Help ► Online Manuals** menu item.

Spotfire S+ documentation.

Information you need if you...	**See the...**
Must install or configure your current installation of Spotfire S+; review system requirements.	*Installtion and Administration Guide*
Want to review the third-party products included in Spotfire S+, along with their legal notices and licenses.	*Licenses*

Spotfire S+ documentation. (Continued)

Information you need if you...	**See the...**
Are new to the S language and the Spotfire S+ GUI, and you want an introduction to importing data, producing simple graphs, applying statistical models, and viewing data in Microsoft Excel®.	*Getting Started Guide*
Are a new Spotfire S+ user and need how to use Spotfire S+, primarily through the GUI.	*User's Guide*
Are familiar with the S language and Spotfire S+, and you want to use the Spotfire S+ plug-in, or customization, of the Eclipse Integrated Development Environment (IDE).	*Spotfire S+ Workbench User's Guide*
Have used the S language and Spotfire S+, and you want to know how to write, debug, and program functions from the **Commands** window.	*Programmer's Guide*
Are familiar with the S language and Spotfire S+, and you want to extend its functionality in your own application or within Spotfire S+.	*Application Developer's Guide*
Are familiar with the S language and Spotfire S+, and you are looking for information about creating or editing graphics, either from a **Commands** window or the Windows GUI, or using Spotfire S+ supported graphics devices.	*Guide to Graphics*
Are familiar with the S language and Spotfire S+, and you want to use the Big Data library to import and manipulate very large data sets.	*Big Data User's Guide*
Want to download or create Spotfire S+ packages for submission to the Comprehensive S-PLUS Archive Network (CSAN) site, and need to know the steps.	*Guide to Packages*

Spotfire S+ documentation. (Continued)

Information you need if you...	**See the...**
Are looking for categorized information about individual S-PLUS functions.	*Function Guide*
If you are familiar with the S language and Spotfire S+, and you need a reference for the range of statistical modelling and analysis techniques in Spotfire S+. Volume 1 includes information on specifying models in Spotfire S+, on probability, on estimation and inference, on regression and smoothing, and on analysis of variance.	*Guide to Statistics, Vol. 1*
If you are familiar with the S language and Spotfire S+, and you need a reference for the range of statistical modelling and analysis techniques in Spotfire S+. Volume 2 includes information on multivariate techniques, time series analysis, survival analysis, resampling techniques, and mathematical computing in Spotfire S+.	*Guide to Statistics, Vol. 2*

CONTENTS

THE TIBCO SPOTFIRE S+ WORKBENCH

1

INTRODUCTION

TIBCO Spotfire S+ provides a plug-in, or customization, of the Eclipse Integrated Development Environment (IDE) called the Spotfire S+ Workbench. You can use the Spotfire S+ Workbench, the basic Eclipse IDE features, and other third-party plug-ins for many tasks, including:

- Manage your project files and tasks.
- Edit your code.
- Run Spotfire S+ commands.
- Examine Spotfire S+ objects.
- Debug your code.
- Track resource use, functions, variables, and expressions.
- Troubleshoot problems with Spotfire S+ code.
- Provide source control for shared project files.

The Spotfire S+ Workbench is a stand-alone application that runs the S-PLUS engine. When you run the Spotfire S+ Workbench, you do not need to run any other version of Spotfire S+ (for example, the console or traditional Windows or Java GUI).

Caution

If you run two or more simultaneous sessions of Spotfire S+ (including one or more in the Spotfire S+ Workbench), take care to use different working directories. To use the same working directory for multiple sessions can cause conflicts, and possibly even data corruption.

This chapter introduces the Spotfire S+ Workbench and provides important conceptual information and definitions of terms you need to know to use the Spotfire S+ Workbench most effectively.

- Chapter 2 provides reference for the Spotfire S+ perspective.
- Chapter 3 provides reference for the Debug perspective.
- Chapter 4 provides tasks for learning to use the Spotfire S+ Workbench.

TERMS AND CONCEPTS

Before you start using the Spotfire S+ Workbench, you should understand key terms and concepts that vary from the traditional Spotfire S+ for Windows GUI and Spotfire S+ for UNIX Java GUI.

Note

If you are using the Eclipse IDE on a UNIX platform from a Windows machine using a Windows X-server software package, you might notice that Eclipse runs slowly, similar to the Spotfire S+ Java GUI. See the Release Notes for more information and recommendations for improving UI performance.

Note

Eclipse version 3.2 or later does not support SPARC/Motif for Solaris. If you are using a version of Solaris prior to version 10, you must install the GTK (version 2.2.4 or greater) library. For more information about finding this library, see http://www.sun.com/software/solaris/. (This library is included in Solaris 10.)

Table 1.1: *Important terms and concepts.*

Term	Definition
Perspective	Defines the preferences, settings, and views for working with Eclipse projects. • The Spotfire S+ perspective is conceptually equivalent to the traditional Spotfire S+ Windows GUI or UNIX Java GUI. Use the Spotfire S+ perspective as the primary perspective for interactive Spotfire S+ command line use. For an example of changing the perspective, see the section Customized Perspective Views on page 148. • The Debug perspective provides an integrated debugging and profiling environment, with customized views, menu options, and behavior. For more information about using the Debug perspective, see Chapter 3, TIBCO Spotfire S+ Workbench Debug Perspective.

Table 1.1: *Important terms and concepts. (Continued)*

Term	Definition
Workspace	A physical directory on your machine that manages Spotfire S+ Workbench resources such as projects and other options. On your machine's hard drive, the **workspace** directory contains a single Spotfire S+ **.Data** database and the Eclipse **.metadata** database. (You should never touch these resources.) This design is different from the association you notice when you work in Spotfire S+ in other environments. When you start the Spotfire S+ Workbench, you are prompted to create or identify the workspace. See the section The Spotfire S+ Workspace on page 12.
Project	A resource containing text files, scripts, and associated files. The Spotfire S+ Workbench project is used for build and version management, sharing, and resource management. Before you begin working with any files in the Spotfire S+ Workbench, create a project. You can create a new project by: • Specifying a project name and allowing Eclipse to locate the project in the workspace directory, and then selecting an existing directory containing project files at an alternate location (that is, work with the files at the specified location). • Specifying a project name and selecting an existing directory containing project files. Another important concept is that of the *working project*. Set a project as the working project, which changes the working directory to the project's directory in your workspace and stores data objects in the project's **.Data** database. See the section Setting the Working Project on page 151 for more information. **Important:** If you select an existing Spotfire S+ project directory for your Workbench project, you must set that project to be the *working project* to write data objects to its **.Data** directory. See the section Working Projects and Databases on page 151 for a detailed discussion. See the section Quick Start on page 127.

Table 1.1: *Important terms and concepts. (Continued)*

Term	Definition
View	A perspective's integrated window, containing menus, options, and commands, that display specific parts of your data and projects and provide tools for data manipulation. For descriptions of the Spotfire S+ perspective views, see the section Spotfire S+ Perspective Views on page 68. For descriptions of the Debug perspective views, see the section Debug view on page 100. For practice exercises working with views, see Chapter 4, TIBCO Spotfire S+ Workbench Tasks.
Editor	An integrated code/text editor that includes support for syntax coloring, text formatting, and integration with the other views. Analogous to the Script Editor in the traditional Spotfire S+ GUI. For more information, see the section Spotfire S+ Workbench Script Editor on page 57. To practice using the Script Editor, see the section Editing Code in the Script Editor on page 157.

FINDING HELP FOR THE WORKBENCH

The Eclipse IDE contains extensive, in-depth documentation for its user interface. For information about basic Eclipse IDE functionality, on the menu, see the Eclipse *Workbench User Guide*.

Getting Started Tutorial

If you are not familiar with the Eclipse IDE, after you start the Spotfire S+ Workbench, take the first few minutes to learn the basic concepts and IDE layout by working through the basic tutorial in the *Workbench User Guide*.

To view the Eclipse Getting Started tutorial

1. From the Spotfire S+ Workbench main menu, click **Help ▶ Help Contents**.

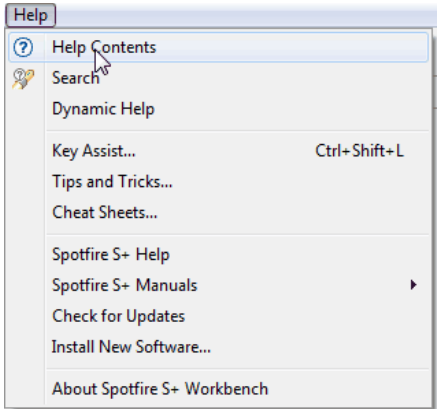


Figure 1.1: *Eclipse IDE **Help** menu.*

2. In the left pane, expand the table of contents by clicking **Workbench User Guide**.
3. Click **Getting Started**, and then click **Basic tutorial**.

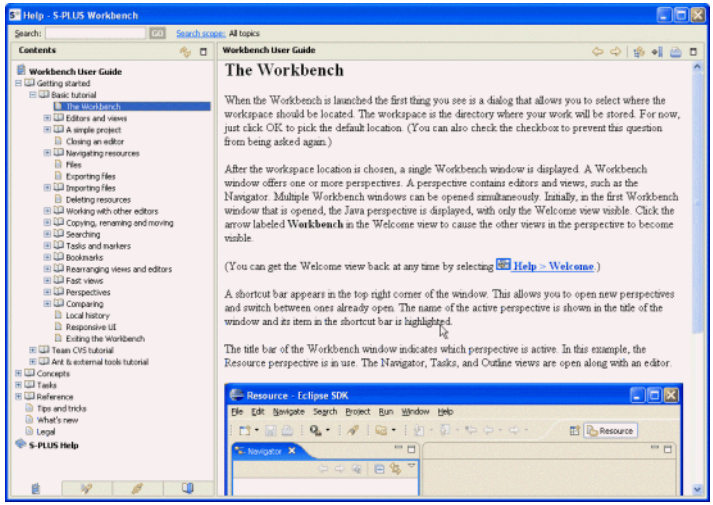


Figure 1.2: *The Eclipse basic tutorial.*

The *Workbench User Guide* opens in a separate window; you can toggle between the Spotfire S+ Workbench application and the Help browser.

Help for Spotfire S+ Functions

The Spotfire S+ Workbench provides access to function help topics.

- In the **Console**, type `help(`*`functionname`*`)` where *`functionname`* is the function for which you want help.
- In the Script Editor, highlight the function for which you want help, and then press F1.
- Use the Spotfire S+ Workbench menu options. In the Script Editor, select the function for which you want help, and then, on the menu click either:
  - **Spotfire S+ ▶ Open Spotfire S+ Help File**

  or
  - **Help ▶ Spotfire S+ Help**

The Spotfire S+ Workbench PDF

If you browsed to and opened this document directly from the installation directory, you might be interested to know how you can open it directly from the Spotfire S+ Workbench user interface.

Note

Whether you are working in Windows® or a UNIX® platform, You must have access to a PDF reader to open any of the PDFs shipped with Spotfire S+.

On the Spotfire S+ Workbench menu, click **Help ► Spotfire S+ Manuals ► Spotfire S+ Workbench Guide**. (Note that all Spotfire S+ manuals are available from the **Spotfire S+ Manuals** menu, including the *Programmer's Guide*, the *Application Developer's Guide*, the *Function Guide*, the *Big Data User's Guide,* the *Guide to Package*s and the *Guide to Graphics*, among others.)

For more information about setting preferences, see the following documentation:

- The section Examining Spotfire S+ Preferences on page 14.
- The section Setting the Spotfire S+ Workbench Preferences on page 137.
- The Eclipse *Workbench User Guide,* available from the Spotfire S+ Workbench menu item **Help ► Help Contents**.

Note

For information about creating a package project using the Spotfire S+ Packages feature with the Spotfire S+ Workbench, see the section To create a package project on page 168.

STARTING THE SPOTFIRE S+ WORKBENCH

The Spotfire S+ Workbench user interface is the same in both Microsoft Windows and UNIX platforms.

From Microsoft Windows

In Microsoft Windows, click the **Start** menu ▶ **All Programs** ▶ **TIBCO** ▶ **TIBCO Spotfire S+ 8.2** ▶ **TIBCO Spotfire S+ Workbench**.

Setting Environment Variables

When you start the Spotfire S+ Workbench from the Windows Start menu, it uses a shortcut that starts a Java virtual machine (`-vm`) immediately. The Workbench supports a Java system variable, `splus.environment.vars`, that can pass environment variables to the engine for startup consumption. For example, you can set your Spotfire S+ Workbench environment to start without printing copyright and version infromation by setting the environment variable `S_SILENT_STARTUP=<any value>`.

To use the Java system variable, create a shortcut or a **.bat** file that contains the following instructions:

```
"SHOME\eclipse\eclipse.exe"
-vm "SHOME\java\jre\bin\javaw.exe" -vmargs
-Dsplus.home="SHOME"
```

(Where *SHOME* is your Spotfire S+ installation location.

Note that this is the default Windows XP shortcut, as it appears in the **Spotfire S+ Workbench Properties** dialog (see Figure 1.3).

To add an environment argument in Windows

1. Click **Start** ▶ **Program Files** ▶ **TIBCO** ▶ **TIBCO Spotfire S+ 8.2**.
2. Right-click **Spotfire S+ Workbench**.
3. In the **Spotfire S+ Workbench Properties** dialog, type the following after `-vmargs`:
4. `-Dsplus.environment.vars="VAR1=arg1, VAR2=arg2"`

   where *VAR* is the variable to set and *arg* is the argument you are setting. For example:

```
-Dsplus.environment.vars="S_LICMGRSN=WTP10987654321,
   S_SILENT_STARTUP=X"
```

Note

The Windows startup shortcut is defined to run a command with the option to set memory heap size: `-Xmx400m`.

```
"SHOME\eclipse\eclipse.exe" -vm "SHOME\java\jre\bin\javaw.exe"
-vmargs -Dsplus.shome="SHOME\eclipse\eclipse.exe -Xmx400m"
```

You can override this setting and increase the memory heap size by appending a different setting at the end of the shortcut. (For example, change `-Xmx400m` to `-Xmx600m` at the end of the command to set the memory heap size to 600mb.) See Figure 1.3 for an example.

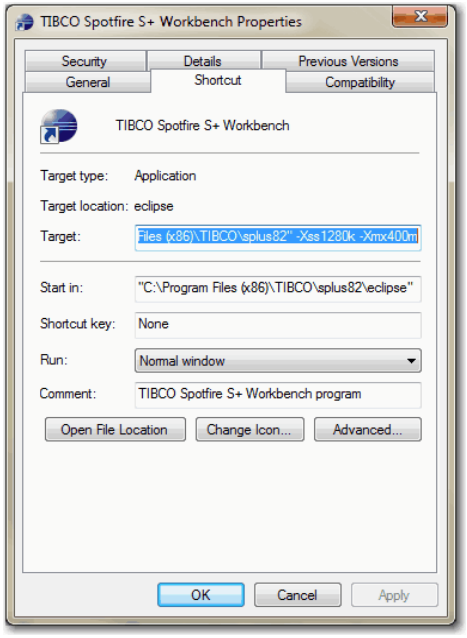


Figure 1.3: *Spotfire S+ Workbench Properties dialog.*

From Unix

In UNIX, at the command prompt, type

```
Splus -w
```

or type

```
Splus -workbench
```

Setting Environment Variables

Certain required environment variables are set to work with UNIX and Linux as part of the Spotfire S+ Workbench startup script. To add other environment variables, set them using `env`. For example, you can start the Spotfire S+ Workbench with a particular license and to start displaying no copyright and version information by using the following:

```
env S_LICMGRSN=WTP10987654321 S_SILENT_STARTUP=X
 Splus -w
```

(To set multiple environment variables, separate them with spaces.)

To extend the Java maximum memory heap size to 600MB, set the environment variable `JAVA_OPTIONS` to `-Xmx600m`. For example:

```
env JAVA_OPTIONS="-Xmx600m" Splus -w
```

The Spotfire S+ Workspace

When you launch the Spotfire S+ Workbench, you see the **Workspace Launcher** dialog. You must indicate the location of the workspace.

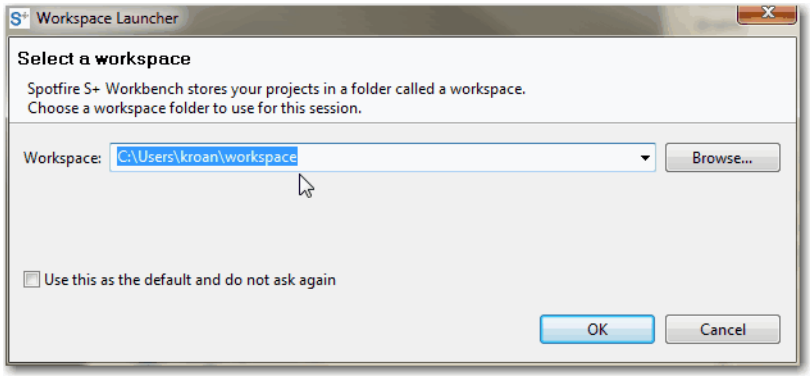


Figure 1.4: *The **Workspace Launcher** dialog.*

The Spotfire S+ workspace is the directory where the Spotfire S+ workspace **.Data** and Eclipse **.metadata** databases are stored. (You should never touch these files.) Optionally, the workspace directory can also store your project directories. The Spotfire S+ workspace is the default directory specified for the project's directory in the **New Project** wizard. See the **section Spotfire S+ New Project Wizard on page 31** for more information. (For instruction on creating a workspace, see the section Setting the Workspace on page 126.)

Important

In the Spotfire S+ Workbench, you have two options for storing data objects:

- Using the Spotfire S+ Workbench model, where the Spotfire S+ workspace contains a **.Data** directory, not individual projects. The **.Data** directory can store objects for projects to share in the workspace.
- Using the familiar Spotfire S+ model, the *working Spotfire S+ project* stores its data objects to its **.Data** directory and replaces the first entry in the **Search Path** with the project's location. It is also the location to which relative paths are resolved.

  Working projects are marked by an arrow icon, and by the cue (**working**) in the navigator:

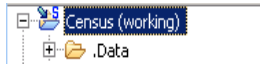


Figure 1.5: *The working project.*

For more information about setting the Spotfire S+ working project, see the section Setting the Working Project on page 151.

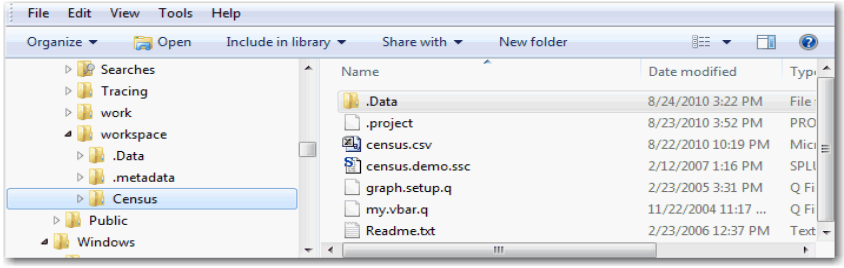


Figure 1.6: ***Workspace*** *directory (in Windows) showing* ***.Data*** *directory,* ***.metadata*** *directory, and project directories.*

Notes

When you work with Spotfire S+ Workbench projects, avoid nesting projects (that is, create one project in a subdirectory of another project).

To avoid conflicts, never work on Spotfire S+ files in the Spotfire S+ Workbench and another Spotfire S+ interface at the same time.

EXAMINING SPOTFIRE S+ PREFERENCES

The Spotfire S+ Workbench IDE defaults are set to the Spotfire S+ perspective. The preferences include project type, window appearance, editor preferences, menu options, debugging options, server options, and file associations. Use the **Preferences** dialog to change these preferences and any other default Eclipse preferences. To display the **Preferences** dialog, on the main menu, click **Window ► Preferences**.

You can also display the **Preferences** dialog for the following Spotfire S+ Workbench views by clicking the drop-down button ( ) and selecting **Preferences** from the control menu:

- **Tasks** view.
- **Problems** view.
- **Output** view.
- **Console** view.

You can display the **Preferences** dialog for the Spotfire S+ Workbench Script editor from the right-click menu (that is, right-click the Script Editor, and from the menu, click **Preferences**).

Hint
The Eclipse *Workbench User Guide* includes descriptions of the Eclipse options in the **Preferences** dialog.

For instruction on setting Spotfire S+ preferences, see the section Setting the Spotfire S+ Workbench Preferences on page 137.

The Spotfire S+ Workbench sets defaults for the following preferences.

File Associations

Spotfire S+ recognized file types include `*.q`, `*.r`, `*.ssc`, and `*.t`. Any of these files, associated with the Spotfire S+ Script editor, are checked for syntax errors and scanned for task tags.

Note that when you select the file type, its associated editors are displayed in the **Associated editors** box. You can add or remove both file types and associated editors.

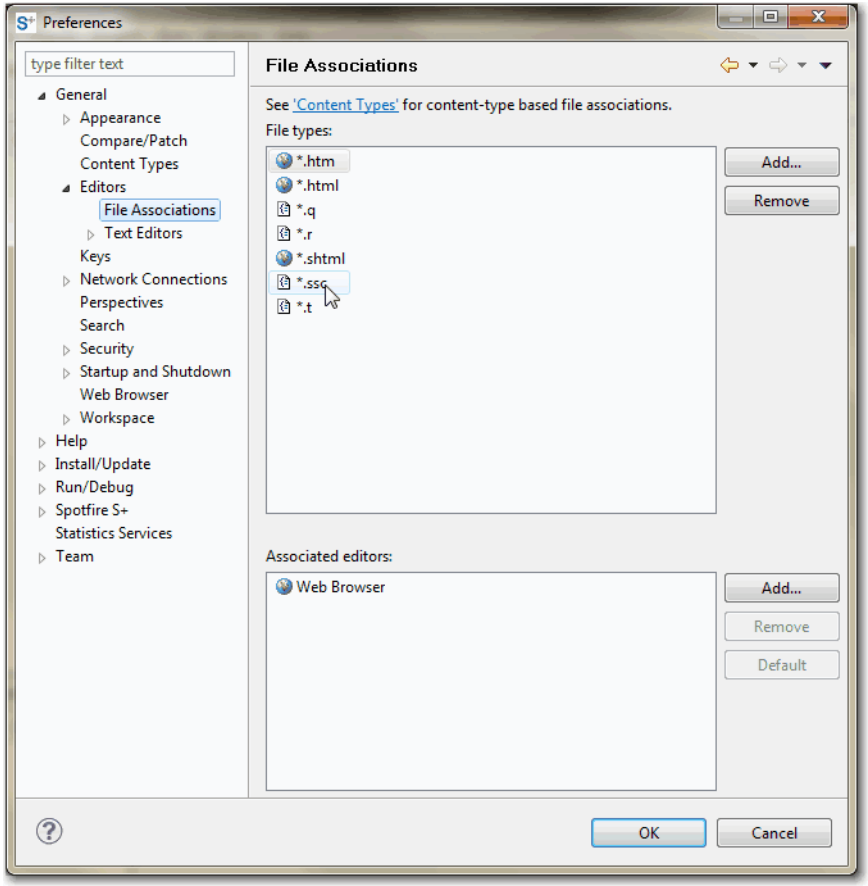


Figure 1.7: *The **File Associations** page of the **Preferences** dialog.*

Spotfire S+ Workbench options

These options control general settings for the Spotfire S+ Workbench.

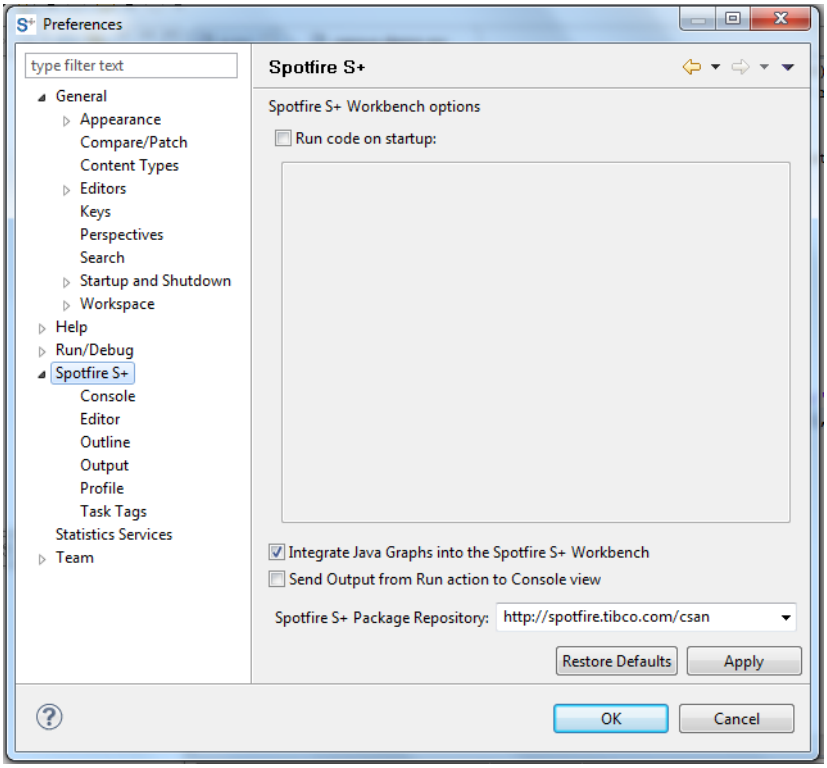


Figure 1.8: *The **Spotfire S+ Workbench Options** page of the **Preferences** dialog.*

Run code on startup

Select this option, and then provide any code that you want the Spotfire S+ Workbench to run when it starts up. Note that this box is selected by default, and the Big Data library is loaded by default.

Note
If you clear the **Run code on startup box**, or if you do not supply the option to load the Big Data library on startup, and then later open a project that uses the Big Data library, you could see unexpected results when you try to perform actions. If your typical projects include large data sets, add the code to load the Big Data library and select **Run code on startup** to load the Big Data library when you start the Spotfire S+ Workbench.

Integrate Java Graphs into the Spotfire S+ Workbench

This option is selected by default. Clear this option if you do not want Java graphs embedded in the Spotfire S+ Workbench.

With this option selected, any Java graphs created as part of your script appear embedded in a view to the right of the folder containing the console view by default.

Note
`java.graph` is the default device for the Spotfire S+ Workbench.

Figure 1.9 shows the a Java graph from the Census sample, embedded in the Spotfire S+ Workbench.

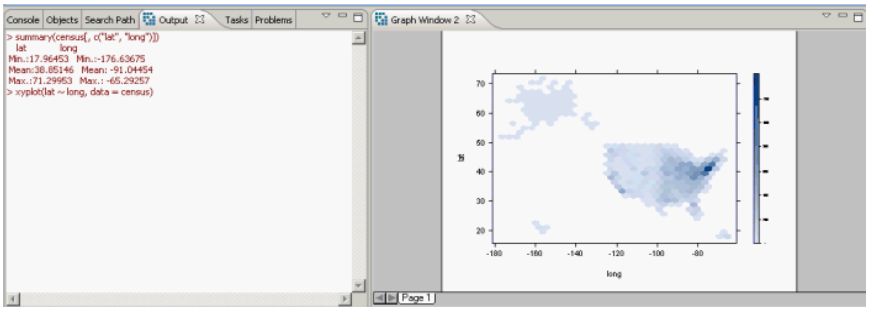


Figure 1.9: *Java graph embedded in the Spotfire S+ Workbench.*

Note
If you have multiple graphs, and you want to display tabbed graph windows, you can set the option from the drop-down arrow in the **Graph Window**. Select **Graph Options ▶ Options**, and in **New Plot Action**, select whether to delete, reuse, or add new pages. Alternatively, you can set this option programmatically using the Spotfire S+ function `java.new.plot.action`. See its Help file for more information.

Send Output from Run Action to Console View

Select this option if you want script output to appear in the **Console** view, rather than in the **Output** view. This option is cleared by default: when you run code from the Script Editor, the **Output** view opens and displays the results.

Note that output for code you type in the **Console** view always appears in the **Console** view.

Spotfire S+ Package Repository

Change this option to specify another location for Spotfire S+ packages. By default, this location is set to the CSAN Web site (**http://spotfire.tibco.com/csan**). The preference specified in this box populates the **Repository** contols in the **Update Packages** and **Find Packages** dialogs. (Selections in these dialog boxes also appear in the **Spotfire S+ Package Repository** drop-down list.)

Console Options

The **Console** page controls settings for the Spotfire S+ Workbench **Console**.

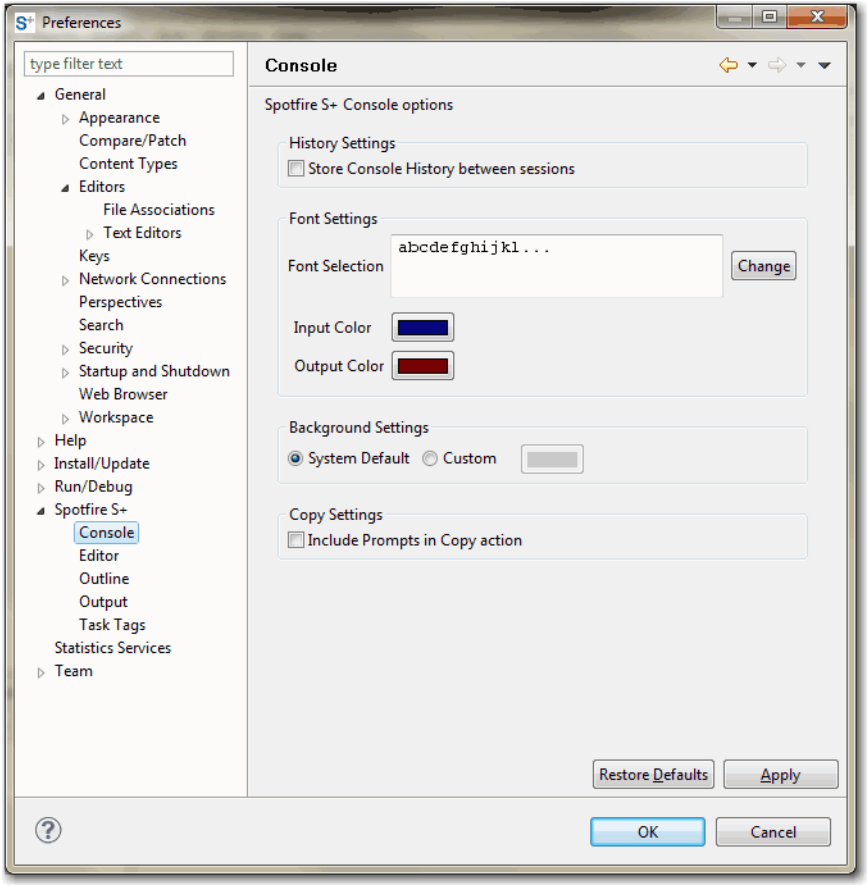


Figure 1.10: ***Console*** *page of the* ***Preferences*** *dialog.*

Store Console History Between Sessions

By default, this option is selected. It persists the commands you issue in the **Console** (which then appear in the **History**), between sessions. When you re-start the Spotfire S+ Workbench, click **History** to display the stored entries. Entries you select in the **History** then appear in the **Console**. Also, you can scroll up and down in the **History** to display items in the **Console**. For more information about using the **History**, see the section Examining the History on page 165. For information about setting options for the **Output** view, see section Output Options on page 24.

Font Settings

By default, the **Console** displays input and output text using the default system font as blue and red, respectively. You can change both the font and the color.

- To set the font, click **Change**, and then, in the **Font** dialog, select from **Font**, **Font style**, **Size**, and any additional font properties to use. Note that the font changes for both input and the output displayed in the **Console**.
- To set a custom font color, click the **Input Color** or **Output Color** button, and then, in the **Color** picker, select a color for the input or output.

Background Settings

By default, the Spotfire S+ **Console** uses the system default. Select **Custom Color**, and then click the color button to display the **Color** picker and choose a different background color.

Include Prompts in Copy action

Select if you want to include prompts (> and +) when you copy code from either the **Console**.

Editor

These options control settings for the Spotfire S+ Workbench Script Editor.

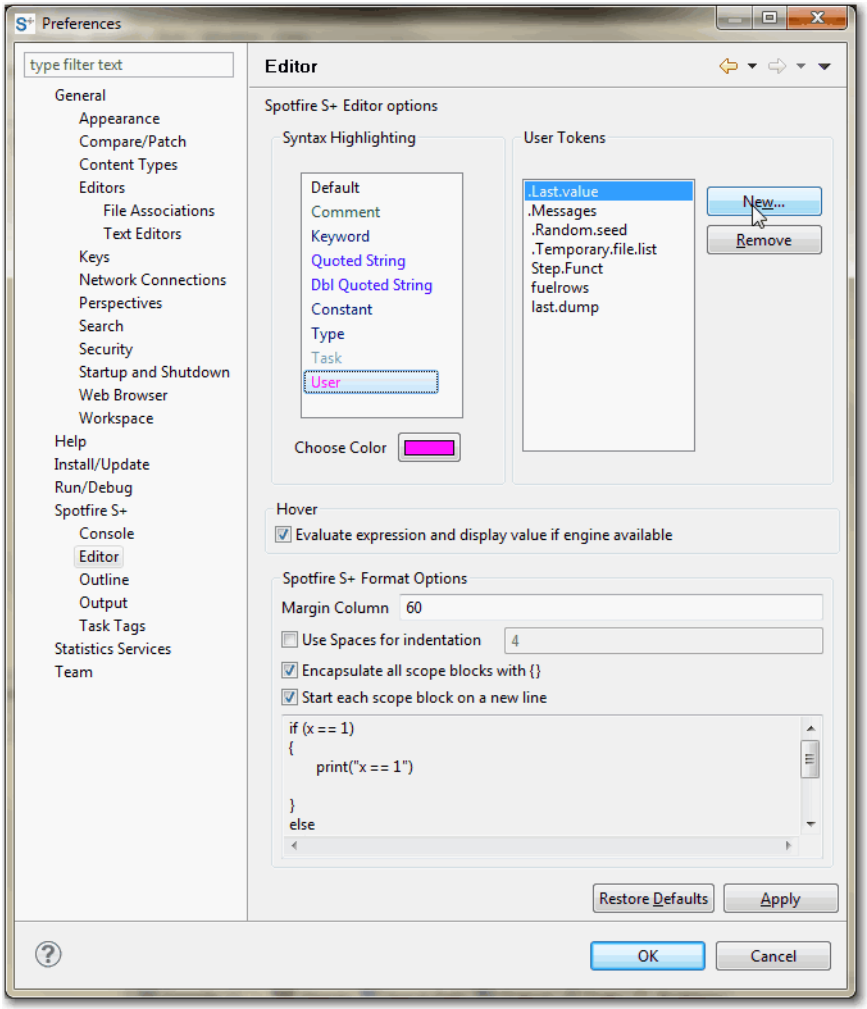


Figure 1.11: *The **Editor** page of the **Preferences** dialog.*

Syntax Highlighting

Specifies the colors for text and defined syntax appearing in the Script Editor. To change the default color for any of the items listed, click **Choose Color** and, from the color picker dialog, select a color.

Note
To set background color, in the **Preferences** dialog, select **General** ▶ **Editors** ▶ **Text Editors**, and, in the **Appearance color options** box, select **Background color**. See the *Workbench User Guide* for more information about setting general options.

User Tokens

Lists items specified for user-defined syntax highlighting.

By default, no user-defined highlighted terms are defined. Any term you define using this option appears in the Spotfire S+ Script Editor in the color you define in **Syntax Highlighting** for the option **User**. To add a user-defined token, click **New**, and then, in the **Add Desired S-PLUS Text** dialog, provide the term or source.

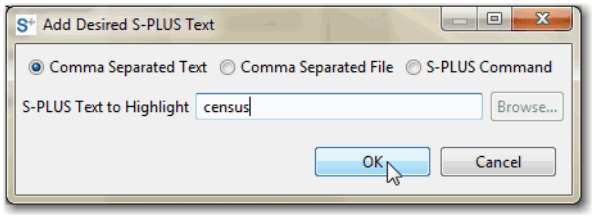


Figure 1.12: ***Add Desired S-PLUS Text*** *dialog.*

In the **Add Desired S-PLUS Text** dialog, you can provide:

- Individual terms, separated by commas.
- The contents of a comma-separated file.
- The results of a S-PLUS command. (Note that Figure 1.11 shows the results of the S-PLUS command `objects()`, which adds all objects in the current working project to the **User Token** list.

