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## Writing Code in SAS® Enterprise Guide®

Susan J. Slaughter, Avocet Solutions, Davis, CA  
Lora D. Delwiche, University of California, Davis, CA

### ABSTRACT

If you are a SAS programmer who has avoided using SAS Enterprise Guide because you think it's only good for point-and-click, then this paper is for you. You may be surprised to learn that SAS Enterprise Guide offers programmers many advantages over Display Manager. We'll show you four different ways to run code, explain how SAS Enterprise Guide can help to organize your work, and discuss issues unique to coding in SAS Enterprise Guide. After reading this paper, you just might decide to make SAS Enterprise Guide your primary coding environment.

### INTRODUCTION

Using SAS Enterprise Guide, you can manipulate data and run reports without ever writing a single line of SAS code. So it's not surprising that many SAS programmers believe that SAS Enterprise Guide is only useful to non-programmers. If you love the SAS language, why would you ever want to use SAS Enterprise Guide?

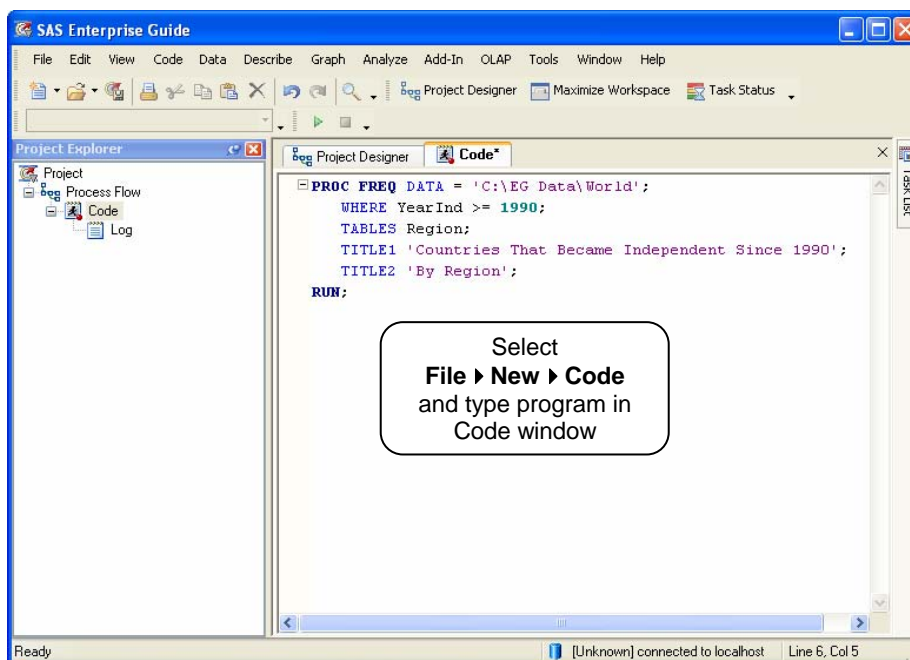
It turns out that there are several reasons why you might want to do just that. SAS Enterprise Guide offers programmers a variety of ways to run code. You can type a program like you do in Display Manager, but you can also use the point-and-click features of SAS Enterprise Guide to generate code that you can then modify. In addition, SAS Enterprise Guide organizes your work into projects making it easy to find your code files, logs, and results; and the process flow diagrams show at a glance how everything in your project fits together.

However, writing programs in SAS Enterprise Guide does require learning a new environment with new windows and a new system for organizing your work. As with any new skill, there is a learning curve. The goal of this paper is to ease that transition by explaining SAS Enterprise Guide from a programmer's perspective.

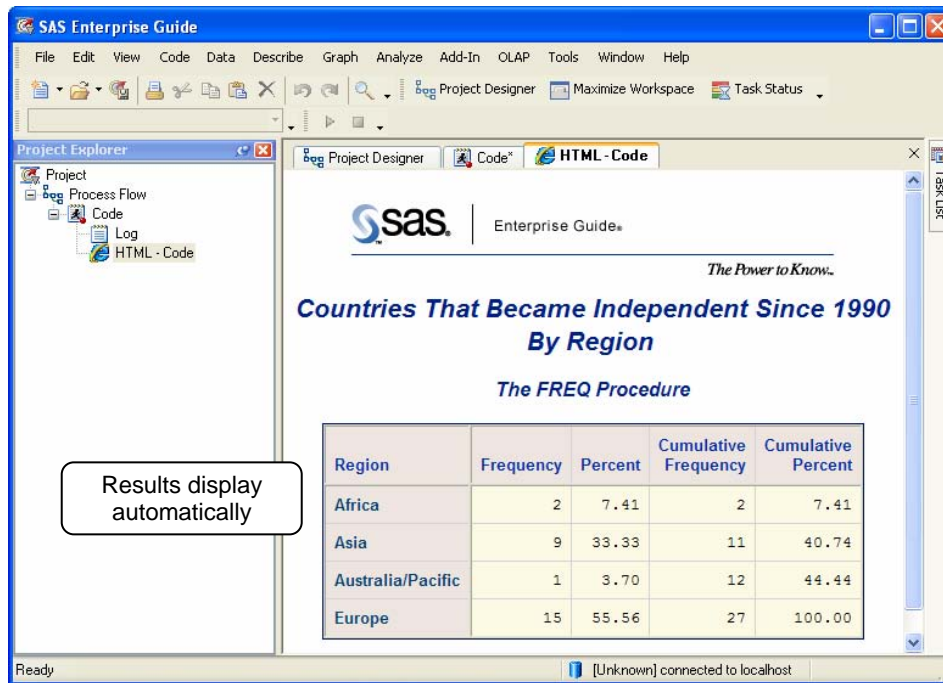
This paper was written using SAS Enterprise Guide 4.1. If you are using another version of SAS Enterprise Guide, you will find some differences in windows and options.

### WRITING AND RUNNING A NEW PROGRAM IN THE CODE WINDOW

To open a Code window where you can type a program, select **File ► New ► Code** from the menu bar. The Code window has a syntax-sensitive editor similar to the one in Display Manager.

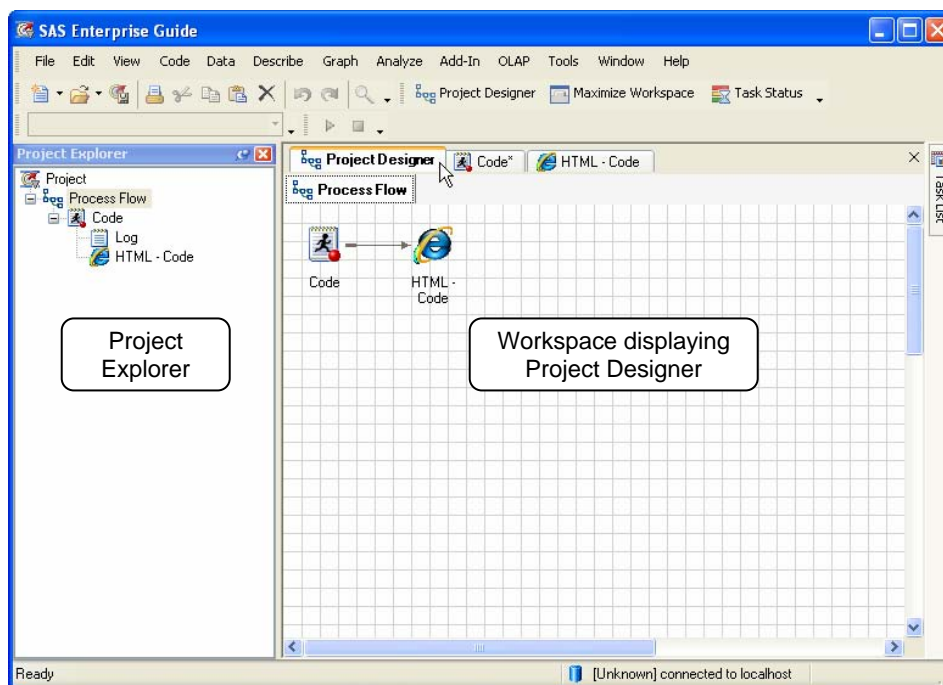


When your code is ready to run, select **Code ▶ Run Code On Local** from the menu bar. SAS Enterprise Guide will submit your code to SAS on your local server (the same machine where you are running SAS Enterprise Guide), and display the results.



## THE PROJECT PARADIGM IN SAS ENTERPRISE GUIDE

We now have a simple project containing code, and results. In SAS Enterprise Guide, all your work is organized into projects. You can only have one project open at a time, but you can have as many projects as you wish. Projects help to organize your work by keeping track of your code, logs, and results.



