



SAS® Enterprise Guide® — A Roadmap

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Amarpal Brar from SAS International, Heidelberg, Germany, provided content for *SAS® Enterprise Guide® — A Roadmap*.

Introduction

With increased demand for fast and effective intelligence delivery, IT departments are under constant pressure to meet ever-growing lists of users' needs and expectations. In many cases decision-making processes have been pushed out to business units. As a result, growing numbers of users across the organization are demanding data access and analytic capabilities that allow them to gain the insight they need to make effective decisions and a simple mechanism for presenting and sharing their results. However, because the majority of users who require self-sufficient, transparent and instant access to data and analytical capabilities are not experienced programmers, do not understand how to access various databases, and need to be guided through analytic methods, providing these capabilities can be difficult.

Today's fast-paced, decentralized organizations require software solutions that are easy to deploy and use. The solution also must enable a large employee population to obtain simple and self-sufficient access to data with guided analytic capabilities and graphing and reporting wizards that enable them to deliver the key intelligence that is needed. SAS Enterprise Guide taps into the power of SAS to address all of these needs.

This paper focuses on the capabilities of Enterprise Guide, a solution supported by SAS' superior analytics, to enable business analysts, statisticians and SAS programmers to achieve their goals while increasing productivity. It also examines how each of these business users is able to access this powerful solution to quickly create simple or complex analytic reports and distribute them with greater ease to targeted groups of users for effective and insightful decision making.

SAS Enterprise Guide user landscape

Customer pains

As organizations decentralize decision-making processes, more and more people need access to the intelligence required for making good decisions. Rapid delivery of quality intelligence is absolutely essential to successfully competing in today's global markets.

With the increased demand for effective intelligence delivery, IT departments are under constant pressure to meet ever-growing lists of user needs and expectations. Users across the organization are demanding data access and analytic capabilities that enable them to gain the insight they need to make effective decisions with easy-to-use tools for presenting and sharing their results. However, providing these capabilities can be difficult given that the majority of users who require self-sufficient, quick access to data and analytical capabilities are not experienced programmers, do not understand how to access various databases, and need to be guided through analytic methods to produce and distribute information.

Figure 1 below shows how different types of users in an organization use SAS Enterprise Guide.

User types

Business analyst

Typically, a business analyst has limited experience in programming and data access via SQL but has a fairly strong understanding of business processes and management decision-making needs and is experienced at converting general business problems into appropriate questions that can be answered by analysis. Business analysts often work on tight timelines, with responses often needed in hours or days. They understand the basics of data relationships and can converse with IT to communicate their data access needs. Using their knowledge of business needs, they transform questions into high-level requests of technical experts in IT to fulfill their data access and reporting needs. Business analysts will often use the data provided by IT for forecasting, what-if analysis and strategic financial analysis for decision-making needs.

Statistician

Typically, a statistician has a degree in statistics or mathematics and is an expert in designing experiments, framing business problems into a statistical context, and analyzing and interpreting statistical analyses and predictive models for business decision making. They often spend days or weeks doing in-depth analysis of the data seeking results for a specific problem. Statisticians are usually fairly technical and are moderately comfortable using programming languages to achieve their objectives.

SAS programmer

Typically, a SAS programmer spends significant time coding for various departments within an organization. They are specialists in using the SAS language and will usually be familiar with other computer languages such as SQL, COBOL, FORTRAN, PERL, C++, C# and Java. It is common for a SAS programmer to have a university degree in computer science, mathematics, statistics or some related discipline. They are usually interested in learning new technology and view this as a challenge. They are largely language agnostic, but over time become SQL experts. Their main job is to develop custom tasks and applications to meet specific user needs and requirements.

Users			
Features	Business analyst	Statistician	SAS programmer
Data access	Yes	Yes	Yes
Data manipulation	Yes	Yes	Yes
Create business and statistical models	Yes	Yes	No
Create custom tasks for users	No	No	Yes
Write data manipulation SAS code to prepare for data for analysis	No	No	Yes
Learn SAS syntax	No	Yes	Yes
Create and publish reports for general distribution	Yes	Yes	Yes
Schedule reports at regular intervals	Yes	Yes	Yes

Figure 1: How different types of users can use SAS Enterprise Guide

An overview of SAS Enterprise Guide

SAS Enterprise Guide is a powerful Windows client application with an easy-to-use interface that delivers a great depth of intelligence to people at all levels within an organization. As a single point of entry to the depth of SAS capabilities, Enterprise Guide enables business analysts, statisticians and programmers to access SAS and non-SAS data transparently and guides them through simple as well as complex analysis and forecasting techniques. The insights gained can be compiled and distributed to targeted groups using the SAS publishing framework. Overall, this enables users throughout the organization to be self-sufficient and provides them with the right intelligence and insights into the company's future enabling more effective decision making. Getting the right intelligence to the right people is critical to success, especially in today's competitive markets.

SAS Enterprise Guide's scheduling feature can automate the analytical process and schedule reports to run at regular intervals that can be automatically distributed via several routes. This can be achieved without involving IT departments since users are self-sufficient in creating and distributing the intelligence across the lines of business. This results in a quicker knowledge exchange and reduced load on already stretched IT departments.

Components of SAS Enterprise Guide

SAS Enterprise Guide environment

SAS Enterprise Guide is a Windows application that transparently leverages SAS servers on any platform. The Enterprise Guide workspace makes it easy for you to work with and manage your files, data sources and results on a business subject basis. The capabilities are just a mouse click away, with all the relevant objects such as data, code, log and results contained within a project. See Figure 2 for an illustration of the Enterprise Guide workspace and environment.

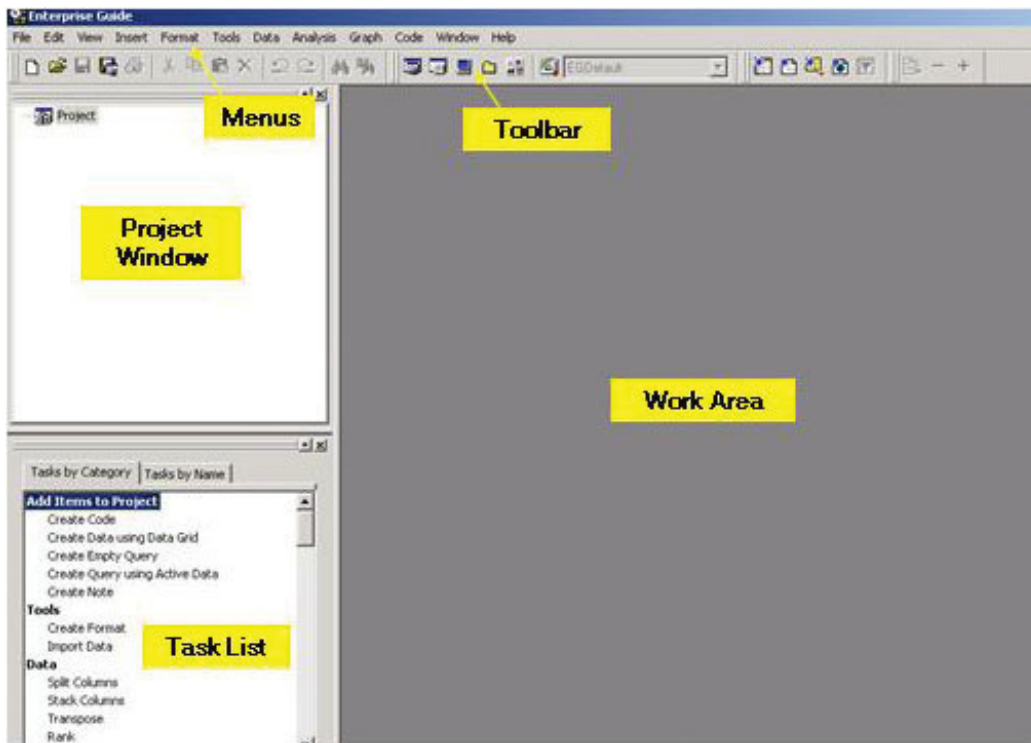


Figure 2: SAS Enterprise Guide at a glance — the workspace environment

With the aid of dialogues and wizards, users transparently access SAS and non-SAS data located anywhere and use powerful SAS analytics to create simple as well as complex analytical reports. Results can be generated in HTML, PDF, RTF and/or text output formats (as illustrated in Figure 3).