For more information about adding user tokens, see the section Spotfire S+ View Preferences on page 138.

Hover

Displays a tooltip when the mouse hovers over an expression. The tooltip displays the value of the expression, if the engine is available.

Spotfire S+ Format Options

Provides control over the Spotfire S+ Workbench's automatic code layout and formatting style.

Note
Changes you make to the **Spotfire S+ Format Options** do not affect your code until you select from the menu **Spotfire S+ ► Format**.

Table 1.2: *Spotfire S+ Format Options.*

Format Option	Description
Code Line Width	Sets the width of the text area, counting from the left-most character. By default, set to 60, making the editing space 59 characters wide.
Use Spaces for Indentation	By default, cleared. If selected, the default value is 4. If you leave this cleared, the auto-formatting feature uses tab indents, rather than character spaces.
Encapsulate all scope blocks with {}	Select to enclose all of your scope blocks with curly brackets (`{}`). Selected by default.
Start each scope block on a new line	Inserts a line break before the first line of a scope block.

The read-only text box appearing at the bottom of the **Spotfire S+ Format Options** area provides an preview of your choices.

Outline Options

Lists the options to display anonymous functions and functions to watch.

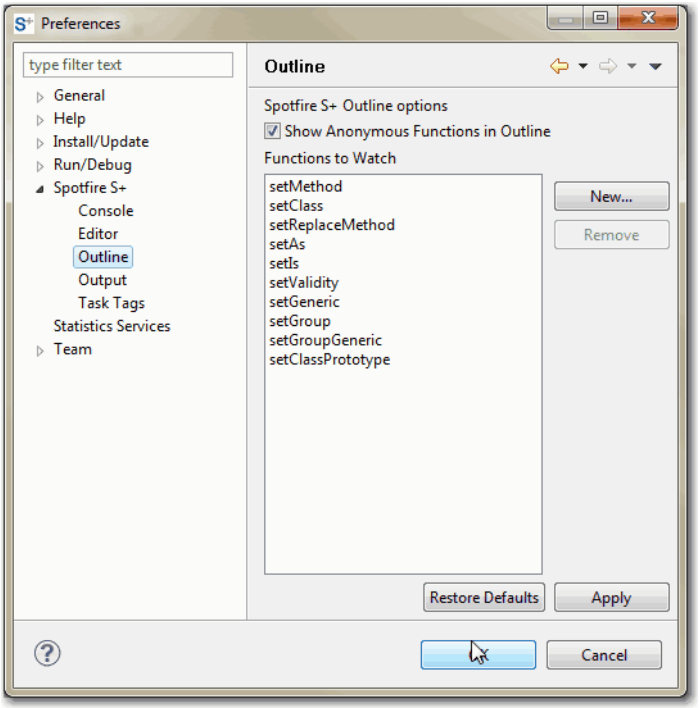


Figure 1.13: *The **Outline** page of the **Preferences** dialog.*

Show Anonymous Functions in Outline

By default, the Spotfire S+ Script Editor shows anonymous functions in the outline.

Functions to Watch

Contains a predefined list of Spotfire S+ functions to identify in the **Outline** view. You can add your own functions to this list using the **New** button. You can also remove functions from the list or reorder the list.

Output Options

The **Output** page controls settings for the Spotfire S+ Workbench **Output** view.

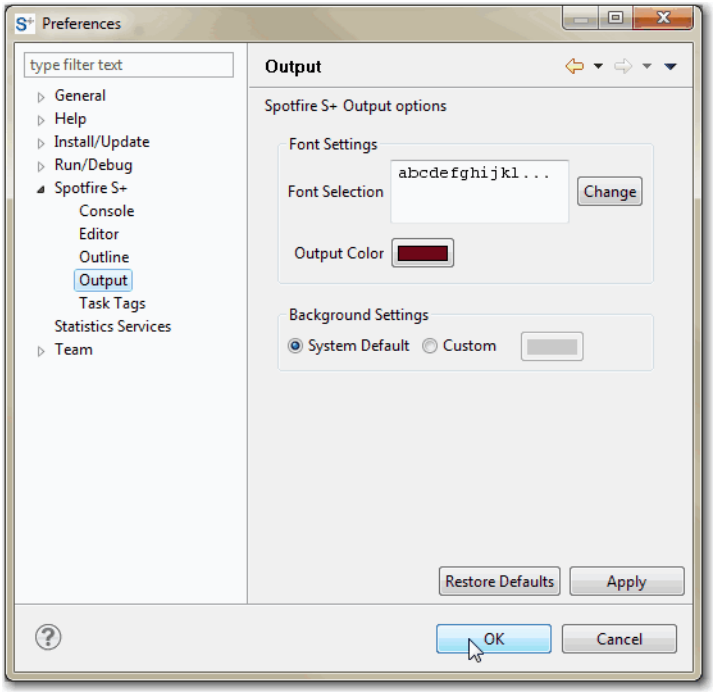


Figure 1.14: ***Output*** *page of the* ***Preferences*** *dialog.*

Font Settings

By default, the **Output** view displays output text using the default system font as red. You can change both the font and the color.

- To set the font, click **Change**, and then, in the **Font** dialog, select from **Font**, **Font style**, **Size**, and any additional font properties.
- To set a custom font color, click the **Output Color** button, and then, in the **Color** picker, select a color for the output.

Background Settings

By default, the **Output** view uses the system default. Select **Custom Color**, and then click the color button to display the **Color** picker and choose a different background color.

Task Options

Lists the three pre-defined default task tags. See the section Tasks view on page 86 for more information.

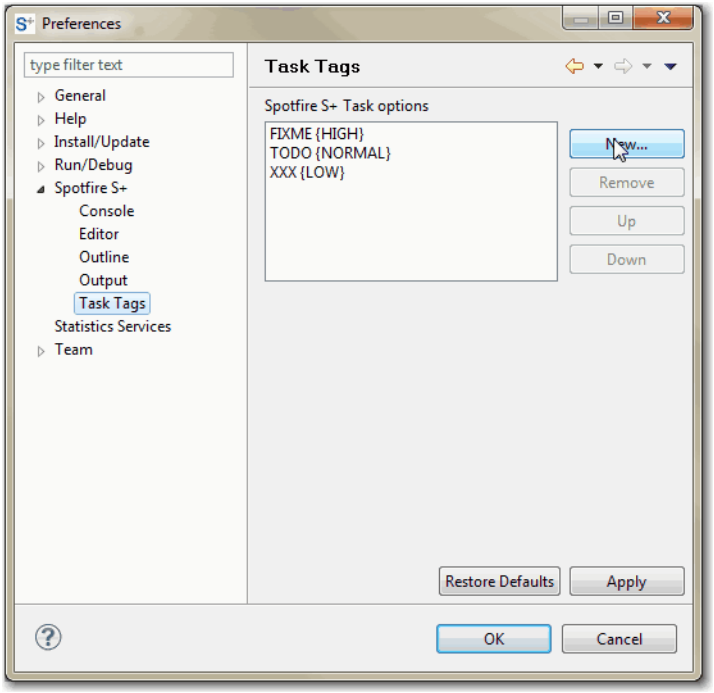


Figure 1.15: *The **Task Tags** page of the **Preferences** dialog.*

Statistics Services Options

If you use TIBCO Spotfire Statistics Services, you can set preferences for interaction between Spotfire S+ Workbench and Spotfire Statistics Services. See the section Statistics Services view on page 76 for more

information about its view. See the section Spotfire Statistics Services Remote Submissions on page 178 for information about using the Spotfire S+ Workbench with Spotfire Statistics Services.

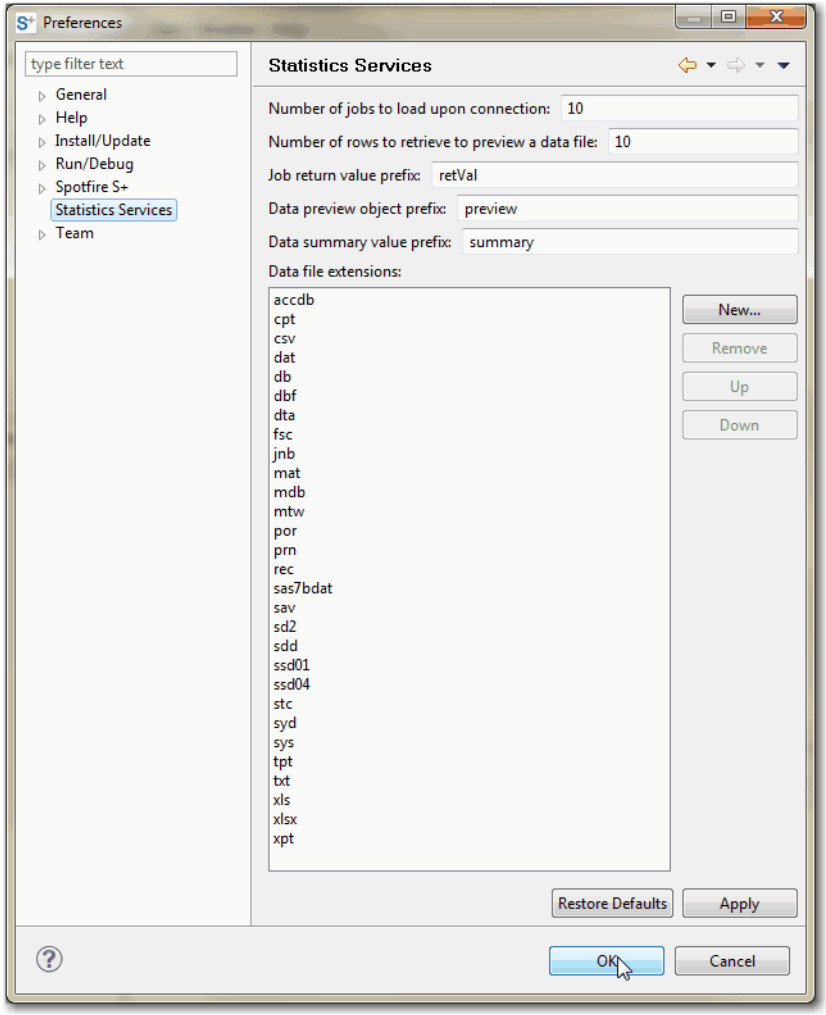


Figure 1.16: *the* ***Statistics Services*** *page of the* ***Preferences*** *dialog.*

Number of jobs to load upon connection

Set the specified list of jobs to appear in the **Statistics Services** view, in the tree view **Jobs** folder. If the Spotfire Statistics Services server you connect to has jobs stored, the specified job list appears, starting with the most recent job. The default is 10. You can set this value to any number greater than 0, up to 1,000.

- If you set it to 0, the default of 10 is used.
- If you specify a number larger than 1,000 or a non-numeric character, the dialog displays an "Invalid field value" error and the text box turns yellow. If the error text contains an ellipsis (...), the message is truncated. Widen the dialog box to display the entire message.
- If you change this number while you are connected to the Spotfire Statistics Services computer, the display does not change until you disconnect and reconnect.
- If you run jobs in excess of this number, all jobs are displayed until you disconnect and reconnect.
- If you delete jobs from the list, any earlier existing jobs are appended to the list, up to the maximum number of available jobs or the specified number.

Number of rows to retrieve to preview a data file

If you have data stored on the Spotfire Statistics Services computer, set the number of rows to display in the **Output** view. Note that this number includes the row containing column names as one of the rows. You can set this value to any number greater than 0, up to 10,000.

- If you set it to 0, the default of 10 is used.
- If you specify a number larger than 10,000, the dialog displays an "Invalid field value" error and the text box turns yellow.
- If you reset this number while you are connected to the Spotfire Statistics Services computer, the number of rows to preview is displayed the next time you select Preview File. (Reconnecting is not required.

Note
The preview and summary options are run on the server, not on the client; therefore, data size limit restrictions of 256k apply. Depending on the data type and/or the number of columns, you might encounter size error limits, even if you specify a number of rows well below the maximum allowed by the Workbench.

Job return value prefix

Set a string of text to prepend to the return value information displayed in the first line of the **Output** view. The string must include only letters from the standard English character set, numbers, and dots (.). The string cannot include spaces. The string can begin with a letter or dot (.), but not a number. In the return value output, this value is separated from the server name and job number by a dot. For example, if you change this option to `Sample.Return.Value`:

Figure 1.17: *Job return value prefix, server name, and job number.*

- If you specify an illegal character, the dialog displays an "Invalid character" error and the text box turns yellow. If the error text contains an ellipsiss (...), the message is truncated. Widen the dialog box to display the entire message.
- If you leave this text box blank, it uses the default of `retVal`.

Data preview object prefix

Set a string of text to prepend to the data preview information displayed in the first line of the **Output** view. The string must include only letters from the standard English character set, numbers, and dots (.). The string cannot include spaces. The string can begin with a letter or dot (.), but not a number. In the return value output, this value is separated from the file name by a dot. For example, if you change this option to `Sample.Data.Preview`:

Figure 1.18: *Data preview prefix and file name.*

- If you specify an illegal character, the dialog displays an "Invalid character" error and the text box turns yellow.
- If you leave this text box blank, it uses the default of `preview`.

Data summary value prefix

Set a string of text to prepend to the data summary information displayed in the first line of the **Output** view. The string must include only letters from the standard English character set, numbers, and dots (.). The string cannot include spaces. The string can begin with a

letter or dot (.), but not a number. In the return value output, this value is separated from the file name by a dot. For example, if you change this option to `Sample.Summary`:

Figure 1.19: *Summary prefix and file name.*

- If you specify an illegal character, the dialog displays an "Invalid character" error and the text box turns yellow. If the error text contains an ellipsiss (...), the message is truncated. Widen the dialog box to display the entire message.
- If you leave this text box blank, it uses the default of `summary`.

Data file extensions

Lists the file extensions of the data types that are displayed in the **Statistics Services** view data repository folders. By default, this list shows common data file types in alphabetical order. You can edit this list to reflect the data types you work with most commonly, in the order that you use them. The **Statistics Services** view filters to display only the listed extensions in the data repository folder.

Note
The **Data file extensions** list does not include all file types supported by the `importData` function in S-PLUS. For a complete list, see its Help file. (Hint: Type **?importData** in the **Console** view to display the help for the function, or access it using the **Help > Spotfire S+ Help** menu item.)

Table 1.3: *Data File Extension actions.*

Button	Description
New	Adds a data file extension for the type of data you have in your Spotfire Statistics Services data repository. When you add a data type extension, it appears at the top of the list in this dialog. If you add an extension that is currently unsupported by S-PLUS, S-PLUS will attempt to read the file as ASCII text.
Remove	Removes a data file extension that you do not use, or you do not need to see displayed. You can add them back to the list as needed.
Up/Down	Moves the selected data file extension either up or down the list. For example, you can use this option to display your most-commonly used data types first.
Restore Defaults	Restores all **Statistics Services** options to their original state.

EXAMINING THE SPOTFIRE S+ WORKBENCH GUI

After the Spotfire S+ Workbench GUI opens, and you set preferences, spend a moment examining the user interface, including the toolbars, menus, perspectives, and views.

- For more information about perspectives, see the section Spotfire S+ Workbench Perspectives and Views on page 42.
- For more information about views, see the section Examining the Views on page 43.

Spotfire S+ New Project Wizard

When you start a new Spotfire S+ project in the Spotfire S+ Workbench, you see the **New Project** wizard, where you specify the location of your project files. See the section Quick Start on page 127 for more information about specifying the project file location.

Working with Files External to the Project

You can use the Eclipse editor to edit non-project files in the Spotfire S+ Workbench. To open a non-project file, on the **File** menu, click **Open File**, and then browse to the location of the file to edit. For more information about editing files in Eclipse, see the Eclipse *Workbench User Guide*.

Customized Menus, Toolbars, and Dialogs

The Spotfire S+ Workbench includes in the Eclipse GUI:

- Customized top-level menu items.
- Customized top-level toolbar.
- Customized view-specific toolbars and view menus. (See the section Control and Right-Click Menus on page 46 for more information about the menus.)

Customized menus

Spotfire S+ customizes the basic Eclipse menu to provide easy access to global Spotfire S+ control and to control debugging options.

File Export (Spotfire S+ Package)

The Eclipse menu item **File ▶Export** contains a **Spotfire S+** option to export a Spotfire S+ package.

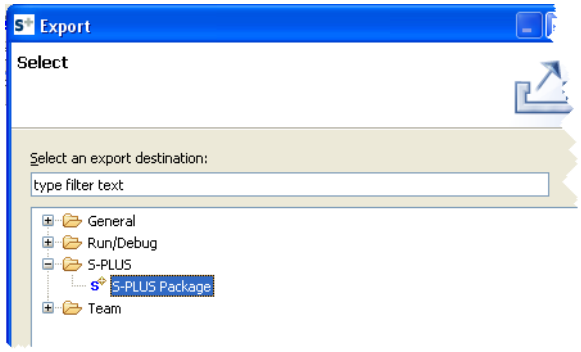


Figure 1.20: ***Export*** *dialog.*

Use this two-step wizard to create either a source or a binary package. The second dialog of the wizard provides the options to specify the package project to build, the type of package to create, and the location to place the package. For more information on using this wizard, see the section Building the Package on page 170.

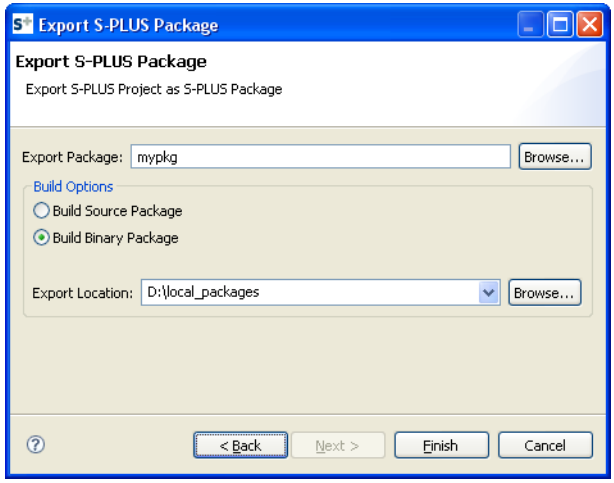


Figure 1.21: *The* ***Export Spotfire S+ Package*** *dialog.*

Spotfire S+ Menu

The **Spotfire S+** menu contains the following options:

Table 1.4: ***Spotfire S+*** *menu options.*

Spotfire S+ Menu Option	Description
Format	Applies Spotfire S+ consistent formatting and line indentation to the entire script.
Toggle Comment	Designates the selected text in the Script editor as a comment, or, if the selected text already is a comment, removes the comment designation
Shift Right	Moves the selected text to the right.
Shift Left	Moves the selected text to the left.
Define Folding Region	In the Spotfire S+ Script Editor, sets the currently-selected code block as a collapsible block. A collapsible region is indicated by the icon in the left margin, and a vertical line, marking the region to collapse. A collapsed region is indicated by the icon . In Windows, you can hover the mouse pointer over the collapsed region to display the contents of the region in a tooltip.
Run Selection	Runs the code that is currently selected. If nothing is selected, the current editor contents are run. This menu item also appears in the right-click menu of the Spotfire S+ Script Editor and is represented by the **Run Spotfire S+ Code** button on the main Spotfire S+ Workbench toolbar.
Run Current File	Runs the entire contents of the script currently open in the Spotfire S+ Script Editor.

Table 1.4: *Spotfire S+ menu options. (Continued)*

Spotfire S+ Menu Option	Description
Find "*function*"	Finds the selected function definition and opens it for editing. **Find** looks first in files currently open in an editor, then it looks through your workspace. Finally, it searches the Spotfire S+ database. If the function is not found in an editor and multiple definitions exist in the workspace, use the resulting dialog to indicate the proper source. **Note**: Highlighting a function and typing CTRL+mouse click also opens the selected function definition for editing. See the section To edit a function definition on page 159 for more information
Find References	Locates and highlights all instances of a function call in a workspace. Find References opens the **Search** view and displays the number of times in a workspace where the selected function is called. You can See the Eclipse *Workbench User Guide* for more information about the **Search** view. See the section To find all references to a function on page 159 for more information.
Copy to Console	Copies the selected code and pastes it into the **Console** view. See the section Copying Script Code to the Console on page 164
Open Spotfire S+ Help File	Opens the Spotfire S+ Language Reference to the topic for the selected function. If you have no documented function selected, the `help` function topic is displayed.

Table 1.4: ***Spotfire S+*** *menu options. (Continued)*

Spotfire S+ Menu Option	**Description**
Update Packages	Locates and optionally copies either source or binary (Windows®) updated packages posted to the specified repository or local folder. If you have no packages installed, or if you have only the latest versions of the packages, then the **Packages** list box displays no results. For **Type**, if you select: • **Binary**: you can either install or install and load the binary package. • **Source**: you can copy the package source files to the location of your choice. By default, the files (and their folder structure) are copied to your current workspace.

Table 1.4: ***Spotfire S+*** *menu options. (Continued)*

Spotfire S+ Menu Option	Description
Find Packages	Locates and optionally copies either source or binary packages located in the specified repository or local folder. (For Windows, you can download either source or binary packages; for UNIX®, you can download only source packages; however, you can install, install and load, and copy source packages.) • If, for **Type**, you select **Binary**, you have the option either to install or to install and load the binary package. • If, for **Type**, you select **Source**, you can download the package source files to the location of your choice. By default, the files (and their folder structure) are downloaded to your current workspace. Note that this option finds built packages only (that is, those that are zipped or tarballed); it does not load unbuilt package directories and their files. To open a package to build and then install, open it as a new project, and then build it and install it. For more information about finding and downloading packages, see the section Downloading Package Source Files from a Repository on page 172

Run Menu

The **Run** menu varies, depending on the perspective selected. In both the Spotfire S+ and Debug perspective, the following Spotfire S+ Workbench options are available. (See the corresponding descriptions for the toolbar buttons in the section The Spotfire S+ Workbench Toolbar on page 38 for more information.)

- **Run Spotfire S+ Code**
- **Run Next Spotfire S+ Command**
- **Stop Spotfire S+ Code**
- **Toggle Spotfire S+ Debugger**

- **Toggle Spotfire S+ Profiler**
- **Toggle Spotfire S+ Warning Breakpoint**
- **Toggle Spotfire S+ Error Breakpoint**

For more information about the **Run** menu options available only in the Debug perspective, see the section Debug Run Menu Options on page 94.

Window Menu

The Spotfire S+ Workbench preferences are available from the **Window ► Preferences** menu option. See the section Examining Spotfire S+ Preferences on page 14 for more information.

Help Menu

Reference help, conceptual help, books, and user-interface guidance are available from the Help menu.

- Click **Spotfire S+ Help** from the **Help** menu to display the Spotfire S+ Language Reference topic for the `help` function.
- Click **Spotfire S+ Manuals** for a list of the PDFs that are installed by default with your Spotfire S+ installation.

Customized Toolbars

Both Spotfire S+ perspectives in the Workbench provide customizations to the Eclipse toolbar and to view-specific toolbars.

The Spotfire S+ Workbench Toolbar

Regardless of the displayed perspective, the Spotfire S+ Workbench toolbar appears in the IDE.

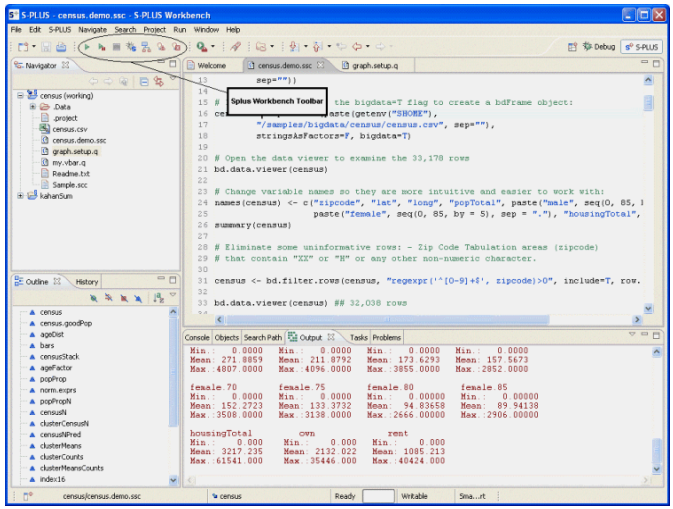


Figure 1.22: *The Spotfire S+ Workbench toolbar.*

Note
Eclipse implements a **Run** menu item that is different from that of Spotfire S+ Workbench implementation. Use the Spotfire S+ Workbench **Run** menu item.

Use the Spotfire S+ Workbench toolbar to control running, debugging, breaking, and profiling your code.

Table 1.5: *Spotfire S+ Workbench toolbar.*

Button	Description
	**Run Spotfire S+ Code**. Click in either the Debug or the Spotfire S+ perspective to run code that appears in the editor. (To view the output, select the **Output**.)

Table 1.5: *Spotfire S+ Workbench toolbar. (Continued)*

Button	Description
	**Run Next Spotfire S+ Command.** Looks for the current selection and runs the top-level S expression found at that location. If the cursor location does not match an expression exactly, the next expression is evaluated (rather than the first one). The output is routed to the **Output**, and the next expression is selected automatically (or the first expression in the script is selected automatically, if the expression that was just run was the last one).
	**Stop Spotfire S+ Code**. Click in either the Debug or the Spotfire S+ perspective to stop running code.
	**Toggle Spotfire S+ Debugger**. Engages the Spotfire S+ debugger. (You can engage the Spotfire S+ debugger in either the Spotfire S+ or the Debug perspectives; however, by default, the views displaying debugging information are visible in the Debug perspective.) After you engage the Spotfire S+ debugger, any expression you type in the **Console**, or that you run by clicking **Run Spotfire S+ Code** on the toolbar, invokes the Spotfire S+ debugger.
	**Toggle Spotfire S+ Profiler**. Engages the Spotfire S+ Profiler. (You can engage the Spotfire S+ Profiler in either the Spotfire S+ or the Debug perspectives; however, by default, the views displaying profiling information are visible in the Debug perspective.) You do not need to engage the Spotfire S+ debugger in order to engage the Profiler. See the section Profiler on page 120 for more information.

Table 1.5: *Spotfire S+ Workbench toolbar. (Continued)*

Button	Description
	**Toggle Spotfire S+ Warning Breakpoint**. Requires that the Spotfire S+ debugger be toggled on. Stops execution if Spotfire S+ encounters a warning. See Table 3.7 in the section Breakpoints view on page 113 for more information about warning breakpoints.
	**Toggle Spotfire S+ Error Breakpoint**. Requires that the Spotfire S+ debugger be toggled on. Stops execution if Spotfire S+ encounters an error. See Table 3.7 in the section Breakpoints view on page 113 for more information about error breakpoints.

View toolbars

For more information about individual views' toolbars, see the individual views' descriptions. See the section Examining the Views on page 43 for more information.

Spotfire S+ Workbench Status Bar

The Workbench features a status bar that provides important information about the working project and the current view.

Figure 1.23: *Status bar.*

Table 1.6: *Spotfire S+ Workbench status bar.*

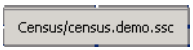
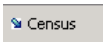
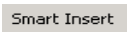
Status Item	Description
	**Show View as Fast View**. An Eclipse feature. • Click to display a list of available views, and then select a view to maximize it and add its icon to the status bar. • Click the view's icon in the status bar to minimize the view. (Alternatively, click the view's minimize icon, in its upper right corner, to minimize it.) For more information, see the Eclipse *Workbench User Guide*.
	**Current working directory and file.** When the Script Editor has focus, this section of the status bar displays the current file.
	**Working project**. Displays the name of the project that is currently set as the *working project*. For more information about the working project, see the section Working Projects and Databases on page 151.
	**Status indicator**. When the box is labeled **Busy**, and the status indicator is filling, then code is currently running. When the box is clear and reads Ready, no code is running.
	**File attribute**. Indicates whether the file is read-only or writable.
	**Smart Insert**. Toggles the insert mode. To toggle this view, type CTRL+SHIFT+INSERT. When **Smart Insert** mode is toggled off, typing aids like automatic indentation, closing of brackets, and so on, are not available. **Smart Insert** is an Eclipse feature.

Table 1.6: *Spotfire S+ Workbench status bar. (Continued)*

Status Item	Description
	**Cursor position**. Indicates the line and column position of the cursor.

Spotfire S+ Workbench Perspectives and Views

The Spotfire S+ Workbench plug-in for Eclipse includes two customized perspectives:

- The Spotfire S+ perspective
- The Debug perspective.

(See Table 1.1 for a short description of the perspectives.) By default, each perspective includes Eclipse views and customized Spotfire S+ Workbench views.

Changing the Spotfire S+ Workbench Perspective

You can change the perspective to suit your development style by moving, hiding, or closing views. For more information about customizing the views within the perspective, see the section Customizing the Spotfire S+ Perspective Views on page 69. For practice exercises customizing the perspective, see the section Customized Perspective Views on page 148.

- To customize the default Spotfire S+ perspective, on the menu, click **Window ► Customize Perspective**. The **Customize Perspective** dialog has two pages: **Shortcuts** and **Commands**. Each of these pages describes global changes you can make to the perspective.
- To save a changed perspective, click **Window ► Save Perspective As**.
- To restore an unsaved perspective's default settings, click **Window ► Reset Perspective**.
- To open another perspective, click **Window ► Open Perspective**, and then select a perspective from the **Select Perspective** dialog.

Figure 1.24 shows the Spotfire S+ perspective with the views set at their default positions.

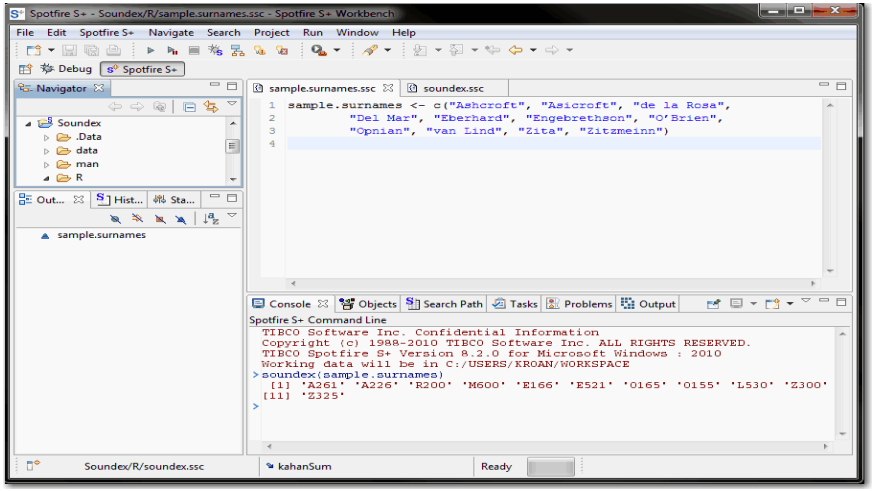


Figure 1.24: *Spotfire S+ Workbench window, Spotfire S+ perspective.*

Examining the Views

A view is a visual component in the workbench. Views support the script editor by providing alternate means of navigating through, working with, and examining the elements of the project.

Using the standard Eclipse IDE features, you can:

- Close a view by clicking the **X** icon on the view tab.
- Reposition a view by clicking its tab and dragging it to another part of the UI.
- Set a selected view to "Fast View." This option hides the view to free space in the **Workbench** window and places a minimized icon, which you can click to open the view, on the status bar.
- Change the views you see in the perspective. See the section To change the displayed views on page 149.

Most views have their own control menus. (See the section Control and Right-Click Menus on page 46 for more information.)

Saving views items changed in views

When you modify an item in a view, it is saved immediately. Normally, only one instance of a particular type of view can exist in the Workbench window.

Perspective views

The following table lists the views shown in each perspective and indicates which views are shared by both perspectives. This section includes descriptions for the views shared across Spotfire S+ Workbench perspectives.

Note

If you do not see one of the following Spotfire S+ specific views in the user interface, you can display it from the menu by clicking **Window ▶ Show View ▶ Other**, and then selecting it from the **Show View** list.

Table 1.7: *Views in the Spotfire S+ Workbench perspectives.*

View Name	Spotfire S+ Workbench Perspective	Debug Perspective	Description reference
Allocations view		x	page 122
Breakpoints view		x	page 113
Console view	x	x	page 49
Debug view		x	page 100
Expressions view		x	page 111
Function Calls view		x	page 121

Table 1.7: *Views in the Spotfire S+ Workbench perspectives. (Continued)*

View Name	Spotfire S+ Workbench Perspective	Debug Perspective	Description reference
History view	x		page 69
Navigator	x	x	Eclipse *Workbench User Guide*
Objects view	x		page 71
Outline view	x	x	page 54
Output view	x	x	page 56
Problems view	x		page 74
Script Editor	x	x	page 57
Search Path view	x		page 75
Statistics Services view	x		page 76
Tasks view	x	x	page 86
Variables view		x	page 106

Hint

Change the view layout by moving views around the IDE, or control the views displayed using the **Show View** dialog. For more information, see the section To change the displayed views on page 149.

Control and Right-Click Menus

Views contain their own control and/or right-click menus, with menu items that act on the view display or on the type of data displayed in the view. Menus are displayed either when you click the drop-down button ( ), located in the upper right corner of each view, or when you right click the body of the view.

The following two images show the two types of menus in the **Navigator** view. For more information about the **Navigator**, see the section Navigator on page 52.

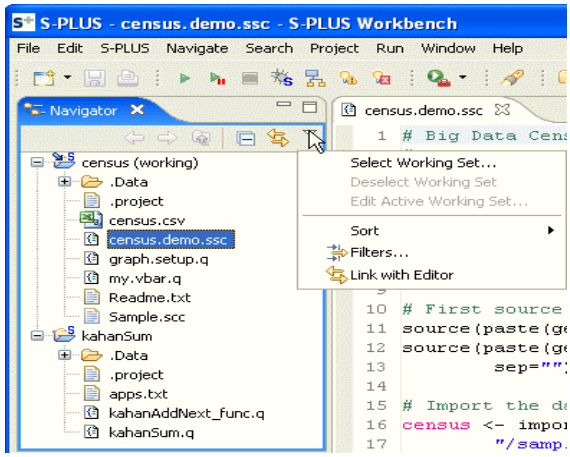


Figure 1.25: *Control menu, available via drop-down button.*

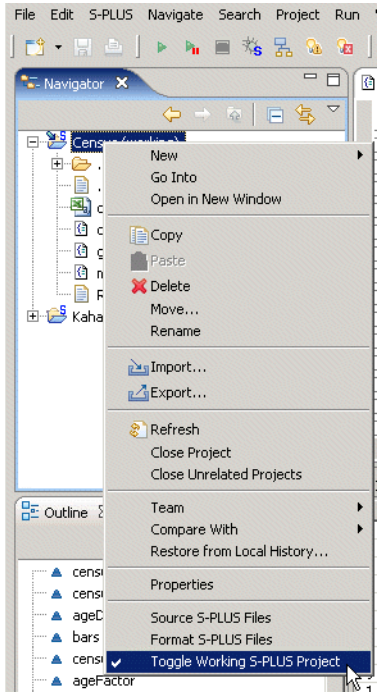


Figure 1.26: *Context-sensitive menu, available via right-click in the view.*

- The Script Editor has only a context-sensitive menu, available via a right-click action. Its available options depend on the current selection in the editor. For example, if you select text and right-click, you have the option to cut or copy the selection. If you select a Spotfire S+ function, you have the option to open the Spotfire S+ Help file for that function.

  The options on the Script Editor's context-sensitive menu are a selection of options that appear on the main menu.

- The **Outline** view and the **Allocations** view have only the control drop-down menu.

In the following views, the right-click (context-sensitive) menu and the control drop-down menu are identical. The control menu for each view is described in this document in the section describing its view. See the section Examining the Views on page 43 for more information:

- **Console** view.

- **Function Calls** view.
- **History** view.
- **Objects** view.
- **Output** view.
- **Search Path** view.

The following views each contain two different menus:

- The control menu, available from the drop-down button.
- The context-sensitive menu, available via right-click in the body of the view. The options available on the right-click menu vary according to the item selected in the view (for example, removing a selection, copying a selection, and so on.) For more information about where each view appears, see the section Perspective views on page 44.

Table 1.8: *Views with different control and right-click menus.*

View	Location of more menu information
Breakpoints view	page 113
Debug view	page 102
Expressions view	page 108
Navigator	page 52
Problems view	page 74
Statistics Services view	page 76
Tasks view	page 86
Variables view	page 108

Each view action also has a quick-key sequence to perform an action. (For example, to clear the text in the console, with the **Console** active, type CTRL+L.)