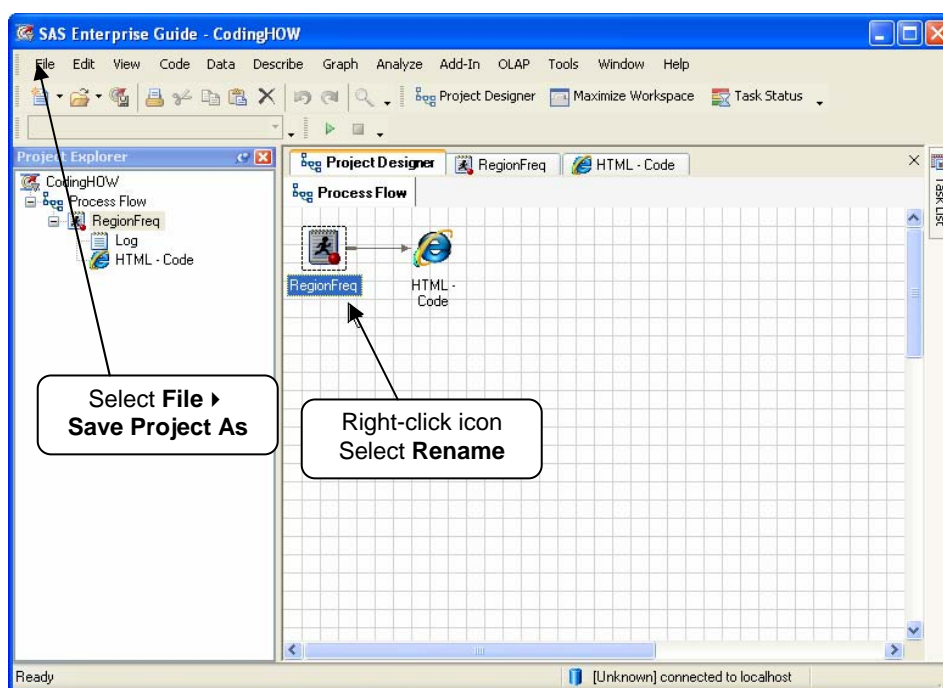
The project is displayed in the Project Explorer on the left and the Project Designer on the right. The space where the Project Designer appears is called the workspace. The Project Designer shares the workspace with many other windows including the Code window and results windows. You can switch between these windows by clicking their tabs at the top of the workspace.

The Project Explorer displays your project in a tree diagram while the Project Designer displays your project in a process flow diagram. Icons representing your code and results appear in both the Project Explorer and Project Designer. However, by default, icons representing log files appear only in the Project Explorer.



## RENAMING CODE AND SAVING A PROJECT

You can give your code a more descriptive name by right-clicking the code icon in the Project Explorer or Project Designer and selecting **Rename** from the pop-up menu.

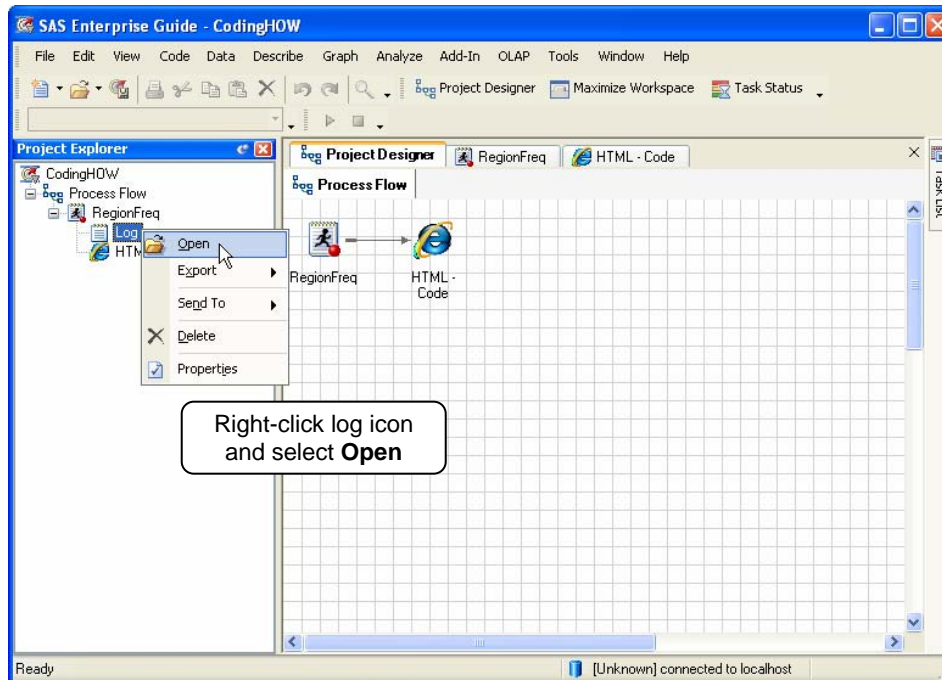
You can save your project by selecting **File ► Save Project As** and navigating to the location where you want to save your project. The next time you open this project, everything will be the way you left it.



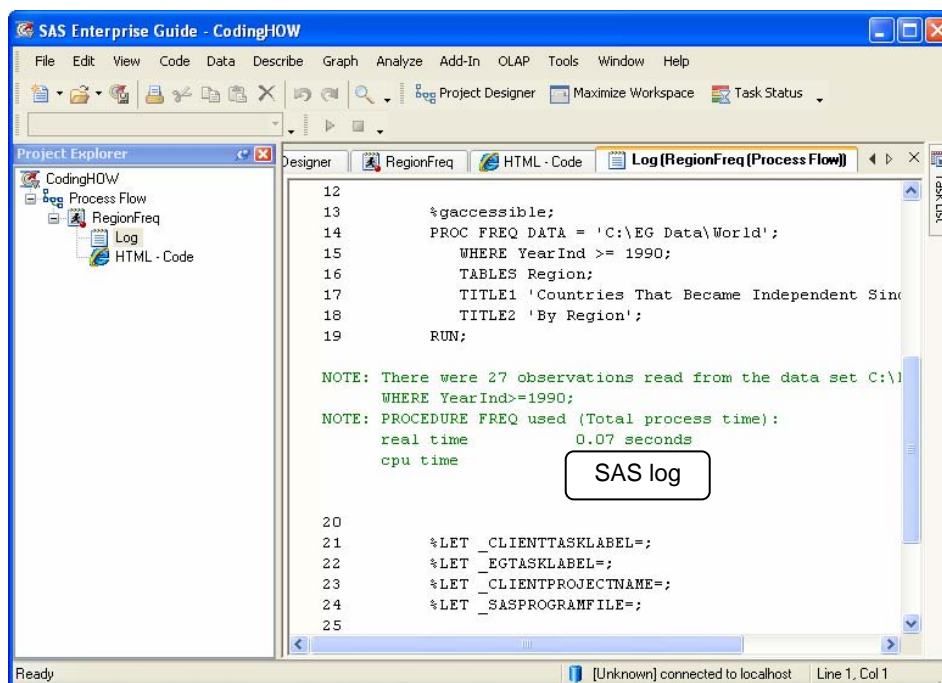
## VIEWING THE LOG

If you see a red X on the code icon , this indicates that the code produced errors (either error messages or data errors such as invalid dates). A yellow caution sign on your code icon , indicates that your log contains warnings (but no errors).

When you run programs in Display Manager, you always see your SAS log. SAS Enterprise Guide, on the other hand, only opens a log when there are errors. If there are no errors, the log will not open automatically. You can open a log by right-clicking the log icon in the Project Explorer and selecting **Open** from the pop-up menu, or by right-clicking the code icon in the Project Designer and selecting **Open Log**.

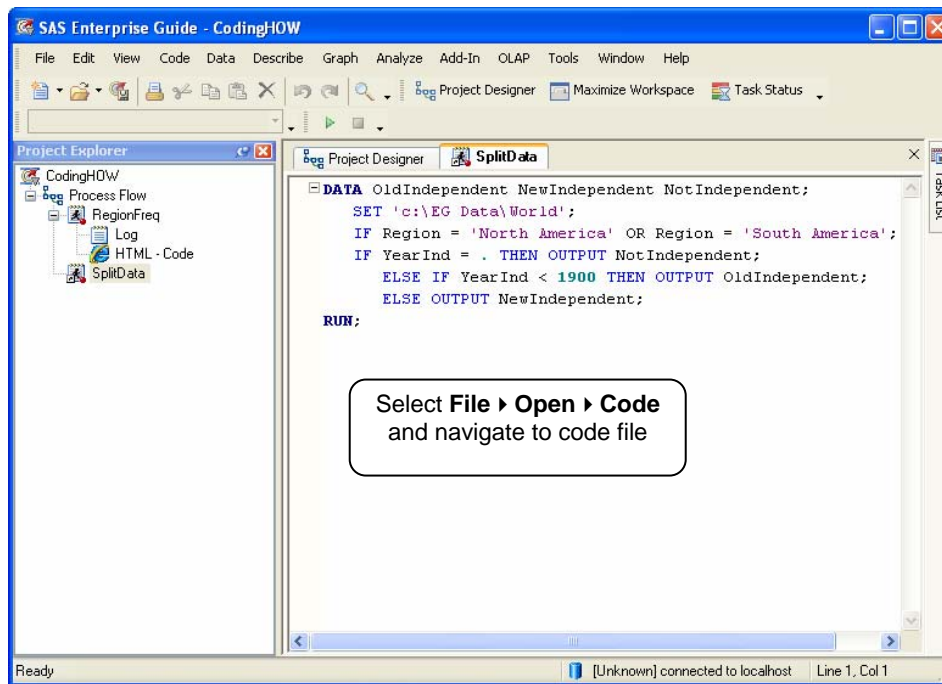


Logs in SAS Enterprise Guide are just the same as logs in Display Manager. They show your program along with any error messages, warnings, and notes. In the log you will also see the housekeeping macros that SAS Enterprise Guide runs automatically before and after every job.