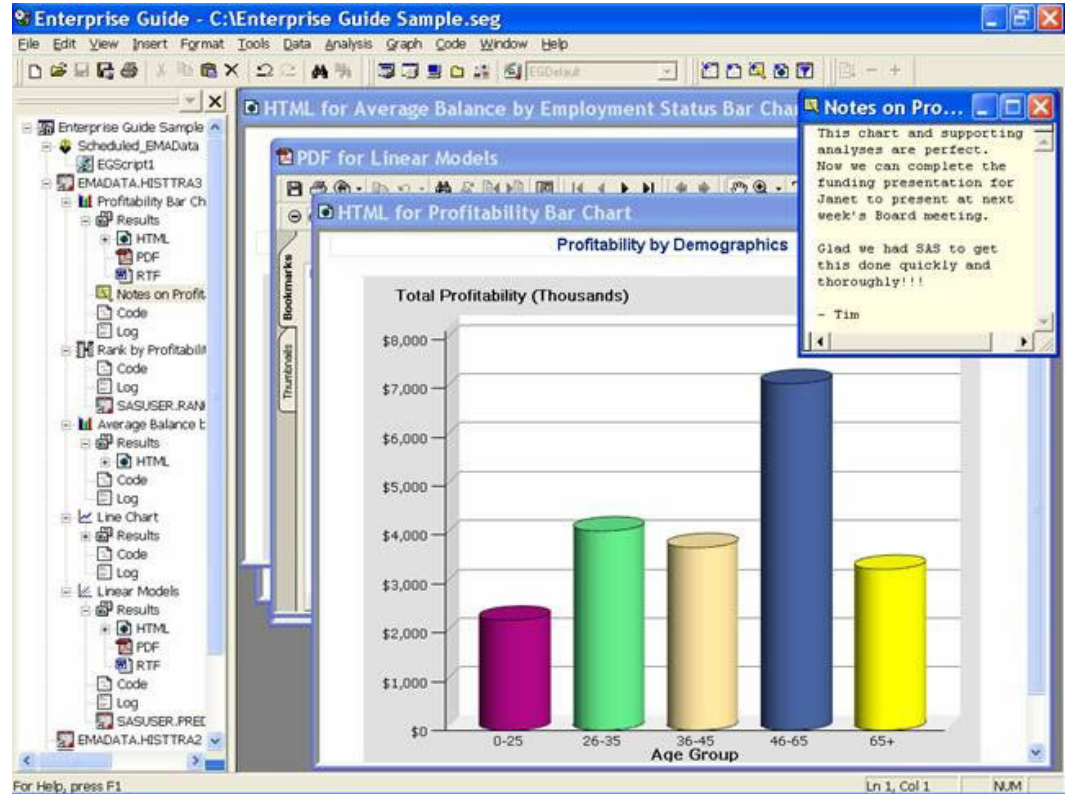


Figure 3: Results generated in HTML and PDF formats

Reports can be generated easily without writing SAS code since Enterprise Guide generates the necessary code behind the scenes. SAS programmers can modify the wizard-generated source code or create code from scratch via the Code window. See Figure 4 for an illustration of how code can be created from within Enterprise Guide.

SAS Enterprise Guide also leverages the extensive array of graphs available with SAS. Graphs can be represented with ActiveX controls, Java applets, GIFs or JPEGs. Both ActiveX controls and Java applets graphs permit direct interaction with the graphs. Up to 12 major chart types are supported by Enterprise Guide and each has a wide array of detailed controls so users can obtain exactly the type of graph needed.

Code window similar to the Enhanced Editor available in the SAS® System.

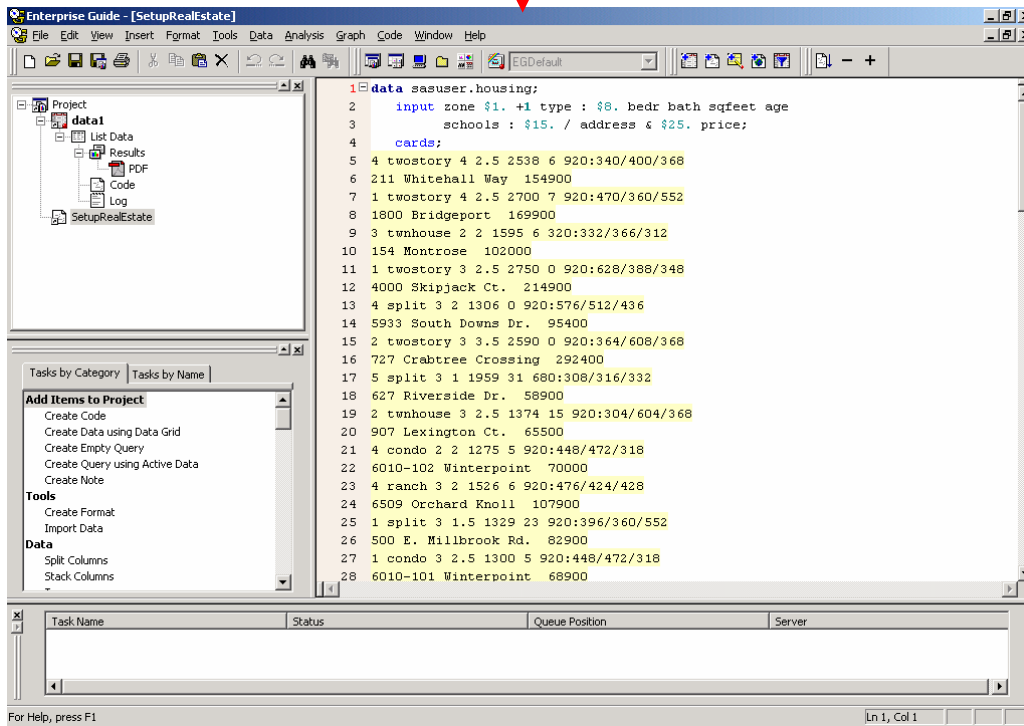


Figure 4: Using the Code window to insert SAS code

SAS Enterprise Guide architecture

Enterprise Guide is a stand-alone application that requires a SAS server, which can be either a local server or a remote server on any major computer platform. To use SAS Enterprise Guide with a remote server, SAS Integration Technologies is also required.

SAS Integration Technologies

SAS Integration Technologies makes the power of SAS computational servers and SAS data servers available to other enterprise applications by extending the reach of SAS software. It links your information world to the power of SAS.

SAS Integration Technologies includes a variety of integration and system development tools based on a combination of industry-standard technology as well as technology developed by SAS. For more details on SAS Integration Technologies, please take a look at "SAS Integration Technologies — A Roadmap," a white paper available from:

<http://www.sas.com/apps/whitepapers/whitepaper.jsp>

Figure 5 is an illustration of how a client such as Enterprise Guide connects to a SAS object server using SAS Integration Technologies.