Default Shared Views

The following sections describe the views that are shown, by default, in both the Spotfire S+ perspective and the Debug perspective.

Spotfire S+ Workbench Console

The Spotfire S+ Workbench **Console** is an editable view, analogous to the **Commands** window in the Spotfire S+ GUI. Using the **Console**, you can:

- Run individual Spotfire S+ commands by typing them and pressing ENTER.
- Scroll through previous commands by pressing the UP or DOWN arrow on the keyboard.
- Copy an individual command or blocks of commands from the Script Editor, using the **Copy to Console** menu item, to run them in the **Console**. (Note that you do not need to select **Paste**; **Copy to Console** copies your selected text in the Script Editor and pastes it into the **Console**.)

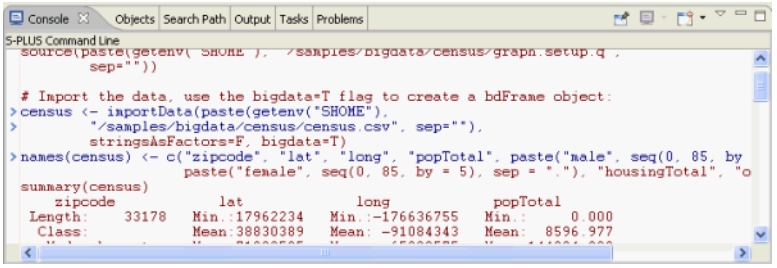


Figure 1.27: *Spotfire S+ Workbench* ***Console****.*

- Copy from the console to a script file. (You can also copy the command prompts. To set this option, on the menu, click **Window ▶ Preferences**, and on the **Console/Output** page, select **Include Prompts in Copy action**.)

Code Completion in the Console

The **Console** provides code completion assistance. When you begin typing a function name, a list of functions matching the string appears in a hint box.

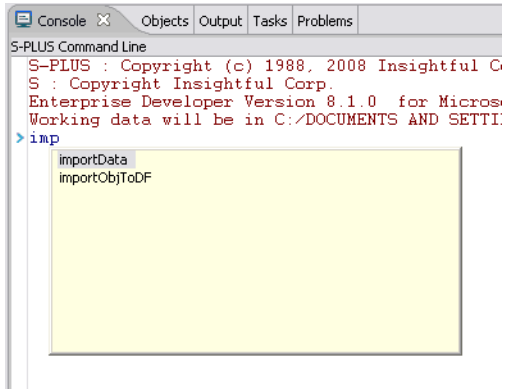


Figure 1.28: *Code completion in the* ***Console****.*

After you select the function from the list and type an opening parenthesis character, the function's arguments appear in a hint box:

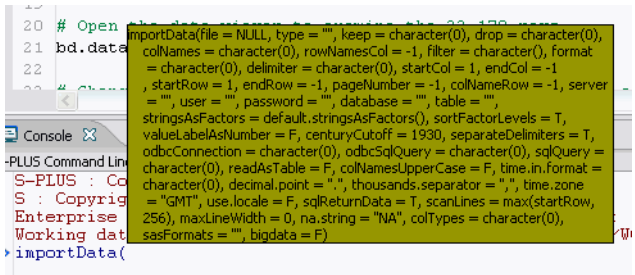


Figure 1.29: *Function arguments available for* `importData`*, displayed as a code completion hint.*

The function's arguments, as shown for `importData` in Figure 1.29, is displayed in the hint box until you type the closing parenthesis character.

Note
For the code completion list, the Spotfire S+ Workbench reads the Search path on startup and includes all functions in loaded libraries. It refreshes that list periodically.

Console control and right-click menus

The **Console** controls include these Eclipse options:

- Pin the view in place ( ).
- Toggle between open **Console** views ( ).
- Open a new **Console** ( ).

The **Console** control menu and right-click menu are the same. You can use the **Console** control menu (click  or right-click the body of the **Console**) to perform the following tasks:

- Clear the contents of the console.
- Copy the selected text.
- Cut the selected text.
- Paste text from the clipboard to the console.
- Find a string.
- Select all text.
- Save the console contents to a file.
- Print the console contents.
- Open the **Preferences** dialog to set such options as font color and style, among others.

For exercises using the Spotfire S+ Workbench **Console**, see the section Copying Script Code to the Console on page 164. For more information about the Spotfire S+ **Commands** window, see Chapter 10, Using the Commands Window in the *Spotfire S+ User's Guide*.

Navigator

The **Navigator** is a standard Eclipse view. Its drop-down ( ) control menu is standard to Eclipse, while its right-click menu contains three Spotfire S+-specific items, described in the following section. For information about using the **Navigator**, see the Eclipse *Workbench User Guide*, available from the **Help ► Help Contents** menu.

Navigator control and right-click menus

In addition to having a drop-down control menu, the **Navigator** has a right-click menu containing three Spotfire S+-specific options:

Table 1.9: ***Navigator*** *Spotfire S+-specific right-click menu options.*

Menu option	Description
Source Spotfire S+ Files	Parses and then evaluates each expression in the selected project or file. (Note that if you have selected the project, every file in that project is sourced.)
Format Spotfire S+ Files	Applies Spotfire S+ consistent formatting and line indentation to all scripts in the working project. To customize the formatting options, on the main menu, click **Window ► Preferences**, in the left pane, click **Spotfire S+** to expand the view, and then click **Editor**. Use the **Editor** page to customize formatting options. See the section To change the code formatting options on page 144 for more instruction.

Table 1.9: ***Navigator*** *Spotfire S+-specific right-click menu options. (Continued)*

Menu option	Description
Toggle Working Spotfire S+ Project	Available when you select a project in the **Navigator**. The project that you set as working becomes the current working directory, or the root to which all relative paths are resolved. The working project also becomes the first position (in the search path, which you can see in the **Search Path**. This path contains the **.Data** database. All objects created as a result of running code in the Spotfire S+ Workbench are written to that **.Data** database (regardless of the project the code is in). When you toggle off (that is, clear) the selection and have no working project, the **.Data** database is set to the current workspace, and the **Search Path** shows the workspace in the first position. In this case, all objects created in any project are written to the **.Data** database in the workspace and are available to any project in the workspace. See Figure 1.30 for an illustration. For more information about working projects and the current working directory, see the section Setting the Working Project on page 151.

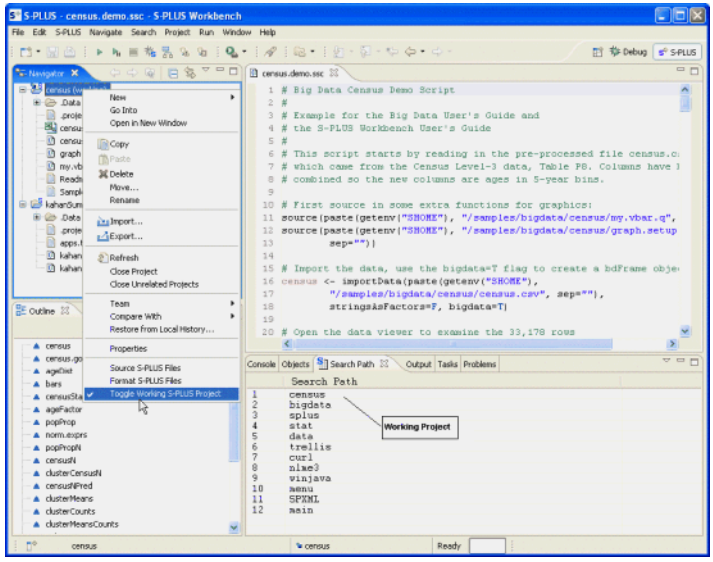


Figure 1.30: ***Toggle Working Spotfire S+ Project*** *shows current working project at the top of the* ***Search Path****.*

Outline view

The **Outline** view displays an outline of the elements in the script open in the script editor. In the Spotfire S+ Workbench, **Outline** view displays functions and objects in the order they appear in the script editor. Items that you have identified to "watch" in the **Functions to**

Watch text box of the **Preferences** dialog appear in the **Outline** view with an arrow. You can jump to the definition of a function or object (or other structure element) by clicking it in **Outline** view.

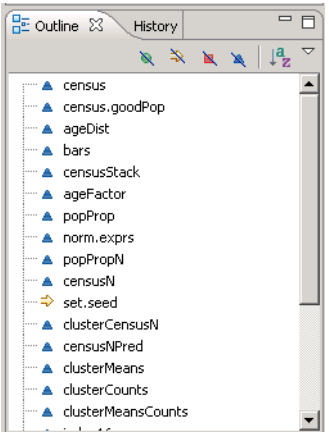


Figure 1.31: *Spotfire S+ Workbench* ***Outline*** *view.*

Note
The **Outline** view updates only after you save changes to its associated file, displayed in the Script Editor.

Outline view toolbar

The **Outline** view contains a toolbar that displays the following toggle buttons:

Table 1.10: ***Outline*** *view buttons.*

Button	Description
	Hides all standard functions displayed in the **Outline** view. Click again to display standard functions.
	Hides all functions that you have designated to watch displayed in the **Outline** view. Click again to display the functions.
	Hides all anonymous functions displayed in the **Outline** view. Click again to display the functions.
	Hides all variables in the **Outline** view. Click again to display the variables.
	Sorts items displayed the **Outline** view alphabetically. Click again to return the items to the order in which they appear in the script.
	Displays a menu showing all buttons available on the button bar. (You can toggle these selections either using the menu, or on the button bar.)

Outline view control menu

The **Outline** view control menu provides menu access to the buttons visible on the **Outline** view toolbar, and to the **Preferences** dialog. See the descriptions in Figure 1.10 for more information. (The **Outline** view contains no right-click menu.)

Output

The **Output** displays the code you run (and the results of the code you run) when you click either **Run Spotfire S+ Code** on the toolbar, or when you press F9. The text displayed in the **Output** is

replaced each time you click **Run Spotfire S+ Code** or press F9. That is, unlike the **Console**, the **Output** does not store and display previously-run commands. Also unlike the **Console**, the **Output** is not editable; however, you can select and copy lines of text in the **Output**. You can also print or clear the entire contents of the **Output**.

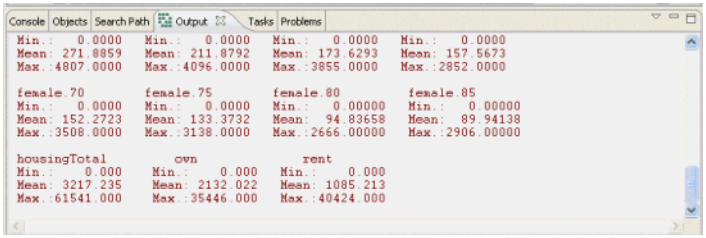


Figure 1.32: *Spotfire S+ Workbench **Output**.*

Output control and right-click menus

You can use the **Output** control menu (click) to perform the following tasks:

- Clear the contents of the view.
- Copy the selected text.
- Find a string.
- Select all text.
- Save the view contents to a file.
- Print the view contents.
- Display the **Preferences** dialog to change the font color and style.

The drop-down control menu and the right-click context-sensitive menu are identical in the **Output**.

Spotfire S+ Workbench Script Editor

The Spotfire S+ Workbench Script Editor is a text editor displayed in both the Spotfire S+ perspective and the Debug perspective. The Spotfire S+ Workbench Script Editor is similar to the Script Editor in

Spotfire S+; however, it contains additional script-authoring features such as syntax coloring, code completion, and integration with the other views in the IDE.

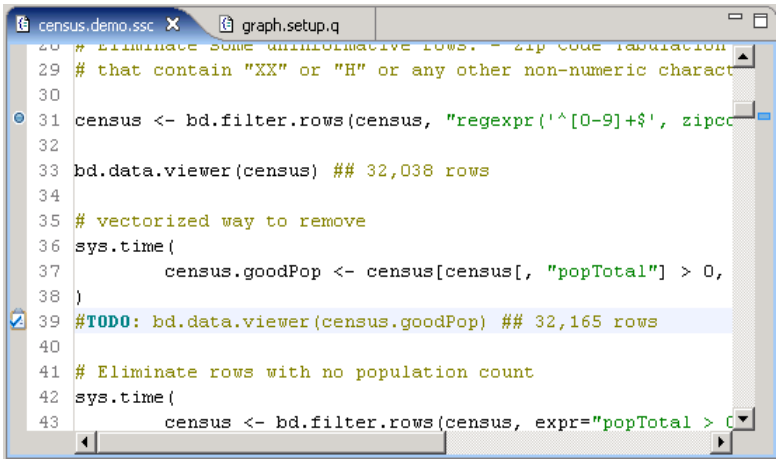


Figure 1.33: *Spotfire S+ Workbench Script Editor.*

You can run code in the Spotfire S+ Workbench Script Editor by highlighting the code and clicking **Run Spotfire S+ Code** ( ) on the toolbar.

Note
To interrupt code that you run from the Script Editor, either click **Stop Spotfire S+ Code** (on the toolbar) or press ESC.

Text Editing Assistance

To help you write efficient, easy-to-follow scripts, the Script Editor provides the following features:

- Displays keywords, user-defined text, and function arguments in customizable colors. See the section Setting the Spotfire S+ Workbench Preferences on page 137.

- Provides code completion hints, both for function names and arguments, as shown in Figure 1.34 and 1.35.

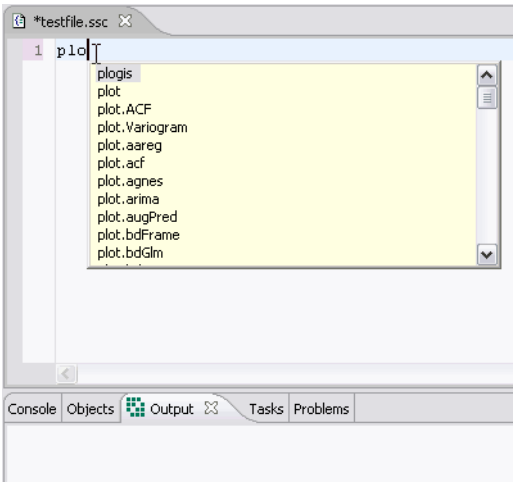


Figure 1.34: *Code completion for the* `plot` *function.*

Figure 1.35: *Arguments displayed as part of code completion for the* `plot` *function.*

Note
For the code completion list, the Spotfire S+ Workbench reads the Search path on startup and includes all functions in loaded libraries. It refreshes that list periodically. The function's argument list, as shown in Figure 1.35, is displayed until you type the closing parenthesis character `)`.

- Displays code line numbers in a column adjacent to the code.

- Provides automatic code indentation and parenthesis matching. (See the Eclipse documentation for more information on the editor's standard features.)

Note

To indent selected text, first highlight the text to be indented, and then press TAB or CTRL+TAB to shift the selected text right or left, respectively.

- Activates the Script **Outline** view when you edit a script.
- Displays task and breakpoint markers in the left margin, and a task marker "thumb" in the right margin.
- Displays the help topic for documented functions when you select the function name, and then type F1.

Note

You can use the Eclipse editor to edit non-project files in the Spotfire S+ Workbench. To open a non-project file, on the **File** menu, click **Open File**, and then browse to the location of the file to edit. For more information about editing files in Eclipse, see the Eclipse *Workbench User Guide.*

View integration

The Script Editor is closely integrated with the views in both the Spotfire S+ perspective and Debug perspective. This integration includes the following:

- When you type a task keyword in the editor, it is automatically added to the **Tasks** view after you save the file. See the section Tasks view on page 86 for more information.
- When you set a breakpoint, the breakpoint appears in the margin of the Script Editor both in the Debug perspective and the Spotfire S+ perspective. (You can also set a breakpoint in the margin of the Script Editor in both perspectives. See the section Setting breakpoints on page 190.)
- When you make an error and save your script file, the error shows in the **Problems** view. See the section To examine problems on page 166 for more information.

- When you create a new object in the script, it appears in the **Outline** view. To make it appear in the **Objects** view, you must run the script and refresh the **Objects** view.

Script Editor right-click menu

The right-click menu in the Script Editor combines actions from the Eclipse main menu, including the options available from the **Spotfire S+** menu, and the **Preferences** dialog.

See the section Spotfire S+ Menu on page 33 for information about the Spotfire S+ options.

See section Setting the Spotfire S+ Workbench Preferences on page 137 for information about setting **Preferences** options.

(The **Script Editor** has no drop-down control menu.)

COMMONLY-USED FEATURES IN ECLIPSE

The core Eclipse IDE contains many additional features that you might find helpful in managing your projects. The following table lists a few of these features, along with references to the Eclipse *Workbench User Guide* to help you learn how to use them effectively.

Table 1.11: *Eclipse Tasks and Features.*

Task	Eclipse Feature Description
Comparing files with previous versions.	The **Compare With Local History** menu item is available from the control menu in **Navigator** view. Using this feature, you can compare the current version of the selected file with previously-stored local versions. For more information, see the topic "Local history" in the Eclipse *Workbench User Guide.*
Replacing files with a previous version.	The **Replace With Local History** and **Replace With Previous from Local History** menu items are available from the control menu in **Navigator** view. Using these features, you can replace the current version of the selected file with one of the previously-stored local versions. **Replace With Previous from Local History** displays no selection dialog; it just replaces the file. To choose a previous state in the **Local History** list, use **Replace With Local History**. For more information, see the topic "Replacing a resource with local history" in the Eclipse *Workbench User Guide.*
Finding a word in a project or a term in a Help topic.	Using the **Search ▶ File** menu item, you can find all occurrences of a word in a project or Help topic. For more information, see the topic "File search" in the Eclipse *Workbench User Guide.*

Table 1.11: *Eclipse Tasks and Features. (Continued)*

Task	Eclipse Feature Description
Filter files in the **Navigator** view.	Using the **Working Sets** menu option on the control menu in **Navigator** view, you can create subsets of files to display or hide. For more information, see the topics "Working Sets" and "Showing or hiding files in the **Navigator** view" in the Eclipse *Workbench User Guide*.
View a file that is not part of your project.	Use the **File ▶ Open File** menu item to open a file that is not part of your project.

Using the Workbench as an Eclipse Plug-In

If you have a current Eclipse installation, and you want to use the Spotfire S+ Workbench as a plug-in for that installation, you can set it up using these steps.

To set the Spotfire S+ Workbench as an Eclipse Plug-in (Windows)

1. In your ***SHOME*/eclipse** directory, locate the zip archive **com.insightful.splus.eclipse_3.4.zip**.
2. Using a zip extractor tool such as WinZip, extract the contents of the zip file into the folder above your Eclipse installation directory. (That is, the folder *containing* the /**eclipse** folder.)

   Alternately, extract the zip archive and copy the contents to the corresponding directories under your Eclipse installation.
3. In the shortcut you use to start Eclipse, add the following:

   ```
   -vmargs -Dsplus.home=SHOME
   ```

   where *SHOME* is the location of your Spotfire S+ installation.

To set the Spotfire S+ Workbench as an Eclipse Plug-in (UNIX)

1. Follow the above instructions, using a UNIX zip utility (rather than WinZip).
2. Start Eclipse, providing the command-line switches as follows:

   ```
   -vmargs -Dsplus.home=SHOME
   ```

   where *SHOME* is the location of your Spotfire S+ installation.

THE TIBCO SPOTFIRE S+ PERSPECTIVE

2

INTRODUCTION

TIBCO Spotfire S+ Workbench perspectives define the appearance and behavior of the Spotfire S+ Workbench Eclipse plug-in, including the Spotfire S+ Script Editor, views, menus, and toolbars. The Spotfire S+ perspective combines Spotfire S+ Workbench views and options so you can accomplish specific types of tasks and work with specific types of resources.

- For more information about the Spotfire S+ Debugger perspective options and views, see Chapter 3.
- For practice instruction using the features in the Spotfire S+ perspective, as well as the Spotfire S+ Workbench and Debug perspective, see Chapter 4, TIBCO Spotfire S+ Workbench Tasks.

Note

You can change a perspective to suit your development style by moving, hiding, or closing views. For more information about customizing the views within the perspective, see the section Changing the Spotfire S+ Workbench Perspective on page 42, or see the section Customized Perspective Views on page 148.

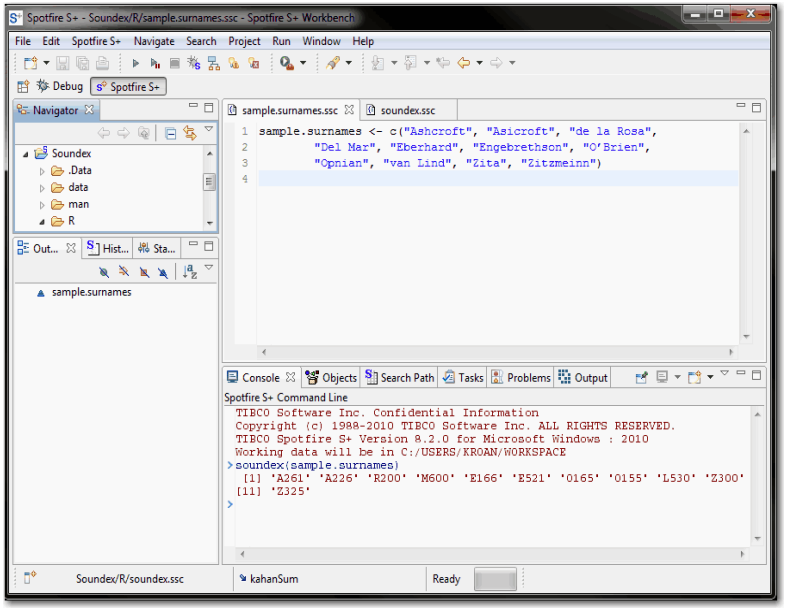


Figure 2.1: *The Spotfire S+ perspective.*

SPOTFIRE S+ PERSPECTIVE VIEWS

The Spotfire S+ Workbench includes views shared across perspectives. For a list of all views and their default perspectives, see Table 1.7 in Chapter 1. (Chapter 1 also includes descriptions of the shared views.)

The Spotfire S+ perspective includes default Eclipse views and customized views. You can show or hide the customized views from the menu by clicking **Window ► Show View ► Other**, and then selecting the views from the list. Views in the Spotfire S+ perspective include the following:

Table 2.1: *Spotfire S+ perspective views and exercise references.*

View	Descriptions	Practice exercises
Console view	Shared view. For a description, see the section Spotfire S+ Workbench Console on page 49.	"To run copied script code" on page 165.
History	For a description, see the section History on page 69.	"To examine the history" on page 166.
Objects	For a description, see the section Objects on page 71.	"To examine the objects" on page 161.
Outline view	Shared view. For a description, see the section Outline view on page 54.	"To examine the outline" on page 160.
Output	Shared view. For a description, see the section Output on page 56.	"To run code" on page 166.
Problems view	For a description, see the section Problems view on page 74.	"To examine problems" on page 166.

Table 2.1: *Spotfire S+ perspective views and exercise references. (Continued)*

View	Descriptions	Practice exercises
Search Path	For a description, see the section Search Path on page 75.	"Adding a Database" on page 153 and "Detaching a Database" on page 154.
Statistics Services view	Spotfire S+ view, applicable only for users of TIBCO Spotfire Statistics Services. For a description, see the section Statistics Services view on page 76	"Submitting a Remote Job" on page 178.
Tasks view	Shared view. For a description, see the section Tasks view on page 86.	"To add a task in the script file" on page 163 and "To add a task directly to the Tasks view." on page 162.

Both the Spotfire S+ perspective and the Debug perspective also display the default Eclipse **Navigator** view, which displays project directories and all files associated with each project. The **Navigator** view and other Eclipse IDE views are described in the Eclipse *Workbench User Guide*.

Customizing the Spotfire S+ Perspective Views

The default Spotfire S+ perspective settings control the views that open by default in preset locations; however, you can customize the view appearance, and then save the resulting perspective. See the section Customized Perspective Views on page 148 for more information.

The following sections describe only the views that appear by default in only the Spotfire S+ perspective.

History

The **History** is similar to the **Commands History** dialog in Spotfire S+ for Windows. The **History** is a scrollable list of commands that have previously been run in the **Console**. (Commands that you run by clicking **Run Spotfire S+ Code** or pressing F9 do not appear in the **History**. See the section Output on page 56.)

- When you select a command in the **History**, the pending text in the **Console** changes to the selected text. You can then press ENTER, or you can double-click the text in the **History** to execute the command. You can select only one line at a time in the **History**.
- When you scroll up or down through previously-run commands in the **Console**, the corresponding command is highlighted in the **History**.

Note
In Windows, Spotfire S+ uses the key F10 to run a selected command. The Spotfire S+ Workbench uses the key F9 to run a selected command in all platforms.

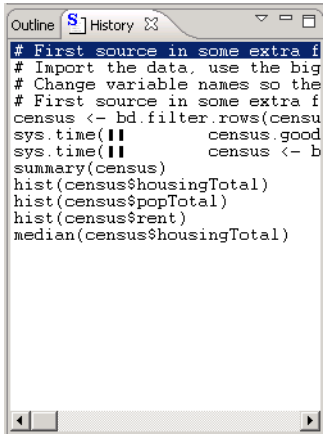


Figure 2.2: *Spotfire S+ Workbench* ***History***

History control and right-click menus

You can use the **History** control menu (click ▽) to:

- Select input displayed in the **History** and copy it to the **Console**.
- Clear the **History**.

Note
In the **Preferences** dialog, you can set the option to persist entries in the **History** between sessions. For more information about this option, see the section Store Console History Between Sessions on page 19. The **History** holds up to 150,000 lines of commands.

The drop-down control menu and the right-click context-sensitive menu are identical in the **History**.

Objects

The **Objects** is similar to the Object Explorer in the Spotfire S+ GUI. It displays all objects for projects associated with the workspace in two panes: a table view and an expandable tree view (the Workbench Object Explorer).

The two panes of the **Objects** are linked: when the **Objects** table pane has focus, items you select in the table are highlighted in the tree pane. When the tree pane has focus, objects you select in the tree are also highlighted in the table pane. (If you select an object member in the tree pane, its corresponding object is highlighted in the table pane.)

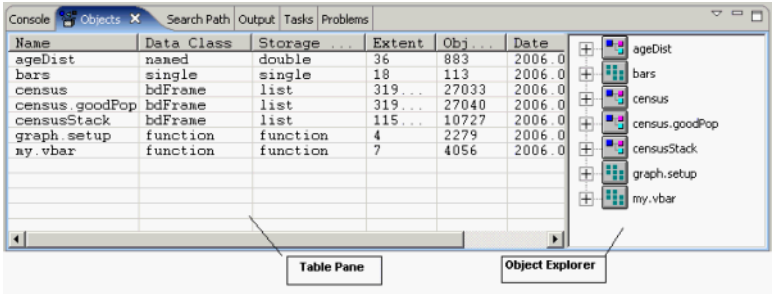


Figure 2.3: *Spotfire S+ Workbench **Objects**.*

Objects control and right-click menus

You can use the **Objects** control menu (click) to perform the following tasks:

- Select another database.
- Refresh the view on the currently-active database.

- Remove the selected object from the currently-active database.
- Show or hide Spotfire S+ system objects, such as `.Last.value`, `.Data`, and `.Random.seed`. (These objects are hidden by default.)
- Change the number of items displayed in the tree view members.

The drop-down control menu and the right-click context-sensitive menu are identical in the **Objects**.

Note

When you run code that creates objects in a Spotfire S+ script, the **Objects** is not automatically refreshed to display the new objects. To refresh **Objects** and display newly-created objects, right-click the **Objects** (or click the control menu button), and then from the menu, click **Refresh**.

Warning

If you select a large database, such as `splus`, in the **Objects**, it can take a long time to display the contents in the table and tree view panes.

Objects table pane

The **Objects** includes a table pane displaying a list of the names and types of objects in Spotfire S+ databases. The **Objects** table includes the following information about each object:

- name
- data class
- storage mode
- extent
- size
- creation or change date.

By default, the Spotfire S+ system objects, such as `.Random.seed` and `.Last.value` are hidden. You can display these objects by toggling the option on the **Objects** control menu.

Object Explorer (tree view pane)

The **Objects** includes an expandable tree view, the **Object Explorer**. (See Figure 2.4.) Objects listed in the **Object Explorer** correspond to objects in the **Objects** table pane.

The **Object Explorer** displays icons representing the type of object or object member, along with its name as a label. (These icons are the same icons used in the standard Spotfire S+ GUI.)

You can expand the objects to display each objects' members. By default, the **Object Explorer** displays up to 25 object members at each expandable level. You can change this default using the **Objects** context-sensitive menu item, **Set Max Children**.

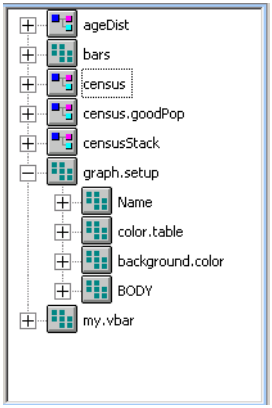


Figure 2.4: *The Spotfire S+ Workbench* ***Object Explorer****.*

- Display the **Set Max Children** dialog to indicate the number of object members to display in the **Object Explorer**. By default, this option is set to 25.

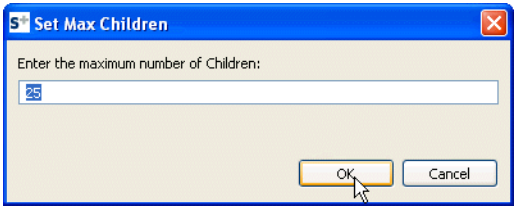


Figure 2.5: ***Set Max Children*** *dialog.*

Problems view

The **Problems** view is a standard Eclipse view that displays errors as you edit and save code. For example, if you forget a bracket or a quotation mark, and then save your work, the description appears as a syntax error in the **Problems** view.

Note
Syntax problems appear in the **Problems** view only after you save the file.

If your code has a problem that is displayed in the **Problems** view, and the view is not the active view, the **Problems** view tab title appears as bold text.

To open the Script editor at the location of the problem, double-click the error in the **Problems** view.

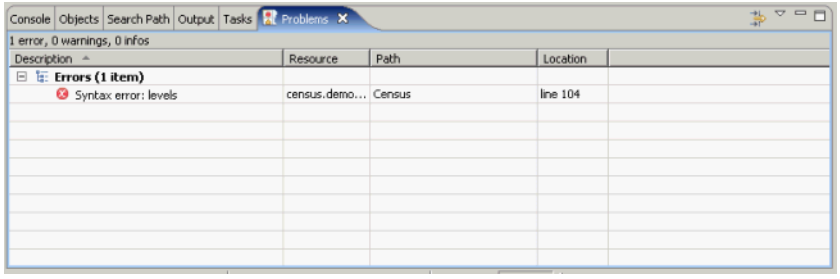


Figure 2.6: *Spotfire S+ Workbench* ***Problems*** *view showing the right-click context-sensitive menu.*

Problems view control and right-click menus

You can use the **Problems** view control menu (click ▽) to perform the following tasks:

- Display the **Sorting** dialog to sort the problems displayed in the view, either in ascending or descending order, and according to the problems' characteristics.
- Display the **Filters** dialog to specify properties for filtering problems.

For more information about using these dialogs, see the Eclipse *Workbench User Guide.*

You can use the **Problems** view right-click context-sensitive menu (see Figure 2.6) to perform the following tasks:

- Jump to the location in the file containing the problem.
- Display the file name containing the problem in the **Navigator**. (This action opens an instance of the **Navigator**.)
- Copy the **Problems** view table to the clipboard.
- Select all entries in the table.
- View the properties of the problem.

These menu items are standard to the Eclipse GUI. For more information, see the Eclipse *Workbench User Guide*.

Search Path

The **Search Path** displays the names and search path position of all the attached Spotfire S+ databases.

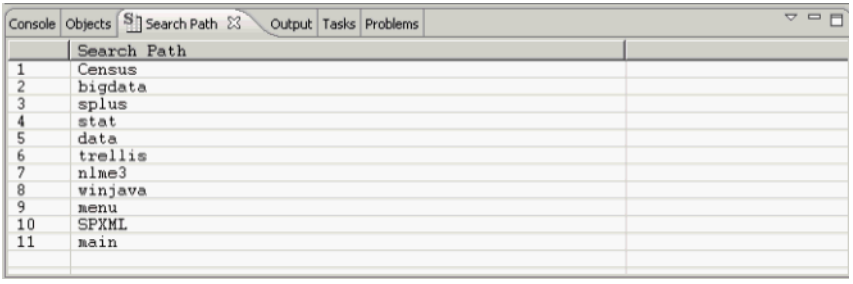


Figure 2.7: *Spotfire S+ Workbench* ***Search Path***.

The databases that are in your search path determine the objects that are displayed in **Objects**. That is, if a database is in your search path, the objects in that database appear in the **Objects**. See the section Examining Objects on page 160. For more information about working with the **Search Path**, see the section Changing Attached Databases on page 153.

The first position in the **Search Path** shows the current working directory, which can be either the workspace or the current path. You can set a project to be the working project by right-clicking its name in the **Navigator**, and then clicking **Toggle Working Spotfire S+ Project**. See the section Navigator on page 52, and the section Setting the Working Project on page 151.

Search Path control and right-click menus

You can use the **Search Path** control menu (click) to:

- Attach a library.
- Attach a module.
- Attach a directory.
- Detach the currently-selected database in the view.
- Refresh the current view.

The drop-down control menu and the right-click context-sensitive menu are identical in the **Search Path**.

Note
When you use the control menu to add to (or remove from) the **Search Path** a library, module, or directory, the view automatically refreshes. When you run code to add or remove a library, module, or directory, the view is not automatically refreshed. To refresh the view, right-click the **Search Path** (or click the control menu button, and then from the menu, click **Refresh**.

Statistics Services view

The **Statistics Services** view provides controls for connecting to one or more running TIBCO Spotfire Statistics Services server(s) and performing a variety of tasks, including:

- Upload and download files, including data files.
- Delete files, including data files.
- Preview data contents and data summary information.
- Upload and download packages.
- View files and packages on the server.
- Run jobs on the server.
- View job results.
- View and save to the local environment return values.
- Schedule jobs.
- Cancel scheduled jobs.
- Monitor jobs.

- View warnings and examine log files.
- View image files stored on the server (.spj, .jpg, .png, .pdf, .wmf).

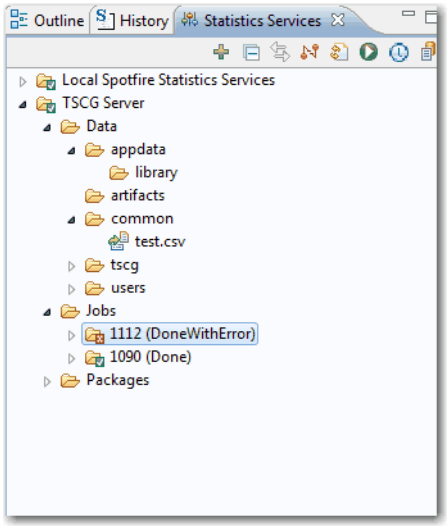


Figure 2.8: ***Statistics Services*** *view.*

For more information about performing these tasks, see the section Spotfire Statistics Services Remote Submissions on page 178.

When you submit a job to the server, to get the results you expect, remember the following:

- The job you submit runs on a new S-PLUS engine instance. The instance of the S-PLUS engine runs the job and stores the results, and then is released. Your code must be self-contained, depending only on objects or functions already available on the server (that is, in a loaded Spotfire S+ library) or part of your submitted job.
- The S-PLUS engine returns only one result (the last requested). If your job requires more than one result, store the results in a list object, and then retrieve the returned object containing the results.

- If your server request produces a large data set, we recommend that you save it in the **Results** directory of the job. (This is the default location, unless you specify an absolute path.) You can download the file from this location, and then view the results.

Default Folders

The **Statistics Services** view shows the folder structure for the selected TIBCO Spotfire Statistics Services.

Table 2.2: *Statistics Services* *view folders.*

Folder	Description
Data	Contains files and folders for data files. You can add individual files to this folder. To add a folder, see your server administrator. The types of data read by the S-PLUS engine are listed in the help file for `importData`. See the section Statistics Services Options on page 25 for information about filtering and expanding the list of available data types.