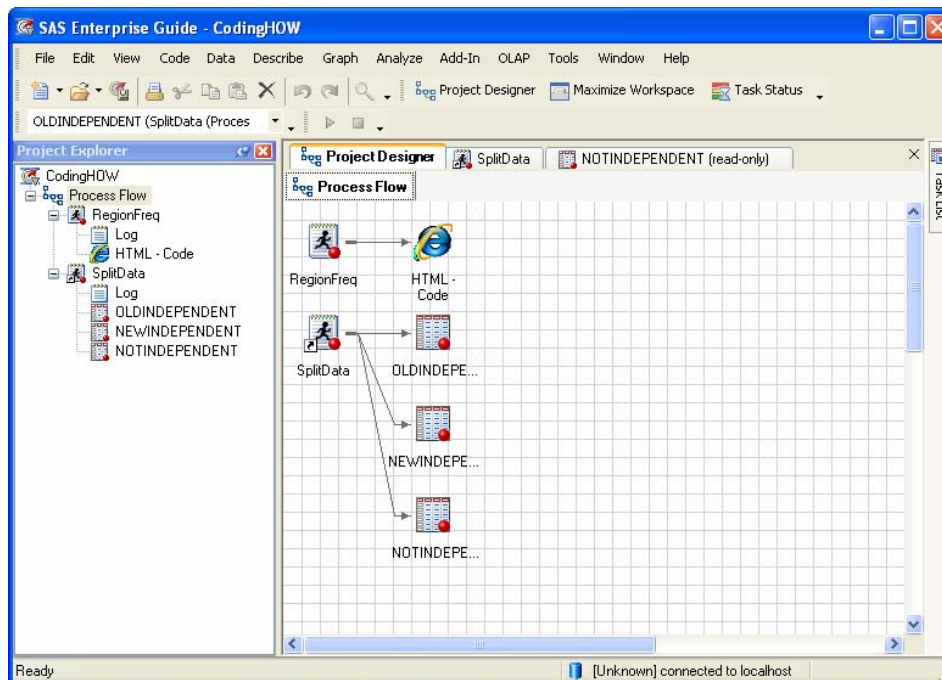


## OPENING AND RUNNING AN EXISTING PROGRAM


As a SAS programmer you are sure to have lots of programs that you have already written. You can open an existing SAS program by selecting **File** ► **Open** ► **Code** from the menu bar, and navigating to the location where your program is stored. This window shows a program named SplitData that was written in Display Manager and then opened in SAS Enterprise Guide.



Using the Code window, you can edit programs that were written in Display Manager. To run the code, select **Code > Run Code On Local** from the menu bar, or right-click the code icon in the Project Explorer or Project Designer and select **Run Code On Local** from the pop-up menu.



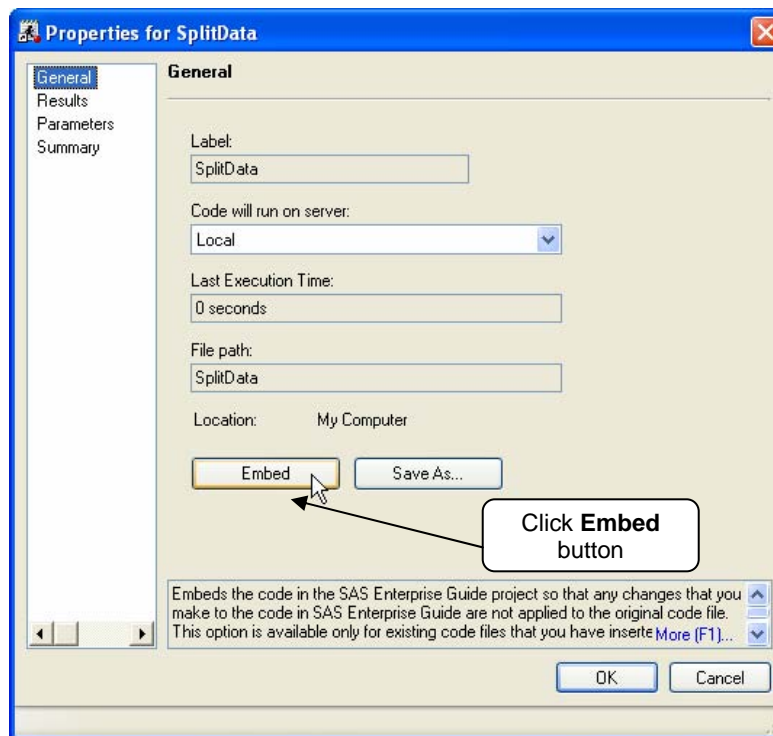
## EMBEDDED CODE VS. UNEMBEDDED CODE

At this point, this project contains two programs: RegionFreq and SplitData. Because SplitData was opened from an external file, its icon includes a little arrow.  The arrow indicates that the project contains a shortcut to the code,

but the code itself is not saved as part of the project. Because RegionFreq was written in SAS Enterprise Guide, its icon does not include an arrow. RegionFreq is saved as part of the project, but SplitData is not.

Code that is saved as part of a project is called embedded code; code that is saved outside of a project is unembedded. You can change whether or not a file is embedded. To do this right-click the code icon in the Project Explorer or Project Designer, and select **Properties** from the pop-up menu. A Properties window will open for the code file. In the General page, click the **Embed** button to embed an external file, or the **Save As** button to unembed the code.

Whether it's better to embed code in your project or save it as a separate file is your choice. One point to consider is that code that is not embedded can be used by more than one project while embedded code can only be used by the project that contains it. Either way, it's important that you understand where your code is stored so you don't accidentally end up with multiple copies of a program when you only want one (or vice versa).

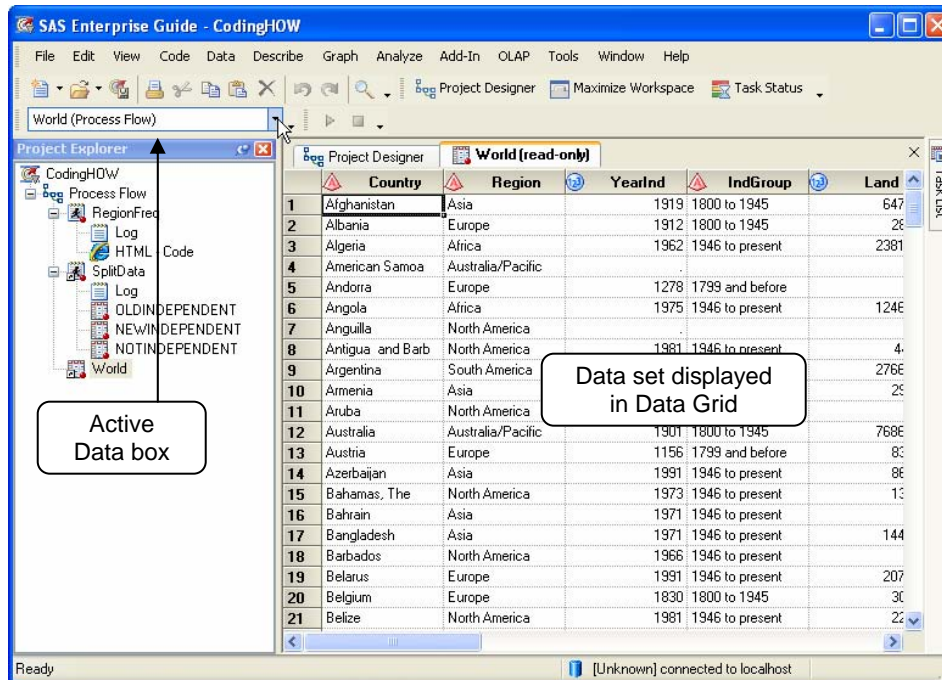


## COPYING CODE GENERATED BY A TASK

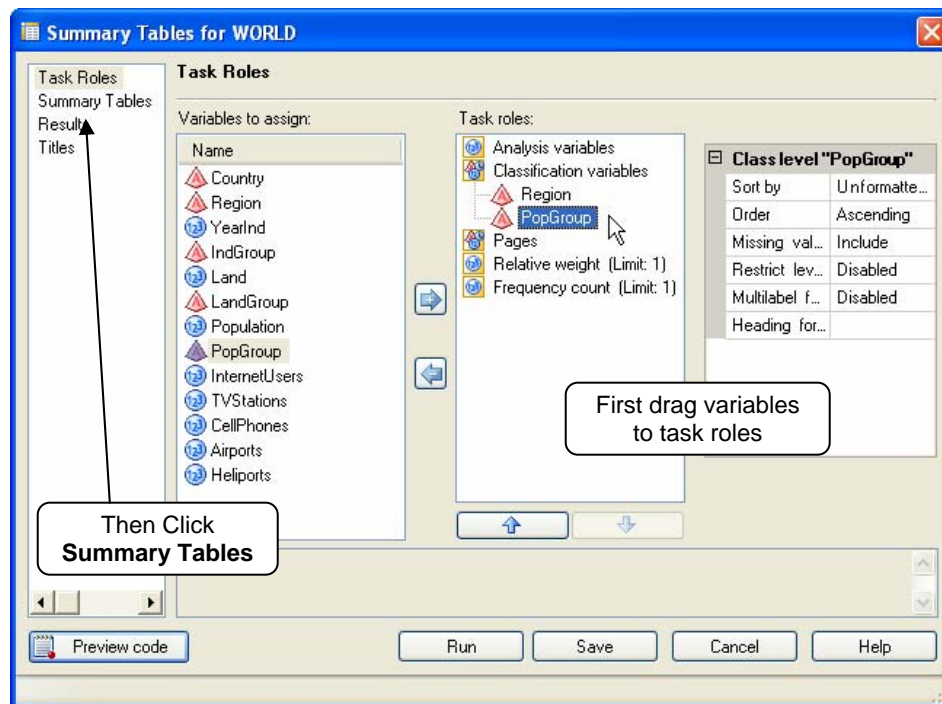
So far we have simply used SAS Enterprise Guide as an environment for writing and running code, but you can also use SAS Enterprise Guide's point-and-click features to generate code for you.

