Find What You Are Looking For And More in SAS® Enterprise Guide®

Casey Smith, SAS Institute Inc., Cary, NC

ABSTRACT

Are you looking to track changes to your SAS® programs? Do you wish you could easily find errors, warnings, and notes in your SAS logs? Looking for a convenient way to find point-and-click tasks? Want to search your SAS® Enterprise Guide® project? How about a point-and-click way to view SAS system options and SAS macro variables? Or perhaps you want to upload data to the SAS® LASR™ Analytics Server, view SAS® Visual Analytics reports, or run SAS® Studio tasks, all from within SAS Enterprise Guide? You can find these capabilities and more in SAS Enterprise Guide. Knowing what tools are at your disposal and how to use them will put you a step ahead of the rest. Come learn about some of the newer features in SAS Enterprise Guide 7.1 and how you can leverage them in your work.

INTRODUCTION

SAS Enterprise Guide has long provided an intuitive project-based programming and point-and-click interface to SAS. SAS Enterprise Guide includes an intelligent Program Editor, querying capabilities, repeatable process flows, stored process creation and consumption, and a multitude of other features.

So, what else *are* you looking for and how would we know? Thankfully, customers continue to provide useful feedback on what they would like to see in SAS Enterprise Guide. Customer feedback directly influences *what* things we work on, as well as *how* we make things work. Almost all of the new features this paper covers were requested or influenced by customers. This paper introduces you to most of the new features and enhancements in SAS Enterprise Guide 7.1. These features are categorized into the following four themes:

- Programmer Productivity

- Business Analyst Enhancements

- Project Organization and Navigation Enhancements

- SAS Visual Analytics Integration

PROGRAMMER PRODUCTIVITY

Programmers are inspired by the challenge and the power to solve problems in easier ways. What programmers expect of themselves they also expect of their tools. Toward this end, we continue to add productivity features and enhancements to the rich SAS Enterprise Guide programming environment, so programmers can focus on the real challenges.

Here are the primary new and enhanced programming features in SAS Enterprise Guide 7.1:

- Program History

- Summary View of the Project Log

- Smart Highlighting in the Program Editor

- SAS Macro Variable Viewer

- SAS System Options Viewer

- Custom Code Feature Integrated Directly Into The Task Code Preview Window

- Expanding Macros in Code Analyzer

The Programming Productivity section of this paper explores each of these features.
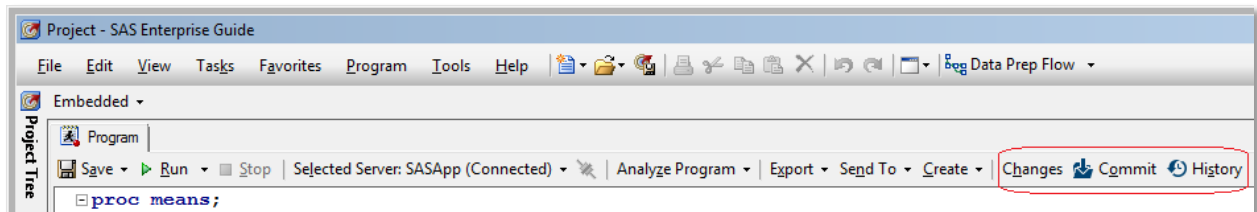
PROGRAM HISTORY

SAS Enterprise Guide now has source control built in!

Source control is a vital tool for programmers. The use of source control in programming is like the use of anchors when rock climbing. If you choose not to use them and things go bad, you might have a long way to fall. Whereas, with a committed version (as with an anchor) you have a relatively close point to which you can always safely get back.

SAS Enterprise Guide 7.1 introduced the program history feature to allow programmers to manage changes to their SAS programs in a more structured way. Program history enables you to commit changes, view the history, compare versions, and even revert to older versions of a program.

As shown in Display 1, the new **Changes**, **Commit**, and **History** buttons are available on the Program toolbar.

Display 1: Program History Features on the Program Toolbar

The **Changes** button enables you to preview your changes. The **Commit** button enables you to commit your changes. The **History** button enables you to view the history for this program.

Preview Changes

Click the **Changes** button to see what changes you have made to your program since you last committed the program. This feature is a convenient way to preview your changes prior to committing them.

Display 2 shows an example of changes being previewed in the built-in file comparison tool.

Note: You can specify a third-party file comparison tool by selecting **Tools > Options > File Comparison**. Then this third-party file comparison tool is used to display any changes here and for the other comparison capabilities in the program history feature.
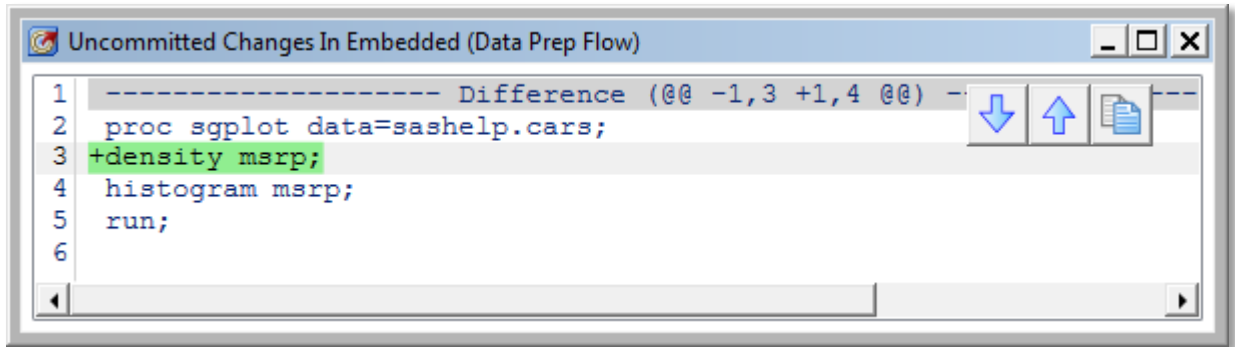
Display 2: Preview Changes Using the Built-in Comparison Tool

Commit Changes

After you make your changes to one or more programs, it is time to commit those changes. As a best practice, commit changes at meaningful work boundaries.

The **Commit** button on the program toolbar opens a dialog box (see Display 3) that allows you to store the current state of your program as a new version. The Commit Changes dialog box displays all the programs in your project that have uncommitted changes. This dialog box also shows you the changes for the currently selected program. Select the programs you wish to commit, add a description that briefly describes your changes, and click **Commit**. You can also reset your changes from the Commit Changes dialog box. The reset functionality restores the selected programs to their prior version.
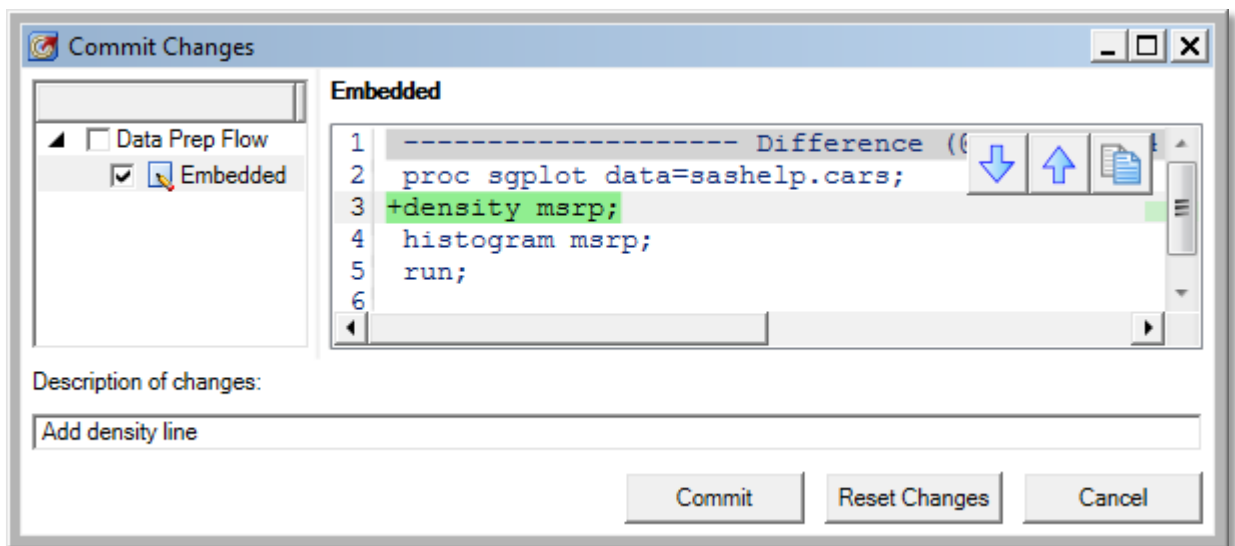
**Display 3: Committing Changes to a Program**

View Program History

Being able to view the history of a program (the when, what, and by whom changes were made) is extremely useful. This history provides anchor points, so you can both see how your program evolved over time, as well as the ability to get back to a previous point if necessary.