Table 2.2: *Statistics Services* *view folders. (Continued)*

Folder	Description

Jobs	Lists the jobs, in the order that they are submitted, with the most recent jobs first. The job folder name consists of the job ID and status (for example, **205 (Done)** or **205 (Waiting)**). Job names whose folders have not been opened appear in boldface font. You can delete completed jobs that you no longer need, or you can interrupt jobs that are waiting to run.
	
	All job folders include the following elements:
	
	• **Results**: Contains the **engine.log** file and any other files (such as graphic files) created as a result of running the job. Double-click the file **engine.log** to displays its contents in the **Output** view. Double-click an image file (such as **.spj**) to display it in a graphics viewer.
	
	• **Output**: Displays the **Output** view.
	
	• **Return Value**: Displays the return value in the output window for this job. The return value consists of:
	
	  • The string `retVal.`*`servername`*`.`*`job#`*, where *servername* is the name of the server containing the S-PLUS engine that ran the job, and *job#* is the job ID.
	
	  • The script's return value.
	
	• **Script**: Opens a new instance of the **Script Editor** view containing the contents of the script that was run for this job.

Packages	Includes any packages installed or uploaded to Spotfire Statistics Services. For example, if your organization uses TIBCO Spotfire Clinical Graphics, when you expand the Packages folder, you see the three protected packages required to run this server: gom, graphlet, and tscg. Any package you upload is displayed in this folder. If you have completed and uploaded the Soundex example, you see the unprotected package folder Soundex. (See the section Spotfire Statistics Services Remote Submissions on page 178.)

Statistics Services Right-Click Menus

The **Statistics Services** view provides context-sensitive right-click menus for the services' files and folders.

- Right-click a *service name* to:
  - Remove the service. When you remove a service, it is removed from the list, but it still appears in the **Add Service Connection Server URL** drop-down list, in case you want to reregister it later.
  - Disconnect from the service. Disconnected services still appear in the list of available services in the **Statistics Services** view, but their folder structures are not visible, and the green checkmark indicating their availability is removed.
  - Refresh the service file and folder list.
  - Run a job.
  - Schedule a job.
  - Monitor service jobs.
  - Examine the service properties.

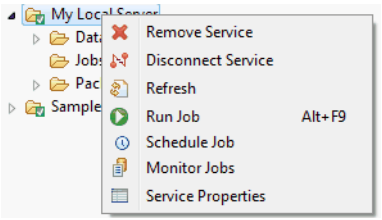


Figure 2.9: *Right-click service menu.*

- Right-click a *data folder* in the service to perform any service-level task, or to upload a data file.
- Right-click a *data file* to perform any service-level task, or to download a file copy or delete the file. You can also preview the data or display a summary of the data from this menu.
- Right-click a *job folder* to perform any service-level task, or to interrupt a waiting job or delete a job that you no longer need.
- Right-click the **Results** folder to upload a file.

- Right-click a *file* contained in a ***Results*** folder to download or delete the file.
- Right-click or double-click **Return Value** to retrieve the return value for the specified job.
- Right-click the ***Packages*** folder in the service to perform any service-level task, or to upload a package.
- Right-click a *package folder* to perform any service-level task, or to upload, download, or delete an unprotected package. You can also examine a package's properties from this menu.

Statistics Services view Toolbar

The **Statistics Services** view also displays a toolbar containing the following buttons:

Table 2.3: *Statistics Services* *view buttons.*

Button	Description
	Click to display the **Add Service Connection** dialog. Use this dialog to register a service. You can provide the display name for the service, the server URL (for example: **http://myserver:8080/SplusServer**), and your login credentials. The Server URL must be unique; if you try to register a service that is already registered, the service registrar displays an error message. Service connections are listed in alphabetical order, according to the friendly **Service Name** you provide.
	Click to collapse the entire server display tree, for all connected servers.
	Click to reconnect to the server selected in the **Statistics Services** view.
	Click to disconnect from the server selected in the **Statistics Services** view.

Table 2.3: *Statistics Services* *view buttons. (Continued)*

Button	Description
	Click to display the **Monitor Server Jobs** view to see the status of jobs queued on the server. Seeing the current server workload is useful if your job is listed as **Waiting**. This view also detects the service state. If the service fails, this view closes automatically and terminates the service connection. This view displays properties of jobs waiting on the selected server. Only properties of jobs that are waiting in the server are displayed. As soon as they finish running, they are removed from the display. (The results of finished jobs appear in the server **Jobs** folder.)
	Click to refresh the view of files and folders for the selected server.
	Click to run on the server the script that is open in the Script Editor.
	Click to display the **Schedule** dialog. Use this dialog to specify a time and date for the script open in the Script Editor to run on the selected server. when you click **OK**, the job is assigned a job ID, and it and the time and date the job is scheduled to run is displayed in the server tree.

Statistics Services Dialogs

This section describes the dialogs providing access to an available Spotfire Statistics Services server. For an example of using Spotfire Statistics Services, see the section Spotfire Statistics Services Remote Submissions on page 178.

Add Service Connection

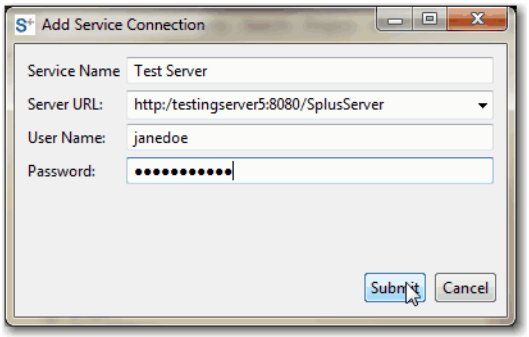


Figure 2.10:

Use this dialog to connect to Spotfire Statistics Services.

Service Name

The friendly name. This name is displayed in the **Statistics Services** view.

Server URL

The URL for the server must contain the server name, the port number and **SplusServer**. For example:

http://myserver:8080/SplusServer

On Microsoft Windows Vista® and Windows 7 operating systems, the letter case for the server name must match the case of the server name that is specified on the server, in its properties file. See your server administrator for more information.

User Name and Password

If required, provide your credentials that the server can validate.

Schedule Job

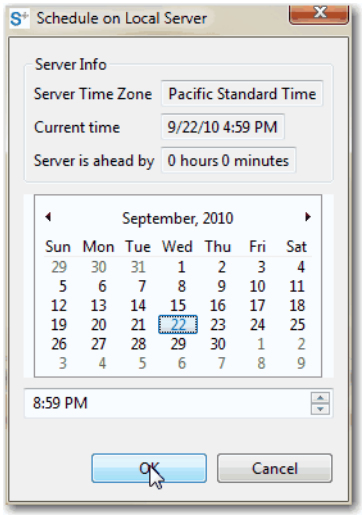


Figure 2.11: ***Schedule Job*** *dialog.*

Use this dialog to specify a future date and time to run S-PLUS code on a server running Spotfire Statistics Services.

Server Time Zone

Indicates the time zone that the server is set to.

Current time

Lists the current time on the server.

Server is ahead/behind by

Indicates the number of hours and minutes the server time is offset by the computer running the Spotfire S+ Workbench.

Calendar

Highlights the current day on your computer and the server day, if different.

Time

By default, displays the current time on the server. Set the time for the job to run. If you specify a time in the past, the job runs immediately, on the first available S-PLUS engine.

Monitor Server Jobs view

The **Monitor Server Jobs** view is not shown by default. You can display it by clicking its button on the **Statistics Services** view toolbar, or by right-clicking a running service and selecting **Monitor Jobs**. The **Monitor Server Jobs** view displays the details of jobs in the queue on TIBCO Spotfire Statistics Services, including:

- Job ID
- Date and time the job was submitted.
- The job's status.
- The name of the user who submitted the job.

The name of the service where the job is running populates the tab title.

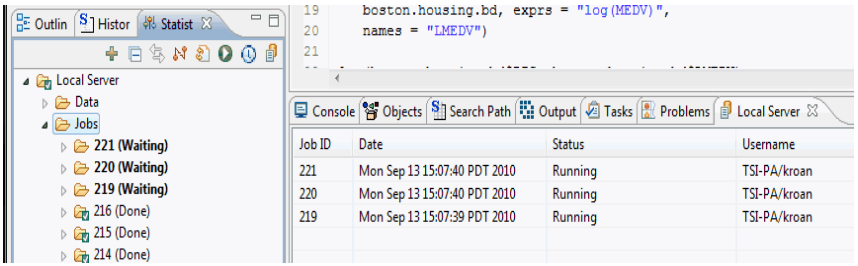


Figure 2.12: ***Monitor Server Jobs*** *view.*

Note
Completed jobs are removed from the Job Monitor. Look for their results in the server's **Jobs** folder. Scheduled jobs do not appear in the job monitor..

Tasks view

The **Tasks** view is a standard Eclipse IDE view, which is customized in Spotfire S+ to provide three levels of tasks:

Table 2.4: *Spotfire S+ Workbench **Tasks**.*

Task	Description
`FIXME`	Defines high-priority tasks. The task appears with an exclamation mark in the **Tasks** view.
`TODO`	Defines medium-priority tasks.
`XXX`	Defines low-priority tasks.

You can change these tasks, or you can add your own custom tasks. For more information about changing task settings, see section Task Options on page 25, and the section To set the Spotfire S+ preferences on page 139.

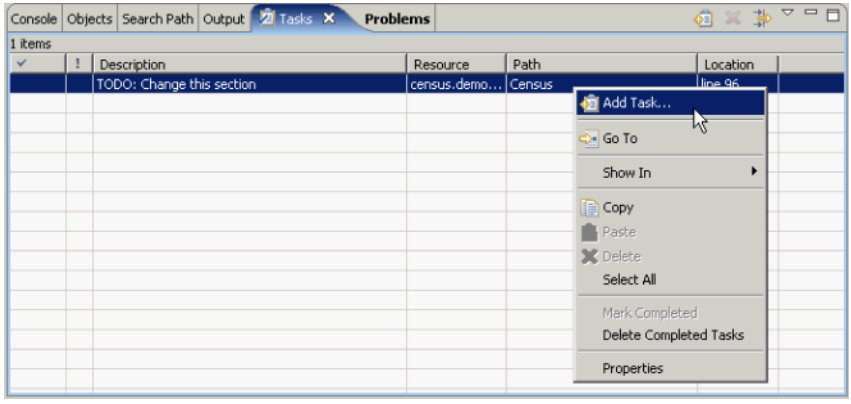


Figure 2.13: *Spotfire S+ Workbench **Tasks** view showing the right-click context-sensitive menu.*

Tasks view toolbar

The **Tasks** view also contains a toolbar that displays the following buttons:

Table 2.5: ***Tasks*** *view buttons.*

Button	Description
	Click to display the **Add Task** dialog to add a custom task.
	Click to delete the selected custom task. (Note that you cannot use this button to delete tasks identified in the script.)
	Click to display the **Filters** dialog to specify properties for filtering the tasks.

Tasks view control and right-click menus

You can use the **Tasks** view control menu (click ) to perform the following tasks:

- Display the **Sorting** dialog to sort the tasks displayed in the view, either in ascending or descending order, and according to the tasks' characteristics.
- Display the **Filters** dialog to specify properties for filtering tasks.

You can use the standard Eclipse **Tasks** view right click context-sensitive menu to:

- Add a task to the list that is not linked to a file (Displays the Eclipse **Add Task** dialog).
- Open a file and display the location of a linked task in the Script Editor.
- Display the location of a linked task in the **Navigator** (opens an instance of the **Navigator**).
- Copy the **Tasks** view table to the clipboard.

- Select all entries in the table.
- Delete all tasks marked as completed (that is, containing a check mark in the first column).
- View the properties of the task.

For more information about the basic Eclipse **Tasks** view, see the Eclipse *Workbench User Guide*.

TIBCO SPOTFIRE S+ WORKBENCH DEBUG PERSPECTIVE

3

INTRODUCTION

The TIBCO Spotfire S+ Workbench includes the Debug perspective, which is based on the Eclipse standard debugging perspective.

From the Debug perspective, you can observe the run-time behavior of your program and determine the location of semantic errors. The Spotfire S+ debugger understands features that are built into the Spotfire S+ programming language and its associated libraries. With the Spotfire S+ debugger, you can break (suspend) execution of your program to examine your code and evaluate variables.

After you have written your code and resolved any syntax errors, you can use the Spotfire S+ debugger to correct any logic errors that keep your code from running correctly. Using the Spotfire S+ debugger, you can:

- Control your code testing by setting break points, stepping into, though, and out of code, and pausing or terminating the process at any point using the Spotfire S+ debugger features.
- Set, disable, enable, or remove breakpoints while you are debugging.
- View variable and expression values at breakpoints while stepping through your code.
- Track resource allocation and function use.

Note

Because a significant amount of computation is required when you run a debugger, you should expect to see Spotfire S+ running at a slower speed than usual when you toggle the Workbench to Debug mode. Try this simple test for a demonstration:

1. With Debug mode off, examine the results of running:

```
sys.time(lm(fuel.frame))
sys.time(validate()).
```

2. Toggle on Debug mode and rerun the commands.
3. Examine the difference.

Figure 3.1 shows the Debug perspective's views. This chapter describes the options, features, and views included in the Debug perspective.

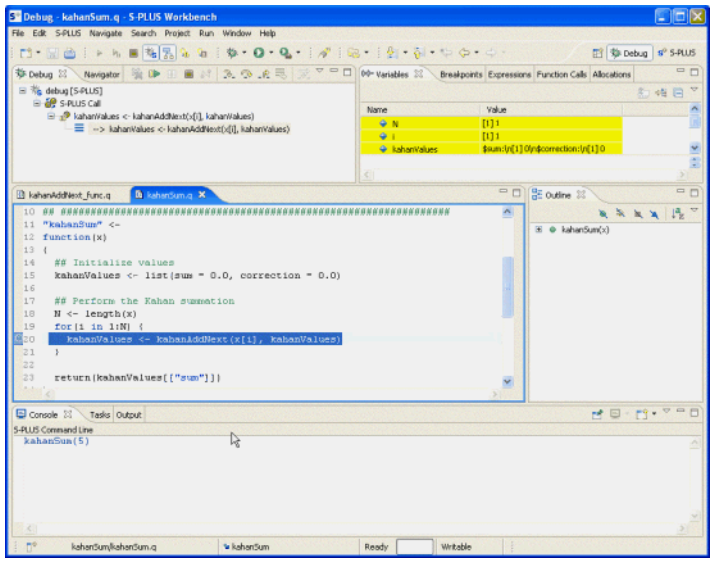


Figure 3.1: *The Debug perspective.*

The Debug perspective also includes a profiler, which you can use to inspect allocated memory and functions called, including call count and duration. For more information about the Spotfire S+ Profiler, see the section Profiler on page 120.

- For tasks that walk you through using the Spotfire S+ debugger and profiler, see the section Chapter 4, TIBCO Spotfire S+ Workbench Tasks.
- For information about the Spotfire S+ perspective, see Chapter 2, The TIBCO Spotfire S+ Perspective.

Note
You can create your own perspective that displays a combination of views from the perspectives, or you can change the Debug perspective to suit your development style by adding, moving, hiding, or closing views. For more information about customizing the views within the perspective, see the section Changing the Spotfire S+ Workbench Perspective on page 42, or see the section Customized Perspective Views on page 148.

DEBUG PERSPECTIVE OPTIONS AND PREFERENCES

When you examine the Debug perspective, examine the Spotfire S+ Workbench toolbars, menus, default options, and preferences in the IDE.

Note that the Spotfire S+ Workbench toolbar includes the Spotfire S+ debugger buttons (as well as the **Profiler** button). These buttons are described in greater detail in Table 1.5.

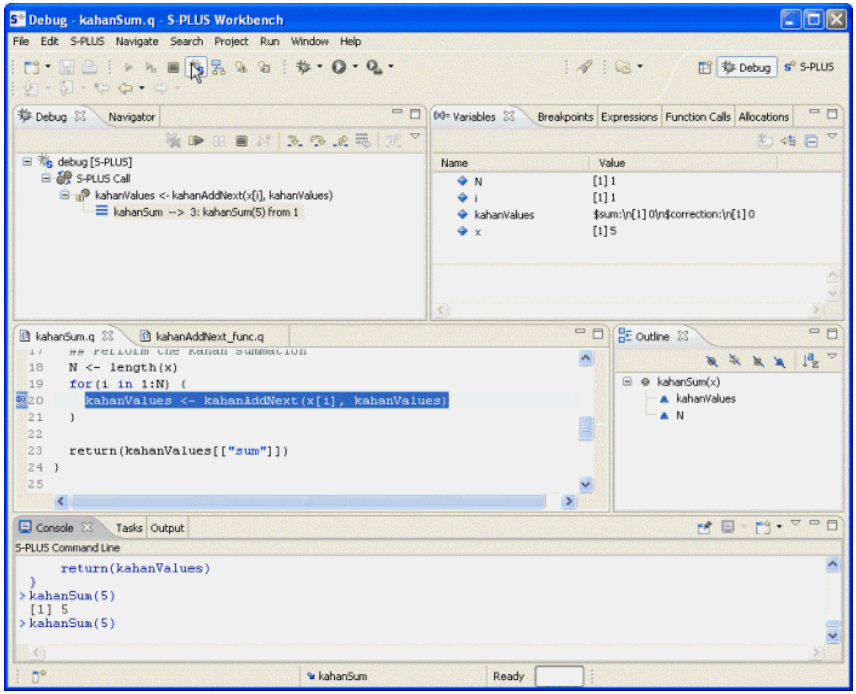


Figure 3.2: *The Spotfire S+ Workbench toolbar.*

Note

When you are in the Debug perspective, notice that the Eclipse environment displays a generic toolbar that includes a **Run** button, a **Debug** button, and an **External Tools** button. These buttons might work with other Eclipse plug-ins, but they are not intended to be used with Spotfire S+. You can set breakpoints from the **Debug** view toolbar, or from several menus, and you can run code using the **Run Spotfire S+ Code** button on the Spotfire S+ toolbar or from the console.

Setting Preferences

From the menu, click **Window ► Preferences** to open the **Preferences** dialog and examine the options. (For more information about setting preferences, see the section Examining Spotfire S+ Preferences on page 14. For more information about Eclipse preferences, see the Eclipse *Workbench User's Guide*, available from the **Help ► Help Contents** menu in the IDE.)

Most options in the **Spotfire S+** pages of the **Preferences** dialog apply to global settings in the Spotfire S+ Workbench. For example, options controlling editor or **Console** text colors apply to both perspectives. Only the **Profiler** page under **Spotfire S+** controls Spotfire S+ debugger behavior, and that controls only the refresh rate for system allocations and function calls. See section Examining Spotfire S+ Preferences on page 14 for more information.

Debug Mode

To start debugging, first activate the debugger using one of the following methods:

- On the toolbar, click **Toggle Spotfire S+ Debugger** .
- On the menu, click the **Run ► Toggle Spotfire S+ Debugger**.
- On the keyboard, press CTRL+ALT+D.

After you activate the Spotfire S+ debugger, any expression you type in the **Console**, or that you run by clicking **Run Spotfire S+ Code** ( ) on the toolbar, invokes the Spotfire S+ debugger.

Note

You can set Eclipse an option to be notified that a debug session is about to begin (that is, if you click **Debug** ( ) and try to run a function in the **Console** that encounters any breakpoints).

1. From the main menu, click **Windows ► Preferences**.
2. Expand **Run/Debug** and select **Perspectives**.
3. In the **Perspectives** dialog, in the **Open the associated perspective when launching** group, select **Prompt**. Click **OK**.

Using this Eclipse option, you are prompted to change to the Debug perspective with the message box shown in Figure 3.3. Clicking **Yes** displays the Debug perspective with the **Debug** view open and the debugging started.

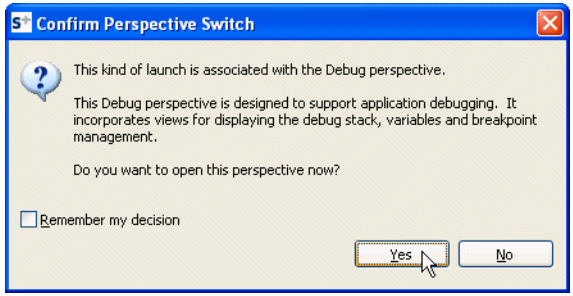


Figure 3.3: *The **Confirm Perspective Switch** message box.*

Debug Run Menu Options

When you switch to the Debug perspective, the Spotfire S+ Workbench **Run** menu changes to list all of the code control actions specific to that perspective. Note that many of the options listed in this menu are default Eclipse debugging options. For more information about those options, see the Eclipse *Workbench User Guide*. The Spotfire S+ Debugger actions are available in the Debug perspective views.

Table 3.1: *Debug perspective **Run** menu.*

Menu item	Description
Run Spotfire S+ Code	Runs the code in the currently-active file, or runs the selected code.
Run Next Spotfire S+ Command	Runs the next available Spotfire S+ command.
Toggle Spotfire S+ Debugger	When toggled on, engages the Spotfire S+ debugger. (You can engage the Debugger in either the Spotfire S+ or the Debug perspectives; however, by default, the views displaying debugging information are visible in the Debug perspective.)

Table 3.1: *Debug perspective* ***Run*** *menu. (Continued)*

Menu item	Description
Toggle Spotfire S+ Profiler	When toggled on, engages the Spotfire S+ Profiler. (You can engage the Spotfire S+ Profiler in either the Spotfire S+ or the Debug perspectives; however, by default, the views displaying profiling information are visible in the Debug perspective.) You do not need to engage the debugger in order to engage the Profiler. See the section Profiler on page 120 for more information.
Resume	Resumes debugging when the debugger is paused.
Suspend	Suspends debugging.
Terminate	Terminates debugging.
Step Into	Steps into the current function by one level
Step Over	Stays at the same expression level but steps to the next expression.
Step Return	Steps out of the current function by one level.
Run to Line	Core Eclipse debugger option; not implemented in Spotfire S+.
Use Step Filters	Core Eclipse debugger option; not implemented in Spotfire S+.
Run Last Launched	Core Eclipse debugger option; not implemented in Spotfire S+.

Table 3.1: *Debug perspective* ***Run*** *menu. (Continued)*

Menu item	Description
Debug Last Launched	Core Eclipse debugger option; not implemented in Spotfire S+.
Run Last Launched	Core Eclipse debugger option; not implemented in Spotfire S+.
Debug Last Launched	Core Eclipse debugger option; not implemented in Spotfire S+.
Run History	Core Eclipse debugger option; not implemented in Spotfire S+.
Run As	Core Eclipse debugger option; not implemented in Spotfire S+.
Run	Core Eclipse debugger option; not implemented in Spotfire S+. (Use the **Run Spotfire S+ Code** option at the top of the main menu, F9, the **Debug** view context-sensitive menu, or on the Debugger toolbar.)
Debug History	In its submenu, lists the previously-launched debugging actions. From this list, you can select a previous
Debug As	Core Eclipse debugger option; not implemented in Spotfire S+.
Debug	Core Eclipse debugger option; not implemented in Spotfire S+.
External Tools	Core Eclipse debugger option; not implemented in Spotfire S+.

Table 3.1: *Debug perspective* ***Run*** *menu. (Continued)*

Menu item	Description
Toggle Spotfire S+ Warning Breakpoint	Requires that the Spotfire S+ debugger be toggled on. When toggled on, stops execution if Spotfire S+ encounters a warning. See Table 3.7 in the section Breakpoints view on page 113 for more information about warning breakpoints.
Toggle Spotfire S+ Error Breakpoint	Requires that the Spotfire S+ debugger be toggled on. When toggled on, stops execution if Spotfire S+ encounters an error. See Table 3.7 in the section Breakpoints view on page 113 for more information about error breakpoints.
Toggle Line Breakpoint	When toggled on, removes the breakpoint on the selected line.
Toggle Method Breakpoint	Core Eclipse debugger option; not implemented in Spotfire S+.
Toggle Watchpoint	Not implemented in the debugger.
Skip All Breakpoints	When selected, disregards but maintain (that is, does not remove or disable) all breakpoints. When this button is toggled on, all breakpoints appear with a diagonal slash, as shown in the button.
Remove All Breakpoints	Removes every breakpoint from files in open projects**.** (This item does not remove breakpoints from files in closed projects.)

DEBUG PERSPECTIVE VIEWS

The Debug perspective includes views specific to using the debugger and the profiler, as well as views shared across perspectives. For a list of all views and their default perspectives, see Table 1.7 in Chapter 1. (Chapter 1 also includes descriptions of the shared views.)

The Debug perspective includes the default Eclipse **Navigator** view and customized views. Customized views in the Debug perspective include the following:

Table 3.2: *Debug perspective views and exercise references.*

View	Descriptions and Practice exercises
Allocations view	A Spotfire S+ Profiler view. For a description, see the section Allocations view on page 122. For practice using this view, see the exercise in the section Examining Resource Usage on page 199. (The Profiler views are discussed in more detail in the section Profiler Mode on page 121.)
Breakpoints view	For a description, see the section Breakpoints view on page 113. For practice using this view, see the exercise in the section Setting breakpoints on page 190.
Console	Shared view. For a description, see the section Spotfire S+ Workbench Console on page 49. For practice using this view, see the exercise in the section To run copied script code on page 165.
Debug view	For a description, see the section Debug view on page 100. For practice using this view, see the exercise in the section Examining the call stack on page 193.
Expressions view	For a description, see the section Expressions view on page 111. For practice using this view, see the exercise in the section Examining Variables and Expressions on page 194

Table 3.2: *Debug perspective views and exercise references. (Continued)*

View	Descriptions and Practice exercises
Function Calls view	A Spotfire S+ Profiler view. For a description, see the section Function Calls view on page 121. For practice using this view, see the exercise in the section Examining Function Calls on page 199. (The Profiler views are discussed in more detail in the section Profiler Mode on page 121.)
Outline view	Shared view. For a description, see the section Outline view on page 54. For practice using this view, see the exercise in the section To examine the outline on page 160.
Output	Shared view. For a description, see the section Output on page 56. For practice using this view, see the exercise in the section To run code on page 166.
Variables view	For a description, see the section Variables view on page 106. For practice using this view, see the exercise in the section Examining Variables and Expressions on page 194.
Tasks view	Shared view. For a description, see the section Tasks view on page 86. For practice using this view, see the exercise in the section Adding a Task to A Script on page 161.

Additionally, the Debug perspective displays the Script Editor, which is shared with the Spotfire S+ perspective. See the section Editor on page 103 for more information about using the Script Editor with the Spotfire S+ Debugger. See the section Spotfire S+ Workbench Script Editor on page 57 for more general information about editing code in the Script Editor.

From the Debug perspective, you can observe the run-time behavior of your program and determine the location of semantic errors. The Workbench debugger understands features that are built into the

Spotfire S+ programming language and its associated libraries. With the debugger, you can break (suspend) execution of your program to examine your code and evaluate and edit variables.

Debug view

The **Debug** view displays the call stack of a currently-paused expression. Clicking any level of the call stack displays in the **Editor** the current function and/or the highlighted expression.

Figure 3.4 displays the **Debug** view, in its default position, displaying the call stack for the kahanSum example.

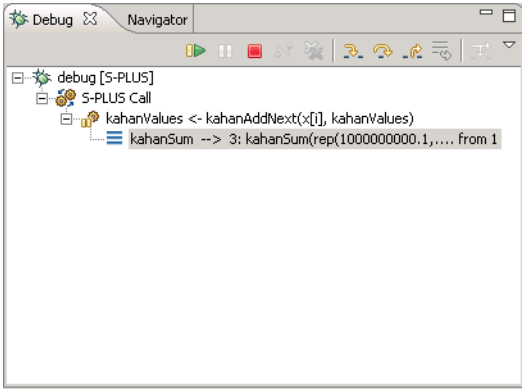


Figure 3.4: *The **Debug** view.*

Debug view toolbar

The **Debug** view contains a toolbar with the following buttons for evaluation control, in the order of their appearance, left to right:

Table 3.3: ***Debug*** *view toolbar buttons.*

Button	Description
	**Remove All Terminated Launches**. Clears the call stack of all debugging sessions that ended with a termination.
	**Resume**. Continues to the next breakpoint.
	**Suspend**. Pauses the execution as though a breakpoint had been hit.
	**Terminate**. Stops the execution. Similar to ESC functionality.
	**Disconnect**. For remote debugging. Not implemented for Spotfire S+.
	**Step Into**. Steps into the current function by one level.

Table 3.3: ***Debug*** *view toolbar buttons. (Continued)*

Button	Description
	**Step Over**. Stays at the same expression level but steps to the next expression.
	**Step Return**. Step out of the current function level.
	**Use Step Filters/Step Debug**. This feature is not supported in the Spotfire S+ Workbench.

Note
The feature **Drop to Frame** is not implemented in the Spotfire S+ Workbench.

Debug view control and right-click menus

The **Debug** view contains a control drop-down () menu with one command: **View Management**, which displays the **View Management** page of the Eclipse **Preferences** dialog, in which you can set options to open and close views automatically. This dialog is also available from the **Windows ► Preferences** menu. For more information about using this menu item, see the Eclipse *Workbench User's Guide*.

You can use the **Debug** view right-click menu (Figure 3.5) to perform the following tasks:

- Copy the contents of the stack.
- Step into the code.
- Step over the code.
- Step one level out of the current function.
- Resume debugging.
- Suspend debugging.

- Terminate the debugging session.
- Terminate and restart the current debugging session.
- Remove from the view all previously terminated debugging sessions.
- Terminate and remove the currently-active debugging session.
- Restart the current debugging session.
- Terminate all debugging.

These menu items are available on the toolbar, or from the main **Run** menu. For more information, see the section Debug view toolbar on page 101 or the section Debug Run Menu Options on page 94.

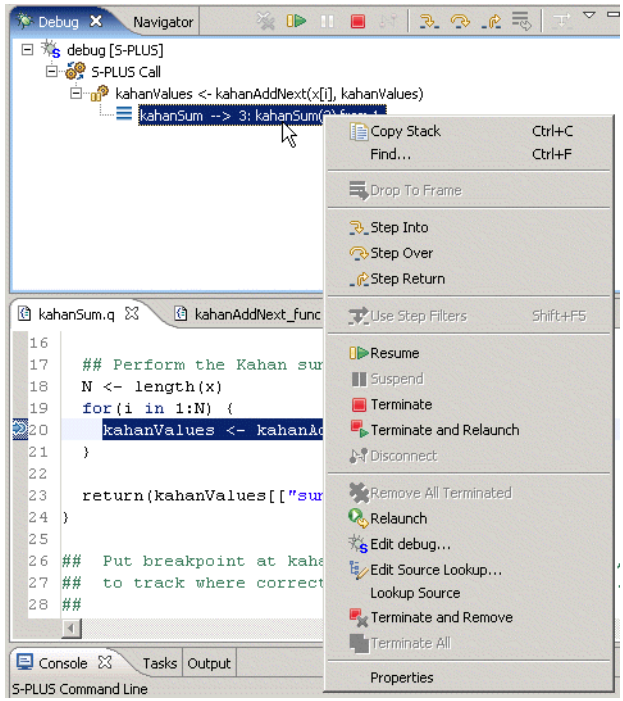


Figure 3.5: *The **Debug** view right-click context-sensitive menu.*

Editor

The Debugger perspective uses the existing Spotfire S+ Workbench editor. You can set and remove breakpoints in the Script Editor by:

- Double-clicking the margin on the left side of the screen (to the left of the line numbers).

- By right clicking the margin, and from the menu, select **Toggle Breakpoint**.
- By using the **Run ▶ Toggle Line Breakpoint** menu option.
- By pressing CTRL+SHIFT+B.

When you are debugging, if your functions call any functions in files other than those in your workspace (including functions in a library), you can double-click the expression in the **Debug** view and open a temporary file that contains the called function. You can set breakpoints in these functions, too.

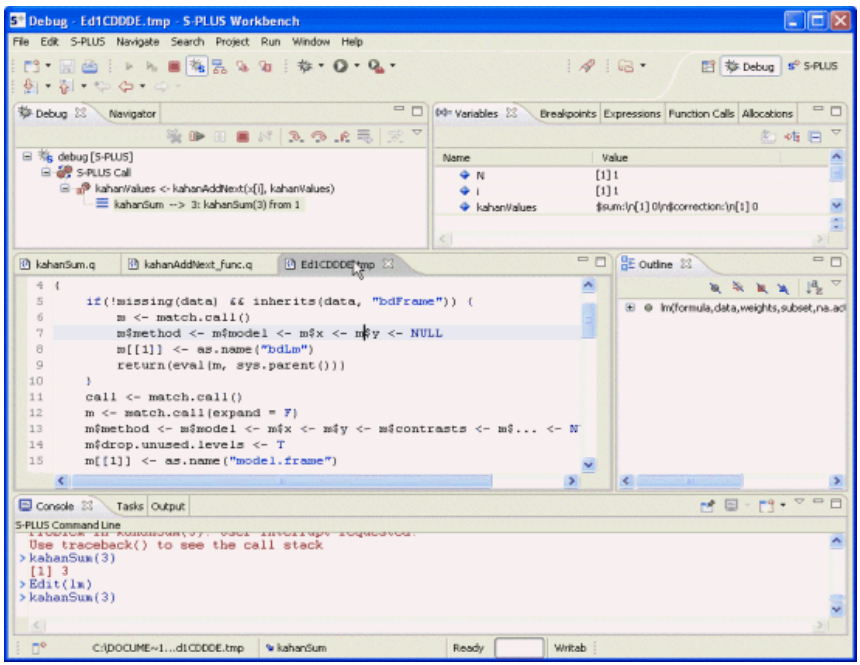


Figure 1: *A temporary file in the debugger.*

You can view functions that are not defined in your workspace in one of the following ways:

- Double-click the **Debug** view.
- Press CTRL+click in the Spotfire S+ Script Editor.
- On the menu, click **Spotfire S+ ▶ Find**

- Press CTRL+SHIFT+F

Note

- Breakpoints that you set in functions in your workspace are associated with function *and* with the file. These breakpoints persist until you remove them.
- Breakpoints that you set in functions outside of your workspace are associated with the functions, and not with the temporary files. They persist until you remove them.
- Setting breakpoints in code files in the Spotfire S+ Workbench does not affect the file if you open it in the Spotfire S+ GUI in Windows. Breakpoints are evaluated only in the Spotfire S+ Workbench, and only when the debugger is engaged.
- Breakpoints can be set only on a line contained within a function definition. Lines not contained within a function cannot have a breakpoint set.

If you close a temporary file containing a breakpoint, and then rerun your function, the functions called by your code reopen in another temporary file, and any breakpoints you set persist.

Examining Expression Values in Tooltips

Using the **Hover** feature, you can position the mouse over an expression in the Script Editor, and then examine the expression's value, which appears in a tooltip. This feature is available for all expressions in the Script Editor, not just those where a breakpoint appears; however, examining the value of an expression at a breakpoint can be very useful.

You can limit the size of the expression that the **Hover** feature evaluates by using the following Spotfire S+ command:

```
options(workbenchMaxDims=c(rows, columns))
```

See the section Hover on page 21 for more information.

You can enable or disable the hover tooltip feature in the **Editor** options dialog from the **Windows ► Preferences** menu. This feature is enabled by default.

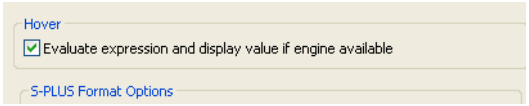


Figure 3.6: ***Hover*** *option in the* ***Editor*** *preferences dialog.*

For practice tasks on setting breakpoints, see the section Setting breakpoints on page 190.