In SAS Enterprise Guide, SAS procedure code is generated by tasks. Before you can use a task, you must first open your data set. To open a data set, select **File ► Open ► Data** from the menu bar, and navigate to your data set. The data set will be displayed in a Data Grid. The following Data Grid shows a data set named World that contains data about all the countries in the world.

When you open a task, it will use the active data set. The name of the active data set is displayed in a box on the toolbar. You can change the active data set using that box on the toolbar, or by clicking the icon of the data set you want to be active in the Project Explorer or the Project Designer.

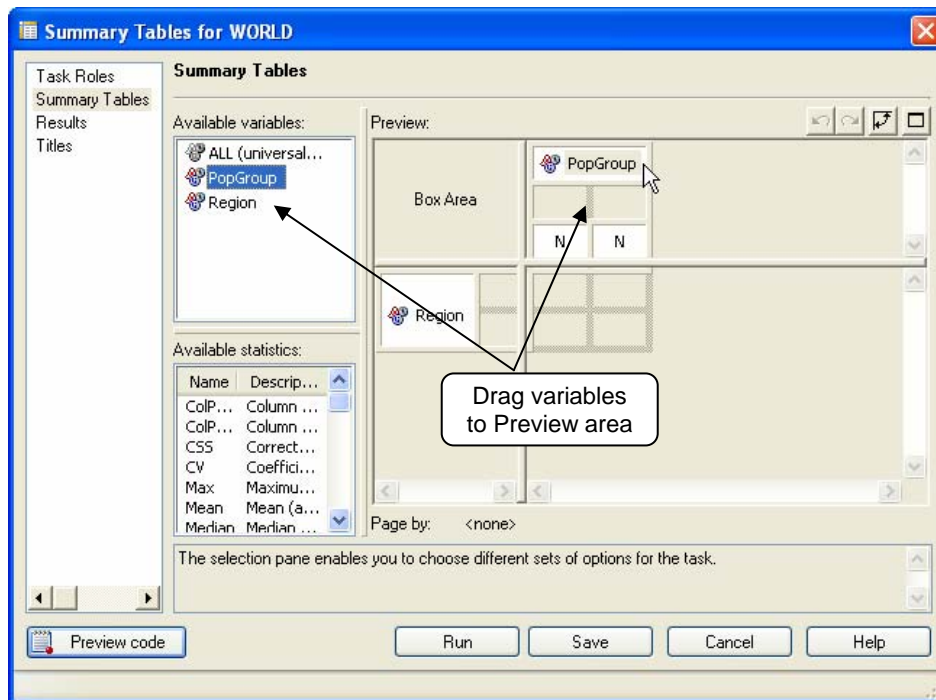


For this example, we use the Summary Tables task, but copying code is similar for all tasks. The Summary Tables task writes PROC TABULATE code. To open Summary Tables, select **Describe ► Summary Tables** from the menu bar. A Summary Tables window, like the one pictured below, will open. The first thing you do in any task is assign variables to task roles, by dragging the variable names to the list of task roles. In this window, the variables Region and PopGroup have been assigned to serve as classification variables.



The second thing you do, in the Summary Tables task, is arrange your table. To do that click the **Summary Tables** option in the selection pane on the left.

In the Summary Tables page you drag variables from the list of available variables to the area labeled **Preview**. To find out more about the Summary Tables task, you may want to read the paper, "Summary Tables Task in SAS Enterprise Guide: PROC Tabulate Made Easy," listed in the reference section at the end of this paper.



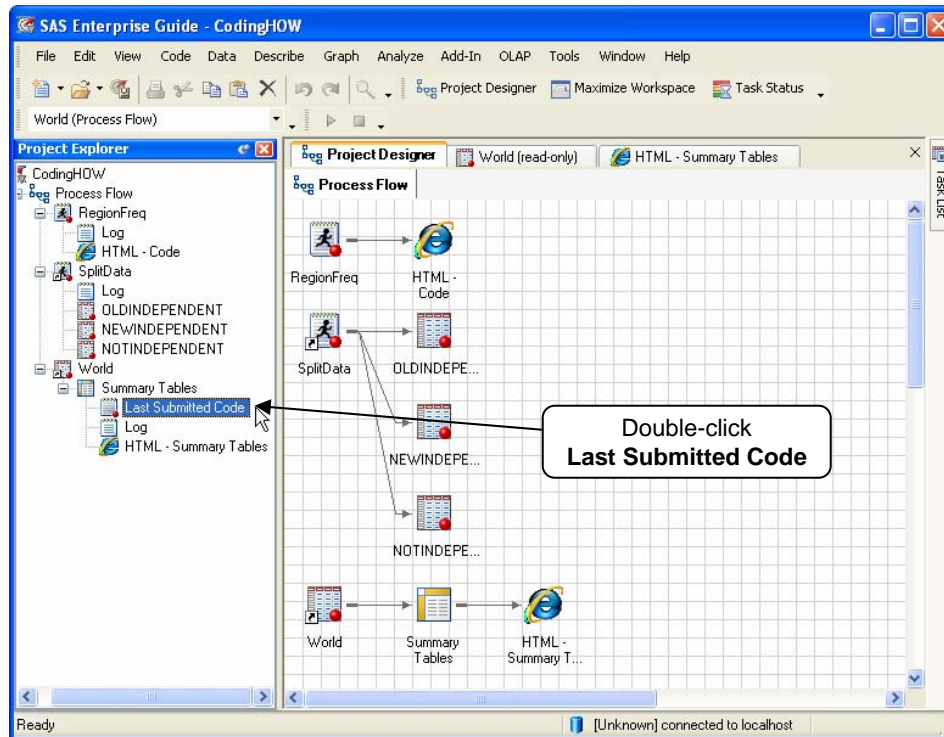
Once you are satisfied with the arrangement of your table, click **Run**. SAS Enterprise Guide will run the task and display the results.

Region	PopGroup			
	0 to <1M	1M to <50M	50M to <100M	>= 100M
	N	N	N	N
Africa	9	43	3	1
Asia	8	35	4	6
Australia/Pacific	22	3	.	.
Europe	15	30	5	1
North America	20	13	.	2
South America	3	9	.	1

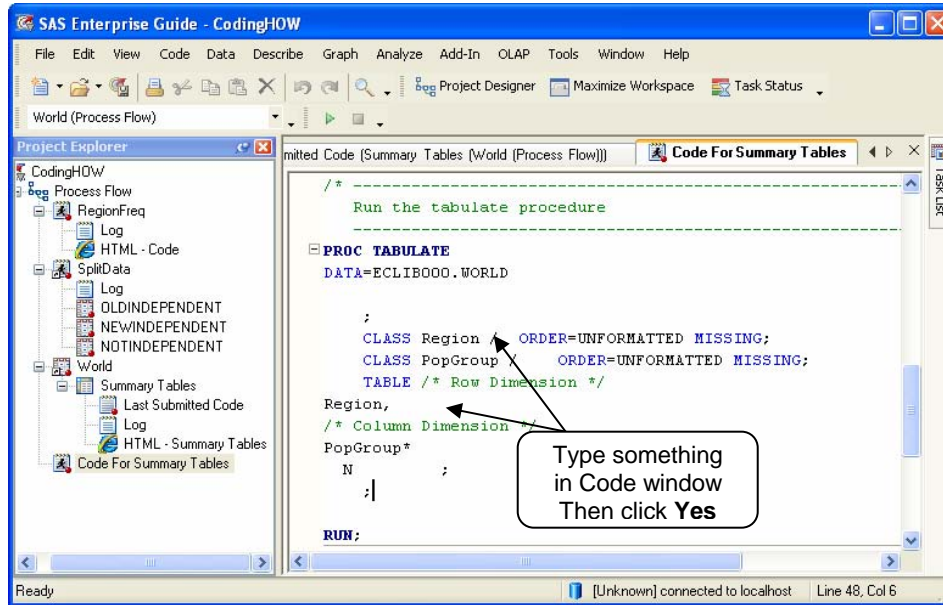
The screenshot also shows the SAS Enterprise Guide interface with the 'Project Explorer' on the left, the 'World (Process Flow)' pane, and the 'HTML - Summary Tables' task selected. The SAS logo and 'Enterprise Guide' branding are visible at the top of the main window.



