

Paper 136-2010

SAS Enterprise Guide®: The Self-Service Environment for Reporting and Analytics

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ABSTRACT

With the ever-increasing demand for timely business intelligence, business analysts require simple tools for reporting and analytics, which liberates IT.

SAS Enterprise Guide® provides a point-and-click interface to the full power of SAS®. It provides a broad set of 'out-of-the-box' tasks for reporting and analysis. It eliminates programming time, so users can concentrate on their core job. Advanced users can include their existing SAS programs in the process flow generated by SAS Enterprise Guide in order to generate a customized job.

Key features of SAS Enterprise Guide include:

- a Windows-based interface
- intuitive wizards to build tasks with options for adjusted results
- output in almost any format (such as HTML, RTF, or PDF)
- a process flow diagram with a visual presentation of the program flows
- access to almost any data type
- integration with the other SAS tools
- data manipulation tasks through an advanced query builder
- wizards to build descriptive reports, graphs and analytical results
- access to OLAP data sources
- result distribution and result sharing.

INTRODUCTION

SAS Enterprise Guide is used by a variety of user profiles:

- The experienced SAS user benefits from the overview through the process flow and uses SAS Enterprise Guide as a code template.
- The business analyst knows the data but is unfamiliar with SAS coding. He/she benefits from the variety of available tasks and wizards to build reports and analytics. For both the experienced user and the business analyst, programming time is eliminated because the code is generated automatically.
- The end-user combines for instance OLAP cubes with reporting wizards. Users can access information from SAS Information Map Studio, which presents the data in business terminology instead of in IT terminology.

The power of SAS Enterprise Guide is illustrated by building the following workflow:

- Data from a travel agency are available in SAS tables and Excel files. These data tables must be combined, manipulated and filtered.
- The combined data must be used to perform data analysis.
- Existing SAS code must be integrated in the work flow.
- Reports must be created on consolidated data.
- Dynamic reports must be added to the analysis, with prompts to the users, requesting values for specific parameters.
- Result tables must be exported to ".txt" or ".csv" format.

The input data is stored in two SAS tables and an Excel file:

- The SAS table "Trip_FT" is a fact table containing travel information.
- The SAS table "Trip_DT" is a dimension table, containing the description of "Trip_Code", one of the keys in the table "Trip_FT".
- The Excel file "Country_DT" contains a sheet with the country name and continent name for each country code. "Country_Code" is one of the keys in the table "Trip_FT".

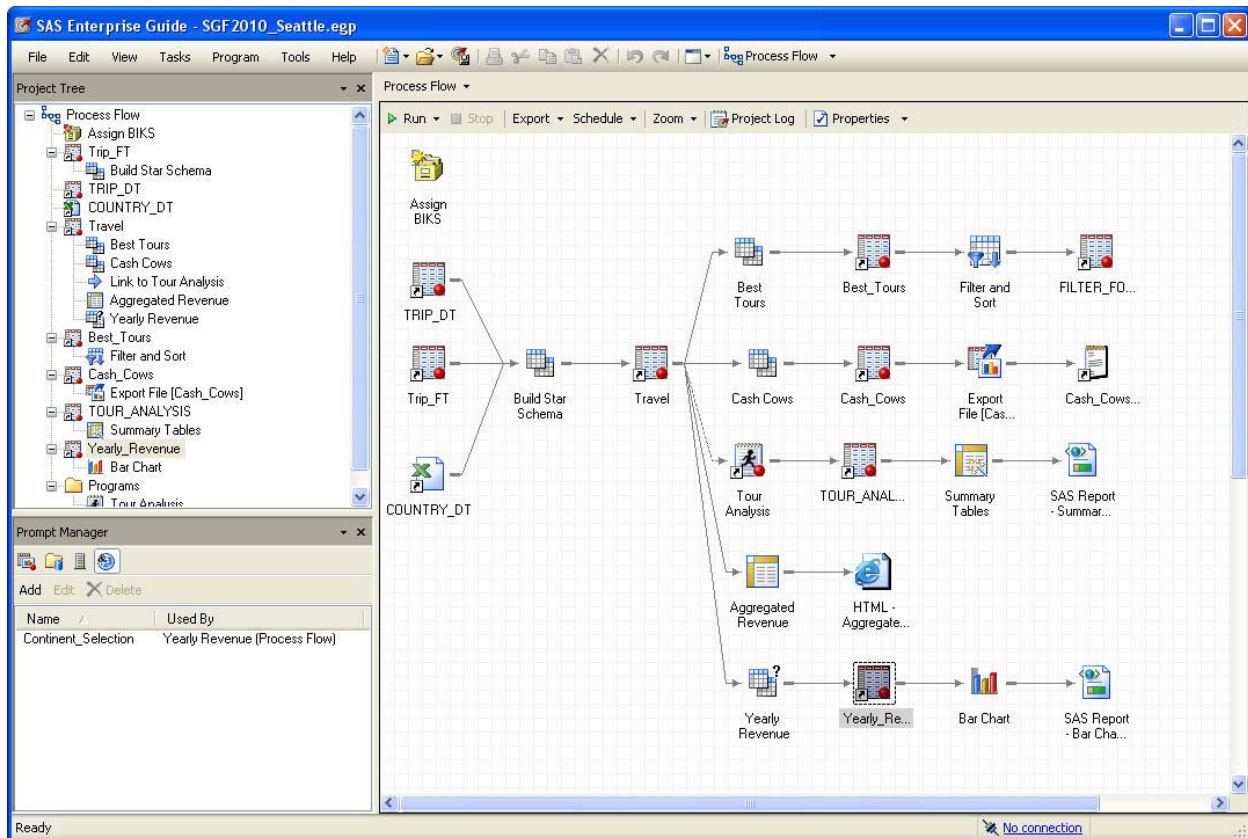
BASIC CONCEPTS

A **project** in SAS Enterprise Guide is a collection of data, analysis results, reports and tasks. A project can be saved (in a file with extension “.egp”) and can be run in interactive mode or in batch mode.