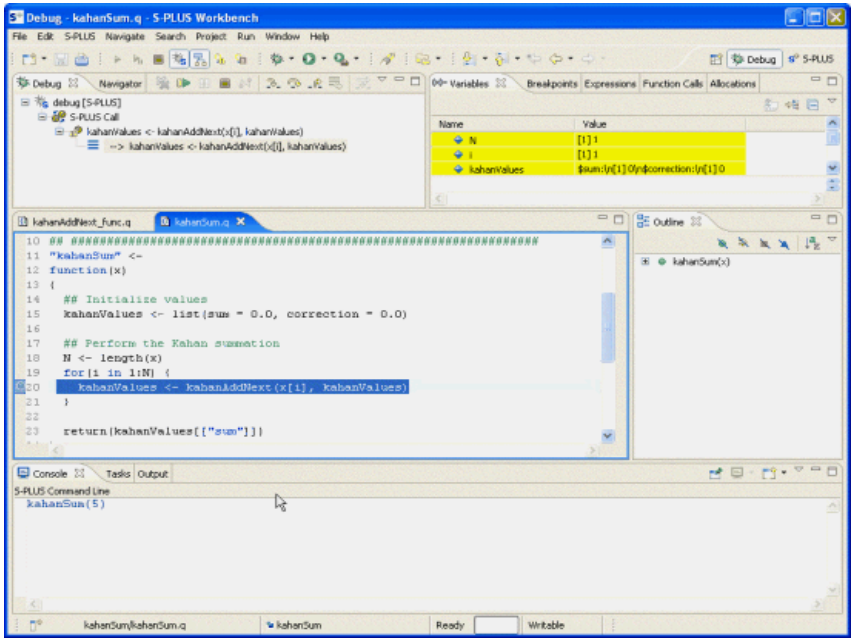


Figure 3.7: ***Breakpoints*** *view and* ***Editor****.*

Variables view

Displays all variables in the current frame. As you debug, at each breakpoint or step, the debugger re-evaluates the variables. At any breakpoint or stopping point, you can review, but not edit or alter, the variables at the current frame.

Figure 3.8 shows the **Variables** view with the current variable selected. The **Details** pane of this view contains variable information that would result from calling `print()` on the selected variable or

expression. The **Details** pane is editable; you can select, cut, or copy the contents of this pane. Editing the **Details** pane does not affect the value of a variable.

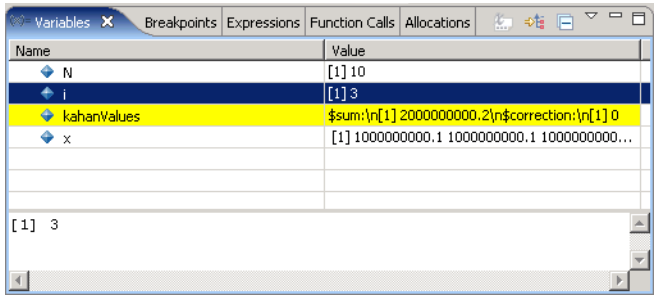


Figure 3.8: *The **Variables** view.*

Variables view and Expressions view toolbars

The **Variables** view and Expressions view contain similar toolbars to control the view display and feature options.

Table 3.4: ***Variables*** *view and* ***Expressions*** *view toolbar buttons.*

Button	Description
	**Show Type Names**. Select to display the variables' types.
	**Show Logical Structure**. This feature is currently not supported in the Spotfire S+ Workbench.
	**Collapse All**. Collapses the logical structure display (which is currently not supported in the Spotfire S+ Workbench).
	Remove Selected **Expressions** (**Expressions** view only).
	Remove All **Expressions** (**Expressions** view only).

Variables view control and right-click menus

The **Variables** view and **Expressions** view drop-down control menus provide additional options to control the view's display. The respective menus are available from the down arrow button on the **Variables** or **Expressions** view toolbar.

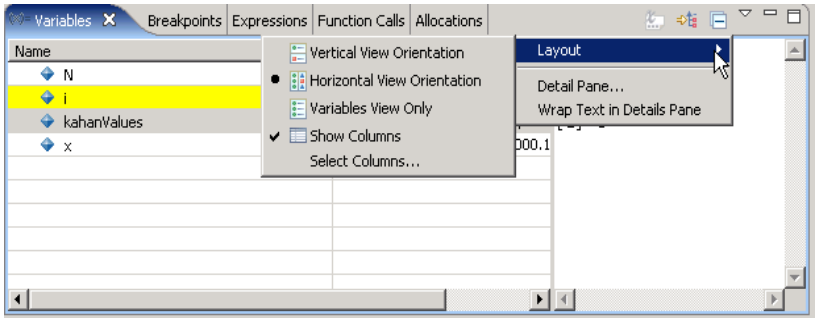


Figure 3.9: *The **Variables** view control menu.*

The **Variables** view and **Expressions** view control menus include the following options:

Table 3.5: ***Variables*** *view and* ***Expressions*** *view control menu options.*

Menu item	Description
Vertical View Orientation	Tiles the **Details** pane of the view vertically. That is, the **Details** pane appears below the **Variables** or **Expressions** pane.
Horizontal View Orientation	Tiles the **Details** pane of the view horizontally. That is, the **Details** pane appears beside the **Variables** or **Expressions** pane.

Table 3.5: ***Variables*** *view and* ***Expressions*** *view control menu options.*

Menu item	Description
Variables View Only **Expressions View Only**	Hides the **Details** pane of the **Variables** or **Expressions** view.
Detail Pane	Displays the **Configure Details Area** dialog, which controls the maximum number of characters to display in the **Details pane**. See Figure 3.10.
Wrap Text in Details pane	Wraps the text that appears in the **Details** pane.

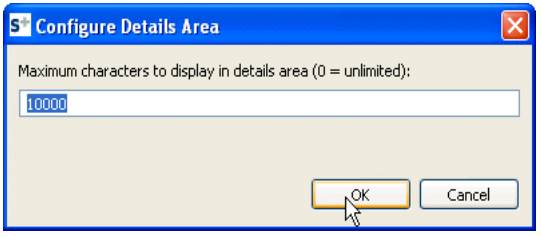


Figure 3.10: ***Configure Details Area*** *dialog.*

Note

Figure 3.10 shows the **Configure Details Area dialog**, with which you can set the number of characters to display. This option just controls the number *displayed*; it does not limit the number of characters *returned*. To limit the number of text variables and expressions to return, use the Spotfire S+ command `options(workbenchMaxDims=c(rows, columns))`. This option is useful if you are working with a large number of text variables or expressions.

Setting this option also limits the size of the expression that the hover feature evaluates. For example, if you are evaluating a large data object, and you hover the mouse over the expression, if you do not set this option, Spotfire S+ tries to evaluate the expression on the spot.

The **Variables** view contains two right-click context-sensitive menus:

- The **Variables** view (Figure 3.9).

- The **Details** pane (Figure 3.12).

You can use the **Variables** view right-click context-sensitive menu to perform the following tasks:

- Select all variables in the pane.
- Copy the selected variable.
- Find a specified variable.
- Set an expression watch for the selected variable. (When you select this option, the selected variable is added to the **Expressions** view.)

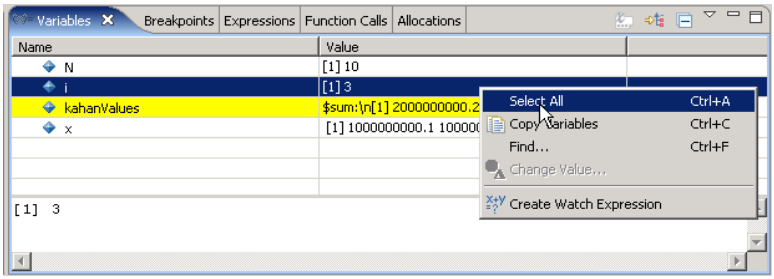


Figure 3.11: ***Variables*** *view showing the right-click menu.*

You can use the right-click context-sensitive menu in the **Variables** view **Details** pane to perform the following tasks:

- Cut the currently-selected text.
- Copy the currently-selected text.
- Paste the contents of the clipboard to the cursor location in the pane.
- Select all text in the pane.

- Find a specified string in the pane. (The Spotfire S+ Workbench does not support replacing strings in the **Details** pane using the **Find/Replace** dialog.)

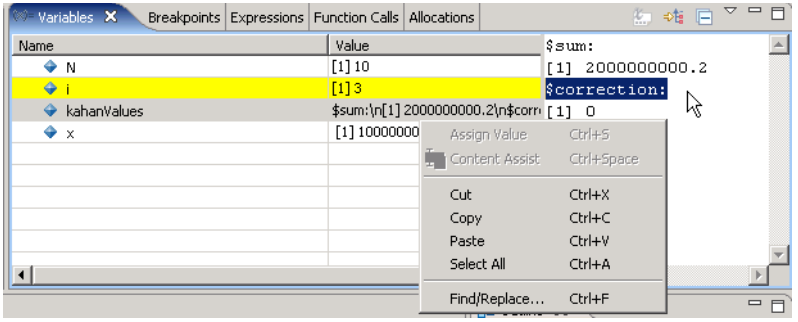


Figure 3.12: ***Variables*** *view showing the right-click menu in the* ***Details*** *pane.*

Expressions view

The **Expressions** view displays the values of any Spotfire S+ expression. Like the **Variables** view, it is re-evaluated at each evaluation pause (breakpoint or step).

Note on Expressions

An *expression* is any syntactical interaction that Spotfire S+ can evaluate. Expressions persist from session to session. Spotfire S+ recognizes a wide variety of expressions, but in interactive use, the most common are names, which return the current definition of the named data object, and function calls, which carry out a specified computation. Any of the following are Spotfire S+ expressions:

```
1:10
rnorm(5)
mean(1:10)
traceback()
```

If you were debugging a function, for example:

```
incrementByTwo <- function(x) {
   * x + 2
}
```

you could have an expression that evaluated:

```
x + 2
```

at the breakpoint (denoted with the * in the above function definition).

Note

If you leave in the **Expressions** view expressions that are no longer in scope for your current debugging session, you might notice that the debugger slows significantly to evaluate the expression that is no longer in scope. To keep the debugger from slowing down, remove expressions that are no longer in scope for your current debugging session.

For more information about expressions, see the *Programmer's Guide,* or see the Spotfire S+ Help topic **ExpressionLanguage**.

The **Expressions** view toolbar buttons are the same as those of the **Variables** view, with the addition of the **Remove** and **Remove All** buttons. See Table 3.4 for more information.

The **Expressions** view contains two right-click context-sensitive menus:

- The **Expressions** view (Figure 3.13)
- The **Details** pane (Figure 3.12).

You can use the **Expressions** view right-click context-sensitive menu to perform the following tasks:

- Select all expressions in the pane.
- Copy the selected expression.
- Remove the selected expression.
- Remove all expressions in the view.
- Add an expression to watch (opens the **Add Watch Expression** dialog, in which you can provide an expression and indicate whether to enable or disable it).
- Re-evaluate the expressions.
- Disable the currently-selected expression.
- Enable the currently-selected expression (if it was previously disabled).

- Edit the currently-selected expression. (Opens the **Edit Watch Expression** dialog, in which you can change expression and indicate whether to enable or disable it.)

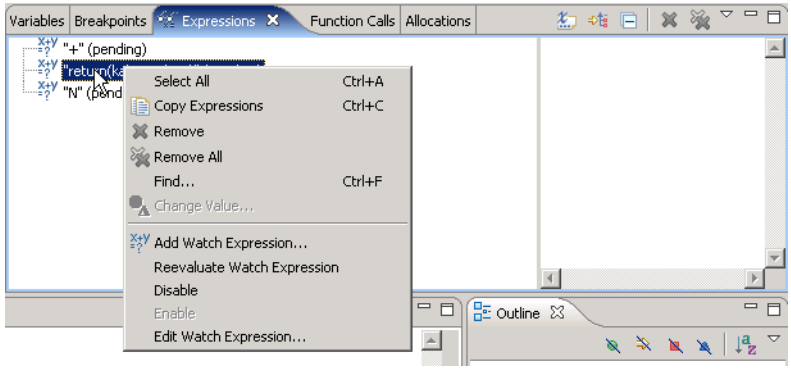


Figure 3.13: ***Expressions*** *view showing the right-click menu.*

The right-click context-sensitive menu for the **Details** pane in the **Expressions** view is the same as that of the **Variables** view **Details** pane. See Figure 3.12 and the section Variables view control and right-click menus on page 108 for more information.

Find a specified string in the pane. (The Spotfire S+ Workbench does not support replacing strings in the **Details** pane using the **Find/Replace** dialog.)

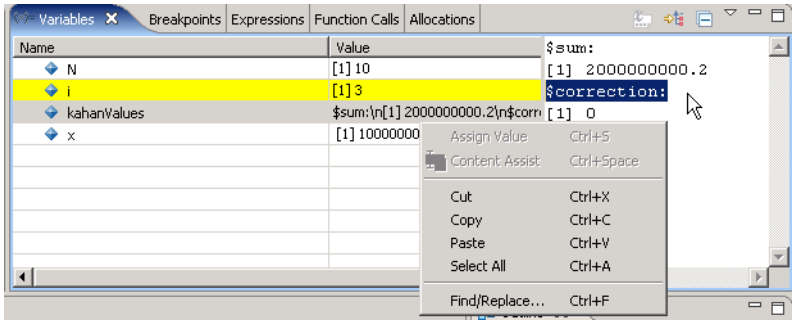


Figure 3.14: ***Variables*** *view showing the right-click menu in the* ***Details*** *pane.*

Breakpoints view

The **Breakpoints** view displays the currently set breakpoints, which you can organize by resources, files, working sets, or just a simple list or type. Each breakpoint displayed in the **Breakpoints** view shows

the function name (e.g., `kahanAddNext`), the file name (e.g., **kahanAddNext_func.q**), and the line number (e.g., `[line 7]`) where the breakpoint occurs.

In addition to setting general user interface options, you can use the **Breakpoints** view to manage breakpoint working sets and group breakpoints. See the Eclipse *Workbench User's Guide* for more information.

Selecting a breakpoint displays in the **Editor** the associated file, highlighting the breakpoint line. You can activate, disable, or delete breakpoints from this view.

Figure 3.15 displays the **Breakpoints** view with the file structure shown, and all breakpoints activated.

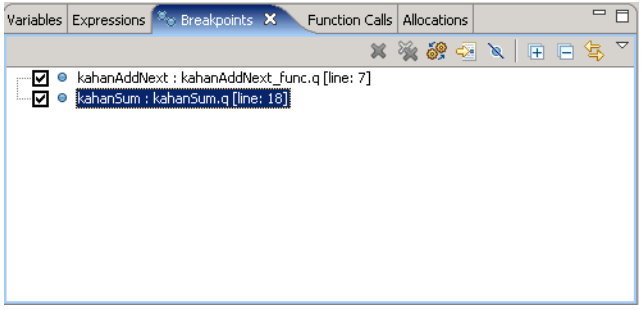


Figure 3.15: *Breakpoints view.*

Breakpoint types

Breakpoints are the best tools to stop an evaluation and inspect the engine's state. The Spotfire S+ Workbench supports three types of breakpoints.

Table 3.6: *Types of breakpoints.*

Breakpoint type	Description
Line breakpoints	Use line breakpoints to stop an evaluation at the specified line number. To set line breakpoints, from any perspective: Double-click the left margin of the **Spotfire S+ Editor**. Right-click the left margin of the **Spotfire S+ Editor**. From the Debug perspective, Click the **Run** ▶ **Toggle Line Breakpoint** menu item. After you set a line breakpoint, you can enable or disable it in the **Breakpoints** view, or by right-clicking the breakpoint marker ( ) in the left margin of the **Editor**. (For more information about using the **Breakpoints** view, see the section Breakpoints view on page 113.)

Table 3.6: *Types of breakpoints. (Continued)*

Breakpoint type	Description
Warning breakpoints	Warning breakpoints are triggered only if the Spotfire S+ Debugger is toggled on. Use warning breakpoints to stop an evaluation when a warning is generated. You can activate warning breakpoints from any perspective by clicking **Toggle Spotfire S+ Warning Breakpoint** ( ) on the Spotfire S+ toolbar, or by clicking the **Run ▶ Toggle Spotfire S+ Warning Breakpoint** menu item. • Warning breakpoints do not appear in the **Breakpoints** view. • Warning breakpoints are not affected by the option **Skip All Breakpoints** ( ).
Error breakpoints	Error breakpoints are triggered only if the Spotfire S+ Debugger is toggled on. Use error breakpoints to stop an evaluation when an error is generated. You can activate error breakpoints from any perspective by clicking **Toggle Spotfire S+ Error Breakpoint** ( ) on the Spotfire S+ toolbar, or by clicking the **Run ▶ Toggle Spotfire S+ Error Breakpoint** menu item. • Error breakpoints do not appear in the **Breakpoints** view. • Error breakpoints are not affected by the option **Skip All Breakpoints** ( ).

Breakpoints view toolbar

The **Breakpoints** view contains a toolbar to control the view's display and feature options.

Button	Description
	**Remove Selected Breakpoints**. From the Breakpoints view, click to remove the selected breakpoint from both the **Debug** view and the **Breakpoints** view.
	**Remove All Breakpoints**. From the **Breakpoints** view, click to remove every breakpoint from both the **Debug** view and the **Breakpoints** view.
	**Show Breakpoints Supported by Selected Target**. When toggled off, all breakpoints are displayed. When toggled on, the **Breakpoints** view displays only breakpoints applicable to the selected debug target. For example, if you had installed a Java package for Eclipse (not included in the Spotfire S+ Workbench), and you were running a Java debug session and a Spotfire S+ debug session simultaneously, you could filter using this feature.
	**Go to File for Breakpoint**. Click to jump to the file and line number containing the breakpoint currently selected in the **Breakpoints** view.
	**Skip All Breakpoints**. Click to disregard but maintain (that is, not remove or disable) all breakpoints. When this button is toggled on, all breakpoints appear with a diagonal slash, as shown in the button.

Button	Description
	**Expand All**. If the **Breakpoints** view is set to display breakpoints in groups such as files, working sets, projects, resources, or breakpoint types, clicking this button expands the tree to display the breakpoints in all groups. (See Table 3.7 for more information about the group display options.)
	**Collapse All**. If the **Breakpoints** view is set to display breakpoints in groups such as files, working sets, projects, resources, or breakpoint types, clicking this button collapses the tree to display only the top-level groups. (See Table 3.7 for more information about the group display options.)
	**Link With Debug View**. As breakpoints are encountered, they are selected in the **Breakpoints** view.

Breakpoints view control and right-click menus

The **Breakpoints** view contains a control menu to control the types and levels of resources displayed, and options for managing working sets. See the Eclipse *Workbench User's Guide* for more information about managing working sets.

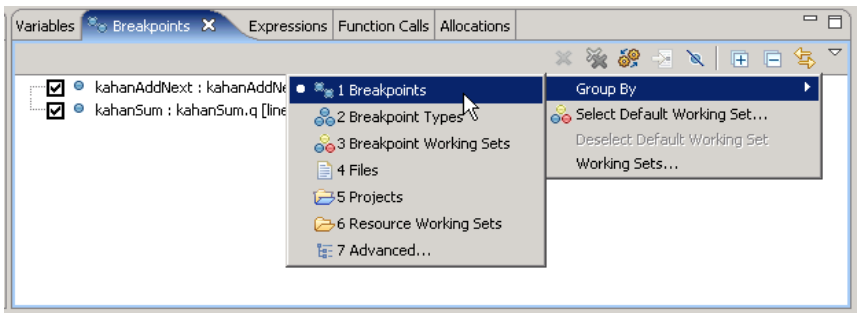


Figure 3.16: *The **Breakpoints** view menu.*

The **Breakpoints** control menu includes the following options:

Table 3.7: *Breakpoints view menu.*

Menu Item	Description
Group By	Displays a submenu providing the following options: • **Breakpoints**. Displays only the breakpoints in a flat list. • **Breakpoint Types**. Displays breakpoints grouped by type (Java, Spotfire S+, and so on). • **Breakpoint Working Sets.** Displays breakpoints grouped by identified working sets. See (working sets section) for more information. • **Files.** Displays breakpoints grouped by the files containing them. • **Projects.** Displays breakpoints grouped by the projects containing them. • **Resource Working Sets.** Displays breakpoints by the resources to which they belong. • **Advanced.** Displays the **Group Breakpoints** dialog. See the Eclipse *Workbench User's Guide* for more information about using working sets and groups.
Select Default Working Set	Displays a dialog to create, select, or remove the breakpoint working set that is your project's default. See the Eclipse *Workbench User's Guide* for more information about using working sets.
Deselect Default Working Set	Clears the working set that you specified in the **Select Default Working Set** dialog.
Working Sets	Displays the **Select Working Set** dialog.

You can use the **Breakpoints** right-click context-sensitive menu (see Figure 3.17) for the following tasks:

- Open the file and location for the selected breakpoint.
- Enable the selected disabled breakpoint.
- Disable selected breakpoint.
- Remove the selected breakpoint.
- Remove all breakpoints in the view.
- Select all breakpoints in the view.
- Copy the breakpoints to the clipboard.

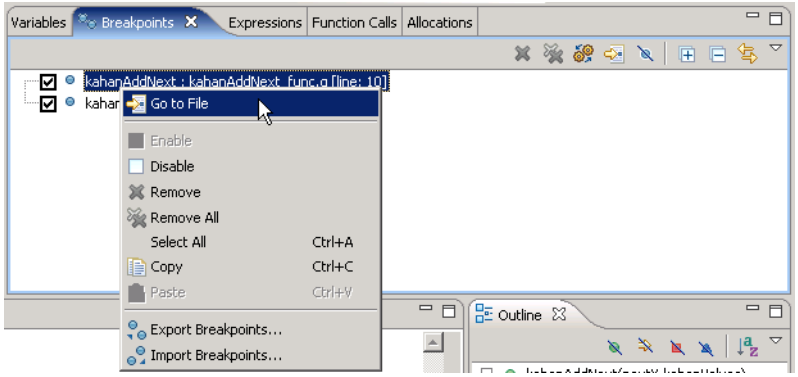


Figure 3.17: *The **Breakpoints** view displaying the right-click menu.*

Working with Working Sets

The Spotfire S+ Workbench provides tools to group and manage project files and resources using working sets. Working set menus are available in several Eclipse views, including the **Breakpoints** view. For general information about using working sets, see the Eclipse *Workbench User's Guide.*

Console, Output, and Outline views

The Debugger perspective shares the Spotfire S+ Workbench **Console**, **Output**, and **Outline** view. For more information about using these views, see:

The section Spotfire S+ Workbench Console on page 49

The section Spotfire S+ Perspective Views on page 68.

Profiler

The Workbench Profiler is composed of two views: the **Function Calls** view and the **Allocations** view, which are available in the Debug perspective. You can run the Profiler from either the **Run**

menu or from the **Toggle Spotfire S+ Profiler** button (), located next to the **Toggle Spotfire S+ Debugger** button on the Spotfire S+ Workbench toolbar. (See Figure 3.2.)

Profiler Mode

To start profiling, first activate the Spotfire S+ profiler by clicking **Toggle Spotfire S+ Profiler** toolbar item, by typing CTRL+ALT+P, or by clicking **Run ▶ Toggle Spotfire S+ Profiler** on the menu. Once the Profiler is activated, any expression you type in the **Console**, or that you enter by clicking **Run Spotfire S+ Code**, invokes the Profiler adds to the **Function Call** and **Allocation** views.

Profiler views

The Spotfire S+ Workbench Profiler includes two views to monitor the system performance:

- **Function Calls** view
- **Allocations** view

These views are described in this section.

Function Calls view

By default, the **Function Calls** view displays a function call tree that reflects the engine's activity.

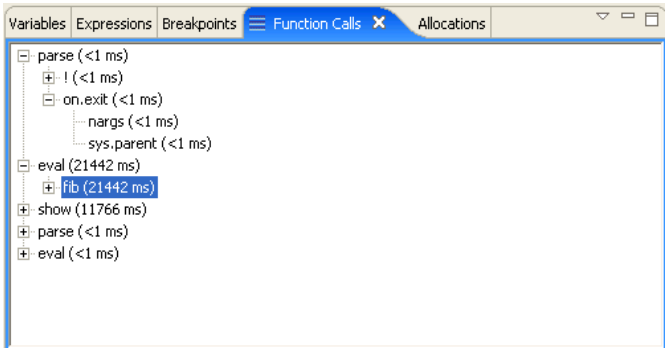


Figure 3.18: ***Function Calls*** *view, tree display.*

Alternatively, you can display the information in a tabular view by either of the following methods:

- Right-click the view, and from the menu, toggle **Show Function Tree**

- From the Function Call menu, toggle **Show Function Tree**.

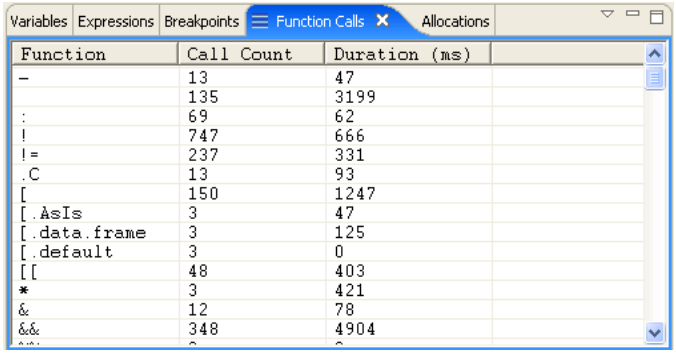


Figure 3.19: ***Function Calls*** *view, table display.*

Function Calls menu

The **Function Calls** view menu displays the following options:

Table 3.8: ***Function Calls*** *view menu options.*

Menu option	Description
Show Function Tree	Toggle to show the function calls in a tree view or in a tabular view. The tabular format displays the total number of calls and total duration of each function.
Refresh Function Calls	Forces an update of the function call tree or table.
Reset Function Calls	Clears the function call tree or table.

Allocations view

Displays the number of allocations the engine has performed. It breaks the allocations down into bytes and the basic Spotfire S+ data types.

Allocations view menu

The **Allocations** view menu displays options to refresh or reset the view, similar to the **Function Calls** view options. See Table 3.8 for more information.

TIBCO SPOTFIRE S+ WORKBENCH TASKS

4

INTRODUCTION

This chapter provides the basic tasks that demonstrate using the TIBCO Spotfire S+ Workbench. For information about basic Eclipse IDE tasks, see the Eclipse *Workbench User Guide.*

This chapter includes:

General Spotfire S+ Workbench tasks, including:

- Setting the Workspace, page 126
- Quick Start, page 127
- Setting the Spotfire S+ Workbench Preferences, page 137
- Customized Perspective Views, page 148
- Specifying Working Projects and Databases, page 151
- Working with Spotfire S+ Project Files and Views, page 156

This chapter also includes tasks that introduce you to using the views and features in the Spotfire S+ perspective. For more information, see the section Spotfire S+ Workbench Projects on page 126.

Finally, this chapter includes tasks that introduce you to using the views and features in the Debug perspective. For more information, see the section Spotfire S+ Workbench Debugger Tasks on page 188.

SPOTFIRE S+ WORKBENCH PROJECTS

Before you begin working with files in the Spotfire S+ Workbench, you must set your workspace and then create a project.

Setting the Workspace

When you first launch the Spotfire S+ Workbench, you are prompted to supply the path to your Spotfire S+ workspace.

To set the workspace

1. In the **Workspace Launcher** dialog (Figure 4.1), specify the directory location where the workspace **.Data** and **.metadata** databases will be stored.
2. Indicate whether you want to be prompted in future sessions to identify a workspace using this dialog.

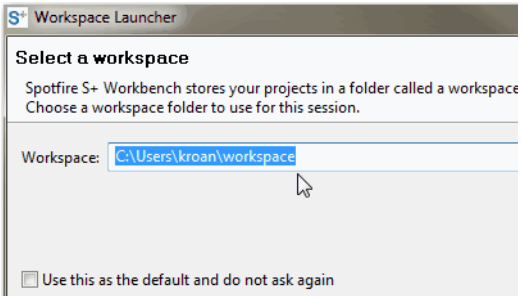


Figure 4.1: *The **Workspace Launcher** dialog.*

Changing the Workspace

You can switch to another workspace from within the Spotfire S+ Workbench user interface.

To open a different workspace in Spotfire S+ Workbench

1. Save your work, and then click **File ▶ Switch Workspace**.
2. In the **Workspace Launcher** dialog, provide the new workspace location.

Note
When you switch workspaces during a Spotfire S+ Workbench session, the current session closes, and a new session of Spotfire S+ Workbench starts, using the new workspace location.

3. After you set the workspace, open the workbench.

Note

On Microsoft Vista® and Microsoft Windows 7®, you must be elevated to the role of administrator to specify the default directory as **C:\Program Files\tibco\splus82\users*yourname***; however, it is not recommended that you use this directory. By default, the workspace directory is **C:\Users*yourname*\workspace**.

Workbench First View

When you launch the workbench the first time, notice the user interface. If you haven't familiarized yourself with the workbench GUI or its customization, see the section Examining the Spotfire S+ Workbench GUI on page 31.

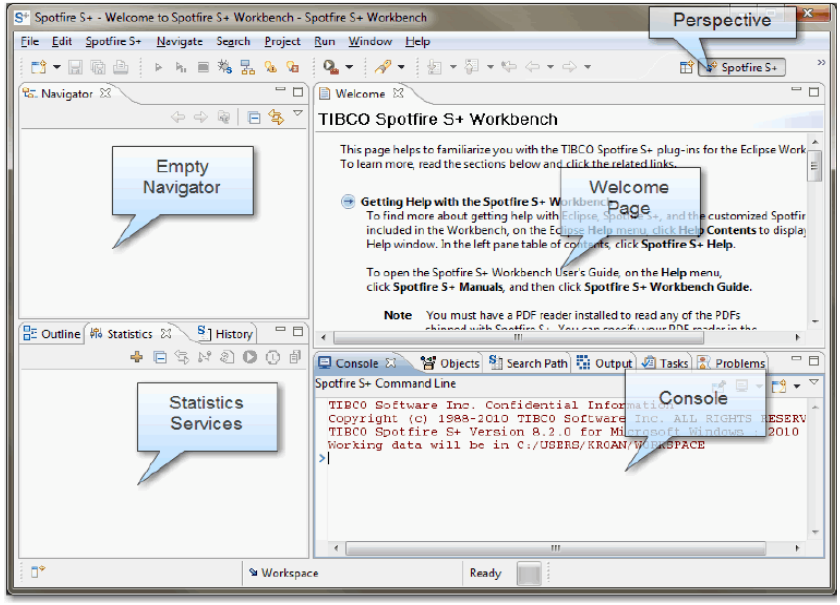


Figure 4.2: *The blank workbench.*

Quick Start

Notice that the **Console** view, in the lower part of the screen by default, looks like the standard Spotfire S+ GUI console. You can type and run commands in the **Console** view. See the section Spotfire S+ Workbench Console on page 49 for more information.

An easy way to display the **Script Editor** is to type an `Edit` command in the **Console** view. For example:

```
Edit(myfunc)
```

opens the **Script Editor** with the beginnings of that function definition. Alternatively, you can create a project or a new script file. See the section Creating a Script on page 156 for more information.

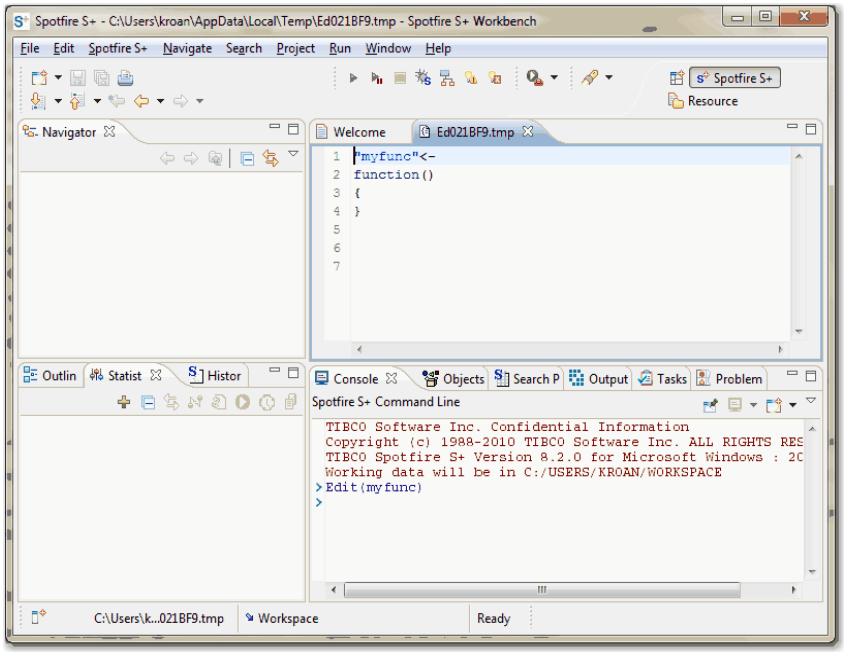


Figure 4.3: *Using `Edit` to open the **Script Editor** and create a function.*

Creating a Project

The Spotfire S+ Workbench project is a resource containing scripts and associated files. You can use the project to control build, version, sharing, and resource management. This section contains guidance for creating a project in the workspace, adding a second project to a workspace, adding a package project, and importing files into an existing project.

Understanding Project Options

Before you create a new project, consider the following scenarios, and then review the Spotfire S+ Workbench options.

Table 4.1: *Spotfire S+ Workbench project scenarios.*

Scenario	Spotfire S+ Workbench Option
You are starting an empty project with no existing files. (**Note:** This is the only way to create a project that is stored in your workspace.)	In the **New Projec**t wizard, specify a project name and accept the default project directory location. If your project is a *package*, navigate through the wizard using the **Next** button. In the **Spotfire S+ Package** tab, select **Create Spotfire S+ Package structure**. Click **Finish**. Your project is created as a subdirectory in the workspace directory. (The **Navigator** view displays the **.Data** directory and the **.project** resource but no existing project files. Do not edit these items.) If your project is a package, the project is created as a subdirectory in the workspace directory, and the package structure and required directories are created, as follows: • **.Data** (Contains required subfolders and files; do not edit this directory.) • **data** • **man** • **R** • **src** In addition, a stub **DESCRIPTION** file is placed in the project directory and informational **README** files are created in each directory. For more information on package directories, see the **Guide to Packages**. For more information about creating a package project, see the section To create a package project on page 168.

Table 4.1: *Spotfire S+ Workbench project scenarios. (Continued)*

Scenario	Spotfire S+ Workbench Option
You have one or more project(s), and you want to work with the files at their existing location.	In the **New Project** wizard, specify a project name, clear the **Use default** check box, and then browse to the location of the project files. Spotfire S+ Workbench works with the files at the specified location. (The **Navigator** view displays the **.project** resource and all files in the project directory.) If you are importing the source files for a package, all of the required directories and are included in the project. Note that the project cannot overlap other projects and cannot be located under your workspace.
You have an existing project, and you want to copy selected files to a workspace directory (for example, in the cases where the files are kept at a remote location, are read-only, or where you do not want to work with the original files).	In the **New Project** wizard, specify a project name and accept the default project directory location. An empty project subdirectory is created in the workspace directory. You can then import your project files. See the section Importing Files on page 131 for more information.

Based on the scenario that applies to your project needs, In the following sections, create an empty project, and then import the Census project files (the third scenario described above).

To create the example census project

1. Click **File ► New► Project**.
2. In the **New Project** dialog, select **Spotfire S+ Project**. Click **Next**.
3. Provide the friendly project name, “Census.”
4. Accept the option **Use default**. This option creates the project directory in the default workspace location.

5. Leave **Create Spotfire S+ Package Structure** clear (the default).
6. Click **Finish** to create the project.

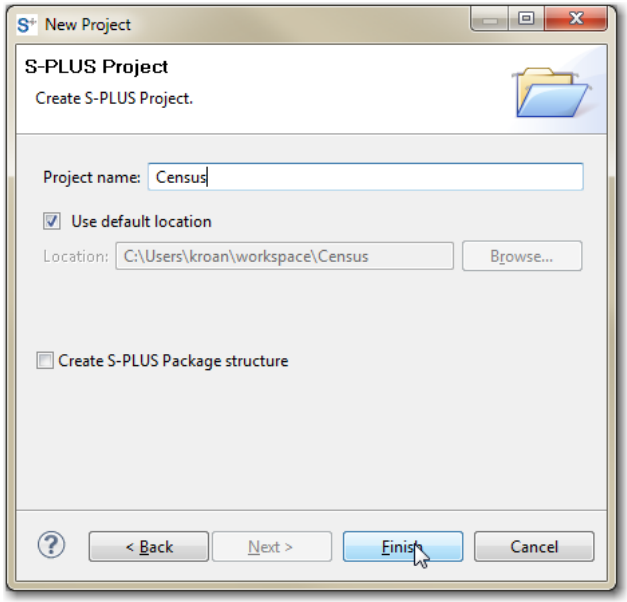


Figure 4.4: ***New Project*** *dialog.*

Note
When you create a project, you see in the **Navigator** view the **.project** resource. This resource is created by Eclipse and contains information that Eclipse uses to manage your project. You should not edit this file.

Importing Files

In this exercise, *import* the Census example, one of the examples provided with Spotfire S+.