Click the **History** button on the **Program** toolbar to view a program's history. Every committed version of the program is listed in the History dialog box (see Display 4). The History dialog box shows you the version, date, author, and description of each commit. This dialog box also shows you the code for that version, the changes between that version and the prior version, as well as the Blame feature. From the

History dialog box, you can compare any two versions, compare a specific version with the code currently in the editor, as well as revert to an older version.

Display 4 shows the history for a sample program. As you can see, this program has been edited by two authors.
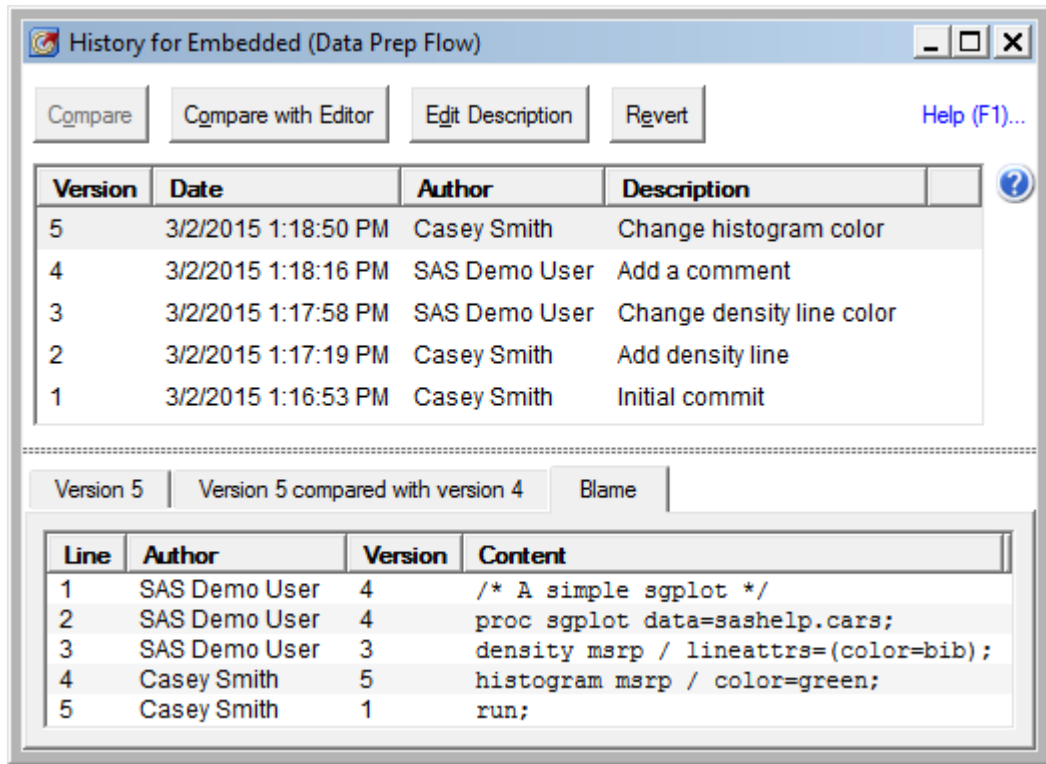
Display 4: Program History and the Blame Tab

In addition to viewing the history for a single program, you can view all commits in the project's embedded program history by using the **Program > View all program history** menu.

Blame

The Blame feature in the Program History dialog box (see Display 4) shows you who last edited each line of a program and the version in which each line was last edited. This feature is particularly useful when you are tracking down the history of a specific line or region of code. It can help you find the individual author and the commit responsible for a specific change -- maybe not just to blame, but perhaps to credit!

The program history feature offers both "baked-in" source control for embedded SAS programs as well as source control integration for externally referenced SAS programs stored in external Git repositories. It is important to note that the program history for embedded SAS programs is also embedded in the SAS Enterprise Guide project. Whereas, the history for externally referenced SAS programs is stored in the external Git repository.

For more in-depth information about the Program History feature, see "Check It Out! Versioning in SAS® Enterprise Guide®" in the References section.
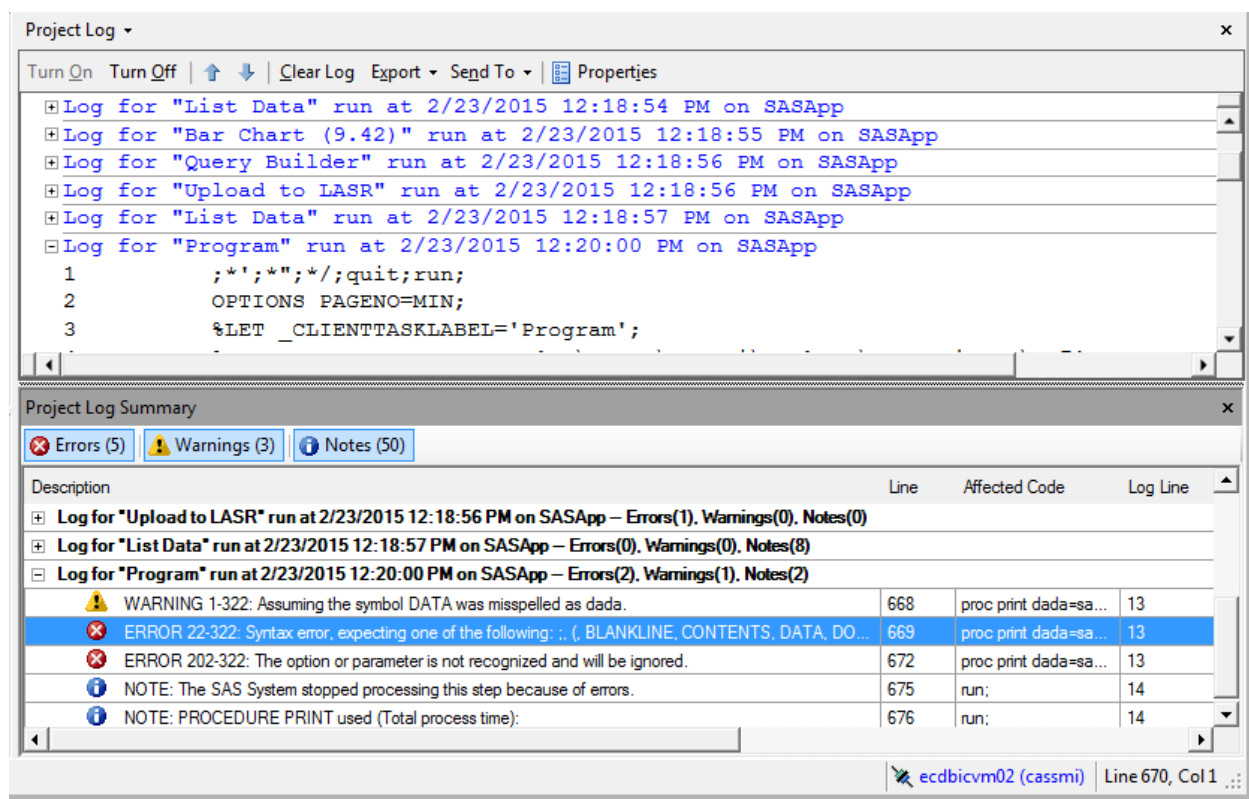
SUMMARY VIEW OF THE PROJECT LOG

It is common practice for SAS programmers to look for errors, warnings, and notes in their logs. The Log Summary view (which was added in SAS Enterprise Guide 6.1) is a very convenient feature for seeing and navigating the errors, warnings, and notes within your logs. Now this feature also works with the project log!

The summary view of the project log functions almost identically to the Log Summary view. The primary difference is that the summary view for the project log summarizes multiple logs, whereas the Log Summary view summarizes one log.