A **process flow** is a graphical presentation of tables, tasks, results and the link between them. You can organize and maintain your tasks visually in the process flow. A project can contain one single process flow or a set of process flows.

Within SAS Enterprise Guide you can run:

- a single task
- a branch in a process flow
- a complete process flow
- a complete project.



The default application layout looks as follows:

- The **Project Tree** displays a hierarchical view of the project, containing data, tasks, programs, log files and results.
- The **Workspace** displays one or more process flows; data and results.
- The **Task List** shows the available tasks by name or by category.
- The **Prompt Manager** shows the parameter list and indicates where parameters are used.

The default application layout can be customized.

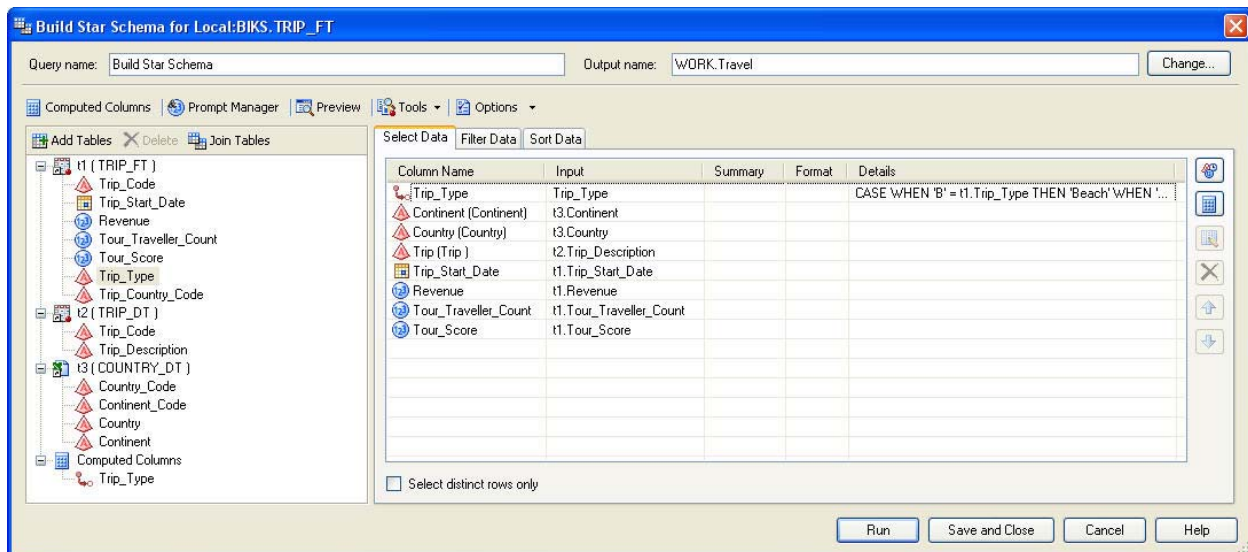
ACCESSING AND COMBINING DATA

SAS Enterprise Guide enables accessing almost any data type. The front end provides a mechanism to access data across the company, on multiple platforms and in different databases.

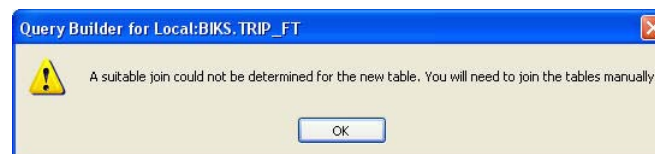
The Query Builder is a graphical interface to create, update, subset, sort and join tables without any SQL knowledge. Users can preview the generated code.

As a first step in our workflow, data from the three data sources must be combined into a new table called "Travel":

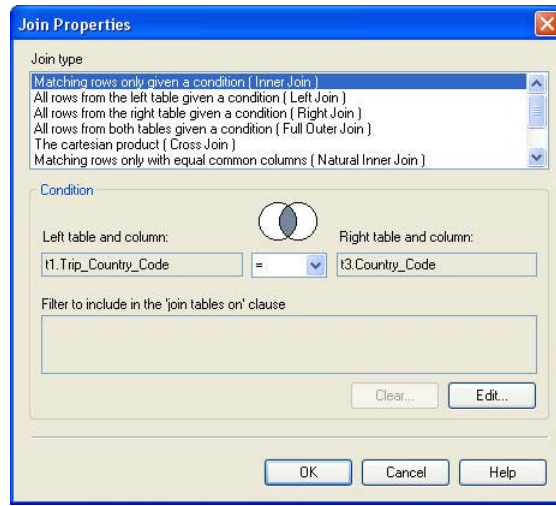
1. Open the table "Trip_DT" in the Process Flow window.
2. Select the **Query Builder ...** task to build a new table called "Travel". Three tables are joined, a set of columns from these tables are selected and a new column is created. The final Query Builder window is shown below.



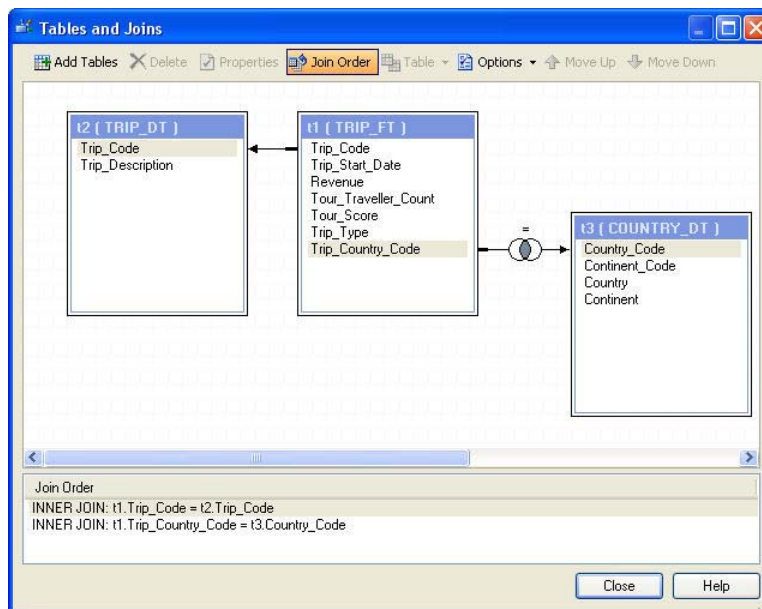
3. Select the **Join Tables** button to open the Tables and Joins window.
4. Select the **Add Tables** button and select the SAS table "Trip_DT". Since both tables have a common column named "Trip_Code" both tables are automatically linked.
5. Select the **Add Tables** button again and select the Excel file "Country_DT". There is no common column in both tables, so no automatic link is created.