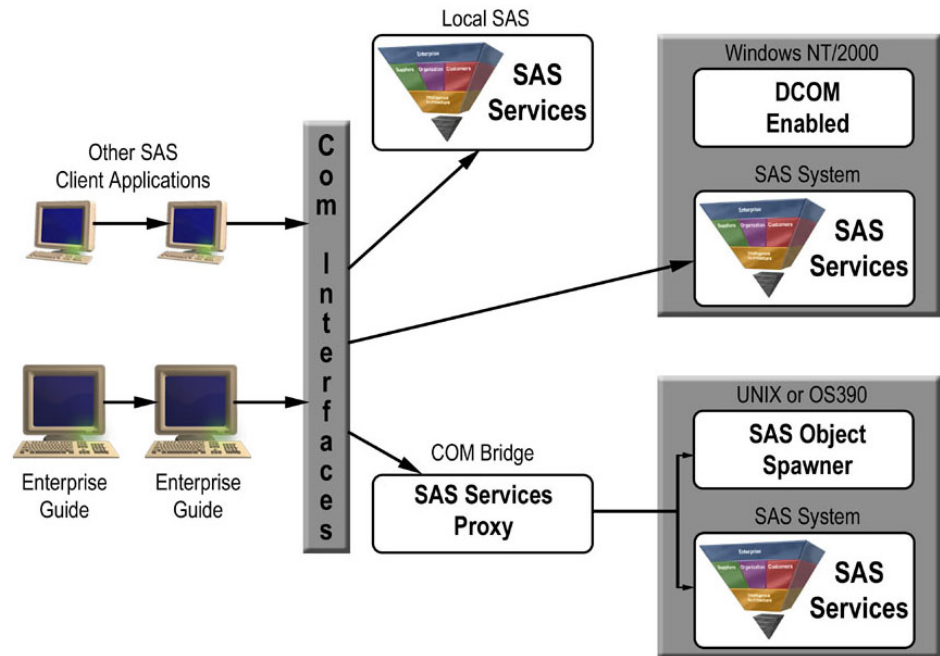


Figure 5: Enterprise Guide and other client applications connecting to a remote SAS Object Server using SAS Integration Technologies

SAS Enterprise Guide Administrator

SAS Enterprise Guide Administrator is a Windows application that enables administrators to centrally manage Enterprise Guide application usage. With Enterprise Guide Administrator, you can provide Enterprise Guide client users with standardized access to their data. Users can then access data sources without needing to remember the locations of the data, arcane servers and database parameters, or understand how to change their connections when data sources are migrated. Enterprise Clients provide an easy-to-use Windows interface to a SAS session running either locally or remotely.

With Enterprise Guide Administrator you can:

- Identify SAS servers on multiple platforms.
- Set up virtual folders with shortcuts to multiplatform data.
- Set up groups of users to ensure secure access to resources.

For example, you could add a SAS server that runs on UNIX, specify which users have access to the server and set up SAS libraries on that server. The specified users could then access the libraries from their Enterprise Client applications.

Enterprise Guide Administrator runs on Windows NT, Windows 95, Windows 98, Windows 2000 and Windows XP.

For details on Enterprise Guide Administrator, please refer to “Administrator for Enterprise Clients: User’s Guide (Second Edition)” available at:

<http://support.sas.com/documentation/onlinedoc/guide/adminguide20.pdf>

SAS Enterprise Guide for the business analyst

Business analysts need access to accurate and timely information to make informed decisions. Many organizations use a variety of tools to perform analysis and reporting, which can create difficulties integrating the relevant results for management. Many tools require business analysts to have programming skills, and integrating results from various tools is often burdensome, error-prone and makes periodic updating problematic. Critical decision making in such an environment is slow and often based on outdated information.

Business analysts often spend significant time creating simple ad hoc reports from a variety of data sources, which frequently require them to make requests from their IT departments. Their inability to create reports unassisted directly contributes to delayed decision making. Finally, companies need a report distribution process so results can be automatically sent to relevant parties enabling them to make decisions based on timely analyses.

To be successful, business analysts need an easy-to-use query, reporting and analytical application. Enterprise Guide enables them to be self-sufficient in accessing the relevant data via a graphical interface, using analytic and graphical wizards, and easily combining relevant results to deliver crucial intelligence to management.

Using Enterprise Guide, business analysts tap into the analytic power of SAS to make the right decisions at the right time. Using wizards, business analysts are guided to access data from almost any platform or source, create queries of varying complexity via a GUI, generate statistical reports from the relevant queries and seamlessly distribute the results to their colleagues. And all of this can be achieved without understanding how to program.

Accessing data

Using SAS Enterprise Guide, a business analyst can access any data source on any platform that is accessible by the SAS server. SAS Enterprise Guide can also access any data source from the client PC including ODBC, OLE DB, Exchange servers, text files, spreadsheets and many other file types.

Once the data is selected, it can be joined, filtered, sorted and manipulated to create the analysis variables required for a particular business need. For example, you can filter the data to view only the sales figures for a region. The Query Builder is used to filter the data enabling the business analyst to join two or more tables (see Figure 6). By default, when joining tables, SAS Enterprise Guide assigns an automatic join on columns in the tables based on column name and data types.

If no column name and type matches are found, a warning is issued to the user that a join should be specified manually. The business analyst can, with a few clicks of the mouse, build a subset of the data. The Query Builder also allows the user to verify a query based on a sample of the data, therefore reducing server loads and allowing checks for efficiency and performance (see Figure 7).

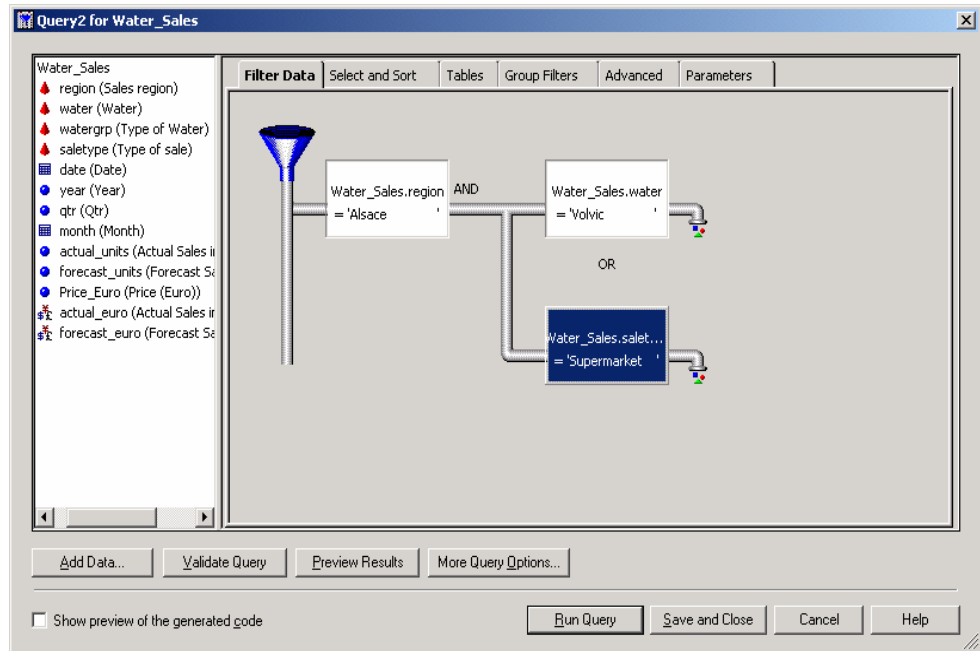


Figure 6: Building a complex join via the Query Builder

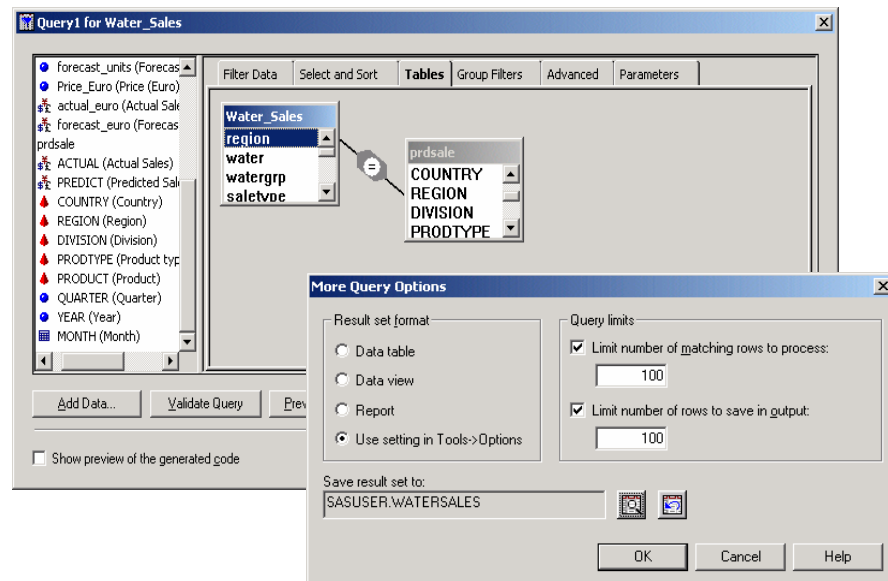


Figure 7: Building a query based on sample data via the More Query Options window in the Query Builder

Analyzing the data

Once the data is in the form needed, the business analyst can proceed to the next phase of the analysis: reporting and graphical examination. To share the data with decision makers, the business analyst needs to prepare and structure the data in a format that is easily understood.