When turned on, the project log stores each log that is generated within your project. The summary view of the project log shows a summary of the errors, warnings, and notes within each of the logs in your project log. The summary view also shows the total errors, warnings, and notes within all of the logs. The logs and their summaries are in collapsible regions, which makes it easier for you to focus on areas of interest. You can toggle the **Errors**, **Warnings**, or **Notes** buttons to see only the ones you are interested in. Also, when you select an error, warning, or note in the summary view, SAS Enterprise Guide takes you to the location of that error, warning, or note within the log. You can even navigate to the program source. To view the online Help, right-click on the error, warning, or note.

Display 5 shows the summary view below the project log.

Display 5: Summary View of the Project Log

SMART HIGHLIGHTING IN THE PROGRAM EDITOR

When you are looking for text within a SAS program, smart highlighting is a convenient feature that allows you to easily locate every instance of a given word. Smart highlighting is activated when you select a word either manually or by using the Find dialog box. When a word is selected, every instance of that word is highlighted. This highlighting is particularly convenient for finding and following multiple references.

Display 6 shows a macro variable that has been smart highlighted. The highlighting makes it easy to see everywhere the macro variable is used in the program.
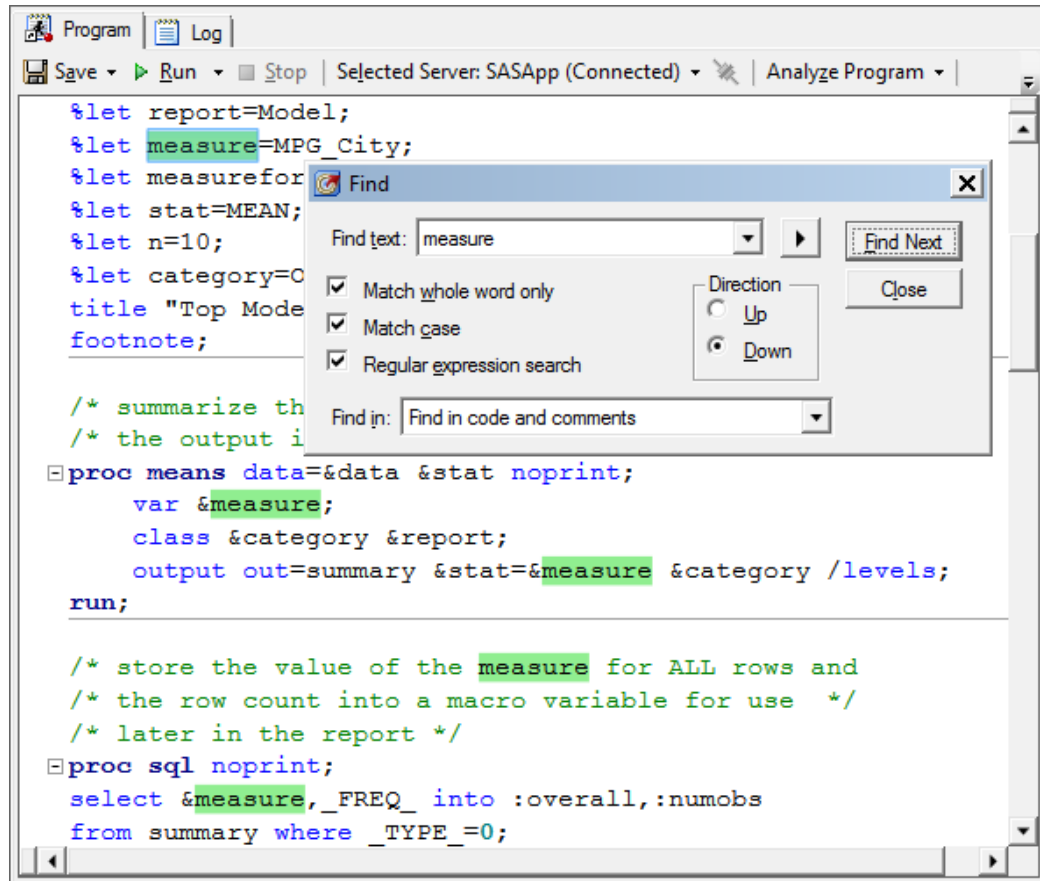
Display 6: Smart Highlighting in the SAS Enterprise Guide Program Editor

SAS MACRO VARIABLE VIEWER

When you are looking to view the current values of any or all the SAS macro variables defined in your workspace session, look no farther than the SAS Macro Variable Viewer.

In addition to displaying all the SAS macro variables and their values, the SAS Macro Variable Viewer provides a handy **Macro expression quick view** that immediately evaluates macro functions and resolves macro variables.

Display 7 shows the SAS Macro Variable Viewer and an example of an evaluated macro expression in the quick view.
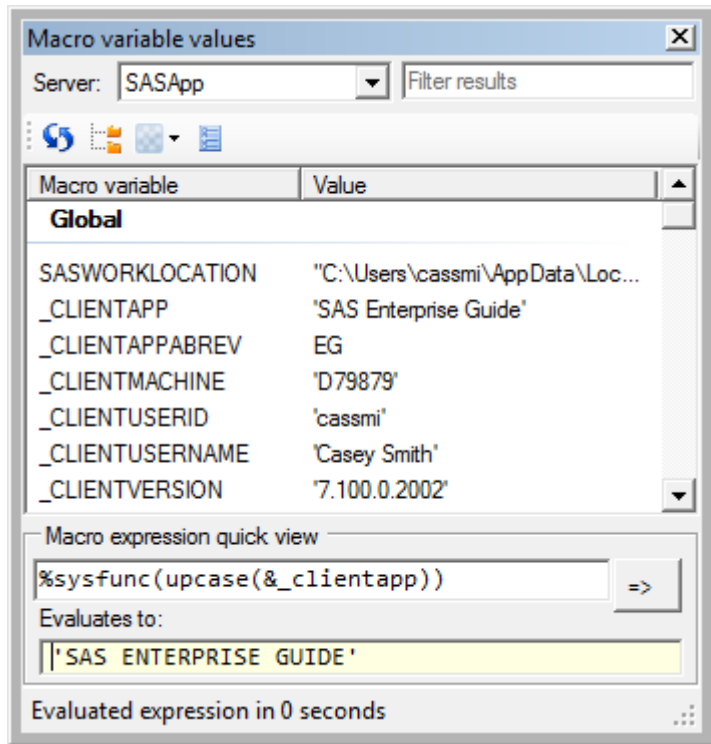
Display 7: SAS Macro Variable Viewer

While submitting `%put _all_;` and scanning the log will get the job done, it is nowhere near as user-friendly as the SAS Macro Variable Viewer. The SAS Macro Variable Viewer is accessed from the **Tools** menu and offers the following advantages:
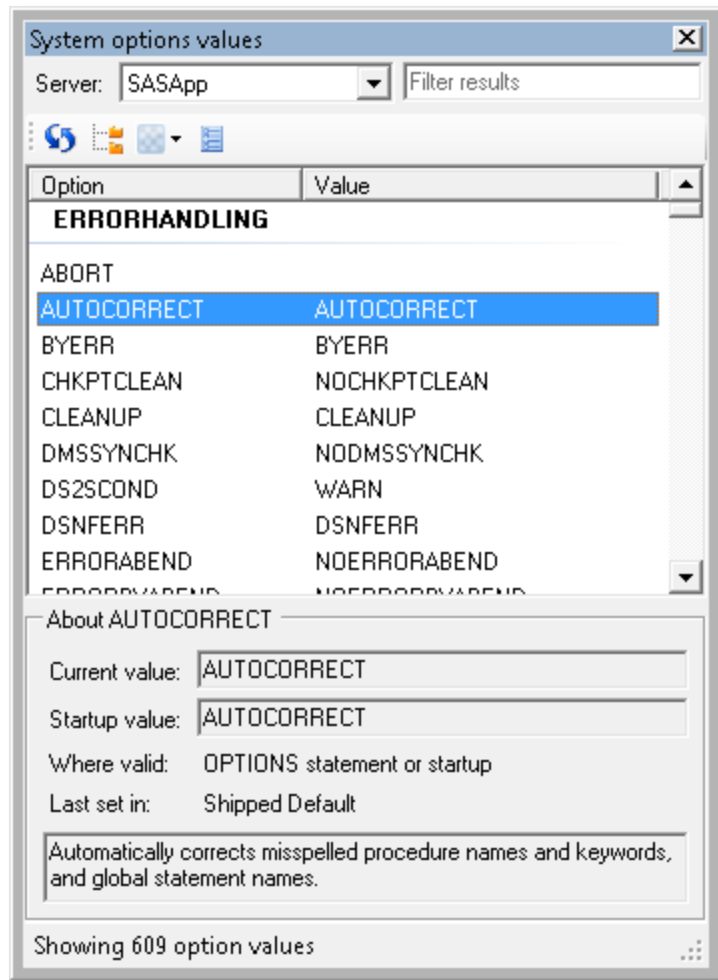
- always-visible window
- switch between servers
- one-click refresh
- view by scope or as a list
- filter and sort results
- set window transparency
- copy macro variables as %LET statements
- macro expression quick view

The SAS Macro Variable Viewer began as a custom task written by Chris Hemedinger, and we decided to incorporate it in SAS Enterprise Guide. See Chris' blog entry in the References section for more information about this tool.