- Define a link between both tables, by connecting "Trip_Country_Code" with "Country_Code". Notice that you can modify the join type and join condition.



- The final star schema is shown below:



- Close the window to return to the Query Builder window.
- Use drag and drop operations to move columns from the three tables into the Select Data tab. Use the **Up** and **Down** buttons to organize the sequence of the columns.
- Select the **Computed Columns** button to build a new column, translating the "Trip_Type" code into a description.

11. Select the **Add** button to build a new column. A wizard guides you through this process. You can build new columns or modify columns by creating expressions or by recoding values. In this workflow, the column "Trip_Type" is re-built by recoding the code into a description.

The screenshot shows the 'New Computed Column' dialog box at step 3 of 5, 'Specify a replacement'. The 'Replacement' table contains the following data:

Replace	With
= B	'Beach'
= T	'Tour'

Other values options: The current value, A missing value, Specify a value: [] [...]. Enclose value in quotes.

Column type options: Character, Numeric.

Buttons: Add..., Edit..., Delete, <Back, Next>, Finish, Cancel, Help.

12. Review the syntax that is created to build this new column.

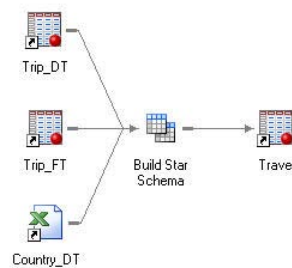
The screenshot shows the 'New Computed Column' dialog box at step 4 of 5, 'Modify additional options'. The 'Column' is 'Trip_Type', the 'Alias' is 'Trip_Type', and the 'Summary' is 'NONE'. The 'Expression' field contains the following SQL code:

```
CASE
  WHEN 'B' = t1.Trip_Type THEN 'Beach'
  WHEN 'T' = t1.Trip_Type THEN 'Tour'
  ELSE t1.Trip_Type
```

Column type: Character, Numeric. Format: None [Change...].

Buttons: <Back, Next>, Finish, Cancel, Help.

13. Select the **Run** button to build the new table. Depending on your options settings the table will be automatically opened. The final process flow is shown below:



MANIPULATING DATA

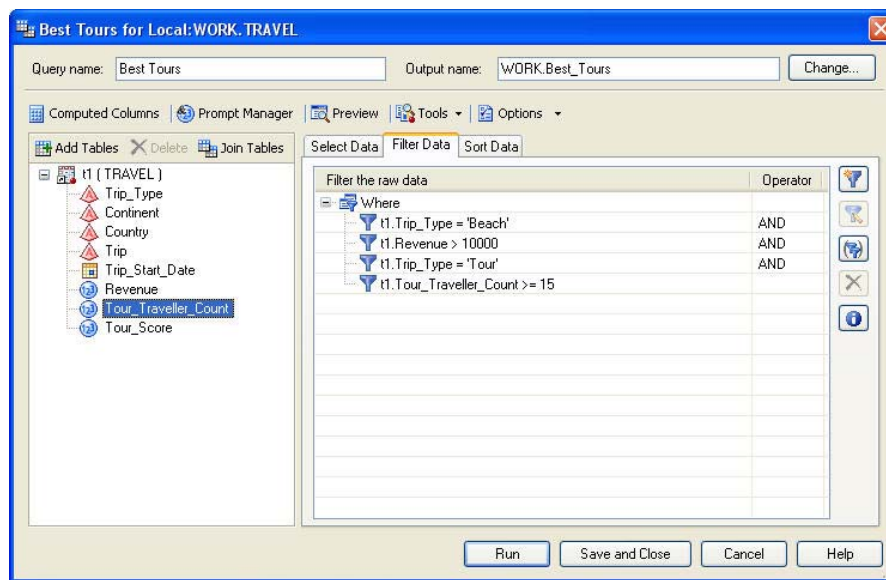
FILTERING AND SORTING DATA WITH THE QUERY BUILDER

The Query Builder task can be used to create a subset of a table by defining filters. Additionally you can specify sorting on one or multiple columns.

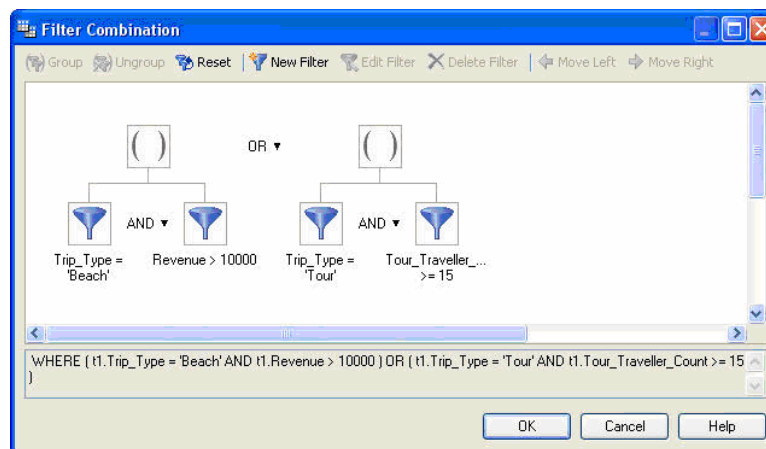
Question: Build a table called “Best_Tours”, starting from the table “Travel”, restricting the result to records for beach holidays with a revenue above €10,000 and tour trips with at least 15 participants.