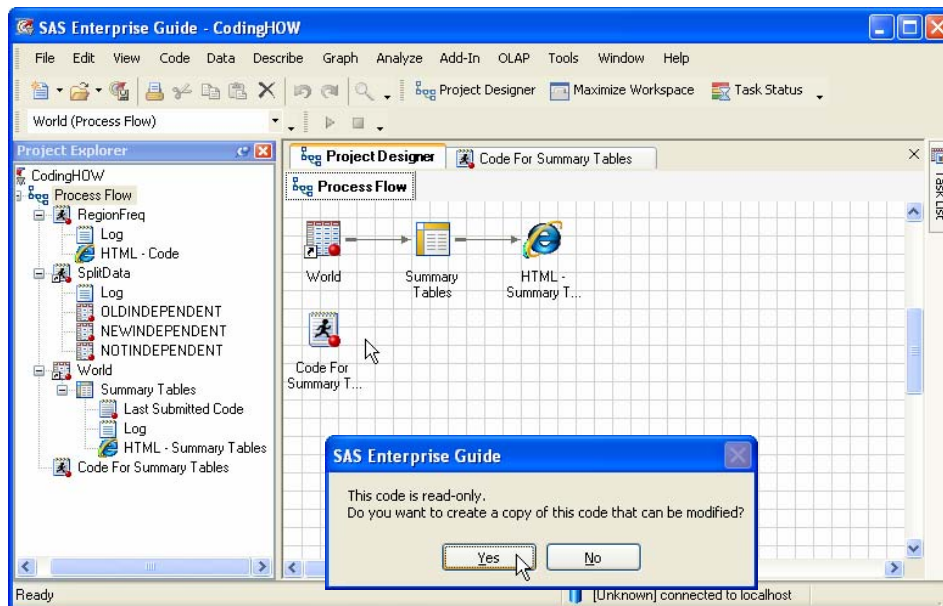
Click the Project Designer tab to see the process flow diagram. At the bottom of the process flow are icons for the World data set, Summary Tables task, and HTML output. The process flow includes icons for the two code files that were created previously, but it does not (by default) show an icon for code generated by tasks. However, the Project Explorer does include an icon for code generated by tasks. You can display that code by double-clicking the icon labeled **Last Submitted Code** in the Project Explorer.



A Code window will open displaying the code generated by the task. You cannot edit the code generated by a task, but you can make a copy of the code and edit the copy. The quickest way to do this is to type something in the Code window. A window will open asking if you want to create a copy of the code. Click the **Yes** button, and SAS Enterprise Guide will open a new Code window containing a copy of the code.

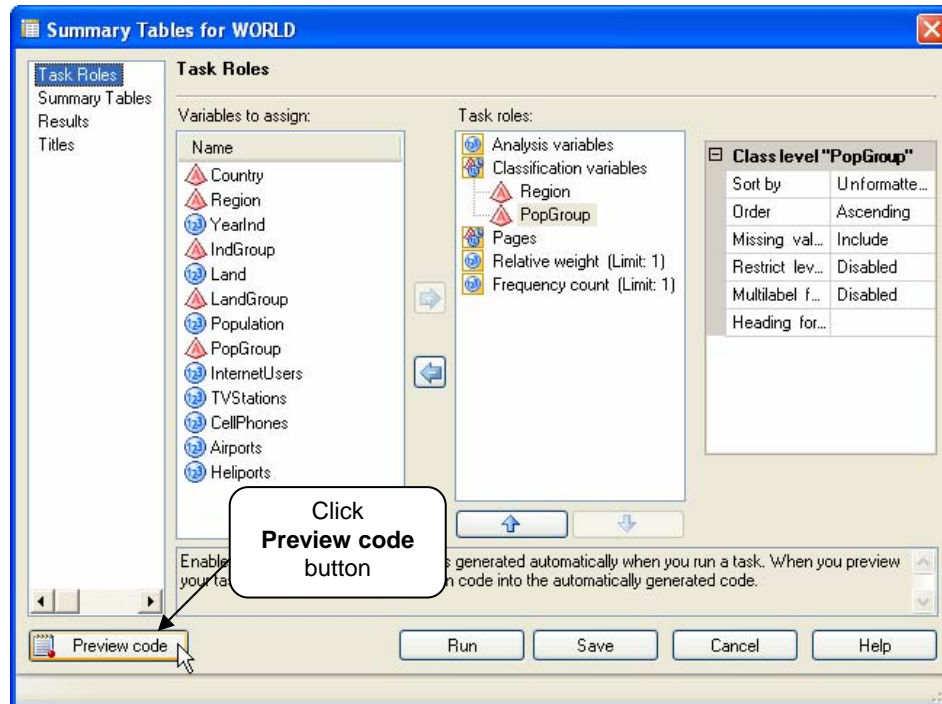


The Project Designer now includes an icon labeled **Code for Summary Tables**. This is the copy of the code. You can edit the copy of the code. You can also use this code in Display Manager by cutting and pasting, or saving this code as an unembedded code file and opening it in Display Manager.

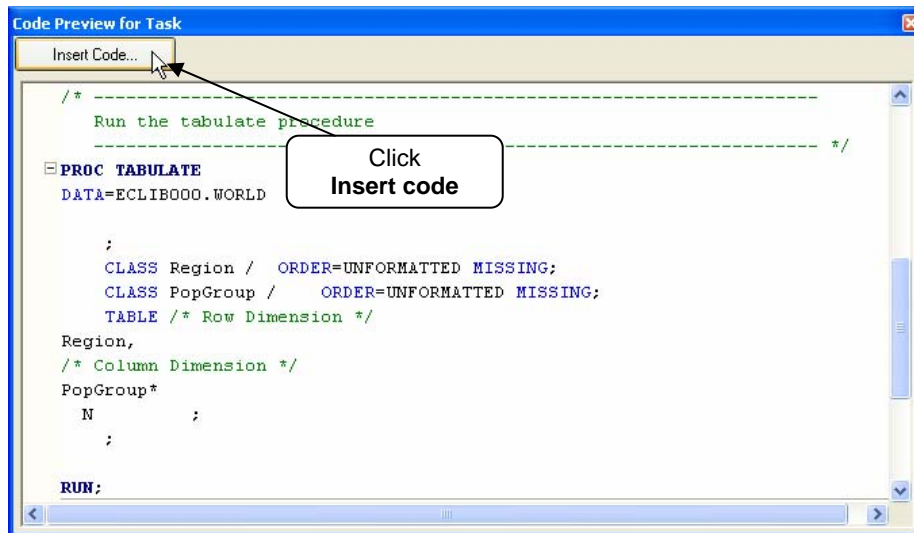


### INSERTING CUSTOM CODE INTO THE CODE GENERATED BY A TASK

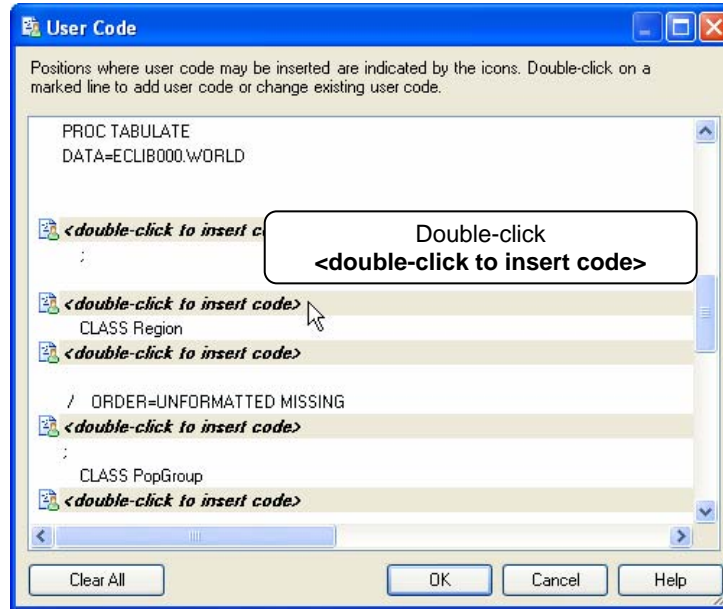
While you cannot edit the code generated by a task, it is possible to insert code into the program generated by a task. To do that, reopen the task by double-clicking its icon in the Project Explorer or the Project Designer. Then click the **Preview code** button in the lower left corner of the task window.



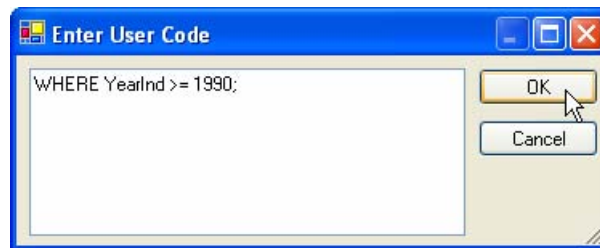
A Code Preview window will open for that task. Click the **Insert Code** button.



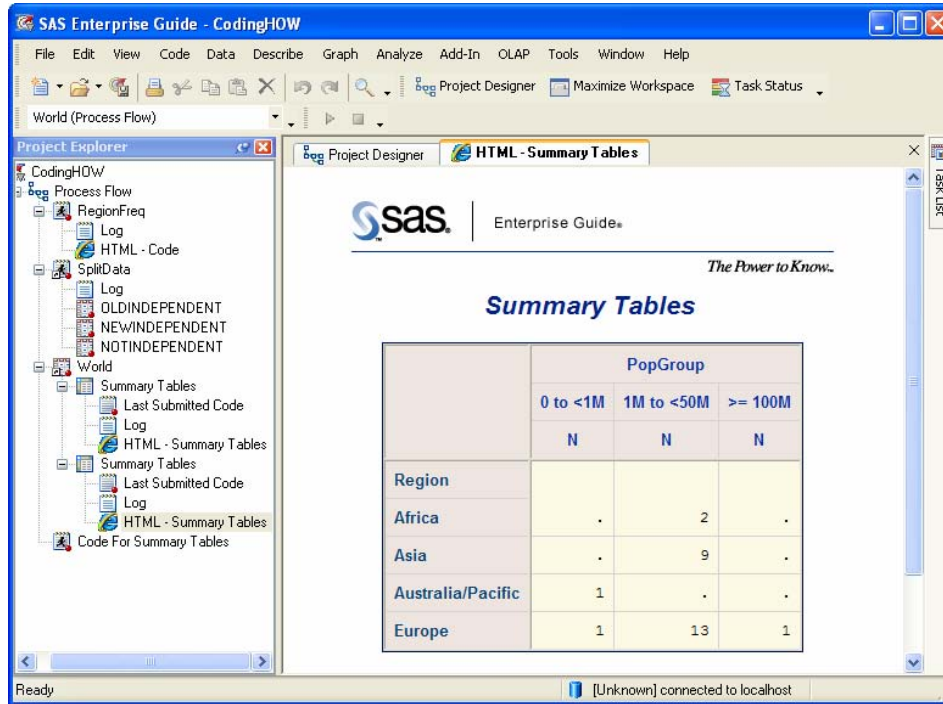
A User Code window will open displaying the code written by SAS Enterprise Guide. This window will show all the locations in the program where you can insert your own code. Find the place where you want to add code, and double-click the words **<double-click to insert code>**.