To import files

1. With the Census project selected in the **Navigator** view, click **File ▶ Import**.
2. In the **Import Select** dialog, expand the **General** folder, and then select **File system**. Click **Next**.

3. In the **Import File system** dialog, browse to the location of the census project (by default, in your installation directory at ***SHOME*/samples/bigdata/census**.)
4. Select the directory, and then click **OK**. The directory name appears in the left pane, and all of the project's files appear in the right pane.
5. Select the folder name in the left pane to select all files, and then click **Finish** to add the files to your project.

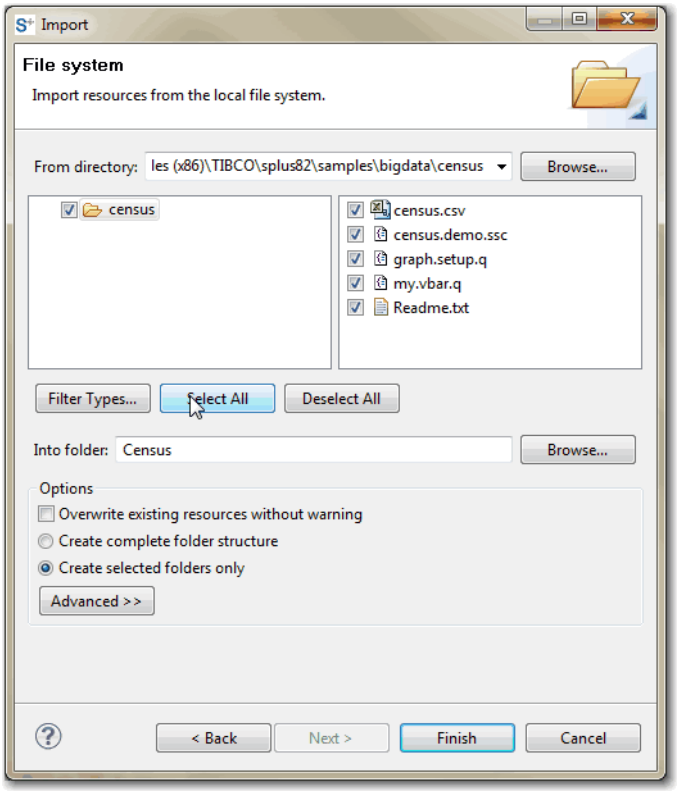


Figure 4.5: *Import File System* *dialog for Census project.*

Hint
You can select just the **.ssc** file to import if you prefer, because the script itself references the data in these files. For the purposes of this part of the exercise, we import all files.

Figure 4.6 shows the **Navigator** with the Census project and all its files.

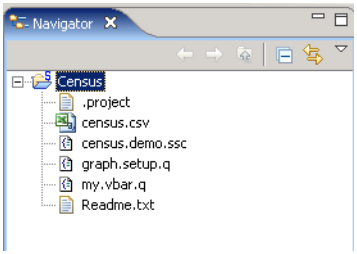


Figure 4.6: ***Navigator*** *showing Census project.*

Note
Alternatively, you can copy files from a different location to your project directory in your workspace. If you simply copy files, you must refresh the **Navigator** view to include the files in your project and display them in the project file list. To refresh the view, right-click the project name, and from the menu, click **Refresh**.

Loading a Library

You work with Spotfire S+ code in the Workbench the same way you work with it in other environments, such as the Java GUI, the command line, or the Windows GUI. To load a library, in the **Console**, simply call:

```
library(libraryname)
```

Where `libraryname` is the library to load.

For example, if you are working with Spotfire S+ packages, before you get started, load the `pkgutils` library:

```
library(pkgutils)
```

Adding a Second Project

In this exercise, create a project with the files for the **Boston Housing** example at their *existing* location (the second scenario described above), rather than importing the files into a workspace directory. **Boston Housing** is an example provided in the Spotfire S+ sample files, by default, in your installation directory at ***SHOME*/samples/bigdata/boston**.

To add a project

1. Click **File ▶ New ▶ Project**.

2. In the **New Project** wizard, select **Spotfire S+ Project**, and then click **Next**.
3. In the **Project name** text box, type "Boston Housing," and then clear the **Use default** check box.
4. Browse to the location of the Boston Housing sample directory, by default in the ***SHOME*/samples/bigdata** directory of your Spotfire S+ installation. Select the **boston** directory, and then click **OK**. Click **Finish** to add the project.

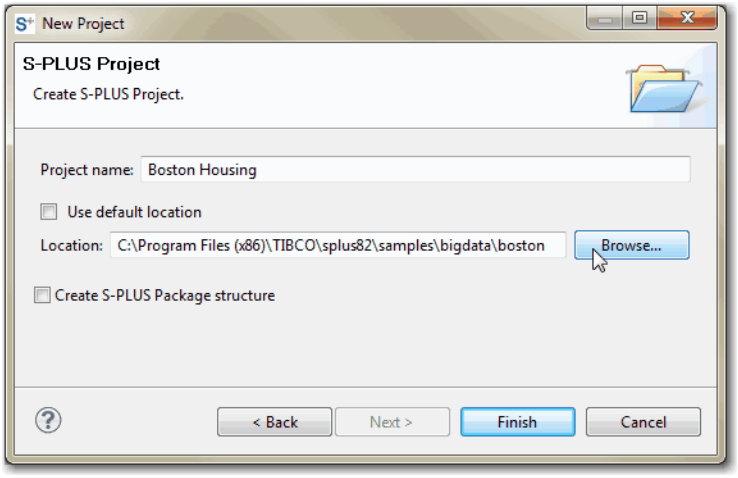


Figure 4.7: ***New Project*** *dialog, using boston files at their installed location.*

5. In the **Navigator** view, the **Boston Housing** project appears. This directory contains all of the files in that sample directory location.

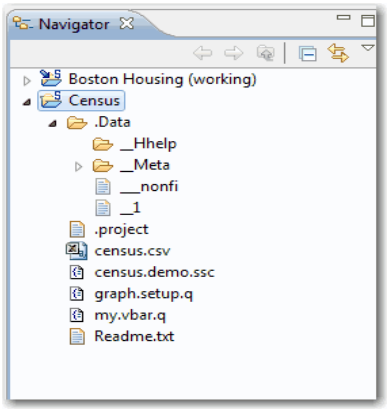


Figure 4.8: ***Navigator*** *containing two projects.*

6. You won't be using this project for the remainder of this tutorial section, so right-click the directory, and then select **Delete**.
7. In the **Confirm Delete Project** dialog, select **Do not delete contents**. (Otherwise, you will delete the sample from your installation directory.)
8. Click **Yes** to remove the project.

Copying Files Between Projects

You can copy files from an existing project to a working project by copying their **.ssc** files from the original project to the working project's directory. Note that to see these files in your project, you must refresh the view. To refresh the **Navigator** view, right-click the project, and from the menu, click **Refresh**. (Restarting the Spotfire S+ Workbench does not automatically refresh the view.) Alternatively, you can use the **File ► Import** menu command: Specify a file system, browse to the original location of the desired file, and then select only that file to import. (Importing a file into a project from another location copies that file to the project folder in your workspace.)

Adding the Sample Debugging Project

In this exercise, add another project, importing the sample files, as you did in the section To create the example census project on page 130. This second project is the project you will use later in this chapter to practice debugging tasks.

Follow the directions for creating a project on pages 130 to page 133, but instead of importing the Census project, import the kahanSum project, located in your installation directory at ***SHOME*/samples/kahanSum**.

To add the kahanSum project

1. Click **File ▶ New ▶ Project**.
2. In the **New Project** dialog, select **Spotfire S+ Project**. Click **Next**.
3. Provide the friendly project name, "kahanSum."
4. Accept the option **Use default**. This option creates the project directory in the default workspace location.
5. Click **Finish** to create the project.
6. With the **kahanSum** project selected in the **Navigator** view, click **File ▶ Import**.
7. In the **Import Select** dialog, select **File system**, and then click **Next**.
8. In the **Import File system** dialog, browse to the location of the census project (by default, in your installation directory at **/samples/kahanSum**.)
9. Select the directory, and then click **OK**. The directory name appears in the left pane, and all of the project's files appear in the right pane.
10. Click **Select All**, and then click **Finish** to add the files to your project.

Figure 4.9 shows the **Navigator** with the kahanSum project and all its files added to the workspace. (You will work with this project later in this chapter.)

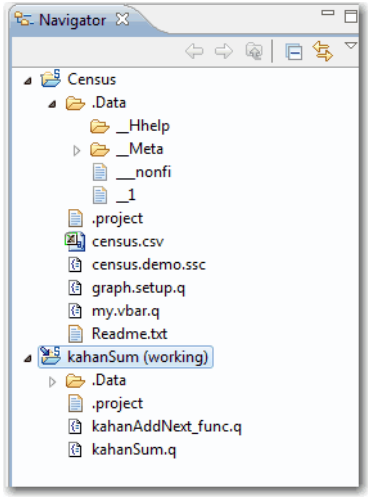


Figure 4.9: ***Navigator*** *showing kahanSum project added to the workspace.*

Setting the Spotfire S+ Workbench Preferences

Spotfire S+ provides customizations to the Eclipse IDE to accommodate the specific needs of the Spotfire S+ programmer. You can change the IDE to suit your development style, including adding, removing, and repositioning the views, and setting the preferences.

- To review the preference options in the **Preferences** dialog, see the section Examining Spotfire S+ Preferences on page 14.
- To review the views available in the Spotfire S+ Workbench, see the section Examining the Spotfire S+ Workbench GUI on page 31.
- To learn more about customizing the views in the Spotfire S+ Workbench, see the section Customized Perspective Views on page 148.

General Options

This section demonstrates setting specific preferences in the **Preferences** dialog.

To set text editor options

1. On the **Window** menu, click **Preferences**.

2. In the **Preferences** dialog, select **General**, and then click **Editors ▶ Text Editors**.
3. Review the options, including tab width (by default 4), line numbers (by default displayed), and appearance color options (by default, the system colors). You can set additional options in the **Spotfire S+ ▶ Editor** options dialog. See Figure 4.14 for an example.

To examine file association preferences

4. In the **Preferences** dialog, select **General**, and then click **Editors**. Examine the dialog pages.
5. Click **File Associations** and review the file types that the Script Editor recognizes.

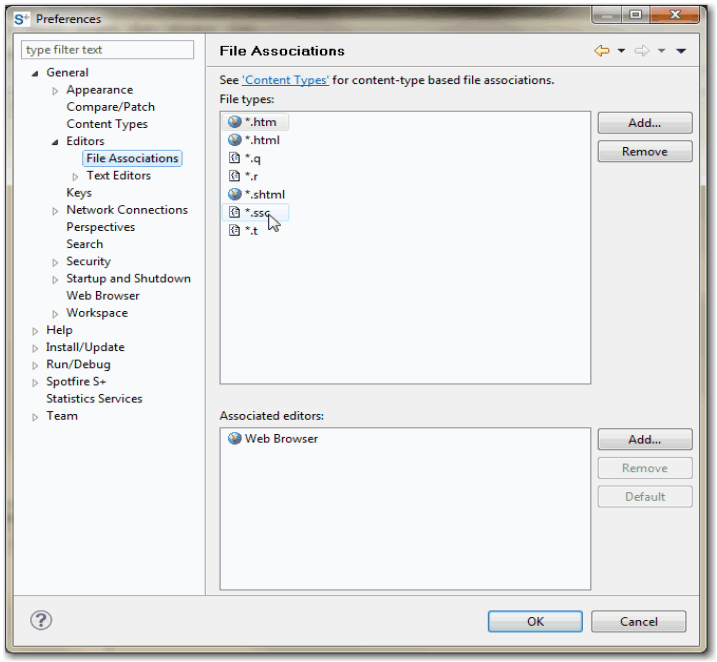


Figure 4.10: ***File Associations*** *page.*

Spotfire S+ View Preferences

The previous section demonstrated setting Eclipse general preferences that the Spotfire S+ Workbench takes advantage of. The following sections demonstrate setting preferences specific to the Spotfire S+ Workbench views. These preferences include general

Spotfire S+ preferences, preferences for the **Console** and the **Output**, preferences for the **Output**, and preferences for defining task tags.

To set the Spotfire S+ preferences

1. Click **Spotfire S+**.
2. Review the options. Make sure the `bigdata` library loads on startup: check the check box **Run code on startup**. (The Census example demonstrated in this chapter uses the `bigdata` library.)
3. Optionally, select **Send Output from Run Action to Console**, if you want your script output to appear in the **Console** rather than the **Output**.

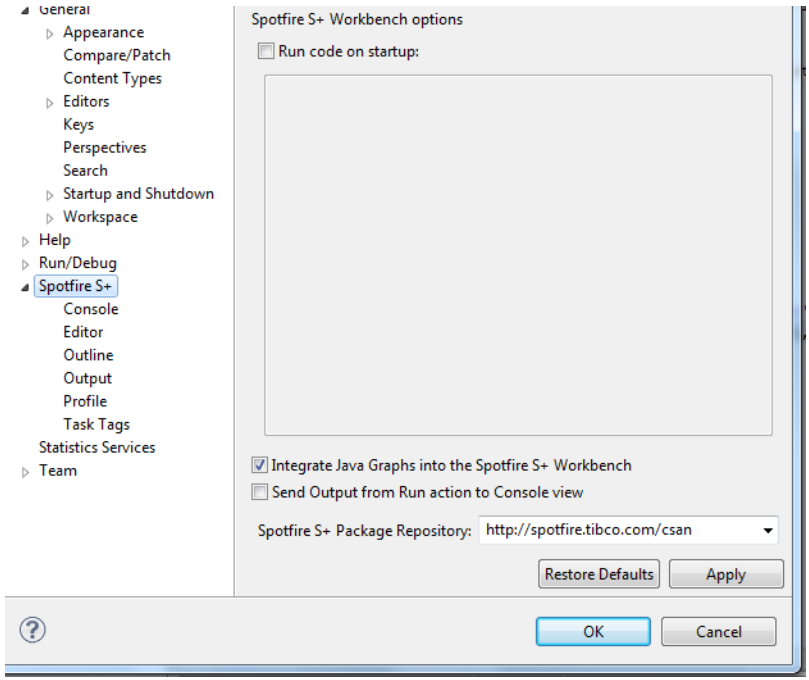


Figure 4.11: ***Spotfire S+ Preferences*** *page.*

To store the console history between sessions

1. In the left pane tree view, click **Spotfire S+** to expand, and then click **Console** to display that page.

2. In the **Console** page, select **Store Console History between sessions**. You can use this setting to persist the contents of the **History** to use later in the **Console**. For more information about storing the console history and using it in the output, see the section Console Options on page 18.

3. Optionally, change the input and/or output color or font to a color or font of your choice. For more information about these options, see the section Font Settings on page 19.

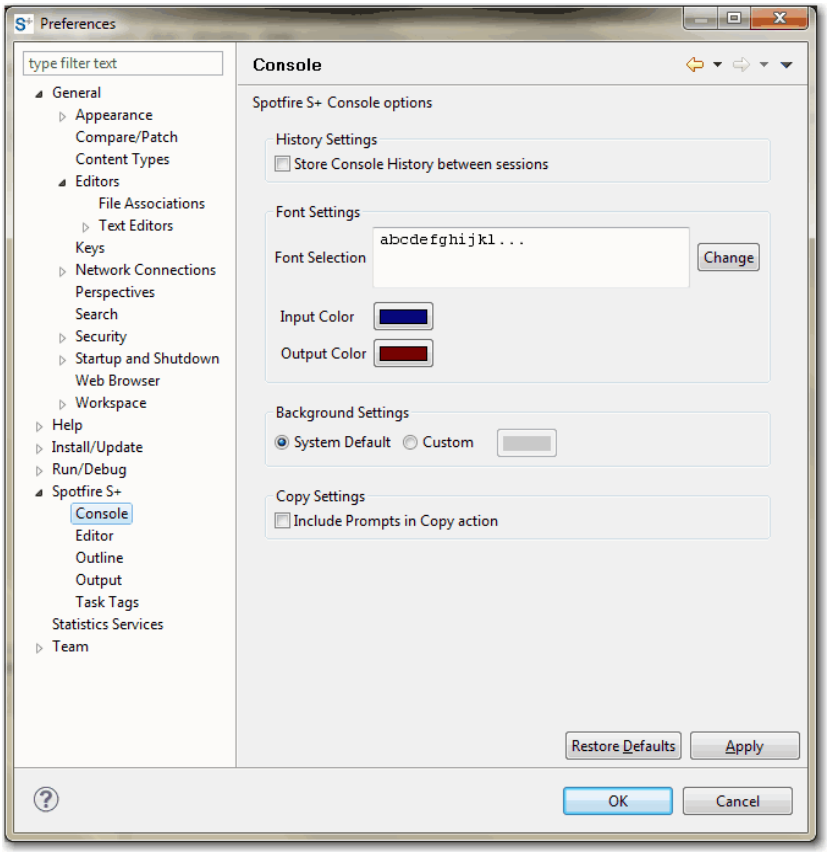


Figure 4.12: ***Console*** *page.*

To add text with a user-defined h

ighlight color

1. In the left pane tree view, under **Spotfire S+**, click **Editor** to display that page.
2. In the **Editor** dialog, in the **Syntax Highlighting** list box, select **User**, and then click **Choose Color.**
3. In the **Color** dialog, select a color, and then click **OK**.
4. In the **User Tokens** area, click **New**.
5. In the **Add Desired Spotfire S+ Text** dialog, select **Comma Separated Text**. In the text box, type `census`, and then click **OK**.

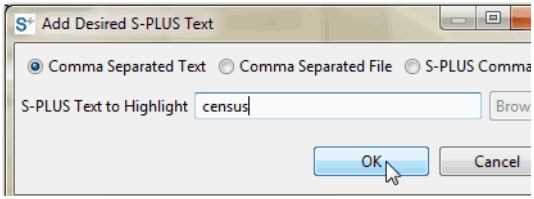


Figure 4.13: ***Add Desired Spotfire S+ Text*** *dialog.*

6. Note that `census` appears in the **User Tokens** list box. Click **Apply**. In later exercises, when you manipulate the **Census** project, you will see the string you selected highlighted in the color you specified. You can add other user-defined terms, including Spotfire S+ commands or the contents of a comma-

separated file and see how it makes tracking these items through your code easier. For more information about this option, see the section Syntax Highlighting on page 21.

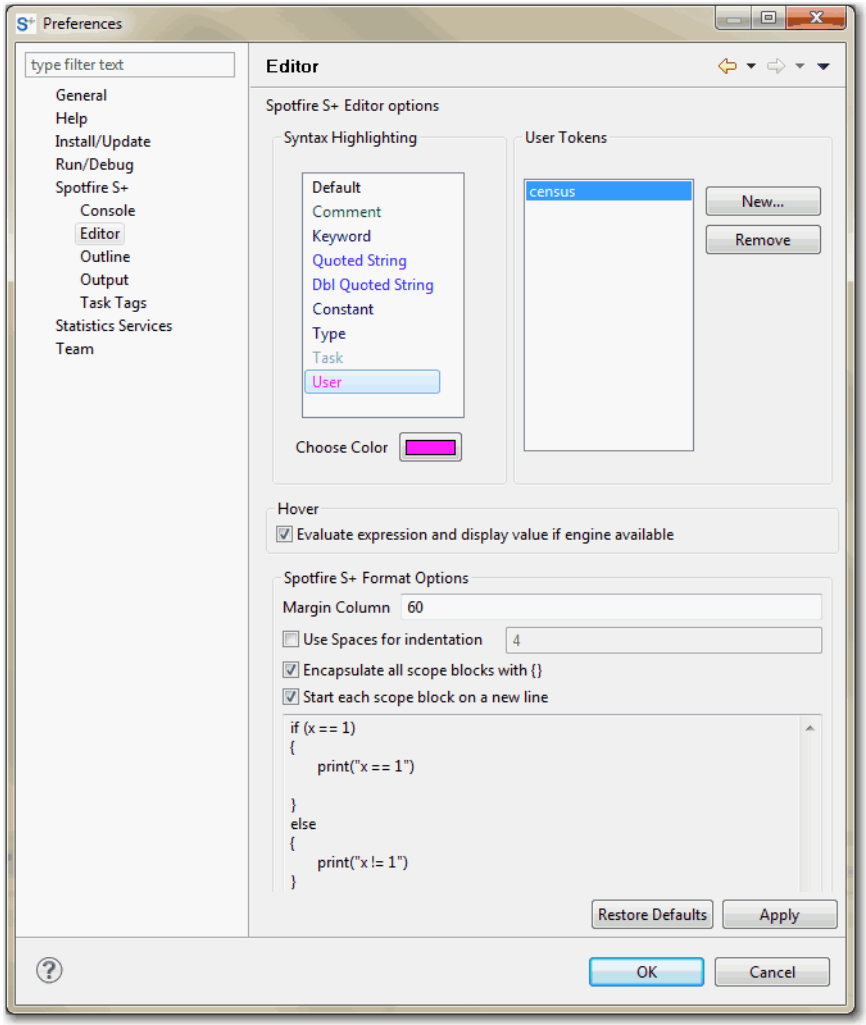


Figure 4.14: ***Editor*** *page with census added as highlighted user text.*

To add the contents of a comma-separated file

1. Open a text editor, such as Notepad.

2. Type some terms to highlight, separated by commas. For example, if you want to highlight in your code every time the data viewer or a graph opens, type `bd.data.viewer`, `hist`, `xyplot`, `bwplot`, `histogram`, and so on.
3. Save the file with a convenient name and to a convenient location (for example, **C:\terms.txt**).
4. Return to the Spotfire S+ Workbench Editor preferences dialog, and, in the **User Tokens** area, click **New**.
5. In the **Add Desired Spotfire S+ Text** dialog, select **Comma Separated File**.
6. Either type the file path, or click **Browse** and browse to the file location.
7. Click **OK**, and notice that all of the terms in the file are added to the **User Tokens** list. Figure 4.15 shows the **User Tokens** list with the terms added from the file.

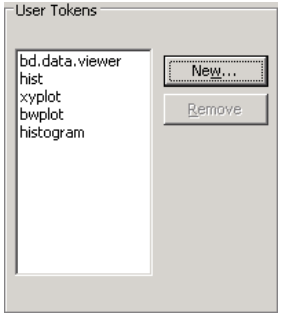


Figure 4.15: ***User Tokens*** *list displaying the contents of a file.*

To add a Spotfire S+ command to the User Token list

1. In the **User Tokens** area, click **New**.
2. In the **Add Desired Spotfire S+ Text** dialog, select **Spotfire S+ Command**.
3. In the **Spotfire S+ Text to Highlight** box, type the Spotfire S+ command `objects()`.

4. Click **OK**, and notice that all of the objects in the working project are added to the **User Tokens** list. Figure 4.16 shows the updated **User Tokens** list.

Figure 4.16: ***User Tokens*** *list displaying working project objects.*

To remove items from the **User Tokens** list, select them and click **Remove**.

To change the code formatting options

1. In the Spotfire S+ **Editor** options page, review the Spotfire S+ Format Options group.
2. Select **Use spaces for indentation**, and notice how the example display changes to reflect the default 4. Clear this option, if you choose, or change the default to add more or fewer indentation spaces.
3. Change some of the other formatting options to suit your programming style, and then click **Apply** to apply any changes to the editor.

To add a function to watch

1. In the left pane tree view, click **Outline** to display that page.
2. Click **New**.

3. In the **Add New Function to Watch** dialog, add `set.seed`. Click **OK**.

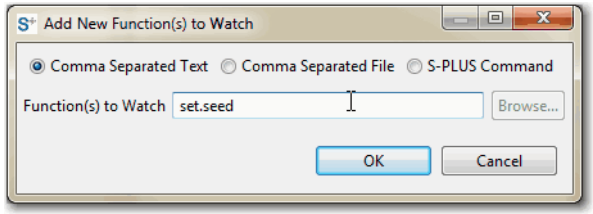


Figure 4.17: ***Add New Function to Watch*** *dialog with* `set.seed`.

4. Review the list in the **Functions to Watch** dialog. Note that `set.seed` has been added to the list. (Later, when you are working with a project that uses the `set.seed` function, you can see its display in the **Outline** view has a special icon.) For more information about this option, see the section Functions to Watch on page 23.

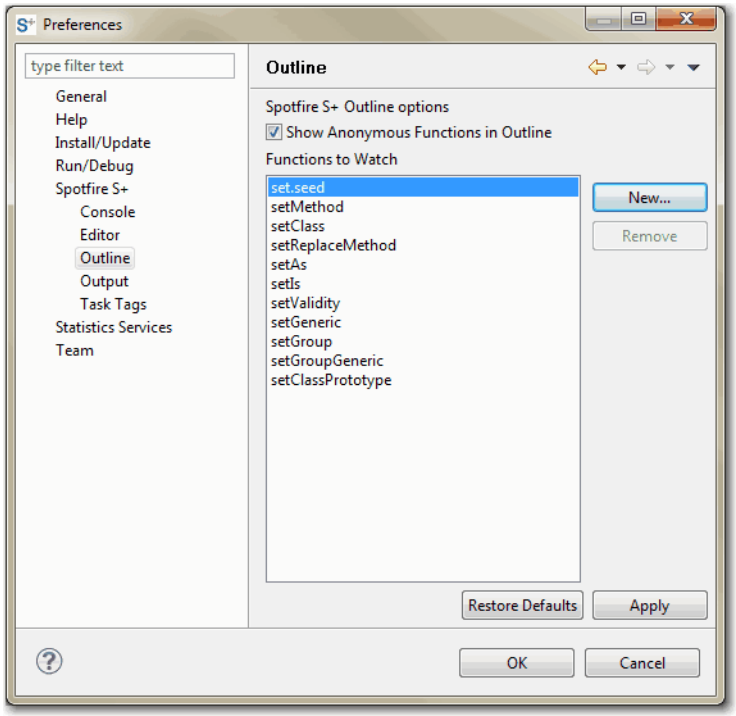


Figure 4.18: ***Outline*** *page with* `set.seed` *added.*

To add a task to the Task Tags options

1. In the left-pane tree view, click **Task Tags**.
2. Click **New** to display the **Add New Task Type** dialog.
3. In the **Task Name** box, type a name for a new task to watch. Set the severity to your preference, and click **OK** to add the task.

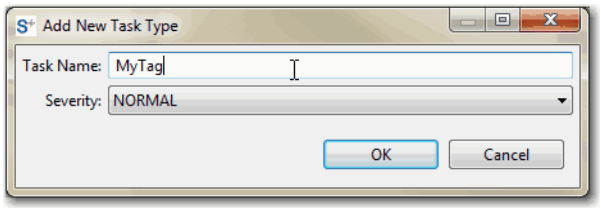


Figure 4.19: ***Add New Task Type*** *dialog.*

4. Highlight the items to change in the **Spotfire S+ Task Options** text box, or, using the **New**, **Remove**, **Up**, and **Down** buttons, edit the available tasks. In the Script Editor,

when you type this term, prefaced with a comment character (#), the line is added to the **Tasks** view with the severity you indicate for the custom tag.

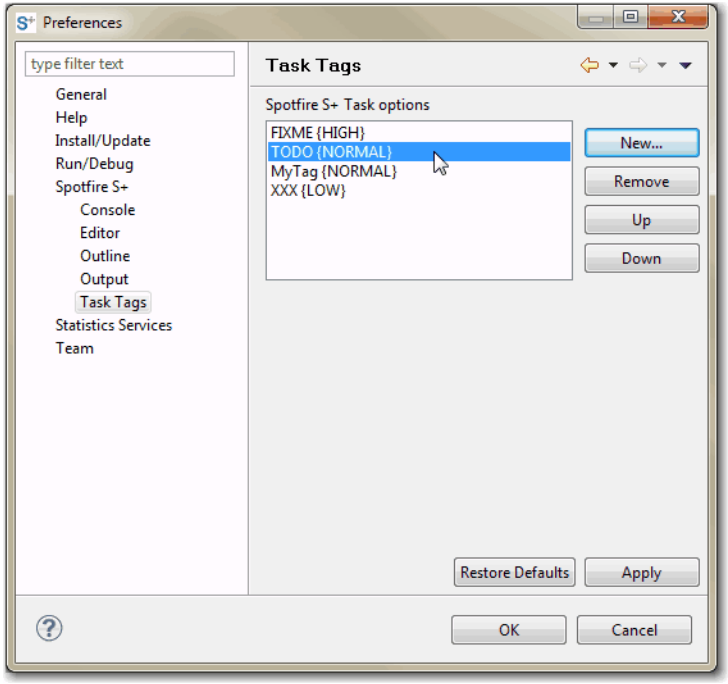


Figure 4.20: ***Task Tags*** *page with a new task added.*

5. Click **OK** or **Apply** to save your changes, or click **Restore Defaults** to return the task options to their default state.
6. Click **OK** to save your changes.

CUSTOMIZED PERSPECTIVE VIEWS

The layout of the Spotfire S+ perspective presents the **Navigator** view, **Outline** view, **Statistics Services** view, and **History** on the left side of the window. The **Console**, **Objects**, **Search Path**, **Output**, **Tasks** view, and **Problems** view are tiled across the bottom of the window. The Script Editor pane is empty.

Note

If you do not see one of the following Spotfire S+ specific views in the user interface, you can display it from the menu by clicking **Window ▶ Show View ▶ Other**, and then selecting it from the **Show View** list.

To customize the Spotfire S+ perspective

1. Click the **Outline** view tab and drag the view beside the **Navigator** view. The **Outline** view now tiles with the **Navigator** view.
2. Click the **History** tab and drag the view to the right; it now tiles with the other views.
3. Right-click the **Tasks** view tab and select **Fast View**. The **Tasks** view minimizes and appears as an icon in the window's status bar.

4. Click the **Output** tab to select it.

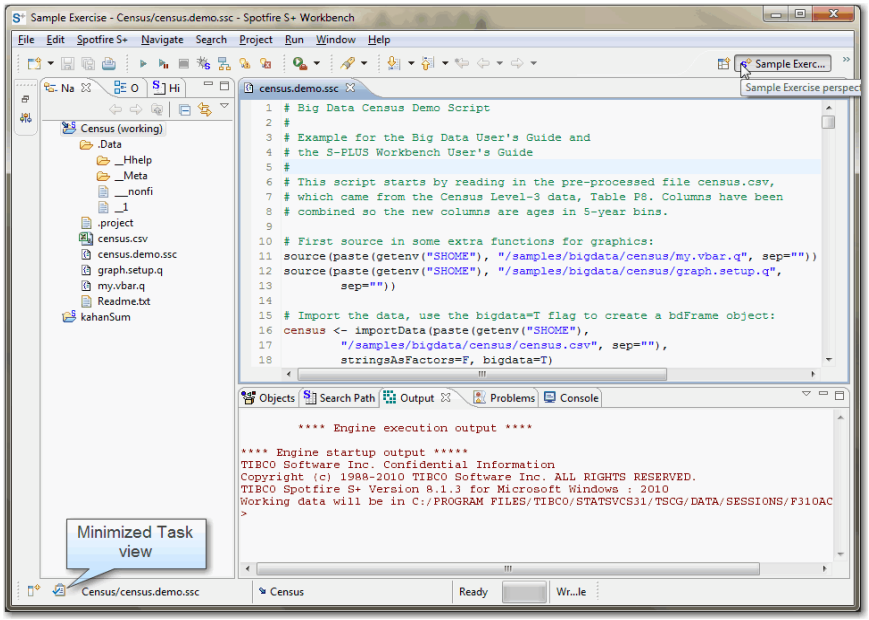


Figure 4.21: *Customized Spotfire S+ perspective.*

5. Click **Window ▶ Save Perspective As**.
6. In the **Name** box, type "Sample Exercise," and then click **OK**.

The **Sample Exercise** perspective button appears on the toolbar:

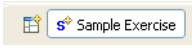


Figure 4.22: *Sample exercise perspective button.*

To change the displayed views

1. To change the views, or to display the list of available views, on the menu, click **Window ▶ Show View**.
2. From the submenu, select the view to display.

Alternatively, if you do not see the view you want to display, from the **Show View** menu, click **Other**, and then select a view from the **Show View** dialog. For example, if you want to display a view that is typically in the Debug perspective, expand **Debug**, and then select a view from the list.

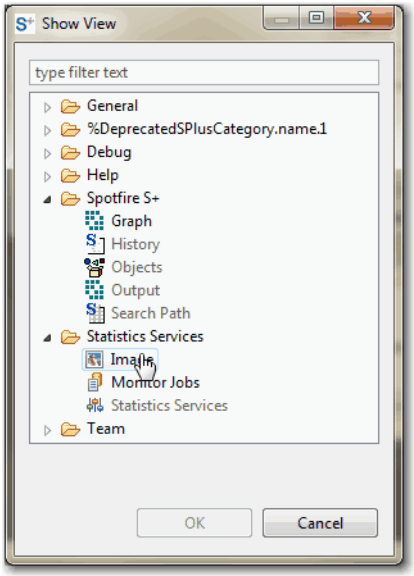


Figure 4.23: ***Show View*** *dialog.*

- If the view is not currently visible in the UI, selecting it displays the view and gives it focus in the UI.
- If the view is available, selecting it gives it focus in the UI.

To return to the Spotfire S+ perspective default

1. Click the perspective button to the left of the **Sample Exercise** button, and then click **Other**.
2. In the **Select Perspective** dialog, select **Spotfire S+**, and then click **OK**. The perspective returns to its previous layout.

You can select other views to display in your perspective.

WORKING PROJECTS AND DATABASES

This section describes setting working projects and changing databases.

The Spotfire S+ Workbench provides the following ways you can store your data objects:

- In the working project **.Data**, where the objects are available only to the project.
- In the workspace **.Data**, where the objects are available to all projects in the workspace.

You can change the **.Data** storage option at any time by setting any project in the workspace as the working project, or toggling off the working project option and writing data objects to the workspace **.Data** database.

Setting the Working Project

When you create a workspace, a **.Data** database is created in the workspace, and (after you refresh the view) the workspace path appears in the first position in the **Search Path**, as shown in Figure 4.24. If you specify no working project, the Spotfire S+ Workbench writes data objects to the workspace **.Data** database, and the objects in that **.Data** database are available to all projects in the workspace.

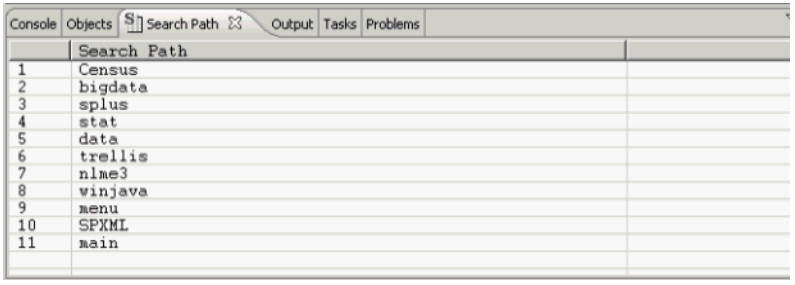


Figure 4.24: ***Search Path*** *with first position set to the workspace.*

When you create a project and import project files, the Spotfire S+ Workbench creates a **.Data** in the project, sets it as the working project, and sets the project in the first position in the **Search Path**. Any objects created are added to the working project's **.Data** database.

To set the working project

1. Select the project to set as the working project.
2. From the main menu, click **File ▶ Toggle Working Spotfire S+ Project**. (Alternatively, in the **Navigator**, right-click the project that you want to set as the working project, and from the context sensitive menu, click **Toggle Working Spotfire S+ Project**.) Figure 4.25 shows the context menu.

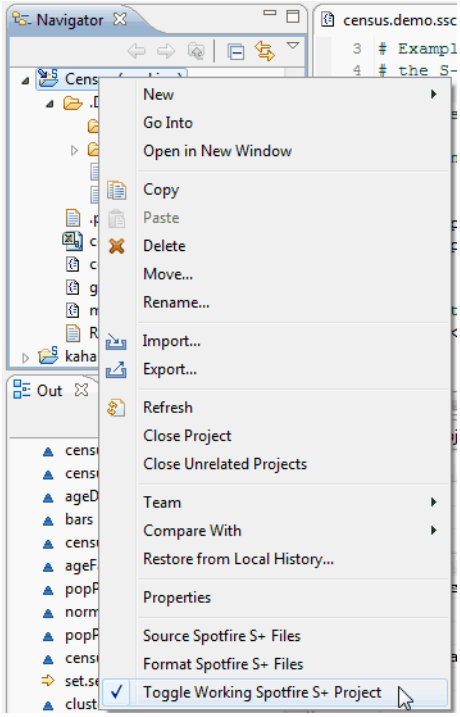


Figure 4.25: ***Toggle Working Spotfire S+ Project*** *on the* ***Navigator*** *context-sensitive menu.*

The selected project is displayed as the working project. Any objects you create are stored in the **Census .Data** database until you choose another project as the working project, or toggle off the working project, so the workspace **.Data** is the database.