To do so:

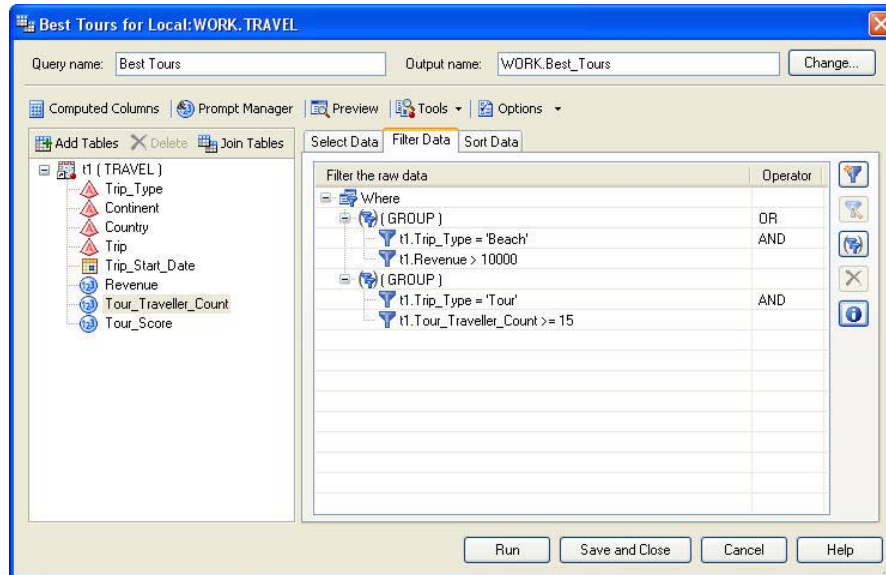
1. Open the **Query Builder ...** task, using the table “Travel” as active table.
2. Define four filters by using the **Filter** icon or by using drag and drop. By default, the four filters are combined with an AND relation. (This will not return any record.)



3. Use the **Combine Filters** icon to open the Filter Combination window. Use the **Group** icon to group individual filter definitions and specify the correct relation between the filters and the groups. The result is shown below:



- Return to the Query Builder window to review the result.



- Run the task. By default – specified in the Options window – the table opens. Notice the icon bar above the table, allowing immediate further processing and analysis.

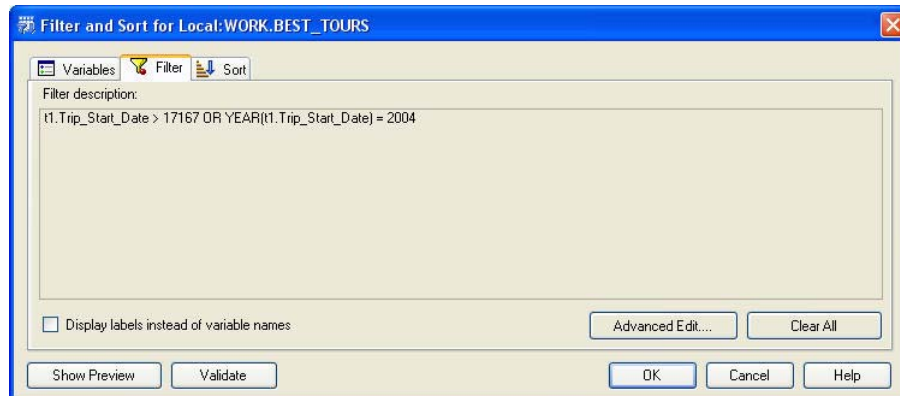
	Trip_Type	Continent	Country	Trip	Trip_Start_Date	Revenue	Tour_Traveller_Count
1	Beach	Asia	Maldives	Maldives (Filitheyo)	12/08/2005	12,240	
2	Beach	Asia	Maldives	Maldives (Filitheyo)	15/02/2007	11,896	
3	Tour	South America	Cuba	Big Tour of Cuba	08/08/2007	39,086	15
4	Tour	Asia	Sri Lanka	Discovery of Sri Lanka	29/07/2005	26,877	17
5	Tour	South America	Peru	Discovery of Peru	16/08/2007	31,803	17
6	Tour	Asia	Thailand	Thailand, Paradise on Earth	14/12/2004	27,308	18

FILTERING AND SORTING DATA OUTSIDE THE QUERY BUILDER

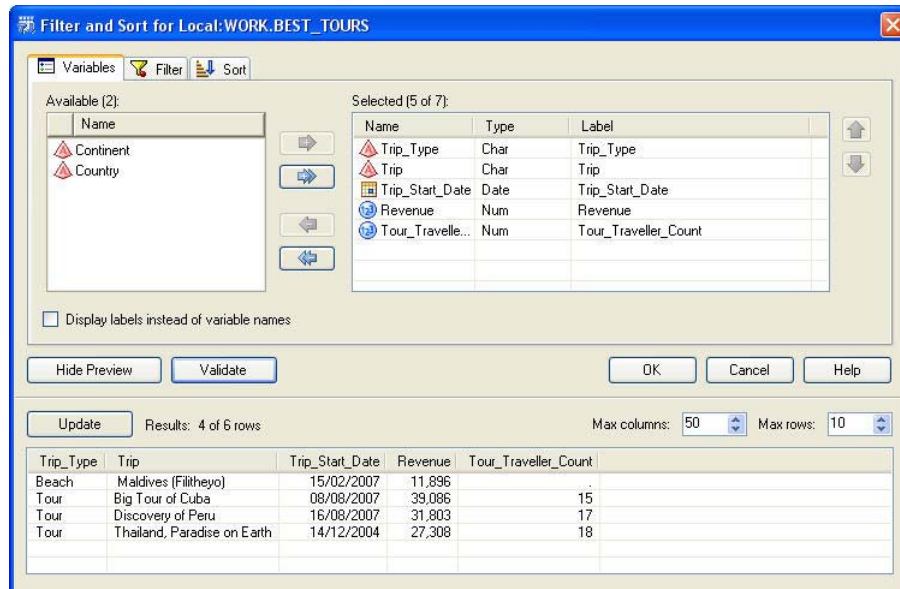
Question: Continue with the previous result and build another subset, restricting to records with trips in 2004 or starting after January 1, 2007.