Often, business analysts need to forecast sales figures over a certain time period and spot market trends. Using Enterprise Guide’s **Basic Forecasting** task — one of many analytic capabilities of the Enterprise Guide wizards — business analysts can accomplish this quickly and easily (see Figure 8).

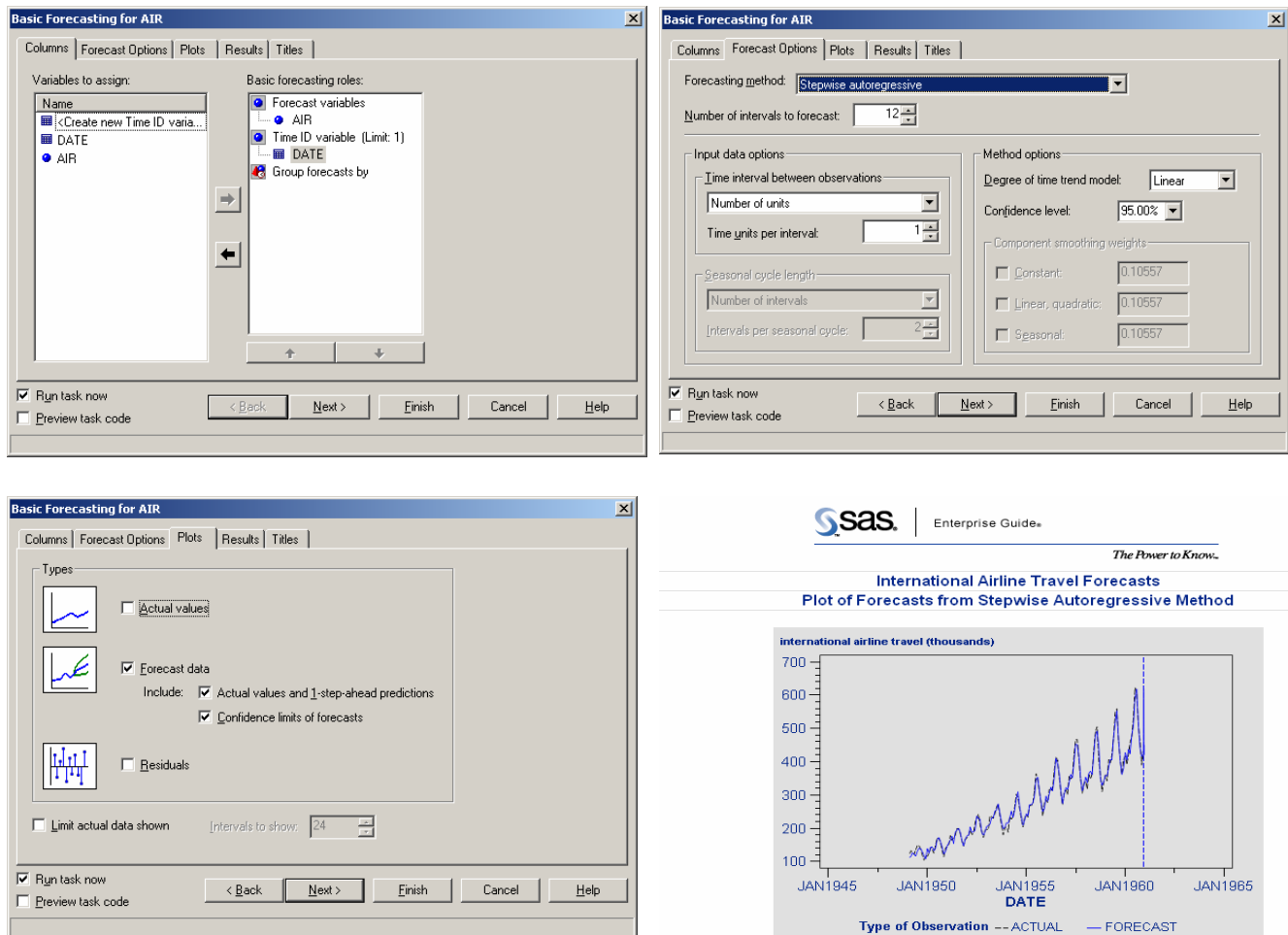
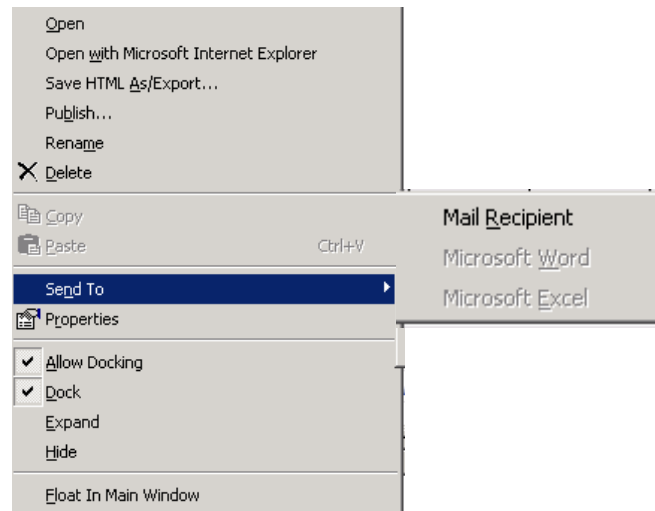


Figure 8: Enterprise Guide’s Basic Forecasting Wizard

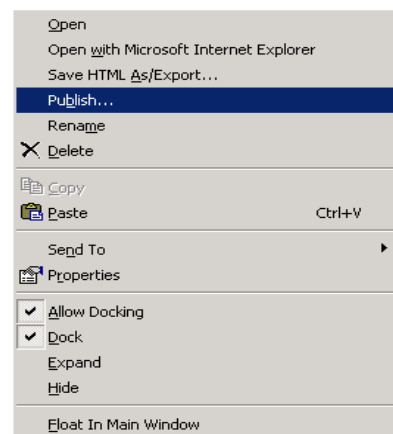
Publishing the results

After the analyses have been performed and the desired results generated, the next step is to share the report with the relevant parties in a timely manner. Enterprise Guide leverages the SAS publishing framework to share information and knowledge with other targeted groups. The

business analyst can distribute forecasting results to various groups via e-mail or publish the results to the SAS Information Delivery Portal via information channels. To send the results via e-mail, simply right click on the report and **Send To->Mail Recipient**.



With SAS Enterprise Guide, business analysts can publish the results to predefined channels — repositories to which users can subscribe. Any information published to a channel is available to all of that channel's subscribers. Each subscriber specifies how the new information is delivered. The advantage of publishing to a channel is that the publisher does not need to create or maintain a list of relevant recipients. Instead, users are responsible for subscribing to the correct channels for their work needs. To publish analysis results, right-click on the task name and select **Publish** and follow the prompts in the **Publish to Channel Wizard** (Figure 9).



Note: You need a Lightweight Directory Access Protocol (LDAP) server available to publish reports to channels. Your LDAP server administrator will know the details on setting up channels.