An Enter User Code window will open. Type the code you want to insert and click **OK**.

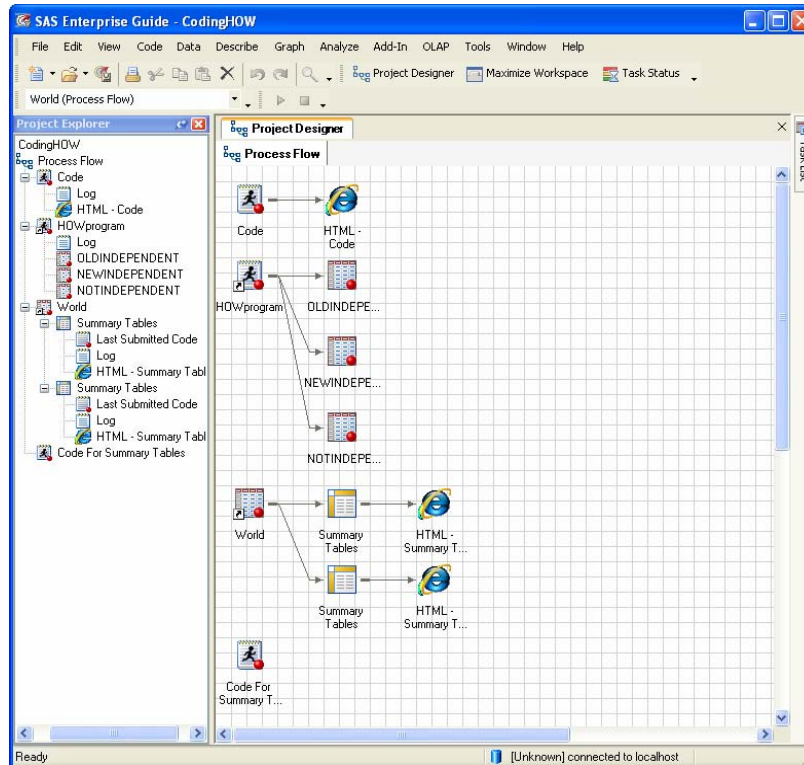


In the task window, click the **Run** button. SAS Enterprise Guide will run the task using the code you inserted.



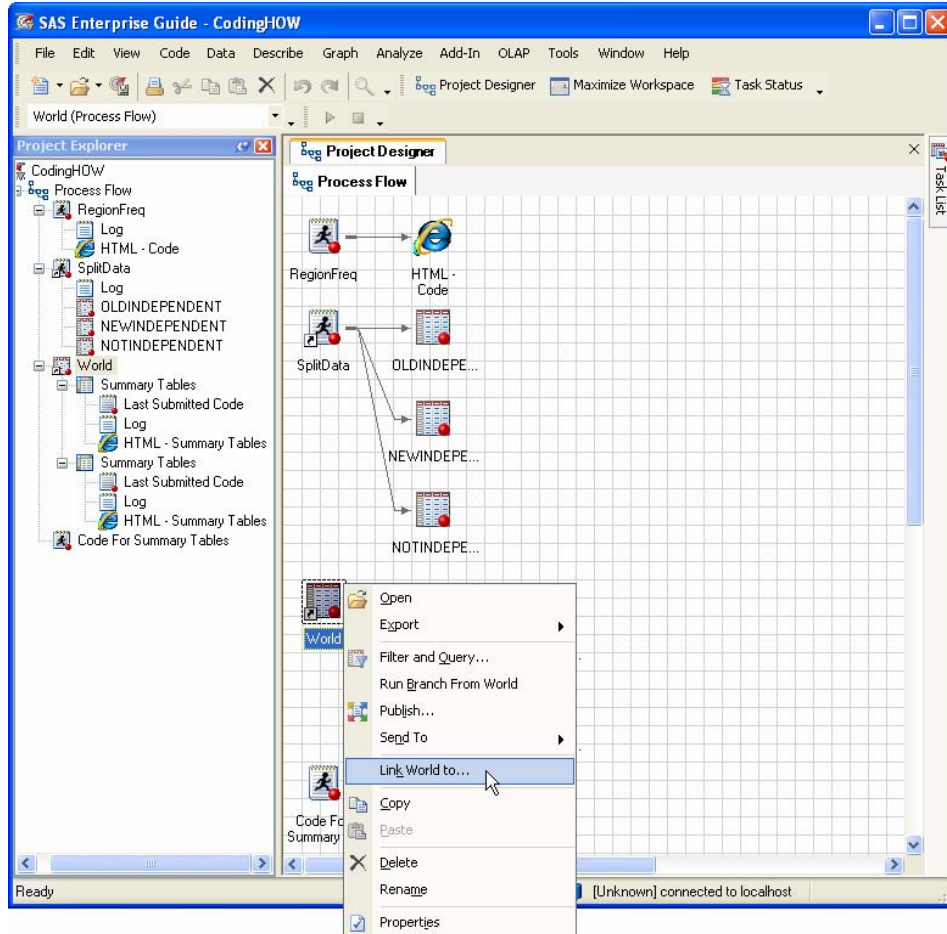
### LINKING ICONS IN THE PROJECT DESIGNER

Looking at the Project Designer, you can see that tasks are automatically connected to the data they use. However, code files are not automatically connected to the data they use.

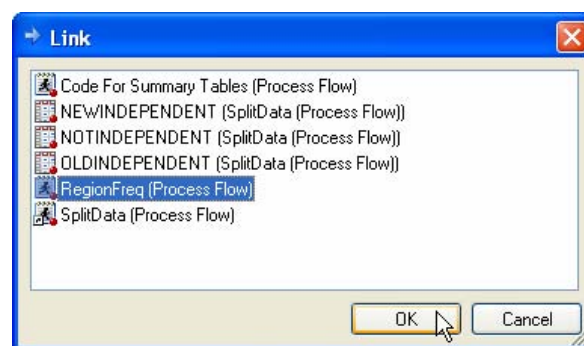


You can add links to make relationships between data sets and code files more clear. The code files in this project use the World data set, so it would make sense to link the data to the code. To add a link, right-click the icon that you

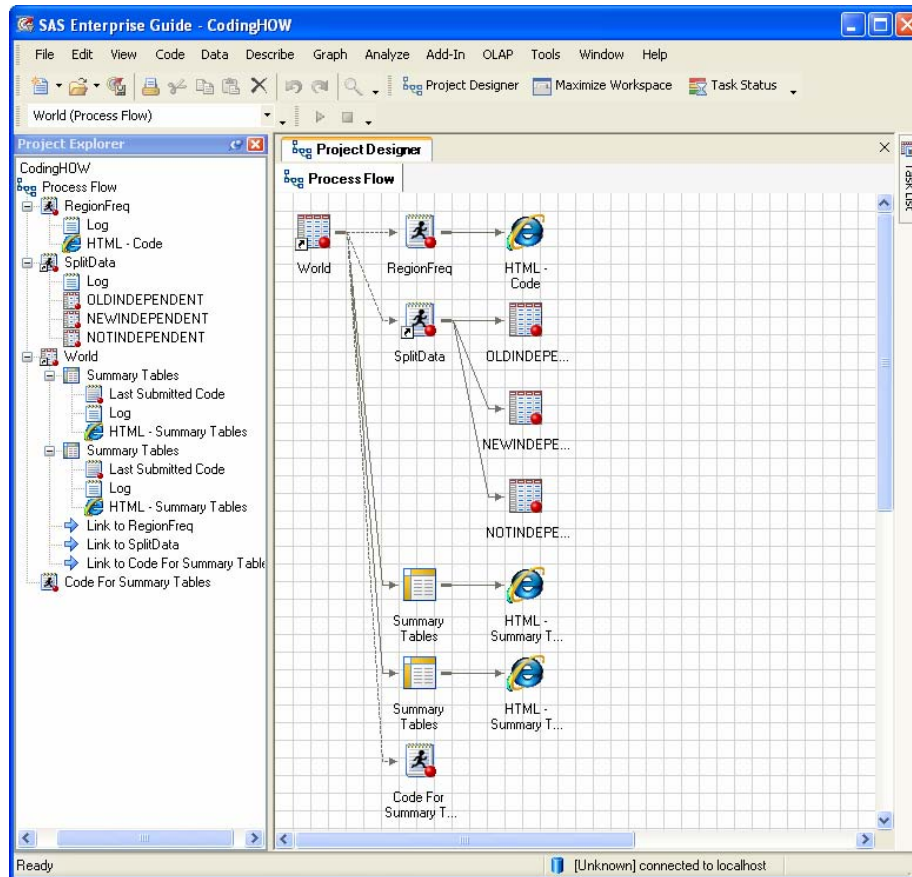
want at the beginning of the link, and select **Link item to** from the pop-up menu.



A Link window will open showing all the items to which you can link. Select one, and click OK.