To do so:

1. Select the **Filter and Sort** icon, to build a new table, without using the Query Builder ... task.
2. Build a filter with two conditions, by using the selection fields and by specifying a complex filter using the **Advanced Edit ...** button. The resulting condition is shown below:



3. The result can be reviewed by selecting the **Show Preview** button.



4. Select the **OK** button to create the new table.

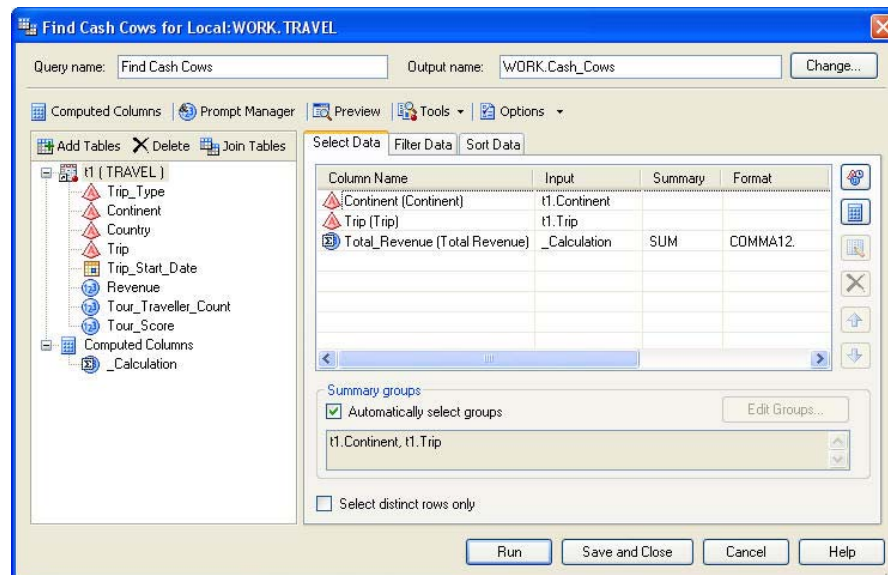
	Trip_Type	Trip	Trip_Start_Date	Revenue	Tour_Traveller_Count
1	Beach	Maldives (Filt...	15/02/2007	11,896	.
2	Tour	Big Tour of Cuba	08/08/2007	39,086	15
3	Tour	Discovery of Peru	16/08/2007	31,803	17
4	Tour	Thailand, Paradi...	14/12/2004	27,308	18

GROUPING DATA WITH THE QUERY BUILDER

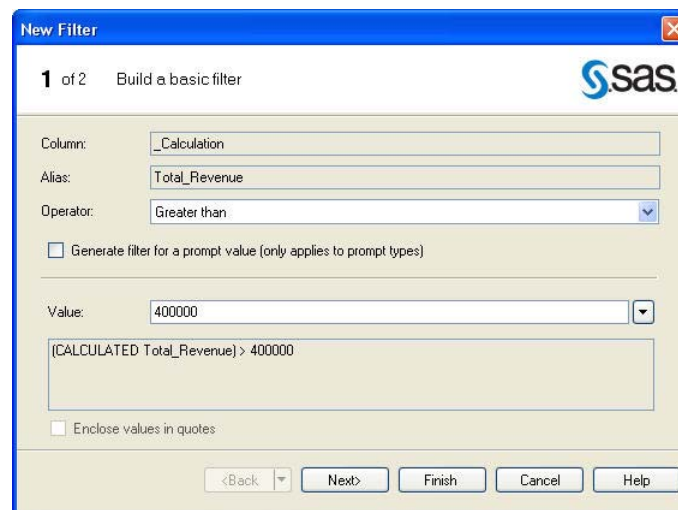
Question: Build a table containing the total revenue per trip (and continent); restrict the result to trips with consolidated revenue above €400,000. Sort the result on descending revenue. Finally, export the result into a “.csv” file.

To do so:

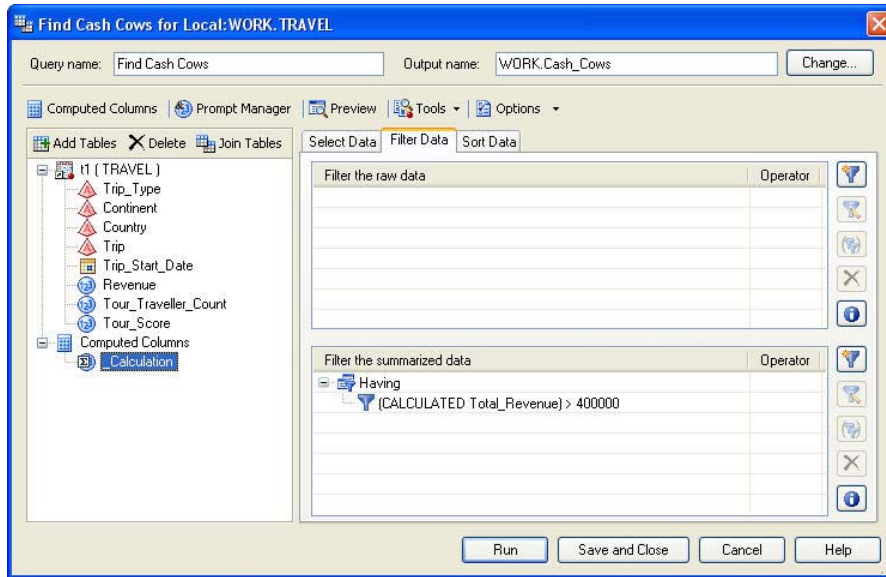
1. Open the **Query Builder...** task on the table “Travel”. Select the columns “Continent”, “Trip” and “Revenue”.
2. Indicate to summarize the data, and use the **Properties** icon to rename the “Sum_of_Revenue” into “Total_Revenue”.
3. Select the option **Automatically select groups**.
4. Assign a meaningful name to the task and define the name of the resulting table.