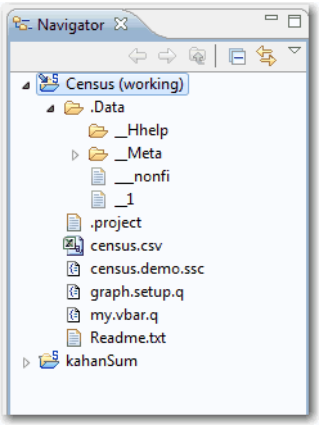


Figure 4.26: ***Census*** *set as the working project.*

Changing Attached Databases

Spotfire S+ recognizes libraries, modules, lists, and directories as legitimate object databases. You can add and detach any of these types of databases to the **Search Path**.

By default, the **Search Path** displays the full path of the working database and all of the attached Spotfire S+ data libraries. Objects existing in a recognized active database appear in the **Objects**.

Adding a Database

Objects in an added database appear in **Objects** when you refresh the view to that database. See the section Examining Objects on page 160.

To add a library

1. Right-click the **Search Path**.
2. From the right-click menu, click **Add Library**.
3. In the **Attach Library** dialog, type MASS. Clear the **Attach at top of search list** check box to indicate that you want add the library to the bottom position.

4. Click **OK** and examine the **Search Path** for the change.

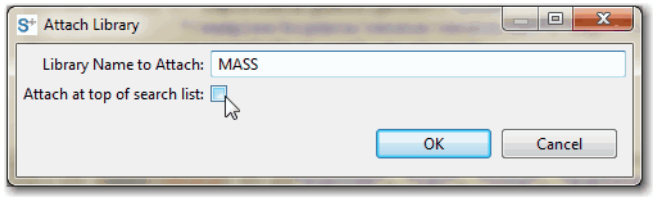


Figure 4.27: ***Attach Library*** *dialog.*

To add a module

1. From the right-click **Search Path** menu, click **Add Module**.
2. In the **Attach Module** dialog, provide an installed module name and indicate whether to add it to the first position.
3. Click **OK** and examine the **Search Path** for the change.

To add a directory

1. Right-click the **Search Path**.
2. From the menu, click **Attach Directory**.
3. In the **Attach** dialog, in the **Directory to attach** text box, browse to the directory location.
4. In the **Label** text box, type `Projects`
5. In the **Position** text box, type `4`.
6. Click **OK** and examine the **Search Path**. The label you provided should appear at position 4.

Detaching a Database

From the **Search Path**, you can detach a database from your current session.

To detach a database

1. In the **Search Path**, right-click **bigdata**.
2. In the right-click menu, select **Detach**.
3. Examine the **Search Path**. The Big Data library is no longer attached.

Refreshing the View

When you refresh the view, any changes to the **Search Path** that have not been reflected in a recent change are displayed. For example, if you add a library by calling the load function in a Spotfire S+ script, the change is not immediately displayed in the **Search Path**.

To refresh the view

1. Using the **Console**, reattach the Big Data library. In the **Console**, type

   ```
   library(bigdata, first = T)
   ```

2. Right-click the **Search Path**.
3. In the right-click menu, click **Refresh**. Notice that the Big Data library appears as attached in the first position (position 2).

SPOTFIRE S+ PROJECT FILES AND VIEWS

The Spotfire S+ Workbench recognizes ***.ssc**, ***.q**, ***.r**, and ***.t** files, all file extensions common in Spotfire S+ code.

Creating a Script

You can create a new Spotfire S+ script file, or you can import an existing script file. The following two examples demonstrate both techniques.

To create a new script file

1. Click **File ▶ New ▶ Other**.
2. In the **Select a wizard** dialog, select **Spotfire S+ Script**. Click **Next**.
3. In the **New File** dialog, select the parent directory (the Census project directory)
4. In the **File name** text box, type **Sample.ssc**.
5. Click **Finish** to create the file.

We won't work with this file for this exercise, so you can either disregard the file, or delete it from your project. Alternatively, you can open the file, add some Spotfire S+ code, and save it in the project.

Viewing Project Files

The **Navigator** view displays the project files. In Windows, if you have Microsoft Excel installed, you can open a CSV file in an external window. In this project, only the files identified in **Windows ▶ Preferences** in the File Extensions page open in the Script editor.

Removing files from a project

Because the project script imports the data in the files from their installation directory in Spotfire S+, you don't need to have them all in the project. However, removing an imported file deletes it from your project directory, so remove individual files with care.

To remove a file from the Census project

1. In the **Navigator** view, open the Census project and select all files except the **.project** file and **census.demo.ssc**.
2. Right-click the selected files, and then click **Delete**.

3. In the **Delete Resources** dialog, click **Yes** to remove the files from the project. The **Navigator** view should now just display the Census Project directory, the project file, and **census.demo.ssc**:

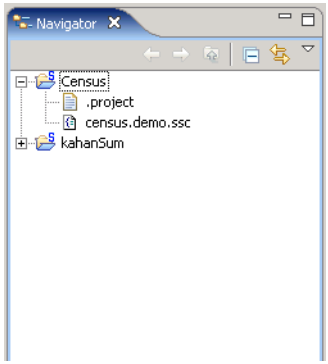


Figure 4.28: ***Navigator*** *view after deleting files*

Editing Code in the Script Editor

The Spotfire S+ script is a text file that you can edit in the Script Editor. In this exercise, just edit **census.demo.ssc** using the menu items provided specifically for Spotfire S+.

To edit script code

1. In the **Navigator** view, double-click the file **census.demo.ssc** to open it in the Script Editor and examine the script. Note that:
   - The comment text appears in the Script Editor as green. (You can change this default color in the **Preferences** dialog. See the Eclipse *Workbench User Guide* and the section Setting the Spotfire S+ Workbench Preferences on page 137 for more information.)
   - Note that the term `census` appears in the color you specified in the section To add text with a user-defined h on page 141.
   - The line that has focus appears highlighted.
   - The line numbers appear to the left of the script text.

2. In the second line of the file, press **Enter** to insert a carriage return, and then begin typing a function name (for example, `library`).

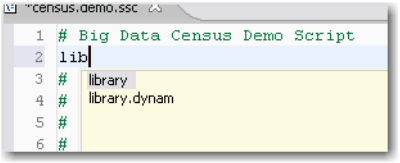


Figure 4.29: *Code completion for the `library` function.*

Note that as you type each character, the code completion feature displays the function names using the character string so far. (The code completion feature reads the Search path on startup and displays functions from all loaded libraries. It refreshes the list periodically.) When you see the function name you want to use, select it from the code-completion list and press **Enter** to insert it into the text editor.

Note
The code completion feature works in both the **Script Editor** and the **Console**.

3. Type the open parenthesis character, `(`. Code completion displays the function's arguments. (The arguments are displayed until you type the closing parenthesis character.)

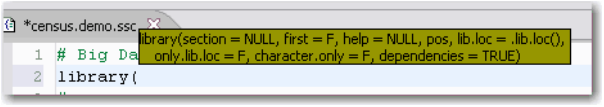


Figure 4.30: *Code completion shows arguments for the function.*

4. Delete the line you just inserted (it is not needed for the rest of this example).

5. Scroll to the line containing the following text (around line 16), and and highlight the line and the next line:

```
 "/samples/bigdata/census/census.csv", sep=""),
stringsAsFactors=F, bigdata=T)
```

6. Click **Spotfire S+ ► Shift Left**. The code shifts to the left.
7. Click **Spotfire S+ ► Format**. This command formats the entire script. Note that the formatting change you made in the previous step has been reverted. Also note that the line numbers for formatted functions are highlighted.

Hint

The line numbers for any line changed in your script are highlighted until the next time you save your work.

8. Click **Spotfire S+ ► Toggle Comment** to add a comment character. Notice that the script text color changes to indicate that the line is no longer a comment.
9. Repeat step 6, or type CTRL+SHIFT+# to remove the comment.

To edit a function definition

1. In the Script Editor, select the function whose definition you want to edit.
2. Press the ctrl key and click the function again.
3. The function definition opens in a temporary file in the Script Editor.

Alternatively, you can open a function for edit by right-clicking the function name, and from the menu, click **Find "*functonname*"**. **Find** searches files currently open in the Script Editor, then files in the working project, and finally in the Spotfire S+ database for the function definition.

Note

Any code changes you make in an editor are not recognized by Spotfire S+ until you source the code.

To find all references to a function

1. Right-click the function whose references you want to find.

2. From the menu, click **Find References**.
3. Review the results in the **Search** view. Figure 4.31 displays the results of running **Find References** on the function `hist` in the Census project.

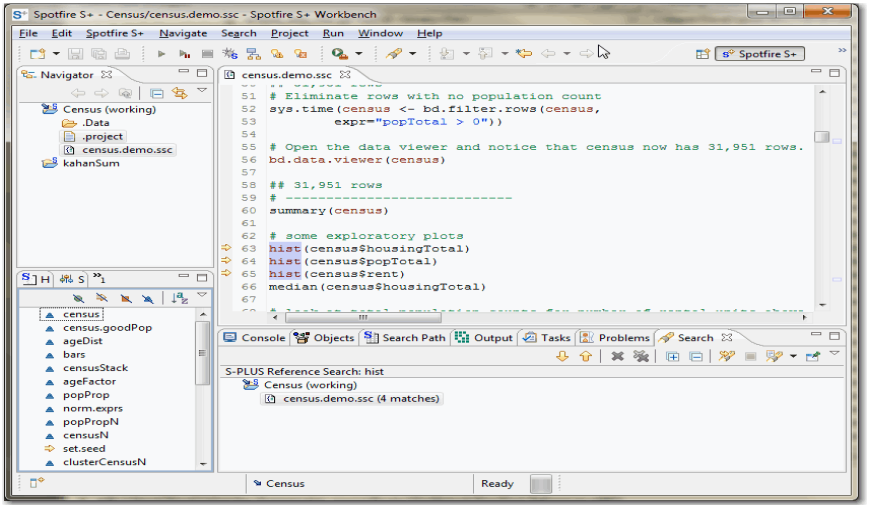


Figure 4.31: *The **Search** view after running **Find References** on `hist`.*

Examining the Outline

The **Outline** view displays all of the items (objects, functions, and so on) that are contained in the open script. **Outline** view is not editable.

To examine the outline

1. Examine the objects that appear in the **Outline** view. Note that `set.seed` appears with a yellow arrow next to it, because in the section Setting the Spotfire S+ Workbench Preferences on page 137, you indicated that `set.seed` was a function to watch.
2. Scroll through the **Outline** view list and highlight an object. Note that the Script Editor scrolls to, and highlights, the line where the object appears.

Examining Objects

When you start a new workspace, the **Objects** is not populated.

Details about your project's objects (and all objects in your database) will appear in the **Objects**. **Objects** is not editable; however, you can refresh the contents, delete objects, or change the view to another attached database. To refresh the view, right-click the **Objects** and click **Refresh**.

To examine the objects

1. Select the **Objects** tab to display the objects and their details. By default, the objects are displayed sorted by name.
2. Right-click the **Objects** table pane and, in the context-sensitive menu, click **bigdata**. The Big Data library objects are displayed in the **Objects**. (It might take a few moments to display all of the objects.)
3. Re-sort the objects by any property displayed in the **Objects** by clicking the property's column title.

To display hidden objects

1. In the **Objects**, right-click the table pane to display the context-sensitive menu.
2. Examine the menu. Note that, by default the Spotfire S+ system objects are hidden.
3. On the menu, click **Hide Spotfire S+ System Objects** to clear the selection.
4. Examine the **Objects** table pane and tree view pane to see the Spotfire S+ system objects in your project.

To select another object database

1. Right-click the **Objects** and, in the right-click menu, click your current working directory (the directory at the top of the list). The project objects are displayed in the **Objects**. (It might take a few seconds to display all of the objects.)

Adding a Task to A Script

The **Tasks** view displays outstanding project tasks. As discussed in the section Setting the Spotfire S+ Workbench Preferences on page 137, the indicators for task levels are stored in the **Preferences** dialog. (Click **Windows ▶ Preferences** to display them.) You can add a task in one of two ways:

- Add the task directly to the **Tasks** view.

- Add the task to the script file.

To add a task directly to the Tasks view.

1. Click the **Tasks** view tab to display its contents.
2. Right-click the view, and then click **Add Task**.
3. In the **Add Task** dialog, provide the description and priority level of the task.

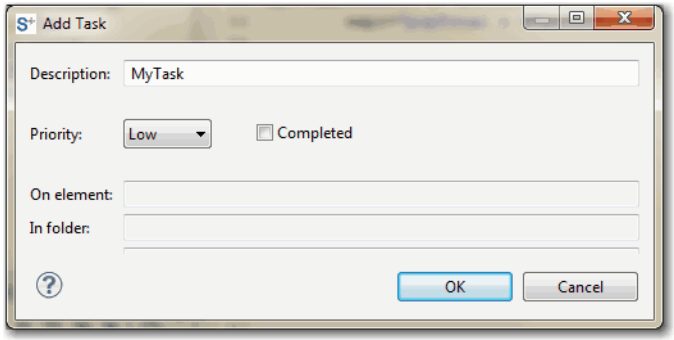


Figure 4.32: ***Add Task*** *dialog.*

4. Click **OK** to save and display the new task.

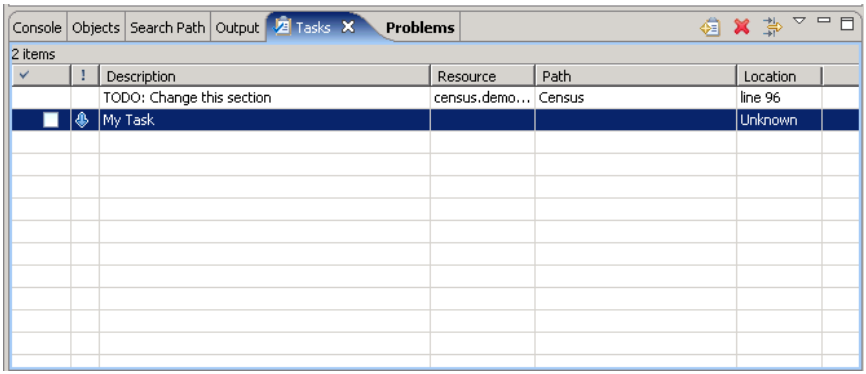


Figure 4.33: *A generic task in the* ***Tasks*** *view.*

A task added directly to the **Tasks** view displays a check box (for marking the task complete) in the **Tasks** view's first column. It does not display a reference to a resource, a directory, or a location.

To add a task in the script file

In the script file, select a blank line.

1. Type the following text:

   ```
   #FIXME: Change this section.
   ```

2. Save the script file.

   Note that the FIXME comment appears in the **Tasks** view as a high-level task, with a red exclamation mark in its second column. The task also displays information about its resource, directory, and line location. You can go directly to any task in your script by double-clicking it in the **Tasks** view.

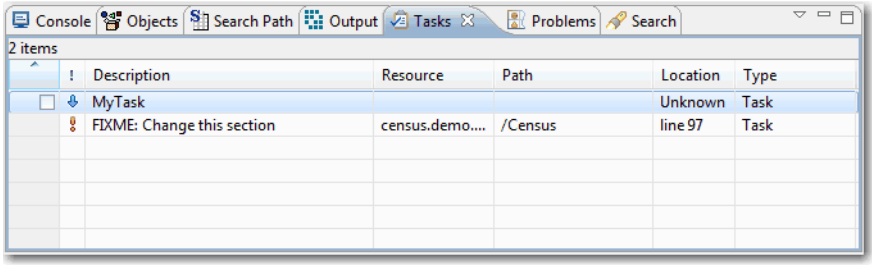


Figure 4.34: *A FIXME task in the **Tasks** view.*

3. In the Script Editor, change the level of the task by changing FIXME to TODO and save the file. Note that the exclamation mark disappears, and the task becomes a normal level task.

Running Code

You can run your Spotfire S+ script code directly from Eclipse in two ways, which are described in the following section.

Script Running Options

The Spotfire S+ Workbench provides the following customized solutions for running your scripts from either the Spotfire S+ perspective or the Debug perspective.

Table 4.2: *Script Editor options for running code.*

Option	Description
Copy to Console	Available from the right-click menu in the Script Editor and from the **Spotfire S+** menu, this option copies the selected code and pastes it into the **Console**. See the section Copying Script Code to the Console on page 164.
Run Spotfire S+ Code	Available from the **Run** menu, by pressing F9, on the toolbar, and from the right-click menu in the Script Editor. This option runs the selected code (or all code, if none is selected), and then displays output in the **Output**. See the section Running Code and Reviewing the Output on page 166 for more information.
Run Current File	Available from the **Spotfire S+** menu. This option runs the file that is open.
Run Next Spotfire S+ Command	Available from the **Run** menu and from the Spotfire S+ Workbench toolbar. This option runs the currently selected S expression or, if the cursor is not exactly on an expression, the next expression.

Copying Script Code to the Console

The **Console** is an editable view (in other words, you can type commands and run them by pressing ENTER); therefore, when you copy script contents to the **Console** using **Copy** and **Paste** actions, you must include the line return, or the script will not run. This behavior is consistent with the Spotfire S+ **Commands** window, in the Spotfire S+ GUI, which also requires a line return to run code.

Also like the Spotfire S+ **Commands** window, the **Console** concatenates the code that runs throughout your Spotfire S+ Workbench session, so you can review and save it.

To run copied script code

1. From within the Census project's script, select lines 1 - 13 in the script. Be sure to select the line return at the end of line 13.
2. Right-click the code and click **Copy to Console**. The selected code is copied immediately to the **Console** and runs. You do not need to paste it in the **Console**.
3. Repeat steps 1 and 2 for lines 15-18.
4. Finally, repeat steps 1 and 2 for a few more lines.

   (You can select all of the code, but if you do so, it appears in the **History** as one line. By following the steps above, the **History** reflects the three different calls to run the code. See the section Examining the History on page 165 for more information.)

Copying Script Code from the Console view

You can select and copy code from the **Console**.

- To copy just code, select the code in the console that you want to copy, right-click the **Console**, and from the menu, click **Copy**.
- To copy code and the prompts (> and +) in the **Console**, set the **Window ► Preferences** option **Include Prompts in Copy action** on the **Console/Output** page. After you set this option, any lines you select and copy using the right-click **Copy** action includes both code and prompts.
- To copy the entire contents of the **Console**, right-click the view, and on the menu, click **Select All**, and then right-click again and select **Copy**.

Examining the History

This exercise uses the script code run in the section Copying Script Code to the Console on page 164.

The **History** reflects the code run in the **Console**. Note that the **History** displays each selection you make, even if it is more than one command, on one line, and if the line extends beyond about 50 characters, the **History** displays an ellipse (...) to indicate more code. To display each line of code in the **History**, you must run the lines individually.

To examine the history

1. To examine and rerun code from the **History**.
2. Click the **History** tab to give it focus.
3. Right-click the first line of code, and click **Select input**. The code is copied to the **Console**. You must return to the **Console** and press ENTER to run the code.

   (Alternatively, double-click the code in the **History** to copy it to the **Console** and run it.)

You can scroll through the individual entries in the **History**; as you scroll, the selection appears in the **Console**. To run a selected item, switch from the **History** to the **Console** and press ENTER at the end of the code line.

Running Code and Reviewing the Output

You can run code directly from the Script Editor by using the **Run Spotfire S+ Code** feature.

To run code

1. Select the **Output** tab.
2. In the Script Editor, select the code to run (or, to run the whole script, select nothing), and press F9, or on the toolbar, click **RunSpotfire S+ Code**.

   The **Output** displays the run code and any Spotfire S+ messages.

To run the current expression

- On the Spotfire S+ toolbar, click **Run Next Spotfire S+ Command**. The currently-selected S expression runs, and the next expression is selected. (If the cursor location does not match an expression exactly, the next expression is evaluated.

Fixing Problems in the Code

Introduce a programmatic problem in the script to examine the results in the **Problems** view.

To examine problems

1. In the Script Editor, on line 13 of the script, remove the closing parenthesis.

2. Save the file. Note that the **Problems** view tab shows bold text.
3. Click the **Problems** view tab to display the view.
4. Click the problem description. Note that the Script Editor highlights the line where the code is broken.
5. In the Script Editor, replace the missing parenthesis and save your file. Note that the problem disappears from the **Problems** view.

Closing and Reopening the Project

The Spotfire S+ Workbench maintains a list of your projects in the **Navigator** view, even after you close all associated files.

To close the project

1. Select the project to close.
2. Right-click the **Navigator** view and, from the menu, click **Close Project**.
3. Examine the **Objects** and note that it still displays project or workspace objects.

To reopen the closed project

1. Select the project.
2. Right-click the **Navigator** view and, from the menu, click **Open Project**.

In the next section, examine the Debug perspective using a different example, creating a new project. You can close the **Census** project at this point, if you choose.

PACKAGES IN THE WORKBENCH

The Spotfire S+ Workbench supports creating or using Spotfire S+ packages by providing a simple mechanism to:

- Create a package project structure that includes all required files and folders.
- Find and install either package source files or binary files from either the CSAN Web site (**http://spotfire.tibco.com/csan**) or other repository.
- Update either the source files or binary packages from either the CSAN Web site or other repository.
- Export a package to a specified repository, either as a source or a binary package.

Creating a New Package Project

In this exercise, create a project for the **soundex** example, which is described in the **Guide to Packages**.

To create a package project

1. If you have not already done so, install the package utilites.

   ```
   install.pkgutils()
   ```

2. Click **File ▶ New▶ Project**.
3. In the **New Project** dialog, select **Spotfire S+ Project.** Click **Next**.
4. Provide the friendly project name, "Soundex." Accept the option **Use default location**. This option creates the project directory in the default workspace location.
5. Select **Create Spotfire S+ Package Structure**.
6. Click **Finish** to create the project.

   To create the package project structure, the wizard loads the pkgutils library (if it is not loaded already), and then it calls `package.skeleton`.

7. Click **File ▶ New ▶ Other**, and in the **New** dialog, select **Spotfire S+ Script. Click Next.**

8. In the **New File** dialog, select **Soundex/R** as the parent folder, and in the **File name** box, type **soundex.ssc**.
9. Click **Finish**.
10. In the **Script Editor**, define the soundex function:

```
"soundex"<-
function(x) {
    base <- gsub("[^A-Z]", "", toupper(gsub
    ("^.*[ \t]",
    "", gsub("[ \t]*$", "", x))))

basecode <- gsub("[AEIOUY]", "", gsub("[R]+", "6",
    gsub("[MN]+", "5", gsub("[L]+", "4",
    gsub("[DT]+", "3", gsub("[CGJKQSXZ]+", "2",
    gsub("[BFPV]+", "1", gsub("[HW]", "", base)))))))

sprintf("%4.4s", paste(substring(base, 1, 1),
   ifelse(regexpr("^[HWAEIOUY]", base) == 1,
    basecode, substring(basecode, 2)),
   "000", sep = ""))
}
```

11. Save the file.
12. Run the function by selecting the code in the Script Editor and clicking **Run**.
13. Repeat Step 7, this time creating a script file named **sample.surnames.ssc**
14. In the **Script Editor**, create the following object:

```
sample.surnames <- c("Ashcroft", "Asicroft",
    "de la Rosa", "Del Mar", "Eberhard",
    "Engebrethson", "O'Brien", "Opnian", "van Lind",
    "Zita", "Zitzmeinn")
```

15. Save the file, and then instantiate the object by selecting the code in the **Script Editor** and clicking **Run**.
16. In the **Console**, call the `soundex` function, passing in the `sample.surnames` object:

```
soundex(sample.surnames)
```

17. Create the soundex **.Rd** file:

```
prompt.Rd(soundex)
```

(Refresh the **Navigator** view to display the new **.Rd** file.)

Note that you are prompted to edit the file and save it to the appropriate directory (that is, the **man** directory).

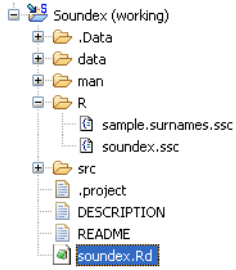


Figure 4.35: *The Soundex project with the newly-created stub* ***soundex.Rd****.*

18. Move **soundex.Rd** from the top level of the project to the **man** subdirectory.

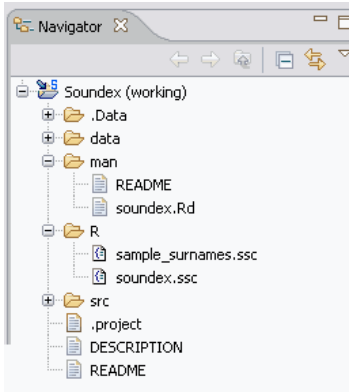


Figure 4.36: *The new Soundex project.*

To build this package, either as a source or a binary package.

Building the Package

After you have created the package, you can build it using the export wizard available from the **Export** menu option.

To build the package

1. Select the Soundex package project.
2. On the menu, click **File ► Export**.

3. In the **Export** dialog, expand the **Spotfire S+** folder and click **Spotfire S+ Package**. Click **Next** to display the **Export Spotfire S+ Package** dialog.

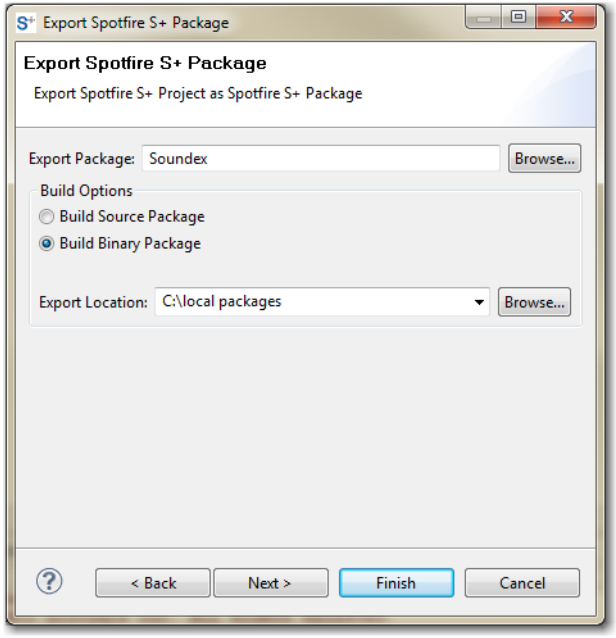


Figure 4.37: *Exporting Soundex as a binary package.*

4. Select either **Build Source Package** or **Build Binary Package**.
5. In **Export Location**, specify the location to place the built package. Click **Finish** to build.
6. Browse to the export location to see the results.

Notes

There are additional options for building and testing packages. For more information, see the Spotfire S+ Guide to Packages.

If you have access to TIBCO Spotfire Statistics Services and you want to deploy a package to be used on the server, you can upload your package from the Spotfire S+ Workbench. See the section Exporting a Package to Spotfire Statistics Services on page 186.

Downloading Package Source Files from a Repository

You can download the source files of an existing package, either from the CSAN Web site or from another repository.

- On Windows, you can use the source as a template for another package, for example, or to just examine the code.
- On UNIX® and Linux® systems, download the source to view the source, install a package, or install and load a package.

To download package source files

1. From the menu, click **Spotfire S+ ► Find Packages**.
2. If you are using UNIX, your option for **Type** is source only. If you are using Windows, select **Source**.
3. In the **Find Packages** dialog, select **Source**, and accept the default repository (**http://spotfire.tibco.com/csan**).

   (Note that you must have an Internet connection to see the packages stored at CSAN.)
4. From the list, select the **discreteChoice** package.
5. Review the remaining dialog contents (note that you can select a package from a local repository, if you have any stored locally). Accept the default **Project Directory** (your workspace). Click **OK** to download the package source.

Note

Find Packages finds built packages only (that is, those that are zipped or tarballed); it does not load unbuilt package directories and their files, even from a local directory.

To open a package to build, open it as a new project, and then build it using **Export > Spotfire S+ Package**, and then install it.

You have downloaded the source successfully. The package project appears in the **Navigator** view, where you can perform any or all of the following tasks to examine it.

- Expand the file structure and open the code files in the **R** folder to examine the code. (Note that the source files for this package were created using the **.q** extension.)

- Expand the **man** folder and examine the **.Rd** files (the source Help files).
- Expand the **data**, **inst**, **src**, and **test** folders to see the additional files that are included to support this package (the package's data sources, reference PDF, C++ code, and test files, respectively. For more information about these folders, see the Spotfire S+ Guide to Packages.).
- Toggle to the package as the working project to add the library to your **Search Path**. (Click **File ▶ Toggle Working Spotfire S+ Project.**)

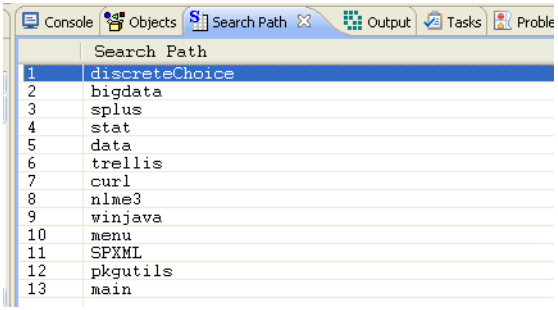


Figure 4.38: *The **Search Path** after setting discreteChoice as the working project.*

- Instantiate the objects to see them in the **Objects** view.

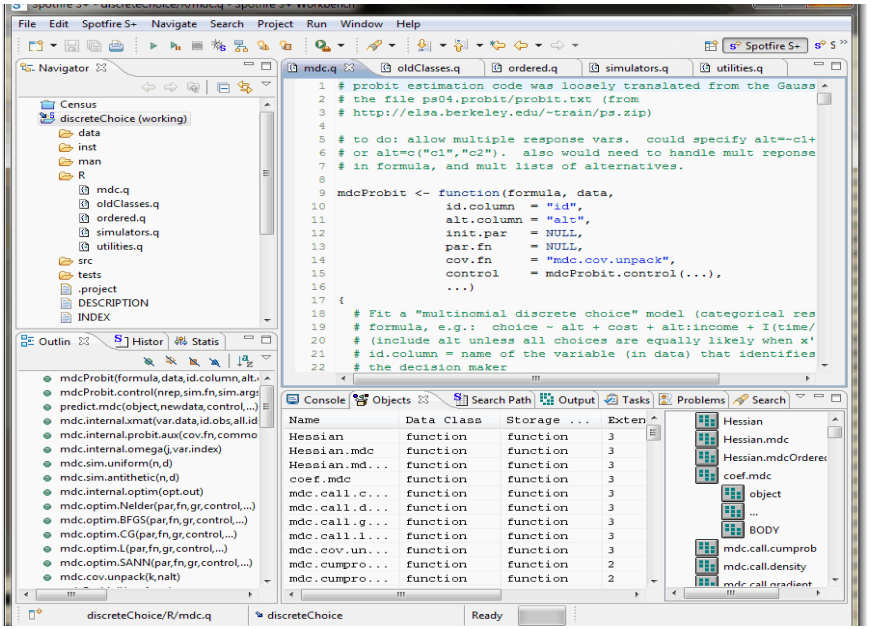


Figure 4.39: *discreteChoice package source, imported into the Spotfire S+ Workbench.*

Downloading a Binary Package from a Repository

If you are working with Microsoft Windows, you can copy binary packages from a specified repository using the **Find Packages** dialog.

Note
If you have installed the source from the section To download package source files on page 172, you must delete the project before downloading the binary package.

To download binary packages

1. From the menu, click **Spotfire S+ ► Find Packages**.
2. For **Type**, select **Binary** (the default; for Windows only. For UNIX, **Type** displays only **Source**).

3. Accept the default repository (**http://spotfire.tibco.com/csan**).

   (Note that you must have an Internet connection to see the packages stored at CSAN.)

4. From the list, select the **discreteChoice** package.

5. For **Install Options**, select **Install Binary + Load**.

Note

When you select **Install Binary + Load**, Spotfire S+ loads the library with the `first` argument set to `False` (that is, the library is not installed in position 2 in the search path). if you want the library in position 2, select **Install Binary**, and then, in the **Console**, call `library(discreteChoice, first=T)`.

6. Review the remaining dialog contents (note that you can select a package from a local repository, if you have any stored locally). Accept the default **Project Directory** (your workspace). Click **OK** to install and load the binary package.

When the binary package loads successfully, the Workbench displays the following message:

```
The downloaded packages are in

C:\DOCUME~1\username\LOCALS~1\Temp\di000B70.tmp\downloaded_
packages

Welcome to the discreteChoice library.  For additional
information see discreteChoice.pdf in C:\Documents and
Settings\username\Application
Data\tibco\splus82_WIN386\library/discreteChoice

Note that some examples in this package use functions from
the lowDiscrepancy package
```

Open the **Search Path** to see that the library appears in your search path:

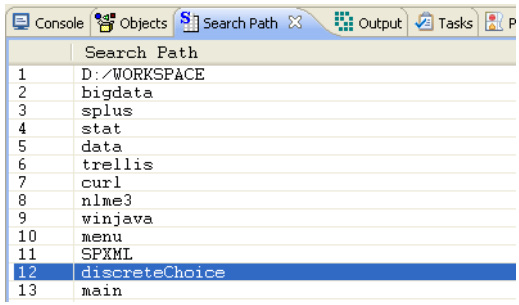


Figure 4.40: *discreteChoice in the search path.*

Updating a Package from a Repository

If you have a downloaded a package, and a newer version is available from a repository, you can find the newer version using the **Update Package** option. The Update Package dialog shows only packages that differ from the versions that you currently have; otherwise, the list is empty.

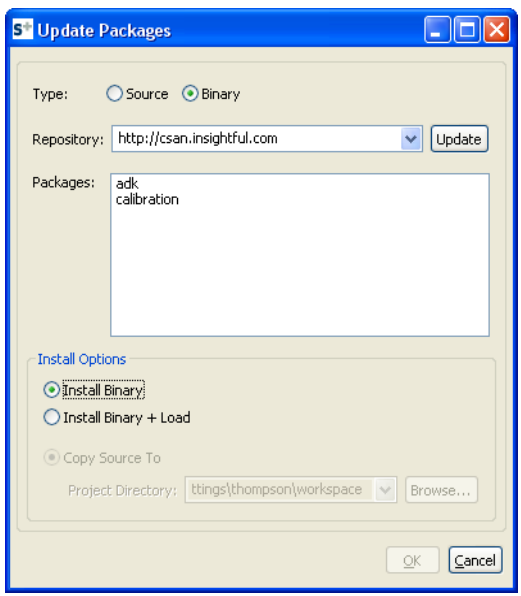


Figure 4.41: ***Update Packages*** *dialog.*

To update a package

1. From the menu, click **Spotfire S+ ► Update Packages**.
2. On Windows, in the **Update Packages** dialog, select the type (either **Source** or **Binary**). UNIX updates only source packages.
3. Select the repository where the newer package exists.
4. From the list, select the package to update, and then select the **Install Options**:
   - **Install Binary**
   - **Install Binary + Load**
   - **Copy Source to Project Directory**

SPOTFIRE STATISTICS SERVICES REMOTE SUBMISSIONS

By default, the Spotfire S+ Workbench displays the **Statistics Services** view. To use this feature, you must have access to Spotfire Statistics Services, a TIBCO service that you can use to run jobs on a remote S-PLUS engine. See your server adminsitrator for more information.

This section walks through

- Adding a new connection to Spotfire Statistics Services.
- Connecting to an existing Spotfire Statistics Services server.
- Submitting a job.
- Examining the contents of the resulting job's folder.
- Scheduling a job.
- Monitoring jobs.
- Uploading a package.
- Deleting a package.

For a description of the menu items and dialogs for this feature, see the section Statistics Services view on page 76.

Submitting a Remote Job

In the following example, send a job to Spotfire Statistics Services. First, add a connection to the server. Then practice disconnecting and reconnecting. Create a simple project with a script and send it to Spotfire Statistics Services. Examine the results.