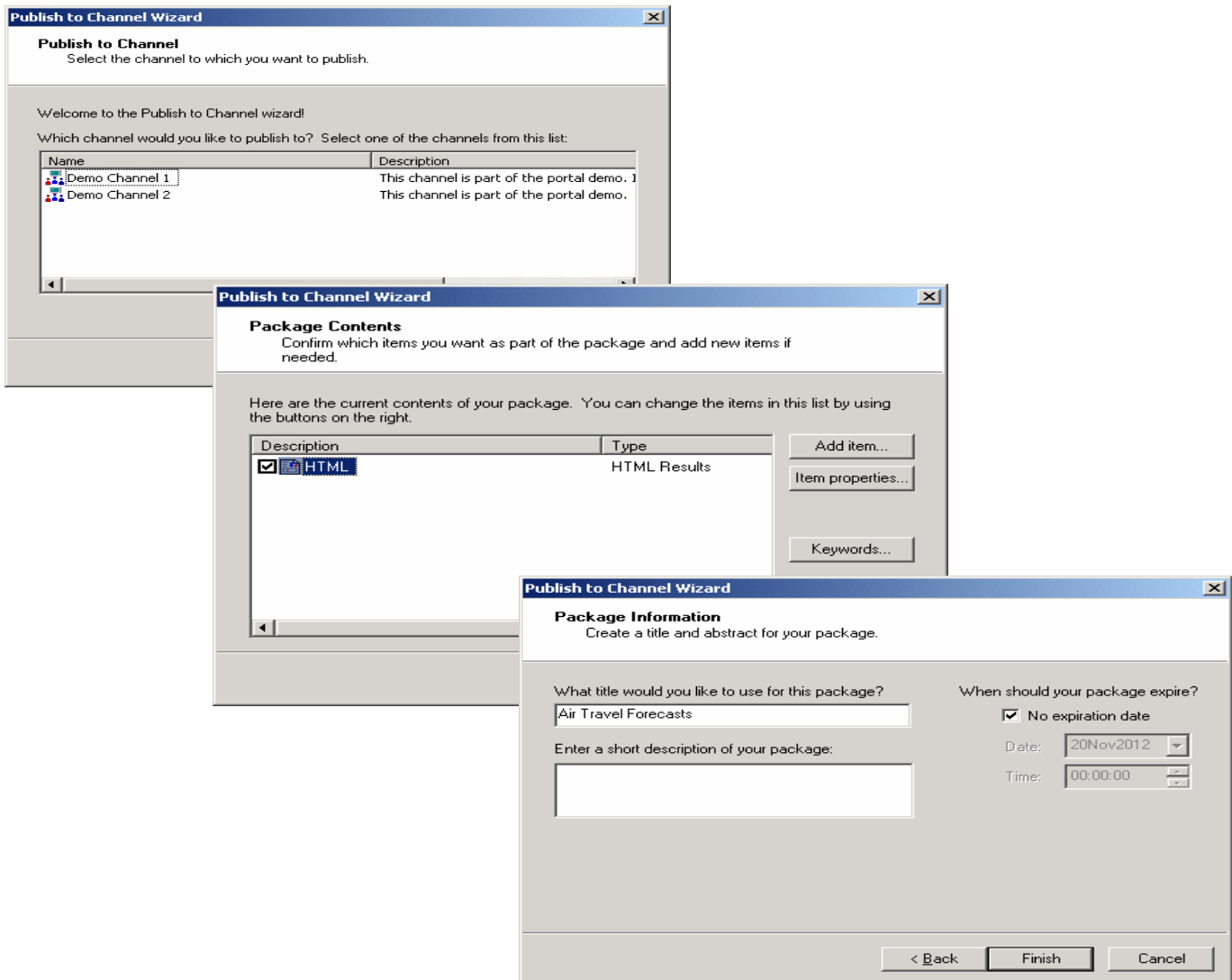


Figure 9: Publish to Channel Wizard

The business analyst may want the reports to run periodically: daily, weekly or monthly. This can be easily achieved with SAS Enterprise Guide using the **Integrated Windows Scheduler** (see Figure 10). The Enterprise Guide project can be scheduled to run at a specific time of day. Reports containing data on a remote server, such as UNIX, can be scheduled easily with the processing done on the remote SAS servers.

Enterprise Guide also allows multiple projects to be combined and scheduled as one job to simplify administration and queue management. Also, projects can be transferred easily from one client to another.

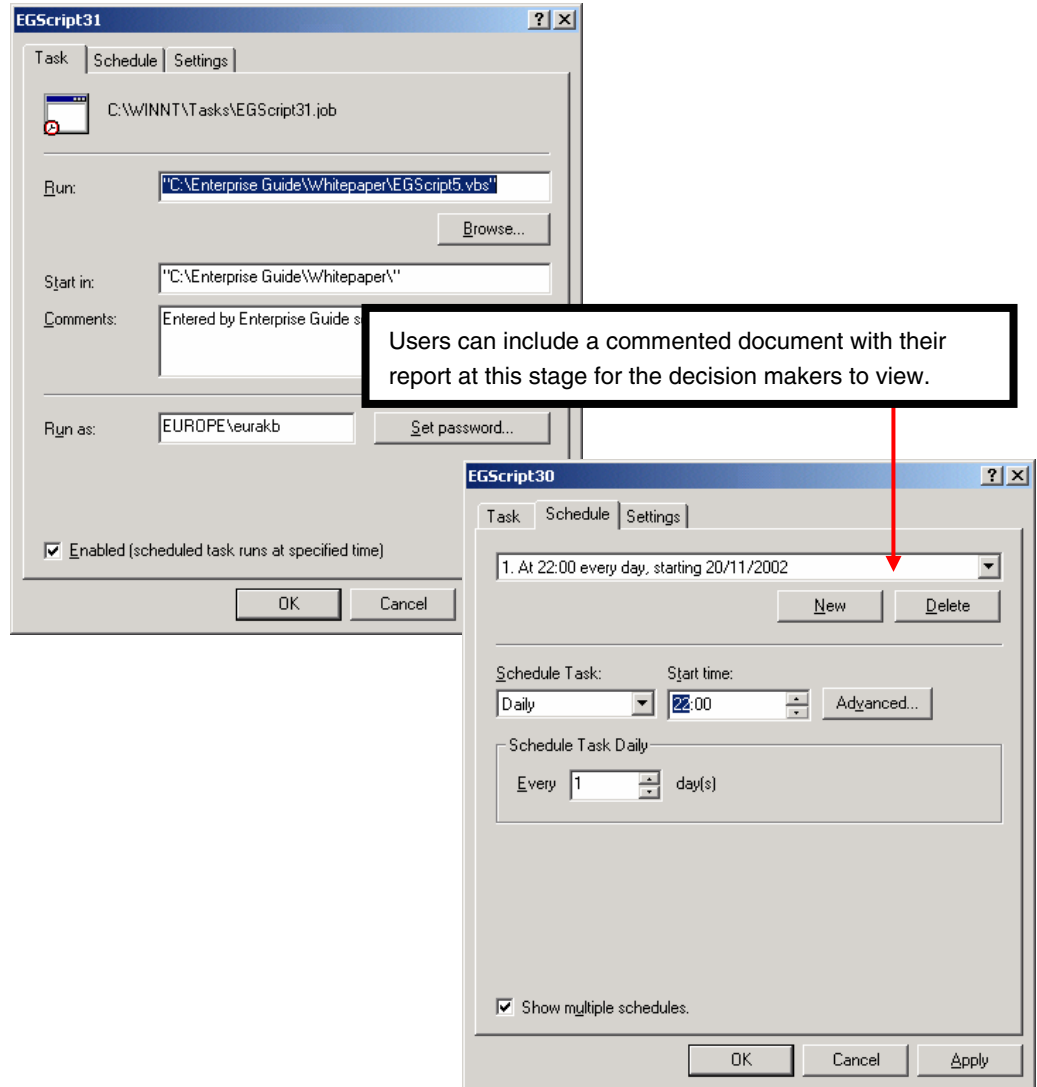


Figure 10: Integrated Windows Scheduler

SAS Enterprise Guide for statisticians

Developing statistical models and reports can take a great deal of a statistician's time, since many of the statistical tools available require some programming knowledge. This often increases training costs for the organization and can slow down the decision-making process immensely.

Statisticians need an application that is easy to use and one that also supports a wide range of powerful statistical capabilities. SAS Enterprise Guide leverages the statistical power of SAS. Via wizards, statisticians can quickly build a variety of statistical models, apply appropriate transformations, examine the model's assumptions and validity, and compare and contrast the various methods to determine the best one for a particular business problem. All this can be achieved without writing code.

Reports typically created by statisticians

The statistician will usually begin by accessing and querying the data in much the same way as the business analyst. Once the data has been prepared, the statistician can begin performing analysis. Frequently, statisticians will create data summaries to characterize the data better and to understand which analytic routes will be taken. A wizard guides them through the data summary process, allowing them to define the data layout in a preview window (see Figure 11). Figure 12 shows a typical summary table.