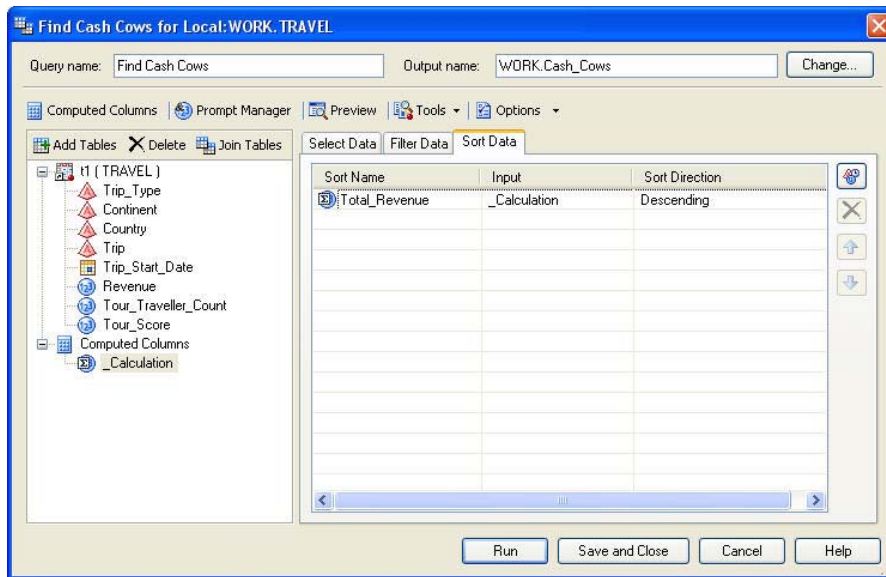
5. Select the Filter Data tab and build a filter in the Filter the summarized data block.



6. The final filter is shown below:



7. Select the Sort Data tab and define a descending sort on "Total_Revenue", using drag and drop and by using the drop down list in the **Sort Direction** field.



8. Select the **Run** button to create the result.

	Continent	Trip	Total_Revenue
1	North America	Big Maya Tour	586,675
2	Asia	Thailand, Paradise on Earth	547,151
3	South America	Big Tour of Ecuador	513,411
4	Asia	Thailand from A to Z	484,126
5	Asia	Discovery of Thailand	460,226

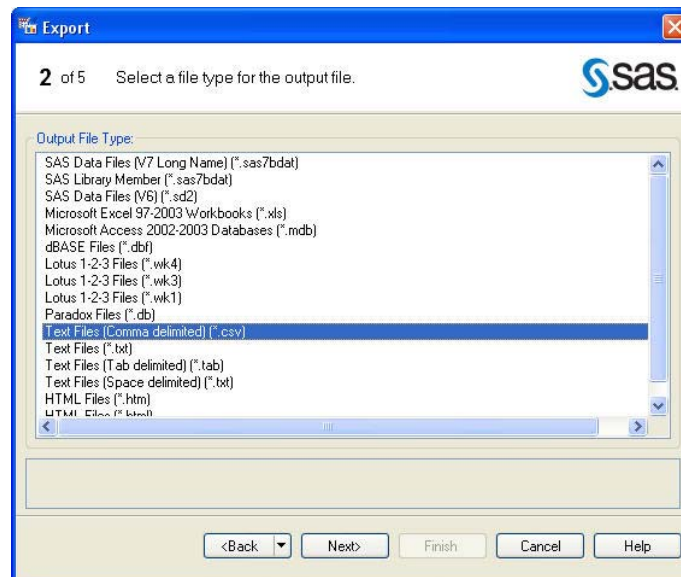
EXPORTING DATA

The icon bar above the table allows exporting the data. Selecting the **Export** option allows creating a one-shot export or adding the export as a step in the full process flow.



To export the result:

1. Select the option **Export Cash_Cows As A Step In Project ...**
2. The export wizard guides you through the export step. Notice the various file types that can be selected; this opens the results of your tasks to almost any third party software.



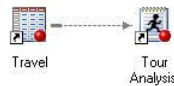
3. Specify the location of the exported result.
4. The full flow is shown below:



INTEGRATING EXISTING CODE

The tasks in SAS Enterprise Guide generate SAS code. Users can create new code in SAS Enterprise Guide or existing SAS code can be integrated in the project. Code can be added as a stand-alone step in a process flow, or it can be completely integrated in an existing flow. To do so:

1. Consider the SAS program “Tour Analysis.sas”. Use the macro variable “&SYSLAST” to refer to the first table used in the SAS code. The SAS code can be connected to a table in the process flow, and will use this table as input for that step. Add the SAS program to the process flow.
2. Select the table “Travel” in the process flow; press the right mouse button and select **Link Travel to ...** from the pop-up list.
3. Select “Tour Analysis” from the available tasks. A dotted line is drawn between the table and the task.



4. The result can be used for other tasks in the process flow.



BUILDING REPORTS

SAS Enterprise Guide offers a set of wizards and a set of task windows to build reports or analysis results. The wizards provide a fast way to generate results. Similar functionality is offered through task windows. Often the task windows provide more detailed customization.