SAS SYSTEM OPTIONS VIEWER

If you are looking to view the current SAS system options for your server, meet the SAS System Options Viewer!

Display 8 shows the SAS System Options Viewer.

Display 8: SAS System Options Viewer

The SAS System Options Viewer is to SAS system options as the SAS Macro Variable Viewer is to SAS macro variables. In addition to both tools being located on the **Tools** menu, you will notice that the user-interface and the functionality are very similar:

- always-visible window
- switch between servers
- one-click refresh
- view by group or as a straight list
- filter and sort results
- set window transparency
- show option details

While submitting `proc options; run;` and scanning the log will eventually get the job done, it is nowhere near as convenient and user-friendly as the SAS System Options Viewer.

The SAS System Options Viewer also began as a custom task written by Chris Hemedinger,and we decided to include it in SAS Enterprise Guide. See Chris' blog entry in the References section for more information about this tool.

CUSTOM CODE FEATURE INTEGRATED DIRECTLY INTO THE TASK CODE PREVIEW WINDOW

Many tasks in SAS Enterprise Guide allow you to insert custom code at select points in the task-generated code. This feature enables you to customize the code, yet maintain the point-and-click benefits of the task (rather than simply copying the code to a new program and being fully responsible for all the code). SAS Enterprise Guide 7.1 enhanced this feature by allowing custom code to be entered directly into the Code Preview for Task window. In addition to being much more intuitive and user-friendly, it now uses the Program Editor features, such as syntax coloring, suggestion, autocompletion, integrated help, and so on.

Display 9 shows custom code being added to the task-generated code in the Code Preview for Task window.
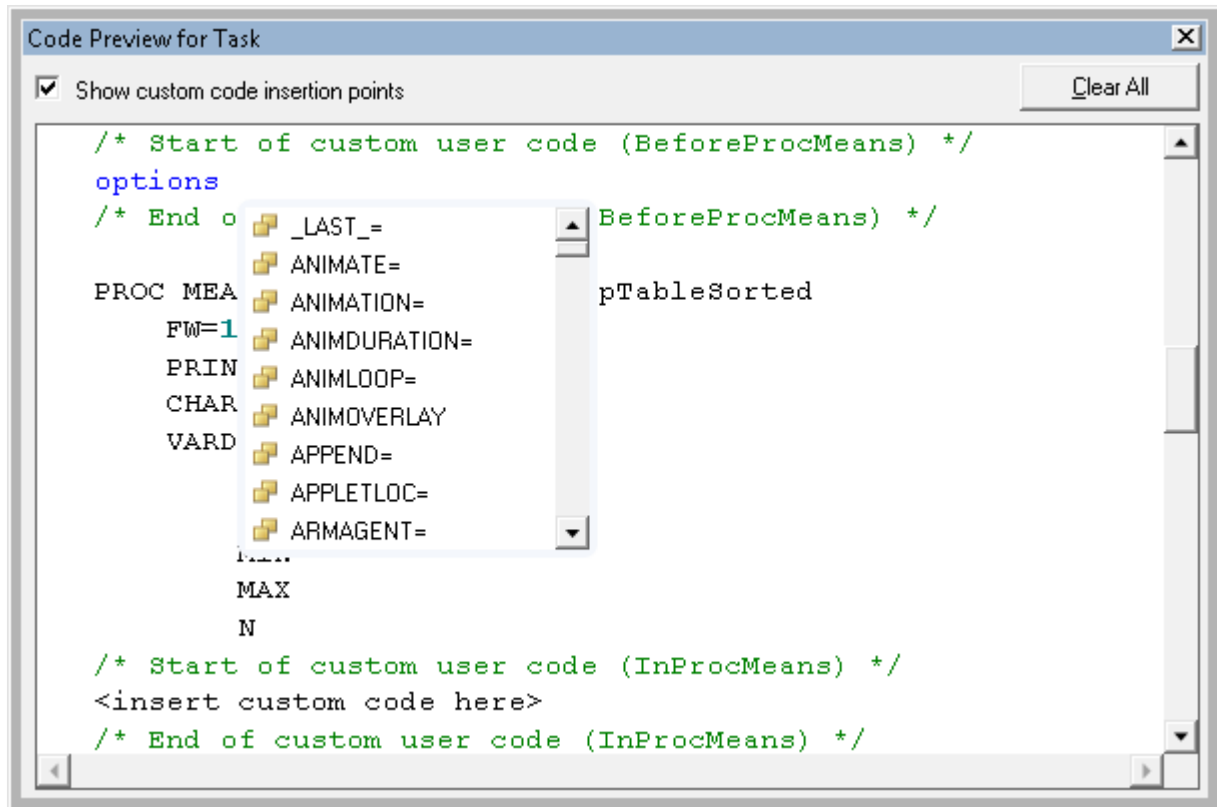
Display 9: Entering Custom Task Code Directly in the Code Preview for Task Window

To enter custom task code, click the **Preview code** button in the task. When the Code Preview for Task window opens, select **Show custom code insertion points**, and start entering your code in one of the custom code regions. (You will not be able to edit outside of the custom code regions.) Click the **Clear All** button to clear all custom code.

EXPANDING MACROS IN CODE ANALYZER

The Analyze Program feature in SAS Enterprise Guide processes and identifies the step boundaries, inputs, and outputs within your program. A process flow can then be created from this information. The Analyze Program feature is a useful way to visualize the component parts of your program.

Starting in SAS Enterprise Guide 7.1, the Analyze Program feature can now expand macro functions. Select **Expand macros** to use this option. In prior releases, macro functions would be interpreted as a single step boundary regardless of how the macro functions resolve.

BUSINESS ANALYST ENHANCEMENTS

In addition to being a development environment for SAS programmers, SAS Enterprise Guide serves business analysts with its point-and-click querying capabilities, seamless access to many data sources, and point-and-click tasks.

The following point-and-click features have been added in SAS Enterprise Guide 7.1:

- SAS Studio tasks integration

- Task Browser

- Start the Query Builder from Multiple Data Sets

- Keep Query Builder Results in the Database

SAS STUDIO TASKS INTEGRATION

A number of new point-and-click tasks are shipped with SAS Studio. When SAS Studio is in your environment, SAS Enterprise Guide is also able to run these SAS Studio tasks. This integration enables you to leverage the same tasks from multiple applications.

SAS Studio tasks are visually unique, but they run very similar to the traditional tasks in SAS Enterprise Guide. They provide a point-and-click user interface that generates SAS code based on the options the user specifies. SAS Enterprise Guide then executes the task-generated SAS code on a SAS Workspace Server. The results are then returned to SAS Enterprise Guide and rendered.