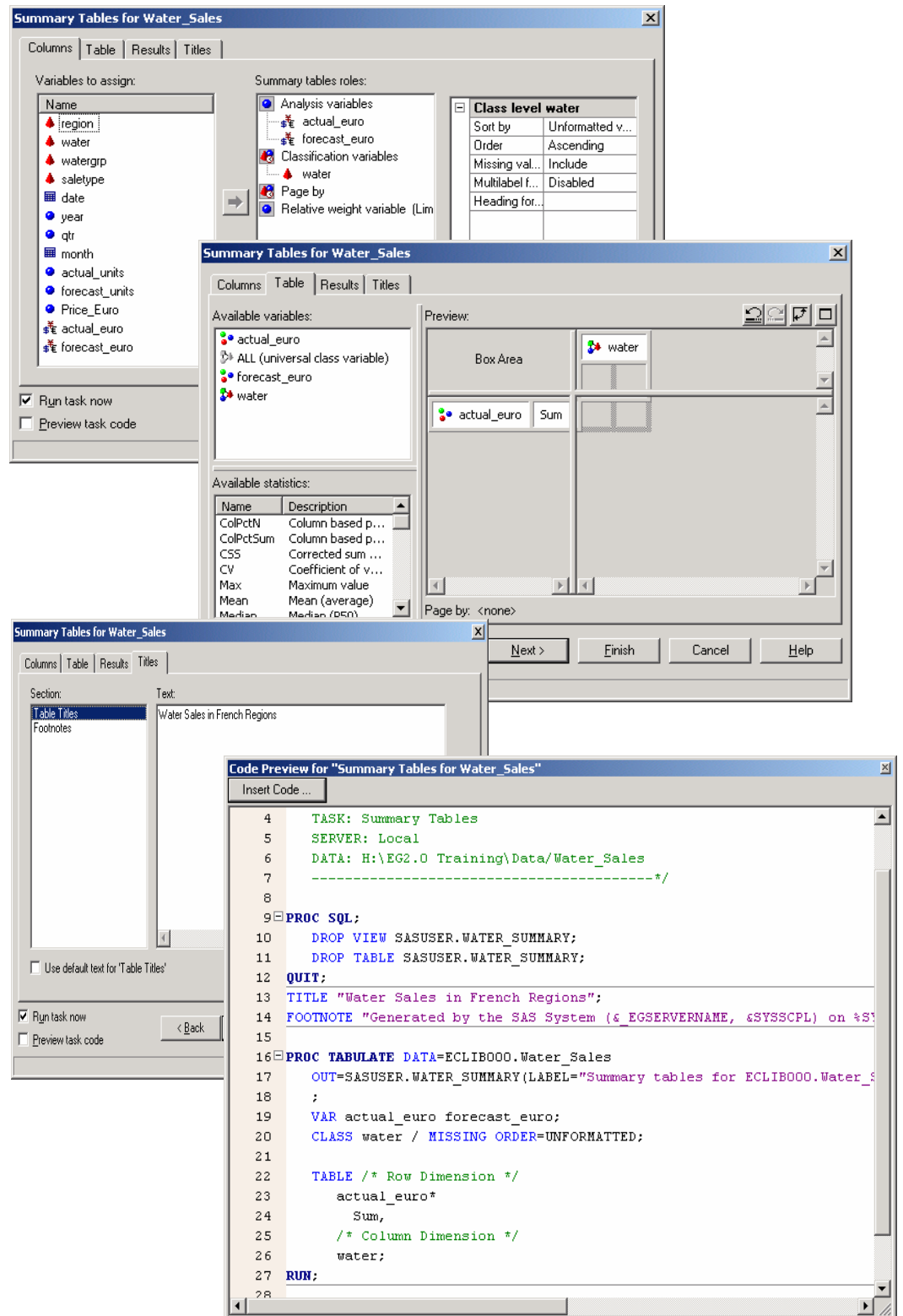


Figure 11: Summary Table Wizard

Summary of Water Sales in French Regions							
		Water					
		Contrex	Eau de Montagne	Evian	Perrier	Vittel	Volvic
Actual Sales in Euros	Sum	134394000.00	158247100.00	320746800.00	921772500.00	364049400.00	120481550.00

Generated by the SAS System (Local, WIN_PRO) on 25NOV2002 at 5:14 PM

Figure 12: Summary Table results

Some frequently used methods of analysis include linear models and multivariate analysis. SAS Enterprise Guide leverages the statistical modeling capabilities within SAS to enable statisticians to perform the analyses they need to make intelligent business decisions. Figure 13 shows just some of the modeling capabilities Enterprise Guide offers.

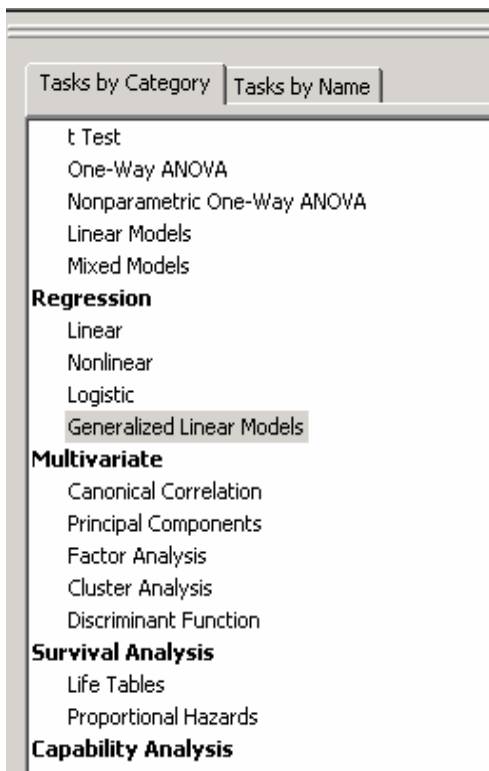


Figure 13: Modeling capabilities in enterprise guide

Publishing the report to the masses

As discussed earlier, relevant results can be made available to all interested decision makers within the organization, either via e-mail or by publishing to the SAS Information Delivery Portal. The analyses can also be scheduled to run periodically via the Scheduler and distributed. With some minor coding, scheduled jobs can be further modified to publish multiple projects to the SAS Information Delivery Portal.

SAS Enterprise Guide for the SAS programmer

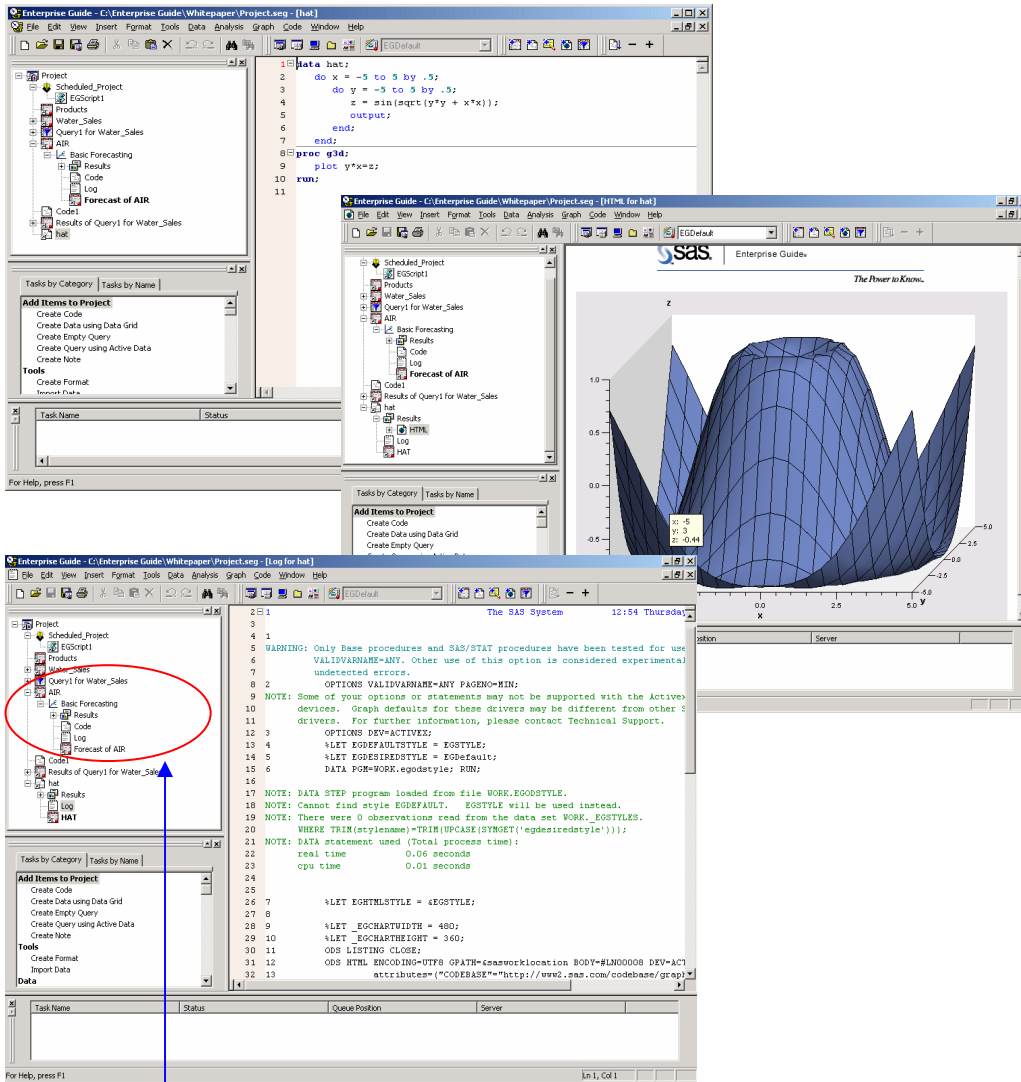
With the increasing number of requests for information and reports coming from various departments within an organization, SAS programmers will benefit tremendously from using SAS Enterprise Guide as their rapid application development environment. Enterprise Guide lets them build and prototype complex SAS code quickly while meeting their users' needs and expectations.