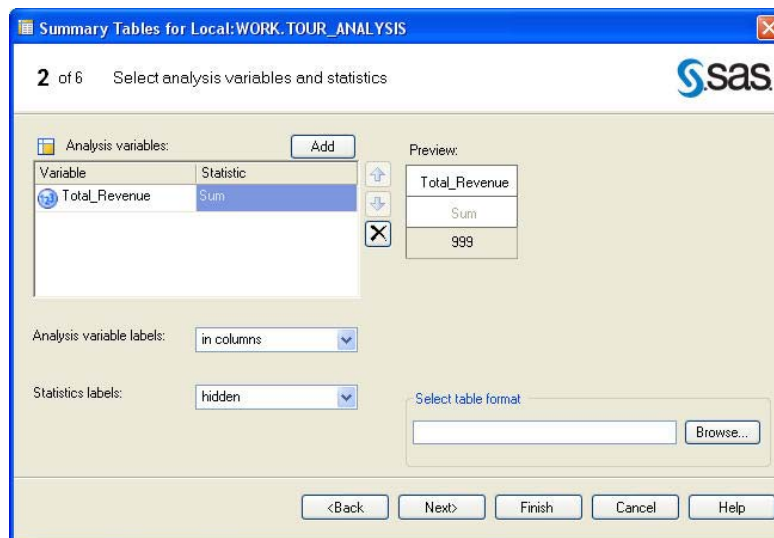
BUILDING REPORTS USING WIZARDS

Question: Use the table “Tour_Analysis” to build a tabular report showing the revenue by continent and country.

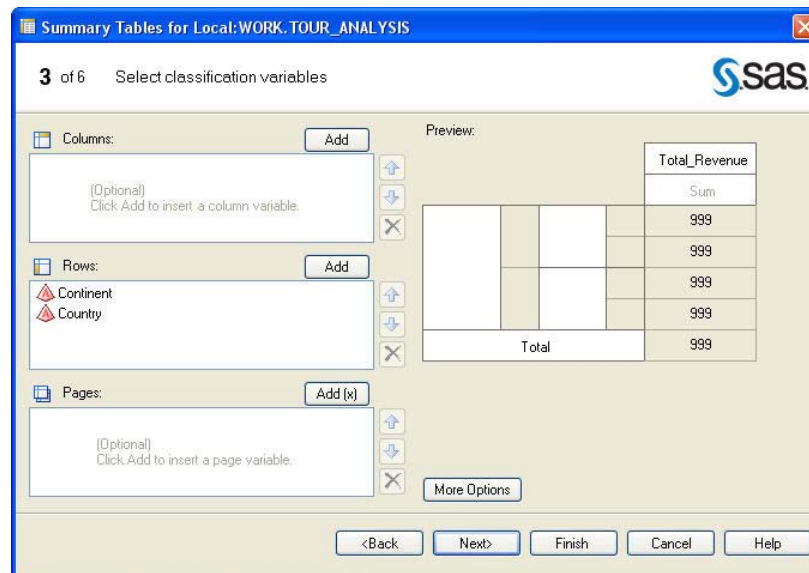
To do so:

1. Select the table “Tour_Analysis” as active table.
2. Select **Tasks - Describe - Summary Tables Wizard ...**
3. The first screen enables selecting another active table or adding filters to the active table. Select the **Next** button.

- In the second screen, add the analysis variable "Total_Revenue", specify the "Sum" statistic and optionally define additional parameters (for instance suppressing statistics labels). Notice that you immediately get a preview of the final result.

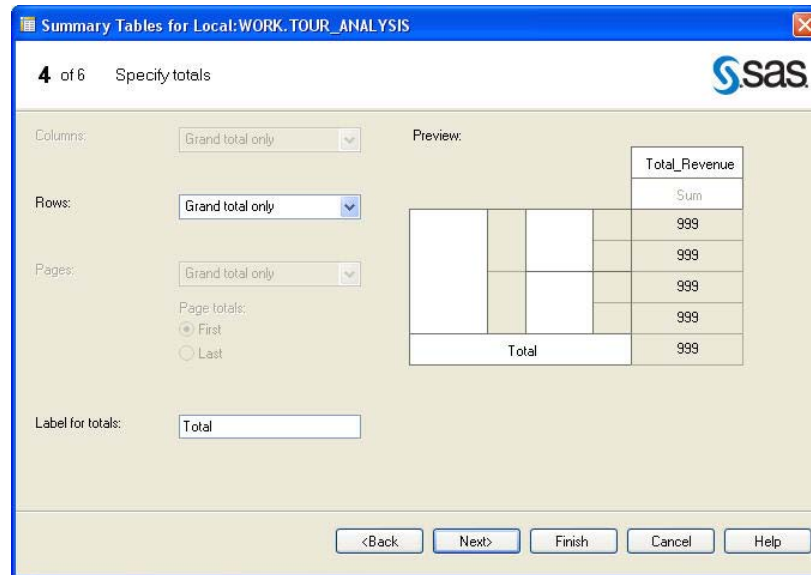


- Use the third screen of the wizard to specify the classification variables. Use the **Add** button to specify both "Continent" and "Country" on row level. Use the **Up** and **Down** icons to change their sequence. You can use the **Delete** icon to remove classification variables.



- Select the **More Options** button to specify for instance to hide the row headers.

7. Use the fourth screen of the wizard to request totals and/or subtotals and to specify the label for these rows or columns.



8. The fifth and sixth screens are used to specify to save the output in a table and to specify titles and footnotes.
9. Select the **Finish** button on any panel to create the report.

BIKS Travel		
		Total Revenue
Africa	Egypt	534862.00
	South Africa	611161.00
Asia	China	361029.50
	Sri Lanka	479253.00
	Thailand	1810676.50
North America	Mexico	586674.50
South America	Cuba	513038.50
	Ecuador	513411.00
	Peru	573084.50
Total		5983190.50

The default output destination is the SAS Report destination. Additionally, you can specify a style. You can write the output of a task to multiple output destinations just by modifying the properties of the task.

When you create results in the SAS Report format, you can use these results to create a customized report that you can print, export and share with other SAS applications. You can add multiple results to the report along with text and images, and you can choose how to arrange them in the report. When the task or code that generated the results is executed again, the results in the report are automatically refreshed.