Display 10 shows the Box Plot task from SAS Studio and a preview of the generated SAS code.
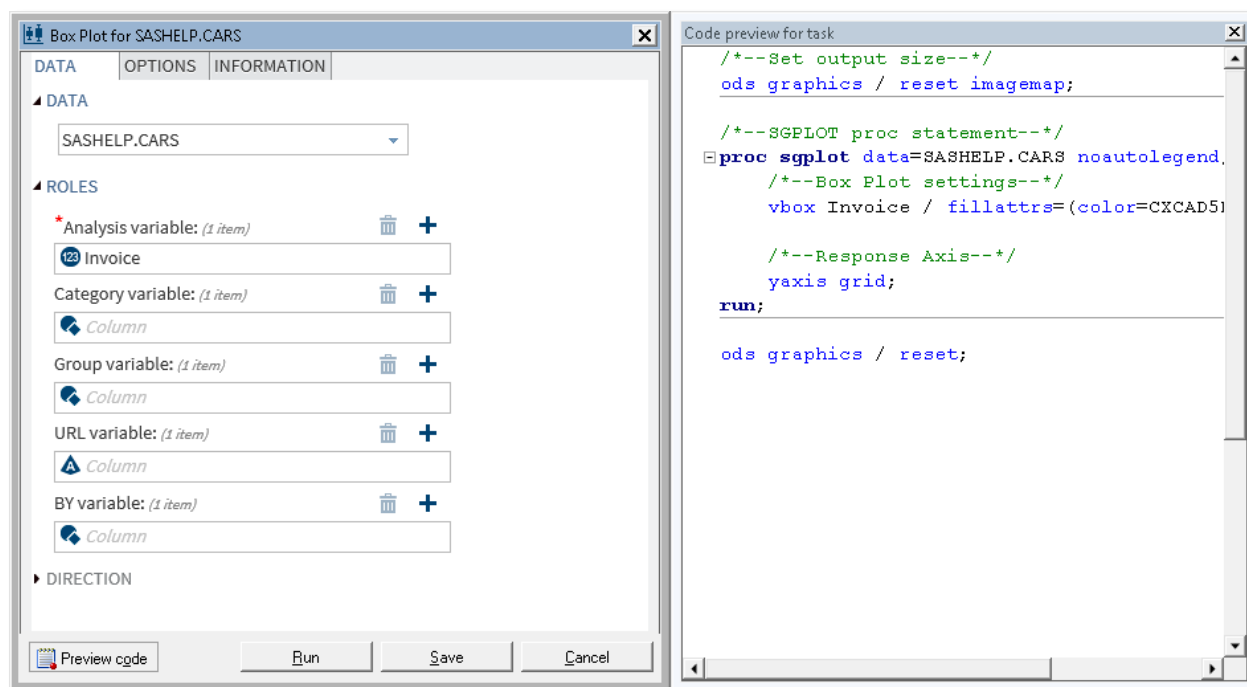
Display 10: SAS Studio Task and Code Preview

SAS Studio tasks are defined by easy-to-read XML. Because the task uses easy-to-read XML, it is relatively easy for you to create your own SAS Studio tasks. These user-written SAS Studio tasks are not currently supported in SAS Enterprise Guide 7.1, but we expect them to be supported in a future release.
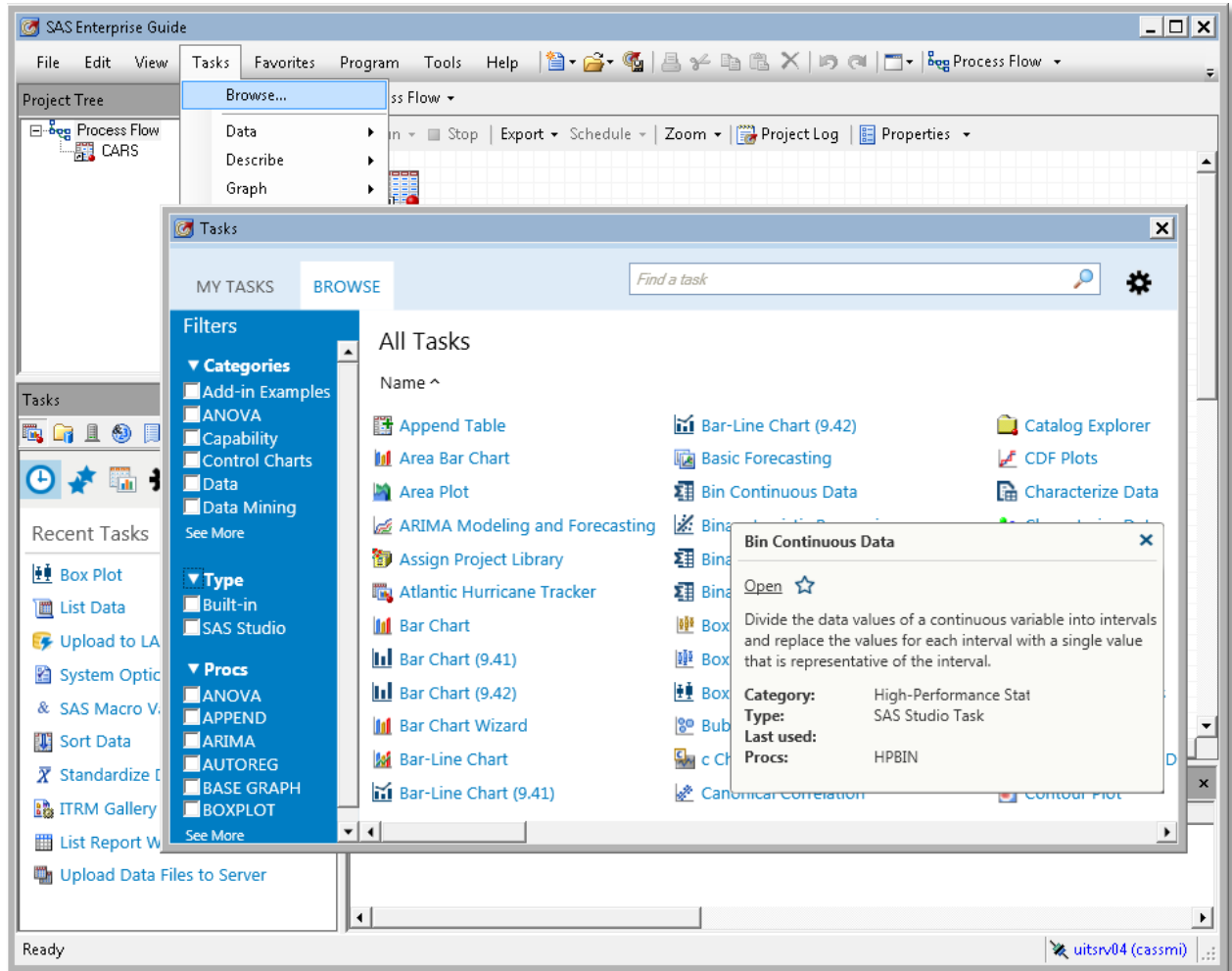
TASK BROWSER

The addition of SAS Studio tasks was the tipping point at which we needed a new way to find and organize tasks. SAS Enterprise Guide has over 90 built-in tasks, which were cumbersome to navigate with toolbar menus alone.

As a result, we added a new task browser that offers a number of advantages:

- a list of recent tasks for convenient access to what you have run lately.

- a list of favorite tasks for convenient access to your preferred tasks.

- a search field for quick discovery of tasks by keyword.

- the ability to filter tasks by category, type, or procedure.

- the abiliity to import and export task templates for sharing task templates.

- quick tool-tip information about a task when you position your mouse pointer over the task name

- a docked tool window for quick task access. This docked view is in addition to the Tasks dialog box that provides more real-estate browsing. The docked view has the same functionality as the full Tasks dialog box, just in a smaller form.

Display 11 shows the full task browser. To open the task browser, select **Tasks**->**Browse**. In the bottom left of Display 11, you see a docked version of the task browser tool, which shows a list of recently run tasks.

Display 11: Task Browser Dialog Box and Docked View

The new task browser makes it much easier to find tasks that you want to run.

START THE QUERY BUILDER FROM MULTIPLE DATA SETS

As a nice convenience, you can now launch the Query Builder with multiple data sets pre-selected. In previous releases, you had to add additional tables one at a time. Now, simply select the tables you want to join or query. Then start the Query Builder from the **Tasks** menu, task browser, or pop-up menu. When the Query Builder opens, it is populated with each table. This feature is particularly useful when you are joining multiple tables.