To add a connection

1. On the **Spotfire Statistics Services** view toolbar, click **Add Connection** ( ).
2. In the dialog **Add Service Connection**, provide a friendly name, a server URL, and your user credentials (name and password). You are required to provide a password only if authentication is enabled on the server. Note that your password is persisted only for the duration of the current Workbench session, and you must provide your credentials

for subsequent Workbench sessions. (Alternatively, you can provide your password in the selected **Service Properties** dialog prior to connecting.)

The server URL contains the server name, port number, and "SplusServer" (for example,
http://myserver:8080/SplusServer).

The default port is 8080. See your server administrator if you do not know your exact server address.

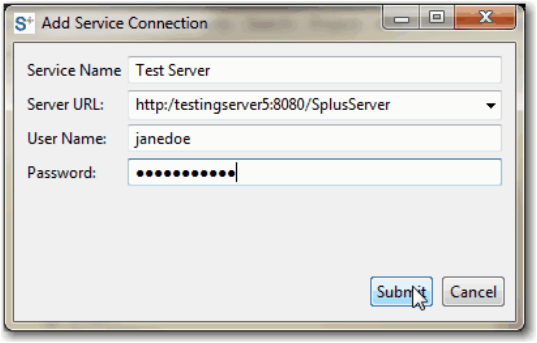


Figure 4.42: ***Add Server Connection*** *dialog.*

3. Click **Submit** to add and connect to the server. Note that the service name you supplied appears in the **Statistics Services** view, with a folder icon decorated with a green check, indicating the service is connected. ( )

For more information about completing the dialog, see the section Add Service Connection on page 83.

To disconnect and connect to a server

1. After you completed the step to add a service, select its name in the **Statistics Services** view. On the toolbar, click **Disconnect from a Remote Service** ( ).

   Note that the service's folder in the **Statistics Services** view no longer has a green checkmark.

2. Select your service folder again, and on the toolbar, click **Connect to a Remote Service** ( ). The service is reconnected.

To submit a job

1. Create a new project called **sample_scripts** and make it your working project. Create a new file, a Spotfire S+ script, in the project and call it **samplescript1.ssc**.
2. Copy and paste the following example code into the Script Editor:

```
java.graph("mygraph.spj", format="SPJ")
show.settings()
dev.off()
```

   - Remember that you can run jobs on Spotfire Statistics Services only from the Script Editor, not from the **Console**.
   - You can run either the entire script, or you can run only the selected code.

3. In the **Spotfire Statistics Services** view, select the service where you want to run the example.
4. In the **Spotfire Statistics Services** view, on the toolbar, click **Run** ( ).

Note
Make sure you click the **Run** button on the **Statistics Services** view toolbar to run your script in the Spotfire Statistics Services S-PLUS engine. The **Run** button on the Workbench toolbar runs your job in your local S-PLUS engine.

5. Note that the service folder expands the **Jobs** folder to display the folder for the running job. When the run is done, if it has run successfully, a green checkmark appears on the folder, and the folder name changes from ***JobID*** (**Waiting**) to ***JobID*** (**Done**). (This job is short, so it should run immediately.)

To examine a job

1. Expand the job folder containing the job run in the previous steps. Note that when you expand the folder, the label changes from boldface to regular typeface to indicate you have examined it.

2. Expand the **Results** folder and examine the contents: **engine.log** and **mygraph.spj.**
   - Double-click **engine.log** to display its contents in the **Output** view.
   - Double-click **mygraph.spj** to display the graph resulting from the code in a **Graph Window**.
3. Double-click **Return Value**. Its contents are displayed in the **Output** view and includes the following:

   ```
   > retVal.ComputerName.JobID

    null device
              1
   ```

   (`dev.off` returns the number of the current device after the device was shut down. By default, it is `1`.)
4. Double-click **Script**. Its contents are displayed in a new Script Editor. The script's label bears an identifier, as follows: **scriptjob_ComputerName_JobID_scriptGUID.**

   The contents of the Script Editor should match the code that you ran. You can close this script.

To schedule a job.

1. Leave the script window open, and in the **Spotfire Statistics Services** view, select your service.
2. In the **Statistics Services** view, click **schedule** ().
3. Examine the dialog for current time and date, and check the server time zone, and if your server is running at a time different from your computer. (If so, adjust the example accordingly.)

4. Leave the calendar date, but in the time spin control, highlight the minutes and set the time to run the job 1-2 minutes ahead of the current time. ,

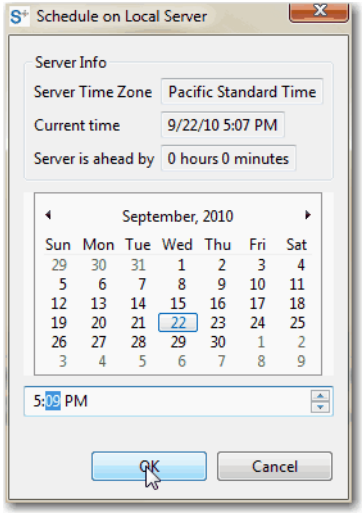


Figure 4.43: *Job scheduled two minutes out.*

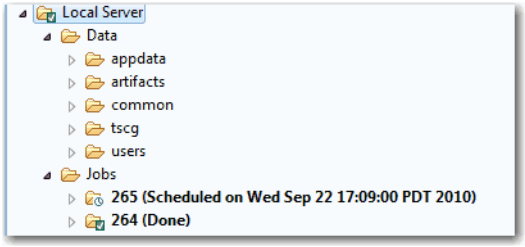


Figure 4.44: ***Statistics Services*** *view displaying scheduled task.*

5. Examine the **Statistics Services** view for the information provided in the label. The job should run quickly when the scheduled time is reached.

Note
Scheduled jobs do not appear in the **Monitor Jobs** view.

To monitor a job.

1. On the Spotfire S+ Workbench menu, click **File > Open File**, and then browse to the following file:

   ***SHOME*/samples/bigdata/boston/bostonhousing.ssc**.

   (where ***SHOME*** is your Spotfire S+ installation directory.)

2. Click **File > Save As** and save this script to the **sample_scripts** project.

3. In the **Statistics Services** view, select your Spotfire Statistics Services, and then on the toolbar, click **Monitor server jobs** ( ). Note that the **Monitor Jobs** view opens, by default, tabbed with the **Console** view, **Objects** view, **Output** view, and so on. Also note that its tab label displays the name of your selected Spotfire Statistics Services.

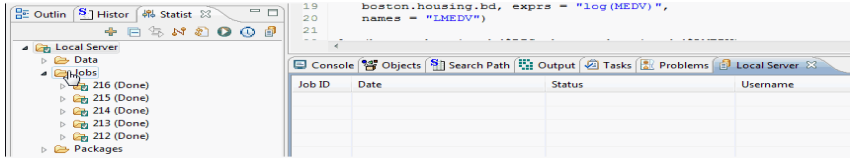


Figure 4.45: ***Monitor Jobs*** *view.*

4. In the **Statistics Services** view, expand the **Jobs** folder for your Spotfire Statistics Services.

5. In the **Statistics Services** view, click **Run** three times.

6. Examine the results in the **Monitor Jobs** view. These jobs should finish quickly.

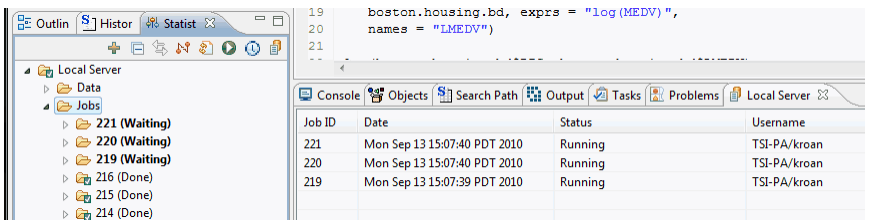


Figure 4.46: *Jobs queued in Spotfire Statistics Services, displayed in the* ***Monitor Jobs*** *view.*

Managing Data Files on Spotfire Statistics Services

You can upload and download files, including data files, from the **Statistics Services** view.

To upload a data file

1. Select the running service, and expand its folder.
2. Select the **Data** folder, or one of its subfolders (depending on where you want to store your data file).
3. Right click the folder, and from the right-click menu, select **Upload File**.
4. Browse to the location of your data file. For example, browse to:

   ***SHOME*/samples/bigdata/stocks**

5. Select a file to upload (for example, **cbe.csv**), and then click **Open** (**OK** on UNIX). The file is added to your **Data** folder.

To preview a data file and get the summary information

1. Expand the **Data** folder to find the file you just uploaded.

2. Right click the file name, and from the right-click menu, click **Preview File**.

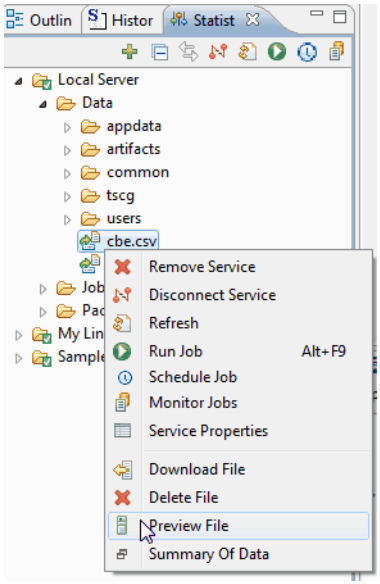


Figure 4.47: *Data right-click menu.*

3. Review the contents in the **Output** view.

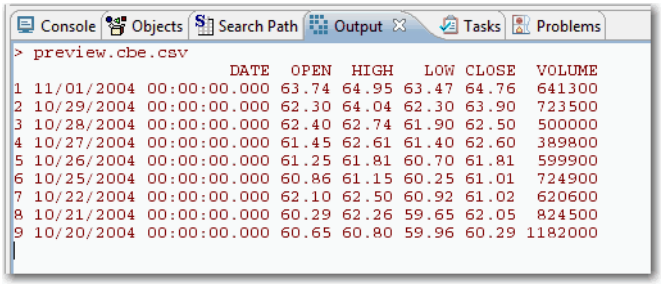


Figure 4.48: *Data preview for* ***cbe.csv****.*

By default, the preview displays 10 rows, the first row containing the column headings. The preview also includes a line containing the data preview object prefix (`preview`) and the data file name (`cbe.csv`, in this case). You can change both the data preview object prefix and the number of rows to

preview in the **Window > Preferences** dialog. See the section Statistics Services Options on page 25 for more information.

4. Right click the data file again, and this time, select **Summary of Data**.
5. Review the results in the **Output** view, including the data summary value prefix (also editable in the **Window > Preferences** dialog).

To download a data file

1. Right click the file a third time, and from the menu, select **Download File**.
2. Browse to a location to store the file, or click **Cancel**.

To delete a data file

- Right click the file in the **Data** directory, and from the menu click **Delete File**. Click **OK**.

Exporting a Package to Spotfire Statistics Services

In this task, export the Soundex package that you created previously, in the section Creating a New Package Project on page 168.

To upload a package to Spotfire Statistics Services

1. In the **Statistics Services** view, make sure you are connected to the remote service. (For more information about this see the section To add a connection on page 178.
2. In the **Navigator** view, select the Soundex package, which you created as part of the exercise in the section Building the Package on page 170.
3. Click **File > Export**.
4. In the **Export** dialog, expand **Statistics Services**, and then select **Spotfire S+ Package Upload**.
5. Click **Next**.
6. In the **Select server to deploy to** drop-down, select your Spotfire Statistics Services from the list.
7. Click **Finish**.

8. In the **Statistics Services** view, for your service, expand the Packages folder. The Soundex package should appear.
9. In the Script Editor, type `library(Soundex)`, and run it from the server.
10. In the Script Editor, type `search()`, and run it from the server.
11. In the **Statistics Services** view, expand the job you just ran, and double-click **Return Value**. The **Output** view displays the search path. Soundex should appear on the list.

Notes

- You must have Perl version 5.8 or later to export a package.
- Exporting as a package for Windows builds a binary.
- The package must be in the S-PLUS engine's INIT file on the server to be loaded and used when the S-PLUS engine is loaded. See your server administrator if you want to have this option set. Alternatively, before using functions in an uploaded package, type `library(`*`packagename`*`)`.
- The package is uploaded to the server as an unprotected package. (That is, you can delete it later.)

See the TIBCO Spotfire Guide to Packages for more information.

SPOTFIRE S+ WORKBENCH DEBUGGER TASKS

This section describes basic tasks you will want to know how to perform on a simple file set.

Note

If you open a file using the **File ► Open File** menu command, and that file is not in a Spotfire S+ Workbench project, you cannot set a breakpoint in that file.

The following instruction works with the kahanSum example, located in your **SHOME/samples/**directory. To create a kahanSum project, follow the steps to create a project (see the section Quick Start on page 127).

Kahan Example

In numerical analysis, the Kahan summation algorithm minimizes the error when adding a sequence of finite precision floating point numbers. (It is also called compensated summation. This algorithm is attributed to William Kahan.)

The Spotfire S+ Debugger example uses a simple Kahan summation algorithm captured in two files. If you have not already done so, create this project and import the example files. See the section Adding the Sample Debugging Project on page 136.

The project's two files are as follows:

- **kahanSum.q** contains the function `kahanSum`.
- **kahanAddNext_func.q** contains the function, `kahanAddNext`, which is called by the function `kahanSum`.

Opening the Debug Perspective

Before using the Workbench Debugger and Profiler, you must open the Debug perspective. If you have closed your project in the previous exercise and want to continue practicing using the Spotfire S+ Debugger, first re-open your project, and open the two files in the Script Editor. Next, change to the Debug perspective.

For a more in-depth description of the Debug perspective, see the section Debug Perspective Options and Preferences on page 92.

To open the Debug perspective

1. On the perspective toolbar, click **Open Perspective**.

2. From the menu, select **Debug**.

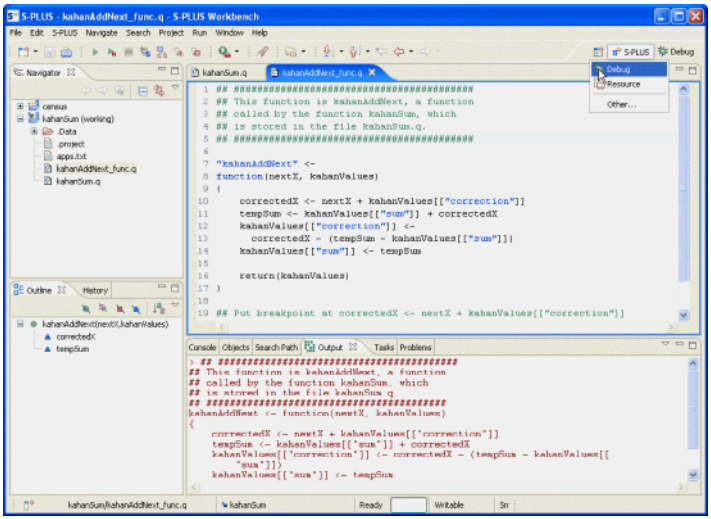


Figure 4.49: *The **Open Perspective** menu options.*

The **Debug** perspective button appears to the left of the **Spotfire S+** perspective button, and the perspective changes to the Debug perspective as shown in Figure 4.50.

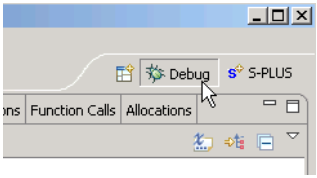


Figure 4.50: *Selecting the **Debug** perspective.*

Now, you can toggle between the **Spotfire S+** perspective and the **Debug** perspective by clicking their respective buttons. The **Debug** perspective button stays visible in this and future Spotfire S+ Workbench sessions, unless you close it by right-clicking its button and clicking **Close.**

Launching the debugger

To start debugging, first activate the Spotfire S+ debugger using one of the following methods:

- On the toolbar, click **Toggle Spotfire S+ Debugger** ( ).

- On the menu, click the **Run ▶ Toggle Spotfire S+ Debugger**.
- On the keyboard, press CTRL+ALT+D.

After you activate the debugger, any expression you type in the **Console**, or that you run by clicking **Run Spotfire S+ Code** ( ) on the toolbar, invokes the debugger.

Setting breakpoints

One of the most basic debugging tasks is setting a breakpoint. Set breakpoints at locations in your code where you want to evaluate variables. In this exercise, set the breakpoints in the Script Editor. For a more in-depth description of the Script Editor, see section Spotfire S+ Workbench Script Editor on page 57.

To set the breakpoints

1. From the Project files, open the file **kahanAddNext_func.q** in the Script Editor. (Note that to work with the debugger, your
2. Find the line in the code that reads:
   ```
   correctedX <- nextX + kahanValues[["correction"]].
   ```
3. In the left margin, right-click to display the menu, and then select **Toggle Breakpoint**. (Double-clicking the left margin next to the code line also adds the breakpoint.)
4. Open the file **kahanSum.q** in the Script Editor.
5. Find the line in the code that reads:
   ```
   kahanValues <- kahanAddNext(x[i], kahanValues).
   ```

6. Repeat step 3 to put a breakpoint at this line.

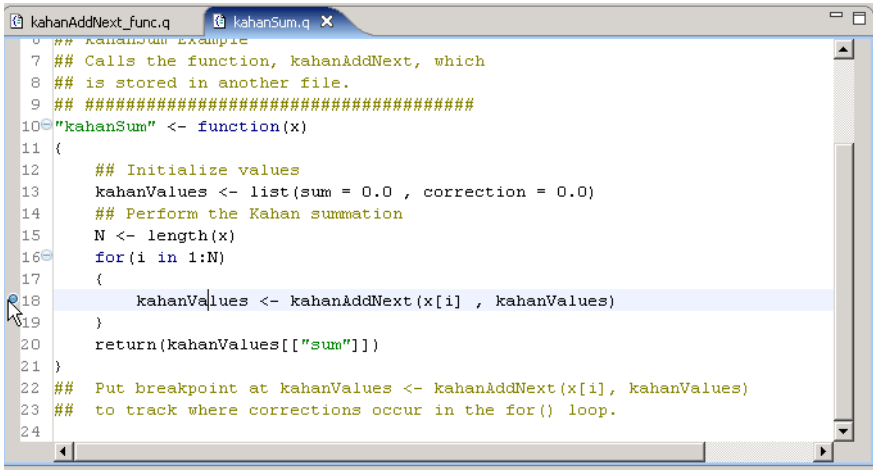


Figure 4.51: *Breakpoint set in the kahanSum function.*

Note
Setting breakpoints in code files the Spotfire S+ Workbench does not affect the file if you open it in the Spotfire S+ GUI in Windows. Breakpoints are evaluated only in the Spotfire S+ Workbench, and only when the debugger is engaged.

To examine your breakpoints

1. Click the **Breakpoints** view tab. Both breakpoints you set appear in this view.

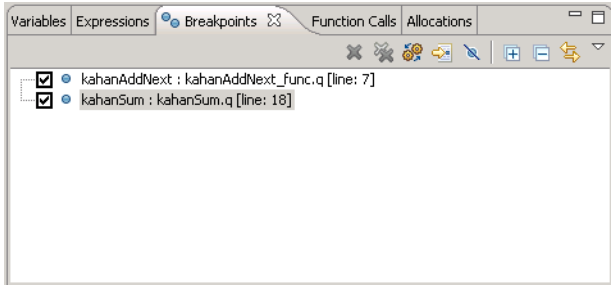


Figure 4.52: *kahanSum breakpoints in* ***Breakpoints*** *view.*

2. Right-click the breakpoint `kahanAddNext`, and from the context-sensitive menu, click **Go to File**. Note that the **kahanAddNext_func.q** file opens in the Script Editor, and the line with the breakpoint is highlighted.
3. In the **Breakpoints** view, clear the check box next to the `kahanAddNext` breakpoint. Note that the icon changes from a solid circle to a blank circle in both the **Breakpoints** view and in the Script file margin. This action disables the breakpoint in future sessions but does not remove it.
4. Select the check box to enable the breakpoint.
5. On the **Breakpoints** view toolbar, click **Skip All Breakpoints** (). Toggling this option disregards but maintains (that is, does not remove or disable) all breakpoints in the **Breakpoints** view.
6. Take some time manipulating the breakpoints using the menu options and buttons in the **Breakpoints** view. For a more in-depth description of the **Breakpoints** view, see section Breakpoints view on page 113.

   When you have finished, re-set the breakpoints in the files as described in the section To set the breakpoints on page 190.

Starting execution

Before you run the debugger, first initialize the objects and set the output display option.

To initialize the objects

1. Open the file **kahanAddNext_func.q** in the Script Editor.
2. On the toolbar, click **Run Spotfire S+ Code** ().
3. Repeat steps 2 and 3 for the file **kahanSum.q**.
4. In the **Console**, at the prompt, type the following code:

   ```
   options(digits=17)
   ```

To start the debugging session

1. Engage the debugger by clicking its toolbar button ().
2. Click the **Debug** view tab to display its contents.

3. In the **Console**, at the prompt, type the following code:

```
kahanSum(rep(1000000000.1, 10))
```

Examining the call stack

After you have started the debugging session, examine the UI:

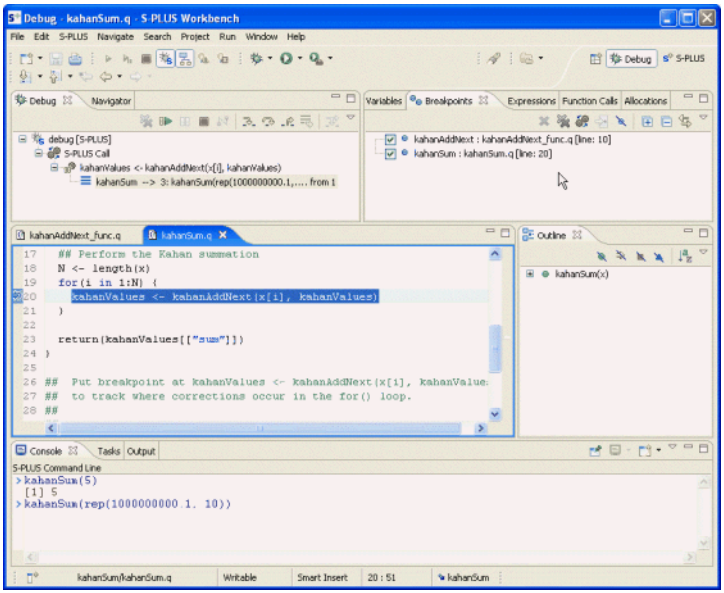


Figure 4.53: *At the first breakpoint in* `kahanSum`.

To examine the call stack

1. Note that the Script Editor highlights the breakpoint line.
2. Note that the **Debug** view shows the contents of the call stack.

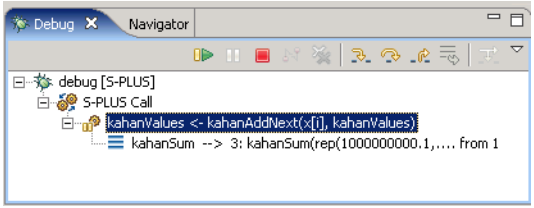


Figure 4.54: *The* ***Debug*** *view containing the call stack.*

To resume debugging

1. Resume debugging by clicking the **Resume** button ( ).

2. Re-examine the **Debug** view, and note that the debugger stops at the next break point: the first breakpoint in the `kahanAddNext` function.

   For a more in-depth description of the **Debug** view, see the section Debug view on page 100.

To remove a breakpoint mid-session and resume debugging

1. You don't need the breakpoint in `kahanAddNext`, so remove it. In the **Breakpoints** view, select the breakpoint for `kahanAddNext`.
2. On the **Breakpoints** view toolbar, click **Remove Selected Breakpoints** ( ).
3. Click the **Resume** button again to run the debugger to the next breakpoint. The code runs the for loop and stops at the `kahanSum` breakpoint again. Observe the results in the **Debug** view.
4. Click **Resume** a few more times to continue debugging to the first calculate correction. In the next section, examine the results of the first calculated correction.

Examining Variables and Expressions

As you debug, at each breakpoint or step, the debugger re-evaluates the variables and displays the results in the **Variables** view. At any breakpoint or stopping point, you can review, but not edit or alter, the variables at the current frame.

For a more in-depth description of the **Variables** view, see the section Variables view on page 106.

To examine the variables

1. Click the **Variables** view to display its contents.
2. In the **Debug** view, highlight the last line in the call stack.
3. Note that the **Variables** view displays the variables resulting from the code run so far.

4. Highlight a variable in the **Variables** view and note that its value is displayed in the **Details** pane.

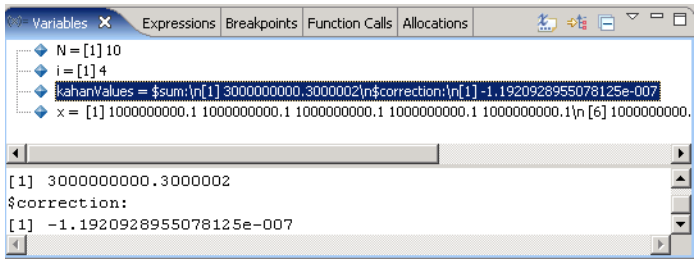


Figure 4.55: ***Variables*** *view during debugging session.*

5. On the **Variables** view toolbar, click the Show Type Names button ( ). Note that the **Variables** view now displays the variable type information.

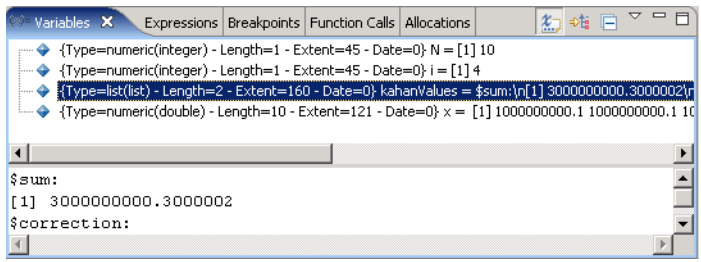


Figure 4.56: ***Variables*** *view showing type names for the variables.*

6. Take some time examining the variables using the menu options and buttons in the **Variables** view, clicking **Resume** in the **Debug** view and watching the variables change.

Setting a Watch Expression

You can track variable assignments in the **Variables** view, and you can track variables and expressions in the **Expressions** view. This section demonstrates how to track individual variable assignments and interesting expressions.

Note on Expressions

An *expression* is any syntactical interaction that Spotfire S+ can evaluate. Expressions persist from session to session. Spotfire S+ recognizes a wide variety of expressions, but in interactive use the

most common are names, which return the current definition of the named data object, and function calls, which carry out a specified computation. Any of the following are Spotfire S+ expressions:

```
1:10
rnorm(5)
mean(1:10)
traceback()
```

If you were debugging a function, for example:

```
incrementByTwo <- function(x) {
   * x + 2
}
```

you could have an expression that evaluated:

```
x + 2
```

at the breakpoint (denoted with the * in the above function definition).

For more information about expressions, see the *Programmer's Guide,* or see the Spotfire S+ Help topic **ExpressionLanguage**.

To watch expressions

1. Right-click the **Expressions** view to display the context-sensitive menu.
2. From the menu, select Add Watch Expression.
3. In the Add Watch Expression dialog, type the following:

   ```
   kahanValues[["sum"]]
   ```

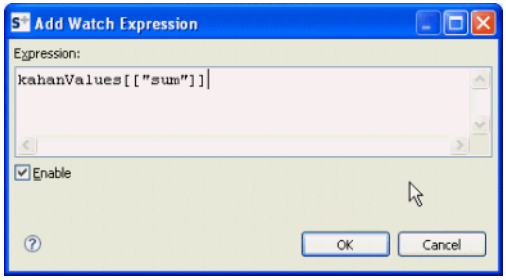


Figure 4.57: ***Add Watch Expression*** *dialog with expression added.*

4. Add a second expression to watch:

   ```
   kahanValues[["correction"]]
   ```

5. Click the **Variables** view and right-click the variable `x`.
6. On the context-sensitive menu, click **Create Watch Expressions**.
7. The debugger returns to the **Expressions** view. Note that the variable X is now on the list.
8. Add the following two more expressions to watch:

   ```
   sum(x)
   sum(x)-kahanValues[["sum"]]
   ```

   The first expression provides the sum of the variable `x`.

   The second expression provides the difference between the sum of `x` and the sum of `kahanValues`.

Optionally, restart debugging to start evaluating the expressions from the start, pausing to see the results between the **Variables** view and the **Expressions** view.

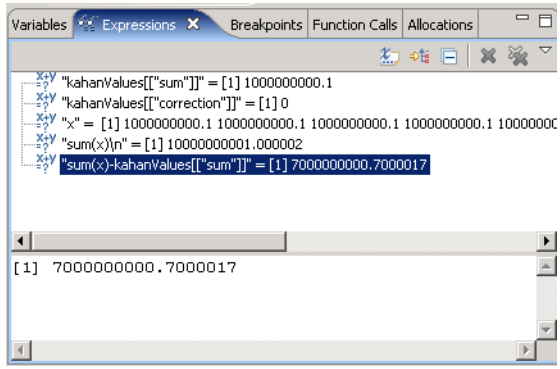


Figure 4.58: *Evaluating expressions.*

Stepping into, over, and out of a function

Other common debugging tasks include stepping through, over, and out of a routine's functions. When you step through a routine, the debugger pauses at every function and function body, giving you the opportunity to examine the results.This feature is also used to enter `if/else` statements, `for` loops, `while` loops, and other routines.

To step into a routine

1. Click the **Step Into** button ( ). Repeat to continue to step into routines and their bodies.
2. Note that as you click **Step Into**, the code being evaluated is highlighted in the Script Editor and is evaluated in the call stack.
3. Keep stepping into the code until you come to an internal function. (See Figure 4.59).

   Because this function is not in your project files, note that the function is displayed in a temporary file. (You can set a breakpoint in such a function, and continue to evaluate it in future debugging sessions.)

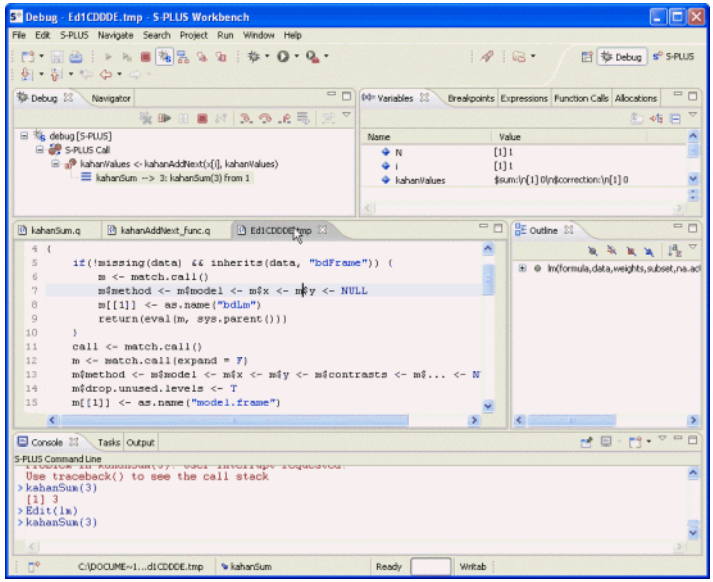


Figure 4.59: *Stepping into a function displayed in a temporary file.*

You can also step over a function (), or you can step out of a function (), using the buttons on the **Debug** view toolbar.

Note
If you are debugging using the **Run** button, rather than running a function via the **Console** view, when you reach the last expression, you can find yourself in internal Spotfire S+ code. To avoid this situation, type the name of the function and parameters in the **Console** view instead. See the section Debugging Using the Run Button on page 206 for more information.

Examining Resource Usage

You can track resource allocation usage by engaging the Spotfire S+ Workbench Profiler.

To track resource usage

1. On the Spotfire S+ Workbench main menu, click the Profiler button () to toggle it on.
2. Click the **Allocations** view tab.
3. Examine the resource usage. Note that it is sorted alphabetically by type. Click the **Type** column head; note that the view is now sorted in reverse.
4. Click the **Amount** column head; note that the view is now sorted by amount, smallest to largest.
5. Click **Amount** again; note that it re-sorts, largest to smallest.
6. Click the drop-down menu, and then click **Reset Allocations**. Note that the table is cleared.

Examining Function Calls

In the next section, examine the functions used in the example. You can examine the functions either in an expandable tree view or in a table view. (Make sure the Profiler is engaged by toggling on the **Profiler** button on the main menu.)

To track functions used

1. Click the **Function Calls** view tab.

2. Examine the tree. Note that after each function, in parentheses, is the amount of time the function call took to run.

3. Scroll down to the `kahanAddNext` function, expand the selection, and examine the time values.

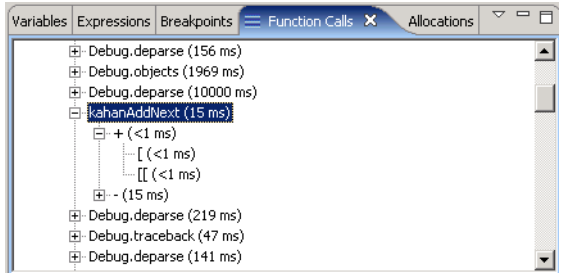


Figure 4.60: *Tree view of the **Function Calls** view.*

4. Right-click the **Function Calls** view and click **Show Function Tree** to clear it.

5. Examine the resulting table.

6. Scroll down to the `kahanAddNext` function and review the call count (that is, number of times called so far) and duration.

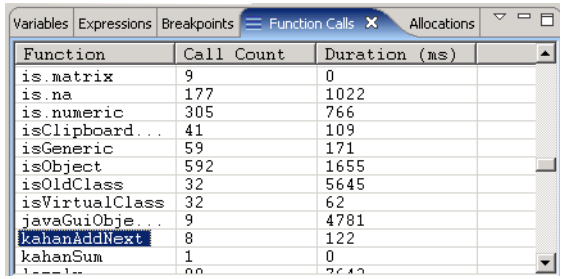


Figure 4.61: *Table view of the **Function Calls** view.*

TROUBLESHOOTING 5

INTRODUCTION

This section provides information about using TIBCO Spotfire S+ code in the Workbench, and presents workarounds and solutions for special cases you might encounter.

"WORKSPACE IN USE" ERROR

Occasionally, when you start the Spotfire S+ Workbench, you might see an error that the workspace is already in use when you have not been running a Workbench session.

This problem occurs when you switch computers or versions of UNIX, and you have changes to absolute paths to a given directory.

1. Check your computer to ensure that the path listed in the **Workspace Selection** dialog exists.
2. After you set the appropriate path to an existing workspace, if the problem persists, check for a **.lock** file in the **WORKSPACE/.metadata** directory. Delete this file.
3. If you do not find a **.lock** file, check the running processes to see if old Eclipse processes are running that point to the workspace. End the processes and try re-starting the Spotfire S+ Workbench.

WORKING WITH CALLS TO SPOTFIRE S+ GUI FUNCTIONS

While you are working with Spotfire S+, you might encounter libraries or sample code that include calls to Spotfire S+ GUI functions. For example, the **nSurvival** library includes calls to `guiCreate` and `guiRemove` functions in their `.First.lib` and `.Last.lib` objects, respectively.

To solve this problem, in `.First.lib` and `.Last.lib` functions, wrap the code that creates and removes Windows GUI elements in conditional statements. For example:

```
if(interactive() && platform() == "WIN386" &&
getenv("S_ECLIPSE") == "") {
##...Code that creates or removes Windows GUI elements...##
}
```

VIEW IS NOT VISIBLE

If you accidentally close a view, or if the view you want to see is not visible, on the **Windows ► Show View** menu, select the view to display. If the view to display is not on this list, click **Other** to display the **Show View** dialog, and then select the folder, and then the view to display.

DEBUGGING USING THE RUN BUTTON

When you use the **Run** button to invoke a debug session rather than using the **Console**, and you come to the last expression and click **Step**, **Step In**, or **Step Out**, you can end up in internal Spotfire S+ functions that are called by your code.

This behavior occurs because any time you click **Run**, the expression that Spotfire S+ runs is wrapped in a complex S expression designed to capture parse errors, syntax errors, and so on.

To avoid finding yourself in this internal code, run the function by typing it in the **Console**.

SUBCLIPSE ADD-IN ERROR WITH WORKBENCH

If you are running the Subclipse add-in while you run the Spotfire S+ Workbench in Microsoft Windows®, you might see the following error when you switch between projects:

```
"Unknown problem executing expression (interrupt?)"
```

It is possible to remove this problem by performing an SVN Cleanup operation in the Workbench.

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