As a SAS code generation tool, Enterprise Guide helps the programmer achieve the desired results by hiding the intricacies of complex SAS procedures, hence speeding up the information delivery process to users. Additionally, Enterprise Guide provides a user-friendly, free-form coding environment where the programmer can code any DATA step or SAS procedure manually. Combining these two facilities gives programmers the best of their traditional development environment and the power of the Enterprise Guide wizards. Programmers can test custom written code anytime and all errors are reported in the log node. To submit code from the code window, click the **Right Mouse Button** in the Code window and select **Run on <Server Name>**. Once the code is submitted to the selected SAS server, the results, log and code are created in the **Project Window** in the left panel (see Figure 14).

If programmers don't want to write code, they can use the **Task Wizards** to generate reports, summaries, graphs and analyses quickly and then modify the automatically generated SAS code later. SAS Enterprise Guide 2.0 also enables users to modify code on the fly from within the wizards. This is extremely useful in the rare instance that the wizards within Enterprise Guide do not provide the option needed to meet report requirements.

Modifying code on the fly

Code can be modified easily while developing your project via the **Task Wizard**. This gives programmers great flexibility; they do not need to rerun the procedures, for example, to further subset the data for a specific report.



Code, Log and Results added to the Project tree.

Figure 14: Log and Results are generated once the code is submitted to the SAS Server

List Data for Water_Sales

Variables to assign: region, water, watergrp, saletype, date, year, qtr, month, actual_units, forecast_units, Price_Euro, actual_euro, forecast_euro

List data roles: List variables, water, watergrp, region, Price_Euro, actual_euro, forecast_euro

Add User Code

Statement: Proc PRINT
VAR
ID
SUM
Run
End of task code.

Code for selected statement: ;where saletype="Supermarket";

Code Preview for "List Data for Results of Query1 for Water_Sales"

```

Code generated by SAS Enterprise Guide
DATE: Tuesday, November 26, 2002    TIME: 06:00:22 PM
TASK: List Data
SERVER: Local
DATA: SASUSER/QUERY8766
-----*/

TITLE "Water Sales in the Alsace Region";
FOOTNOTE "Generated by the SAS System (& EGSERVERNAME, &SYSSCP) on %SY

PROC PRINT DATA=SASUSER.QUERY8766
  NOOBS
  LABEL
  /* Start of custom user code. */
  ;where saletype="Supermarket"
  /* End of custom user code. */
  ;
  VAR water watergrp region Price_Euro actual_euro forecast_euro;
RUN;

/* End of task code. */
TITLE;FOOTNOTE;RUN;
    
```

Water Sales in the Alsace Region

Water	Type of Water	Sales region	Price (Euro)	Actual Sales in Euros	Forecast Sales in Euros
Volvic	Mineral	Alsace	0.85	€97.750,00	€127.500,00
Volvic	Mineral	Alsace	0.85	€123.250,00	€161.500,00
Volvic	Mineral	Alsace	0.85	€6.800,00	€8.500,00
Volvic	Mineral	Alsace	0.85	€57.800,00	€51.000,00
Volvic	Mineral	Alsace	0.85	€73.950,00	€93.500,00
Volvic	Mineral	Alsace	0.85	€5.950,00	€8.500,00
Volvic	Mineral	Alsace	0.85	€60.350,00	€42.500,00
Volvic	Mineral	Alsace	0.85	€106.250,00	€93.500,00
Volvic	Mineral	Alsace	0.85	€34.000,00	€25.500,00

Figures 15: Inserting user code while doing the analysis

Results

Adding custom tasks

Enterprise Guide is a great application for accessing the analytic power of SAS. With the addition of the **Add-In Task** support, you can take advantage of the features in Enterprise Guide to quickly develop a custom analytic solution to fit your users' business needs. An Enterprise Guide add-in extends the application by including functionality that is business need-specific and not in the core product already. Frequent users of Microsoft Office products may be familiar with add-ins.

With Enterprise Guide, you can create Component Object Model (COM) add-ins via Visual Basic, C++ or Microsoft .Net C#. Add-ins are usually targeted to extend the core functionality of Enterprise Guide and allow you to create custom wizards (code tasks) and custom libraries (stored SAS code.) Custom wizards guide users step by step through a complex analysis process. Custom libraries store frequently used procedures and generic code to be run without interaction from the user. Once the custom code is created, it is integrated into Enterprise Guide via the documented Enterprise Guide API.

An excellent example of add-ins was illustrated at SUGI 28 by SAS software developer Joe Carter. Carter created a custom task add-in targeted at retail pricing managers. He leveraged SAS High-Performance Forecasting software and presented an intuitive user interface that retail pricing managers can use to assess product success, price elasticity and appropriate changes in pricing and product placement. Developing this custom task add-in from Enterprise Guide was easy since Enterprise Guide's API already had many of the common features required by such a custom task.

What is a COM add-in?

A COM add-in is a dynamic link library (DLL) specially registered for loading by SAS Enterprise Guide. You can create COM add-ins with Microsoft Visual Basic (Version 6 or later), Microsoft Visual C++, Microsoft .NET C#, or Visual Basic.NET. For more information about these development tools, see the Microsoft Developer Network Web site at <http://msdn.microsoft.com>.

COM add-ins use the Component Object Model, making it possible for you to create an add-in that is available to Enterprise Guide. By developing SAS Enterprise Guide COM add-ins, you can extend the functionality of Enterprise Guide with a focused interface for your business users.