Display 12 shows launching the Query Builder with multiple data sets selected.
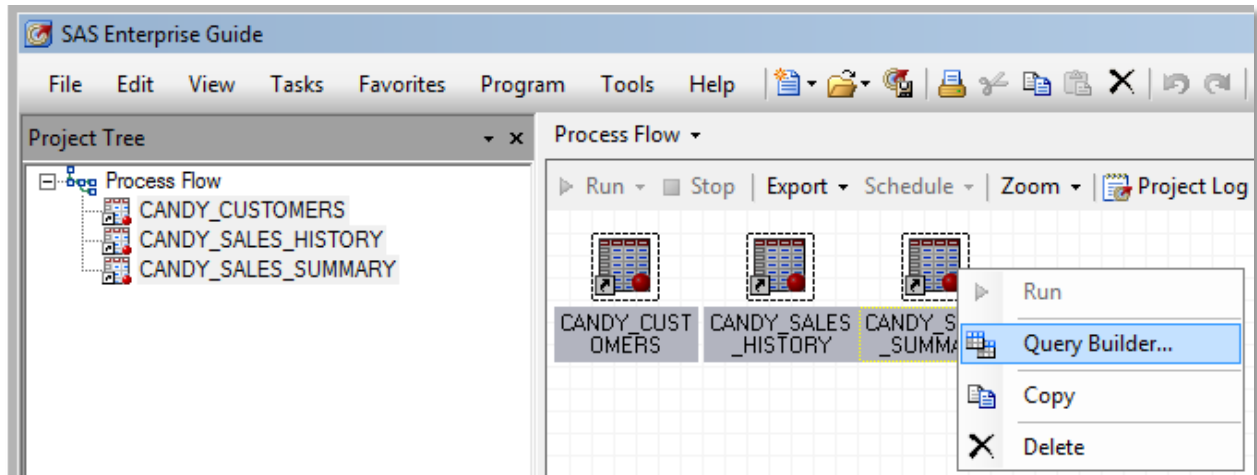
Display 12: Starting the Query Builder with Multiple Data Sets

KEEP QUERY BUILDER RESULTS IN THE DATABASE

The Query Builder in SAS Enterprise Guide supports both implicit and explicit pass-through when working with Database Management System (DBMS) data.
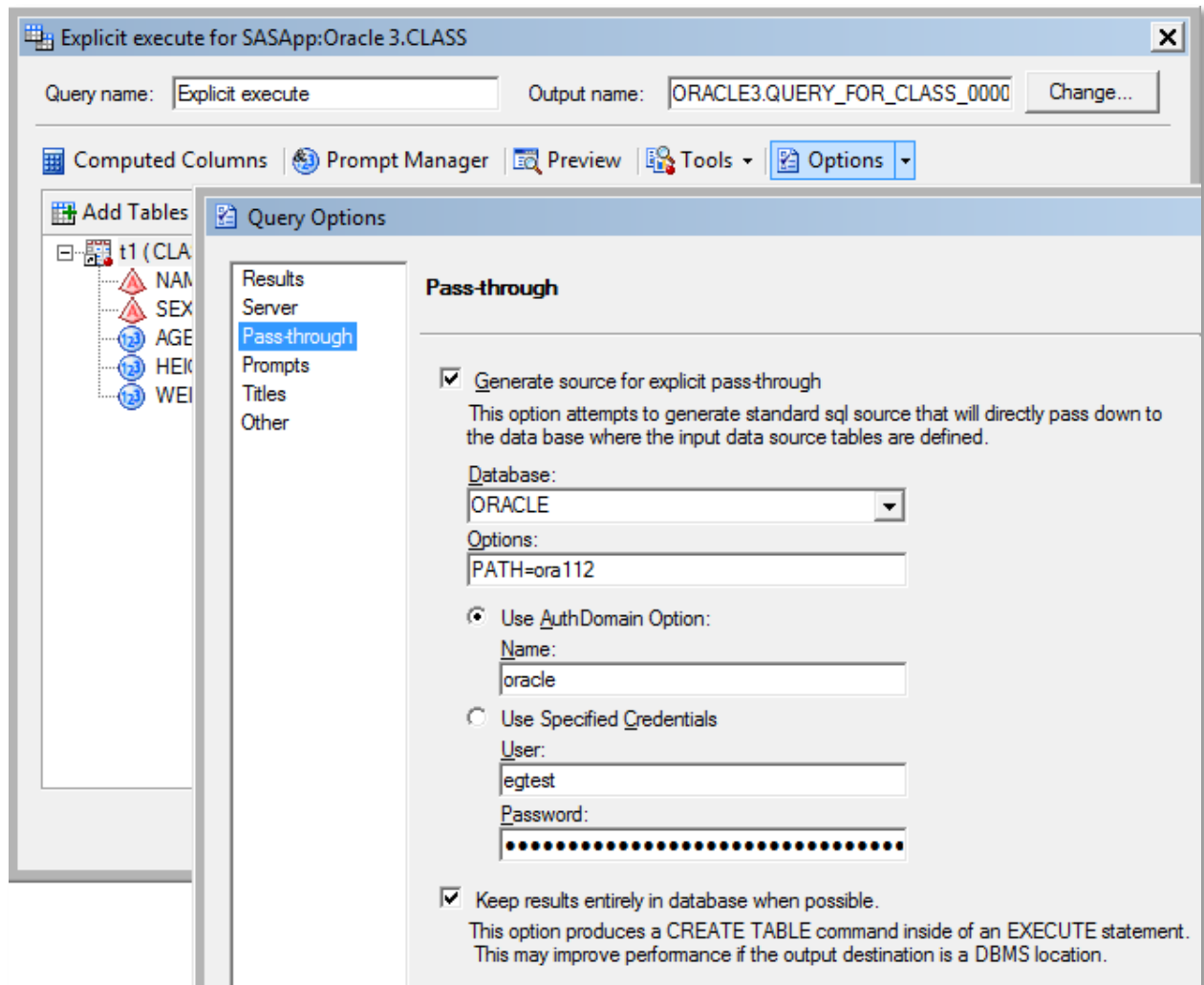
The Query Builder uses implicit pass-through by default. For implicit pass-through, the Query Builder generates and submits standard SQL code that is recognized by SAS. The SAS/ACCESS engine then attempts to convert the query into one or more database-specific queries that are passed to and executed in the database.

To use explicit pass-through, select the **Generate source for explicit pass-through** option in the Query Options dialog box (see Display 13). This option instructs the Query Builder to generate standard generic SQL that is passed directly to the database (rather than being interpreted and translated by the SAS/ACCESS layer, as in implicit pass-through).

Because the work is done in the database (rather than in SAS which requires pulling in the data), implicit and explicit pass-through allow queries to execute more efficiently . However, for both types of pass-through, the *results* are always returned to SAS.

SAS Enterprise Guide now has the ability to explicitly execute the query in the database *and* leave the output data results in the database. This feature can have a positive performance impact, particularly if your query returns large results. To use this feature, select the **Keep results entirely in database when possible** option in the Query Options dialog box (see Display 13).

Note: This feature is available only when your input data and output data are using the same DBMS library.

Display 13: Query Options Showing Explicit Pass-through and Keeping the Results in Database

Here is example code generated by the Query Builder when using explicit pass-through and the **Keep results entirely in database when possible** option is not selected:

```
PROC SQL;
    CONNECT TO ORACLE as con1
      (PATH=ora112 authdomain=oracle);

    CREATE TABLE WORK.QUERY_FOR_CLASS_0000 AS
    SELECT *                                  2. Results returned to SAS
       FROM CONNECTION TO con1 (
       SELECT "t1"."AGE"
          FROM "CLASS" "t1"                   1. Executed in database
          WHERE "t1"."AGE" < 14);

    DISCONNECT FROM con1;
QUIT;
```

Notice that the query is executed in the database, but the results of the query are returned to SAS to be written to an output table.

Here is example code generated by the Query Builder when using explicit pass-through and the **Keep results entirely in database when possible** option is selected:

```
PROC SQL;
    CONNECT TO ORACLE as con1
     (PATH=ora112 authdomain=oracle);

  EXECUTE (
    CREATE TABLE QUERY_FOR_CLASS_0000 AS
        SELECT "t1"."AGE"
            FROM "CLASS" "t1"
            WHERE "t1"."AGE" < 14) by con1;

    DISCONNECT FROM con1;
  QUIT;
```

Executed in and output created in database (no data returned to SAS)

Everything within the EXECUTE statement is run directly in the database. Therefore, both the execution of the query and the creation of the output table occur in the database. The output data stays in the database, rather than returning to SAS.