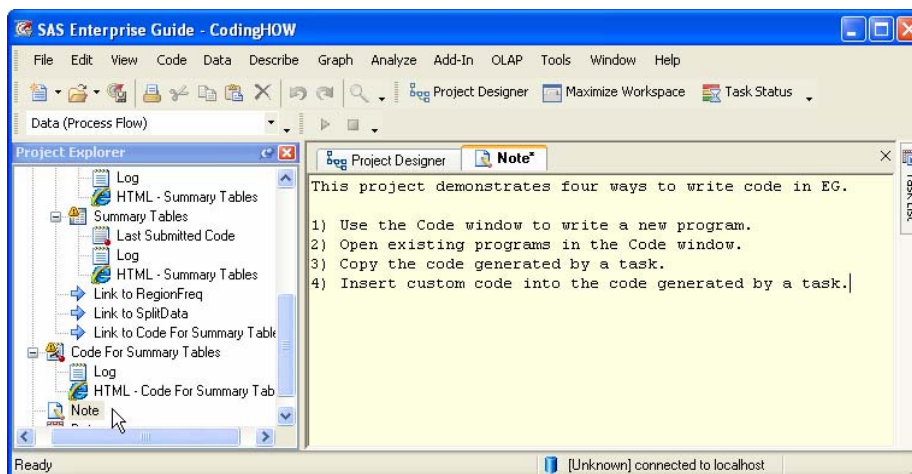
To add more links, repeat the process. Here is the process flow diagram with the World data set linked to each of the code files. Notice that links you add use a dashed line instead of a solid line.



There is another reason why you may want to add links to your process flow. When you run a project, SAS Enterprise Guide executes the project from upper left to lower right, following the branches of the process flow. You can use links to explicitly control the order in which items run.

## ADDING NOTES

As a programmer, you know that it is important to use comments to document your work. Notes are text files that you can use to document a specific part of a project or an entire project. To add a note for an entire project, click the background of the process flow diagram and select **File** ► **New** ► **Note** from the menu bar. A Note window will open. You can type any text you want in this window.



## LIBNAMES IN SAS ENTERPRISE GUIDE

Up to this point, all the examples in this paper have referred to data sets using direct referencing such as

```
PROC FREQ DATA = 'c:\EG Data\World';
  WHERE YearInd >= 1990;
  TABLES Region;
```

When SAS Enterprise Guide sees a reference like this, it dynamically assigns a libref with a name something like ECLIB000. That's fine if you don't need to use any data engines or advanced options. But if your data are more complex, you may need more control. There are at least four ways to define a libref in SAS Enterprise Guide 4.1. Starting with the most basic, and working to the most complex they are: put a LIBNAME statement in your code, use options to automatically execute a LIBNAME statement, use the Assign Library task, and use the SAS Enterprise Guide Explorer.

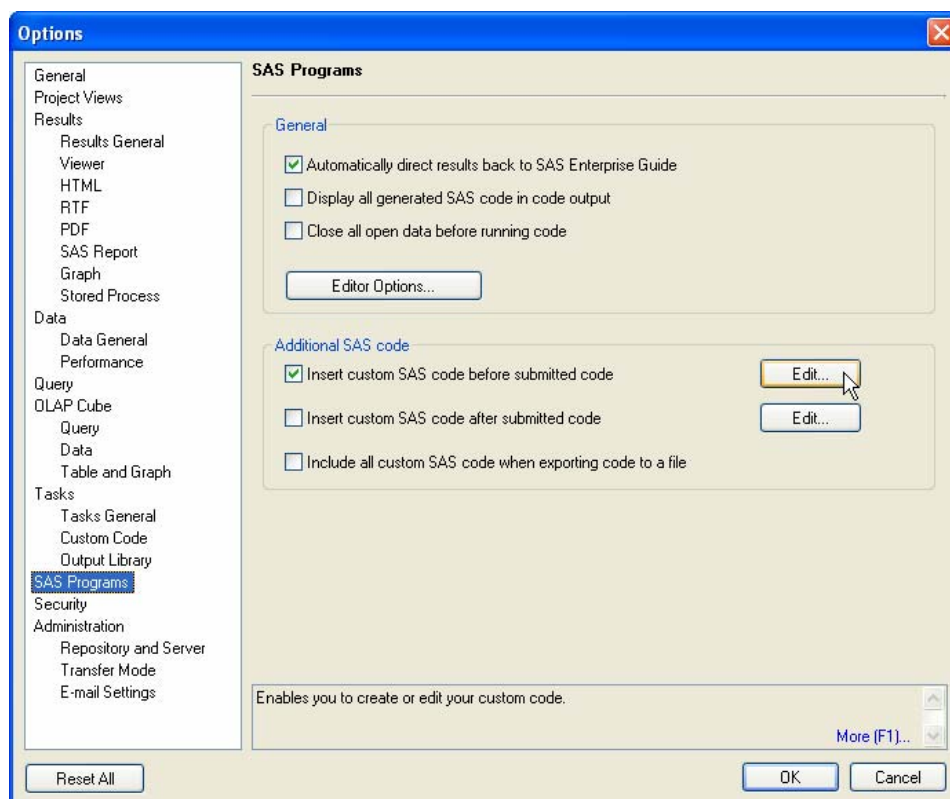
## PUTTING A LIBNAME STATEMENT IN YOUR CODE

You can always write your own LIBNAME statements to create librefs just as you would in Display Manager. For the PROC FREQ example, you could use this:

```
LIBNAME MyData 'c:\EG Data';
PROC FREQ DATA = MyData.World;
  WHERE YearInd >= 1990;
  TABLES Region;
```

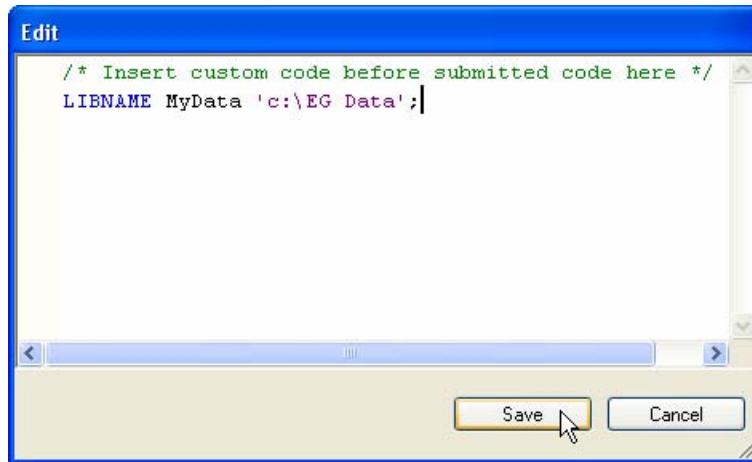
## USING OPTIONS TO AUTOMATICALLY EXECUTE A LIBNAME STATEMENT

There is an option that allows you to specify code that will be automatically executed every time you run something in SAS Enterprise Guide. If you frequently use the same libref, then this may save you a lot of trouble. Open the Options window by selecting **Tools** ► **Options** from the menu bar. In the selection pane on the left, click the **SAS Programs** option. In the SAS Programs page, check **Insert custom SAS code before submitting code**, and click the **Edit** button.



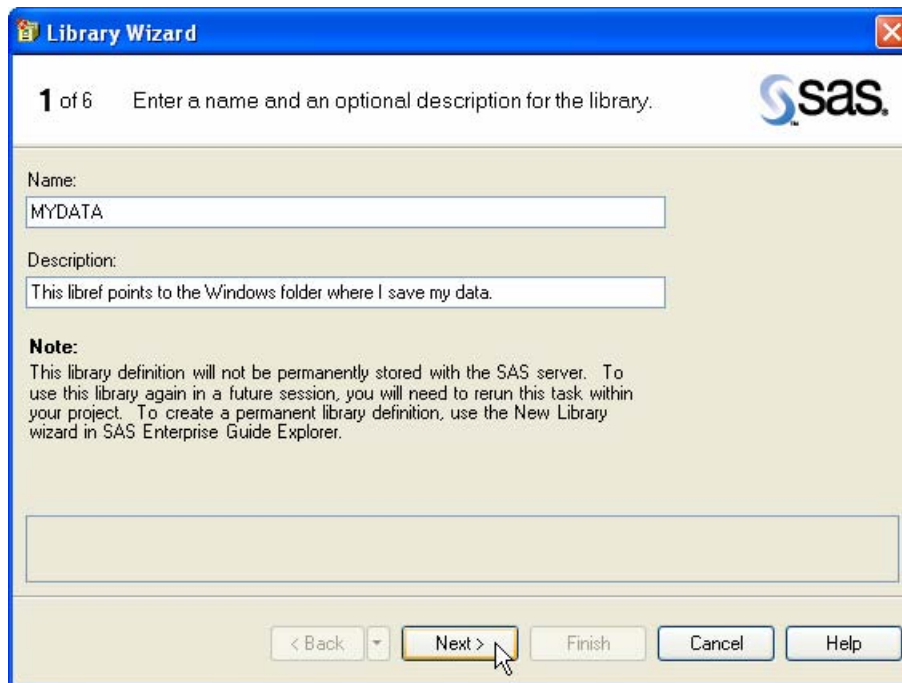


In the Edit window, type the code you want to be run automatically. This could be a LIBNAME statement, an OPTIONS statement, or any code that you want to be submitted every time you run anything in SAS Enterprise Guide.