Creating add-in tasks for Enterprise Guide 2.0

One of the major new features of Enterprise Guide 2.0 is the ability to create your own task dialogs and plug them into Enterprise Guide as add-ins. This allows you to define analysis and reporting tasks specific to your industry or company and then fit them in as a natural part of Enterprise Guide. These tasks can then be used just like any of the built-in tasks. This means that you can provide the task with any data that you can access, submit the task as SAS code and gather the results, include it in a process flow diagram, and script and schedule it as part of a project. The following sections describe some resources that you will find essential as you begin extending Enterprise Guide by creating your own tasks. For further details on the API that you

need to implement your own add-in tasks, please refer to the reference document at <http://www.sas.com/products/guide/customtasks.html>

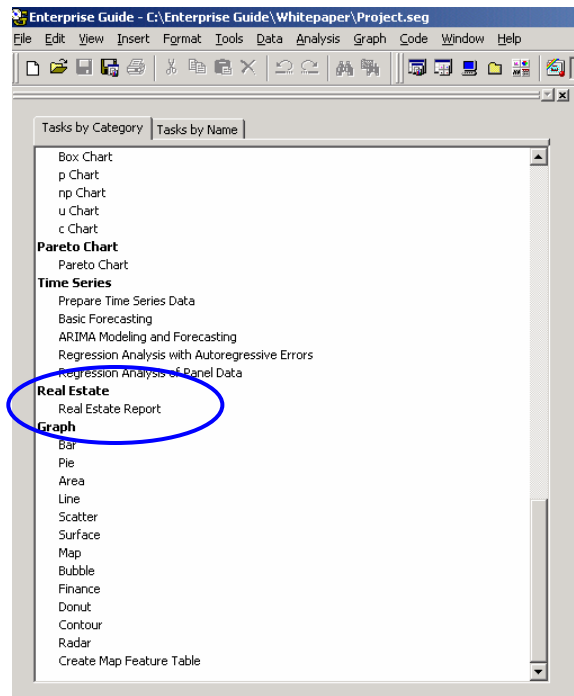


Figure 16: The new task added into the Task List after restarting Enterprise Guide

Deploying reports on the Web

Projects created with SAS Enterprise Guide can be deployed to the World Wide Web using SAS/IntrNet or SAS Integration Technologies. In this section we will focus on using projects from Enterprise Guide with SAS/IntrNet software. SAS/IntrNet opens SAS to the Web, via both the extranets and intranets. SAS/IntrNet provides a solution for running ad hoc reports and analyses via the Web, bringing the power of SAS to the desktop via a Web browser. Since SAS/IntrNet only requires users to have a browser, almost anyone can use the content developed in Enterprise Guide without ever needing to learn SAS. For more details on SAS/IntrNet, please refer to “SAS/IntrNet Software: A Roadmap,” a white paper available at http://www.sas.com/service/library/whitepaper/downloads/44758_0901.pdf

Once the report is created using Enterprise Guide, you will need to make a few modifications to the **SAS/IntrNet application server**, that is, you will need to allocate the library where the data set used to create the report is stored. A **SAS/IntrNet dispatcher program** needs to be created using the code that Enterprise Guide generated to produce the report. Basically SAS Output Delivery System (ODS) statements and the Java device driver need to be added to the code. Once the changes have been added, the file is saved to the **SAS/IntrNet Samples library**. The final step is to invoke a Web browser to view the report generated by Enterprise Guide on the Web as illustrated by Figure 17. This is an ActiveX control, which means that you can interact with the graph and change many of the options on the fly. To change the graph type or any other graphics options right mouse click on the graph object.

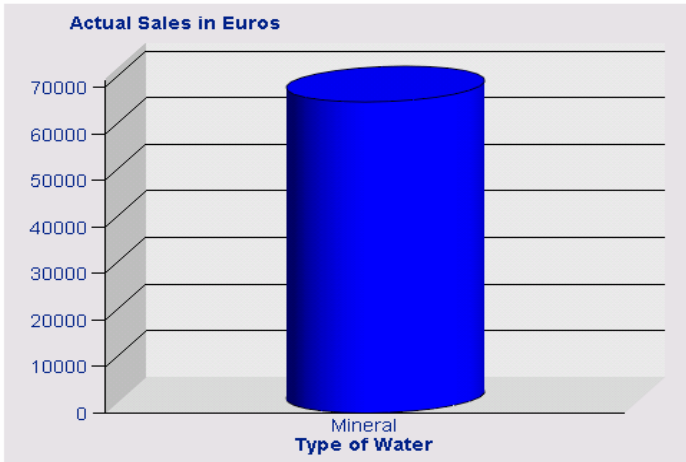


Figure 17: Report created by Enterprise Guide displayed on the Web

Conclusion

Different types of users within your organization can benefit from the powerful capabilities of SAS Enterprise Guide. Enterprise Guide enables each type of user to develop and distribute the right information to the relevant decision makers quickly, allowing them to make informed and insightful decisions.

With Enterprise Guide as the interface to SAS, business analysts, statisticians and programmers can leverage SAS' power on many platforms, accessing data simply and quickly, querying and manipulating the data, performing basic reporting, and using complex analytics to solve critical business needs.

For more information, please visit the SAS Enterprise Guide Web site at <http://www.sas.com/products/guide>.

Appendix

Terminology

ActiveX: ActiveX controls are implementations exclusive to Windows that take advantage of the Microsoft Windows implementation of COM technologies to provide interactivity and interoperability with other types of COM components and services. ActiveX controls are the next generation of Object Linking and Embedding (OLE) controls, providing a number of enhancements designed to facilitate distribution of components over the Web. ActiveX controls can be embedded in HTML pages – much like Java applets – and executed on the client in much the same way.

ActiveX Data Objects (ADO): ADO is an application-level interface to OLE DB and is also a Microsoft technology. ADO is installed with the Microsoft Data Access Components (MDAC) package, distributed independently of Microsoft Internet Information Server (IIS). In simple terms, it is a programming interface for accessing data in a database -- ADO might be used, for example, from within Active Server Pages.

Common Object Request Broker Architecture (CORBA): Common Object Request Broker Architecture was developed by the Object Management Group (OMG) Consortium. CORBA is a way to transfer messages to and from objects between various platforms in a distributed environment. Applications and programming environments such as C, C++, Java, Smalltalk, ADA and many others support CORBA.

Component Object Model (COM): Microsoft developed Component Object Model for the Windows operating system. COM supports objects on the **same** machine, so you can instantiate and manipulate COM objects on the machine from which the request originates. COM and Distributed Component Object Model (DCOM) are supported extensively by applications and programming environments such as VBScript (Active Server Pages), JavaScript (Active Server Pages), Visual Basic, Visual Basic for Applications (VBA), (Visual) C++, Delphi, Java and many others.

Distributed Component Object Model (DCOM): Distributed Component Object Model is an extension of COM that adds requirements to make it easier to create objects to be distributed across a network. Thus, with DCOM you can search for, instantiate and manipulate objects on machines other than the one where the request originates.

OLE DB: OLE DB is a set of interfaces for data access. OLE DB is a Microsoft specification that provides universal data integration over an enterprise's network from mainframe to desktops, regardless of the data type. OLE DB evolved from Microsoft's Open Database Connectivity (ODBC) data access interface.

SAS Integration Technologies: SAS Integration Technologies make the power of SAS computational servers and SAS data servers available to other enterprise applications by extending the reach of SAS software. It links your information world to the power of SAS.

SAS Information Delivery Portal: The Information Delivery Portal extends the information and knowledge generated with industry-leading SAS products and solutions to all knowledge workers in an enterprise via a secure Web-based interface.

SAS/IntrNet: SAS/IntrNet opens SAS to the Internet, extranets or intranets. This software provides a solution for running ad hoc reports and dynamic applications via the Web, bringing the power of SAS to the desktop through a Web browser. SAS/IntrNet provides all this capability without requiring that SAS be installed on every desktop or that everyone learn SAS to access information needed to make informed business decisions.

SAS Output Delivery System (ODS): The SAS Output Delivery System delivers various forms of SAS output such as HTML, PDF, RTF, plain text, XML and many others.

SAS Stored Process: A SAS Stored Process is a previously created and saved set of code that can be executed by SAS software upon request. Often, such programs take parameters and return results to the calling application. By creating stored processes and allowing them to be called by applications developers, you can draw a distinct line between the need for SAS knowledge and the need for other programming skills. Furthermore, by drawing such a distinct line, it becomes easy for the code to be reused by many clients and to be changed in just one place if required, thus reducing maintenance. Perhaps the biggest value add of using a SAS Stored Process is that changes made to the SAS code do not impact any client application code or vice versa.

Visual Basic: Visual Basic is a programming environment from Microsoft in which a programmer uses a graphical user interface to choose and modify preselected sections of code written in BASIC.

Visual Basic for Applications (VBA): A member of the Visual Basic family, Visual Basic for Applications is the development environment in Microsoft Office. VBA is integrated into various third-party software that is available through a VBA licensing program from Microsoft.

Visual Basic Scripting Edition (VBScript): Visual Basic Scripting Edition is a scripting language that is based on the Visual Basic programming language but is much simpler to use. VBScript is similar to JavaScript. VBScript makes it possible to add interactive features, such as buttons and scrollbars, to Web pages. Microsoft developed this scripting language, which works with Internet Explorer.



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