## PROJECT ORGANIZATION AND NAVIGATION ENHANCEMENTS

One of the biggest advantages of SAS Enterprise Guide is the ability to manage and organize your work in projects. Additional conveniences have been added in this area to help you more quickly find what you are looking for as well as to reuse existing work. Specifically, we have added support for Favorites, Project Search, and the ability to Copy and Paste Branches or Entire Process Flows.

FAVORITES

Chances are, once you find something, you will want to find it again. SAS Enterprise Guide allows you to define your favorite items, so they can be easily accessed again. (Currently, favorites are limited to tasks, stored processes, and reports, but we are adding support for additional items in future releases.) Favorites are accessed and managed from the **Favorites** menu. In addition, your favorite and recent tasks are surfaced in the task browser, both in the full and the docked view.

To make an item a favorite, right-click the item in a process flow or the project tree and select **Add to Favorites**. (This option is available for items that can be added to your list of favorites.) You can also indicate a task is a favorite by clicking the star in the flyout window in the task browser.

Display 14 shows how to make a stored process a favorite and the locations that favorites appear. In the task browser, only task favorites are shown in the **Favorites** section.
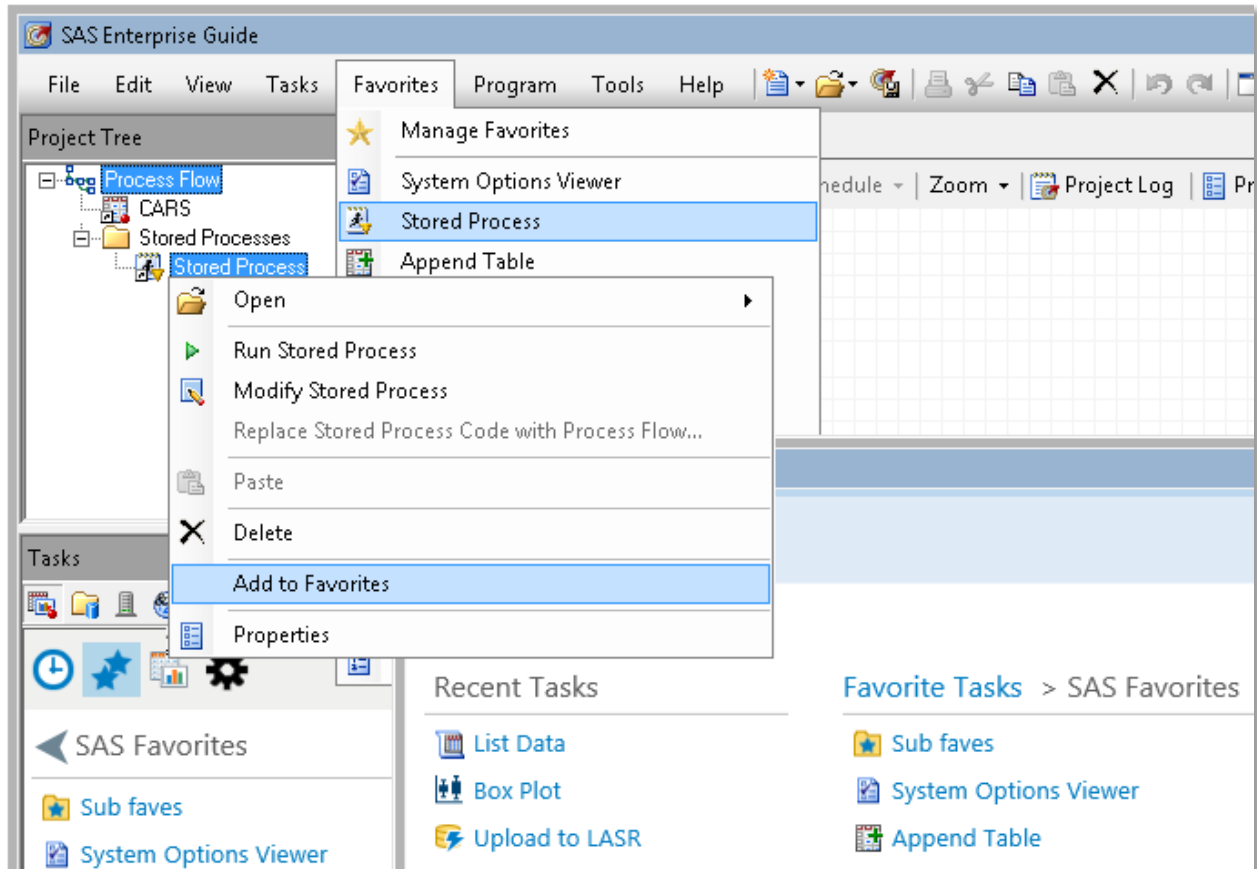
**Display 14: Specifying a Favorite Item and Where Favorites Are Surfaced**

PROJECT SEARCH

SAS Enterprise Guide now provides a familiar and convenient search field in the top right corner of the application, so you can easily find elements within your project. This search feature is particularly useful when working with a large project with many process flows and elements.

The search results can be filtered by type to further help you find the elements that you are looking for.

Display 15 shows the search field and an example of search results.
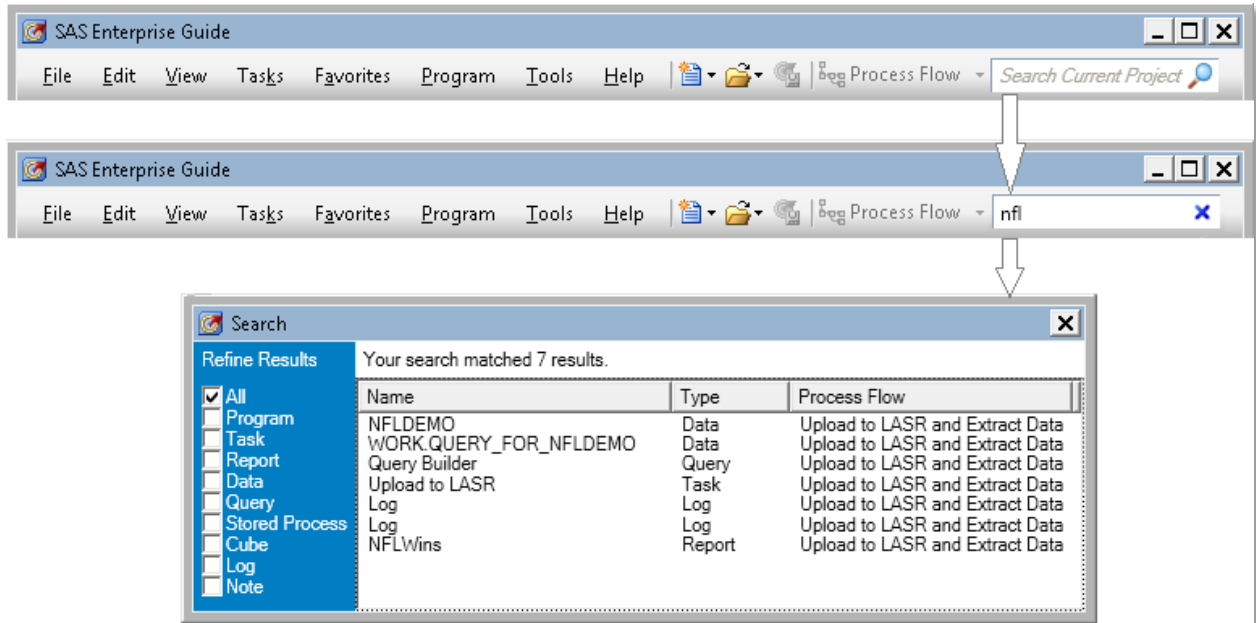
Display 15: Searching for Elements within a Project

This new project search feature is certainly the one that will most literally help you "find what you are looking for"!

COPY AND PASTE BRANCHES OR ENTIRE PROCESS FLOWS

You have always had the ability to copy and paste most individual items within a SAS Enterprise Guide project. However, copying and pasting multiple items, such as a branch in a process flow, was not fully supported. Copying and pasting entire process flows was not supported at all.

SAS Enterprise Guide now supports copying and pasting any items, branches, or even entire process flows. It also does a much better job of maintaining relationships between copied items when pasted. You can paste within the same SAS Enterprise Guide project or to another project.