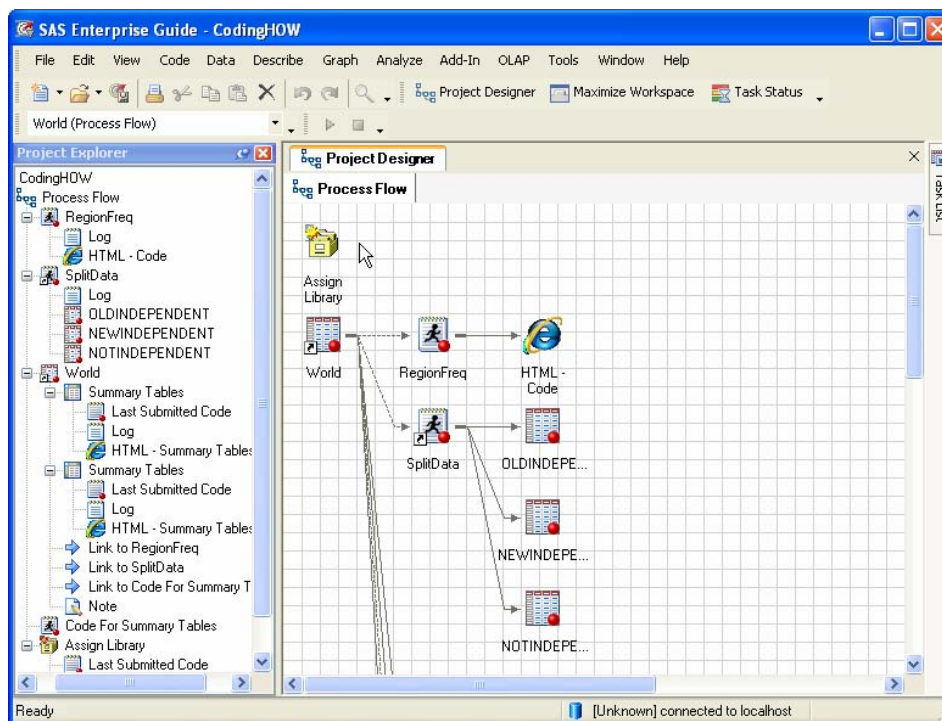


### USING THE ASSIGN LIBRARY TASK TO DEFINE A LIBREF

To open the Assign Library task, select **Tools** ► **Assign Library** from the menu bar. Then follow the directions in each of the six windows of the Library wizard.



After you click **Finish** in the final window, SAS Enterprise Guide will create your libref, and add an Assign Library icon to your project.



When you use the Assign Library task, your libref will not be saved from one session to the next. The next time you open this project, you will need to rerun the Assign Library task. To rerun the Assign Library task, right-click the task icon and select **Run Assign Library** from the pop-up menu. To run the entire process flow, right-click the background of the process flow and select **Run Process Flow** from the pop-up menu.

It's a good idea to drag the Assign Library icon to the beginning of your process flow. This will help to remind you that you will need to rerun it. Also, since process flows run from upper left to lower right, putting the Assign Library icon in the top left corner assures that, if you run the entire process flow, the Assign Library task will run first.

### USING THE SAS ENTERPRISE GUIDE EXPLORER TO DEFINE A LIBREF

Despite the similarity in names, the SAS Enterprise Guide Explorer is totally different from the Project Explorer. The Project Explorer displays your project in a hierarchical tree diagram; the SAS Enterprise Guide Explorer is an administrative tool. To Open the SAS Enterprise Guide Explorer, select **Tools ► SAS Enterprise Guide Explorer** from the menu bar.

If you have administrator privileges, then you can use the SAS Enterprise Guide Explorer to define new SAS data libraries. An easy way to tell if you have administrator privileges is by looking at the SAS Enterprise Guide Explorer window. If you see the words **Admin Mode** in the lower right corner, then you have administrator privileges. If you do not have administrator privileges, you cannot use SAS Enterprise Guide Explorer to create libraries, but you can still create libraries using the other methods described above.

Any library definitions you create in SAS Enterprise Guide Explorer will be stored on the SAS server you select. So, unless you delete them, they will always be available for you to use. They will also be available to anyone else who connects to that SAS server.

To create a new library select **File ► New ► Library** from the menu bar inside the SAS Enterprise Guide Explorer. This opens a Library wizard which is similar to the Library wizard for the Assign Library task. Follow the directions in each of the seven windows. When you click Finish in the final window, SAS Enterprise Guide will create your libref. Unless you delete it, this libref will always be available to anyone using that particular SAS server. No icon will be added to your project because you do not need to recreate the libref each time.

## ISSUES FOR PROGRAMMERS TO KEEP IN MIND

Here are a few things to keep in mind if you run code in SAS Enterprise Guide.

- **Rules for Variable Names**

By default, SAS Enterprise Guide uses the system option `VALIDVARNAME = ANY` (meaning that names must be 32 characters or fewer in length, and can contain any character including blanks). In Display Manager the default is `VALIDVARNAME = V7` which follows the standard rules for SAS names (32 characters or fewer in length, start with a letter or underscore, and contain only letters, numerals, or underscores). If you write a program that produces a SAS data set (such as `PROC TRANSPOSE` or `PROC IMPORT`), then the names of variables in that data set may be considerably different than variable names produced by the same code in Display Manager. Adding the statement

```
OPTIONS VALIDVARNAME = V7;
```

to your code will fix this. If you use this option often, you may want to issue this statement automatically via the Options window. The method for doing this is described in the preceding section “Using Options to Automatically Execute a LIBNAME Statement.”

- **Data Libraries for Output**

If you use any tasks to create output data sets, the default library will be a permanent one—not `WORK`. The most common default library for output data sets is `SASUSER`. However, on OS/390 and some UNIX systems, `SASUSER` may be temporary. In some installations, `SASUSER` may be read-only. If you have more than one SAS server, you may have a `SASUSER` library on each server.

`EGTASK` is a special library. If you define a library having this name on your system, then SAS Enterprise Guide will use it as the default for output data sets instead of `SASUSER`.

You can change the default library for your output data. To do this select **Tools ► Options** from the menu bar, and click **Output Library** in the selection pane on the left. In the `Tasks > Output Library` page, you can add new libraries and move libraries up or down to change their priority. SAS Enterprise Guide will save output data sets in the first library. If that library is not available, then SAS Enterprise Guide will go down the list until it finds a useable library.

- **Submitting Part of Your Code**

As in Display Manager, it is possible to run part of your code in SAS Enterprise Guide. However, the replacing of results can be messy. To avoid this, you may want to divide your code into smaller code files in SAS Enterprise Guide, and then run each piece as a whole instead of running part of a code file.

## MORE FEATURES TO EXPLORE

In a paper this size, we can't cover all the special features that a programmer might want to know. Here is a brief list of some other features you may want to learn more about.

- **Running Code on a Local SAS Server vs. a Remote SAS Server**

A SAS server is any machine that runs SAS software. If SAS software is running on the same machine where you are running SAS Enterprise Guide, then it is considered a local server. If it is a different machine, then it is considered a remote server. If your installation of SAS Enterprise Guide has been set up to access SAS software on more than one machine, then you can easily change where code runs. To change the server that code runs on, select **Code ► Select Server** from the menu bar. Then in the Select Server window, click the server where you want to run your code, and click **OK**. To run your code select **Code ► Run *program-name* On server-*name***.

- **Splitting the workspace**

By default, you see only one thing at a time in the workspace (one process flow, or one code window, or one result). You can split the workspace so that you can display two or more items at a time. Right click one of the tabs in the workspace, and select **New Horizontal Tab Group** or **New Vertical Tab Group** from the pop-up menu.

- **Multiple process flows**

You can only have one project open at a time, but you can have multiple process flows in a single project. To create a new process flow in a project, select **File ► New ► Process Flow** from the menu bar. You can give your process flows different names by right-clicking their tabs and selecting **Rename** from the pop-up window.

- **Scheduling Projects to Run at Another Time**

You can schedule projects to run at a later time or on a regular basis (such as daily or weekly). To schedule a project, select **Tools ► Schedule Project** from the menu bar. In the Schedule window, you can set your password, create or modify a schedule, and specify other settings.

- **Using Parameters to Create Dynamic Projects**

Parameters are macro variables. In SAS Enterprise 4.1 you can use parameters in tasks, queries, or in SAS code. To create a parameter, use the Parameters Manager. Select **Tools ► Parameters (Macro Variable) Manager** to open the Parameters Manager. Click the Add button to create a new parameter. Then you add the parameter to your task, query, or code. Whenever you run something that uses a parameter, SAS Enterprise Guide will prompt you to specify a value for that parameter. To find out more about using parameters in SAS Enterprise Guide, you may want to read the paper, "Dynamic Projects in SAS Enterprise Guide: How to Create and Use Parameters," listed in the reference section at the end of this paper.

## CONCLUSIONS

SAS Enterprise Guide offers programmers a new way to write and run code. If you have never used SAS Enterprise Guide, it will take you a while to get used to the new environment. But once you learn how to use it, you may well decide to make SAS Enterprise Guide your primary SAS environment.

## REFERENCES

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## ABOUT THE AUTHORS

Susan Slaughter and Lora Delwiche are the authors of *The Little SAS Book: A Primer*, and *The Little SAS Book for Enterprise Guide 4.1* which are both published by SAS Institute. The authors may be contacted at:

Susan J. Slaughter  
(530)756-8434  
susan@avocetsolutions.com

Lora D. Delwiche  
(530) 752-9321  
lldelwiche@ucdavis.edu

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