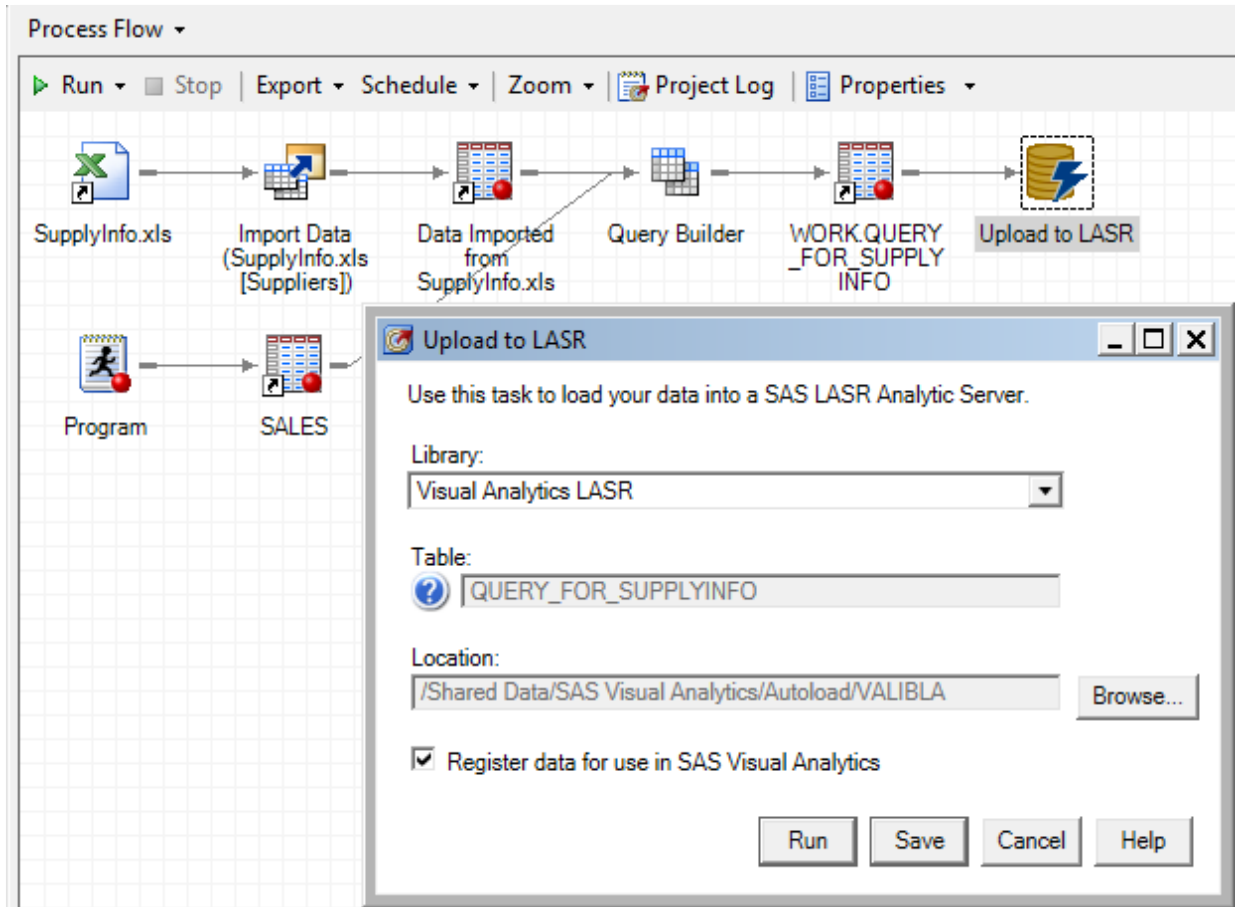## SAS VISUAL ANALYTICS INTEGRATION

SAS Visual Analytics provides easy-to-use advanced data visualization tools, powered by the in-memory processing of the SAS LASR Analytic Server. SAS Enterprise Guide now makes it easier to interoperate with SAS Visual Analytics. Specifically, SAS Enterprise Guide added the ability to Upload Data to a SAS LASR Analytic Server and Extract Data from A SAS Visual Analytics Report.

UPLOAD DATA TO A SAS LASR ANALYTIC SERVER

What if you are looking to share your data results with SAS Visual Analytics users for further interactive exploration and report generation? SAS Enterprise Guide provides an Upload to LASR task that makes it very easy to load your data to a SAS LASR Analytic Server.

In addition to copying the data to the SAS LASR Analytic Server, the Upload to LASR task registers the table for immediate use in SAS Visual Analytics. The Upload to LASR task can also be run as a repeatable step in a process flow.

Display 16 shows the Upload to LASR task being used to upload the data output of a process flow to a SAS LASR Analytic Server library.

**Display 16: Upload Data to a SAS LASR Analytic Server**

Note: Your SAS administrator will need to give you appropriate permissions to create data in a LASR library.

EXTRACT DATA FROM A SAS VISUAL ANALYTICS REPORT

You can view and interact (for example, data brushing, filtering, and so on) with SAS Visual Analytics reports in SAS Enterprise Guide. Starting in SAS Enterprise Guide 7.1, you now have the ability to extract the summarized data that was used to create a SAS Visual Analytics report. The data is extracted into a SAS data set and added to your project. This feature is useful if you want to do additional processing on the pre-aggregated data behind a report, rather than starting from the source data.

The Extract Data dialog box provides options that allow you to specify the rows to extract, the columns to extract, and whether you want formatted or raw data returned.

Display 17 shows data being extracted from a SAS Visual Analytics report into a SAS data set in the project.
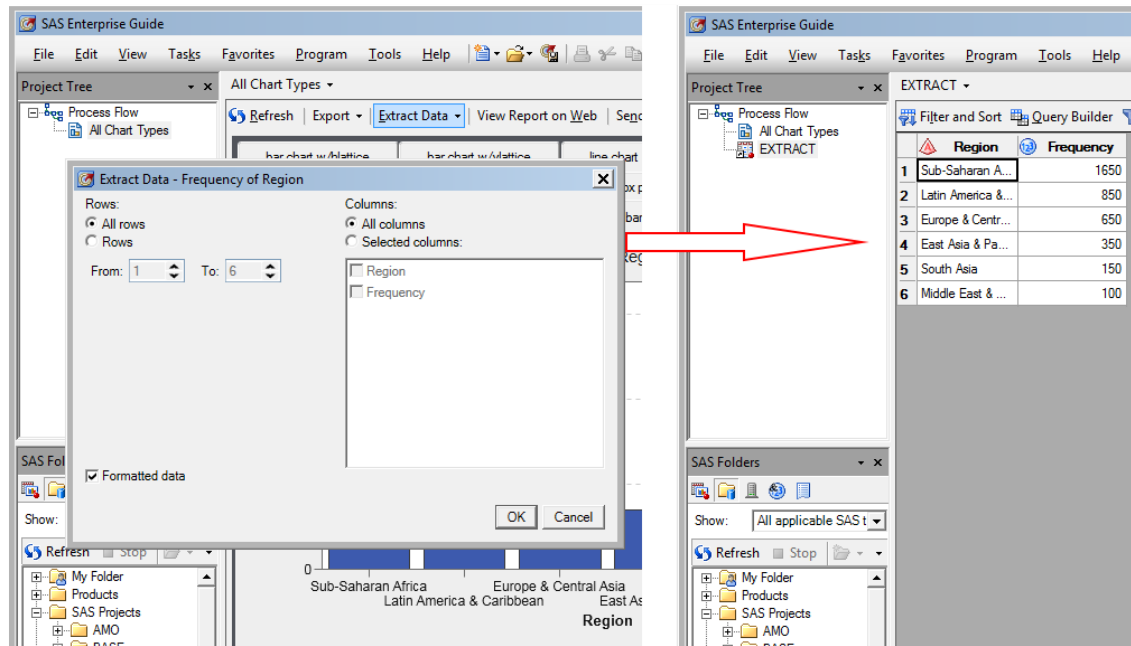
Display 17: Extracting Data from a SAS Visual Analytics Report

CONCLUSION

SAS Enterprise Guide continues to add features and enhancements to help SAS programmers, business analysts, and statisticians use SAS efficiently to solve complex problems. We hope you find most of what you are looking for in SAS Enterprise Guide and that you continue to ask us for the rest!

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CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author:

Casey Smith
100 SAS Campus Dr
Cary, NC 27513
SAS Institute Inc.
casey.smith@sas.com
www.sas.com

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