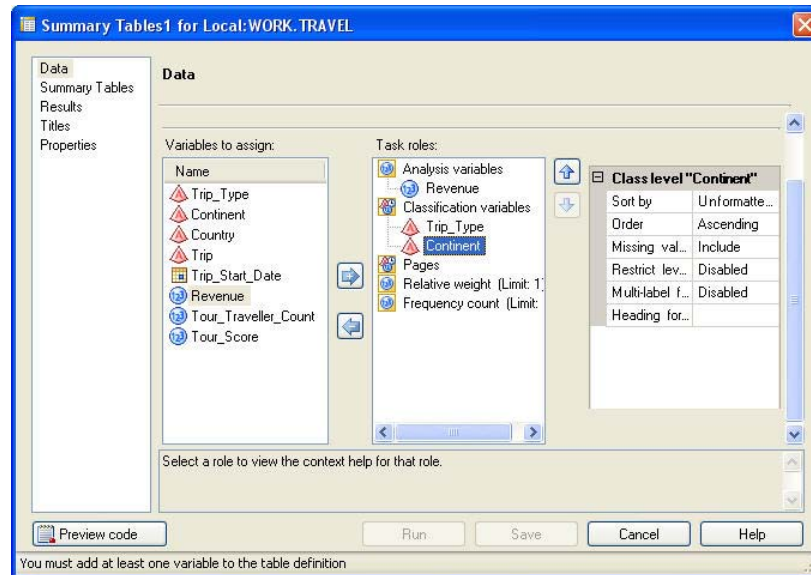
BUILDING REPORTS USING TASKS WINDOWS

Question: Use the table "Travel" to build a tabular report showing total revenue per continent and trip type.

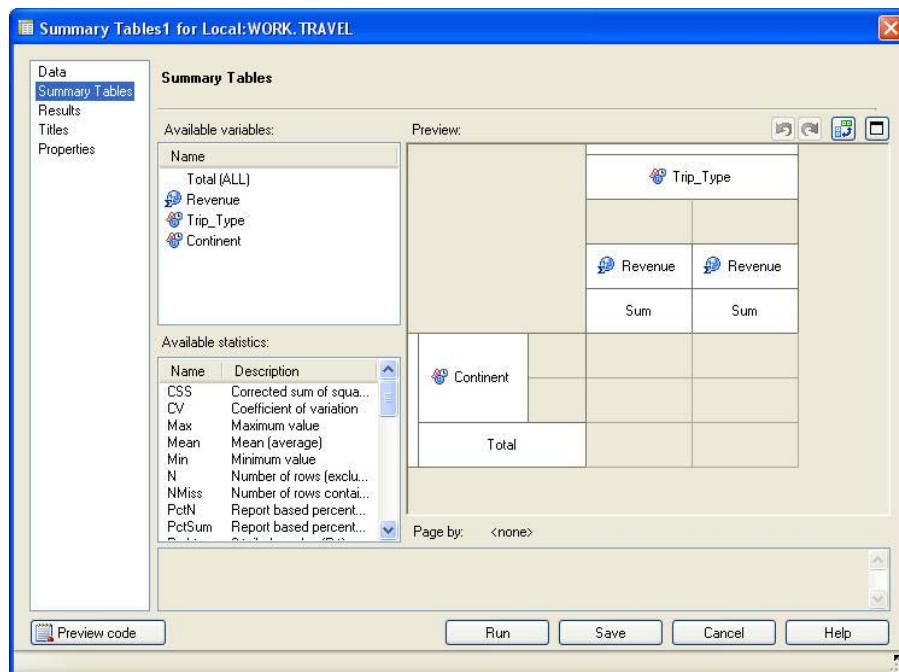
To do so:

1. Select the table "Travel" as active table.
2. Select **Tasks - Describe - Summary Tables ...**
3. Task windows have a common format; they always contain a left pane from which you select the items to work on. The right side of the window provides the details of the selected item. Select **Data** to assign a role to some columns. Use drag and drop actions or use the **Left/Right** buttons to add (or remove) columns from the **Variables to assign:** to the **Task roles:** pane. Each column is preceded by an icon representing the variable's type. Specify "Revenue" as analysis variable and "Trip_Type" and "Continent" as classification variables.

- Specify additional properties for each column. Specify for Instance how to sort the classification variables in the result, how to treat missing values, etc.

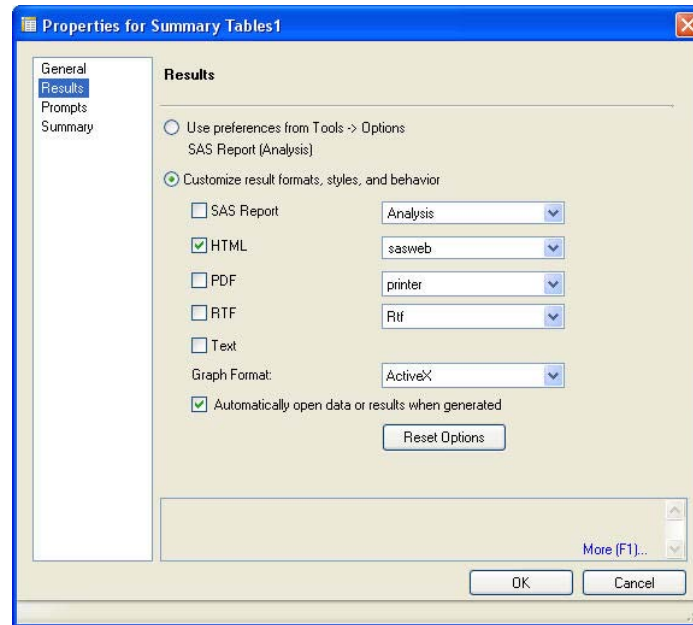


- Each task has a set of task-specific options. Most tasks have an option to specify titles and footnotes. Select **Summary Tables** to draw the layout of the result; use drag and drop to build row and column dimensions, to add analysis variables, specify totals and subtotals, etc.



- Use the right mouse button to select additional options for the output. These options include hiding headers, text for the box area, etc.
- Select the **Preview code** button to view the generated code and optionally insert additional statements.

8. Select **Properties** to open the Properties window of the task. Specify that for this task you do not want to use the default output destination (SAS Report) but to create HTML output, using the “sasweb” style.



9. Run the task.

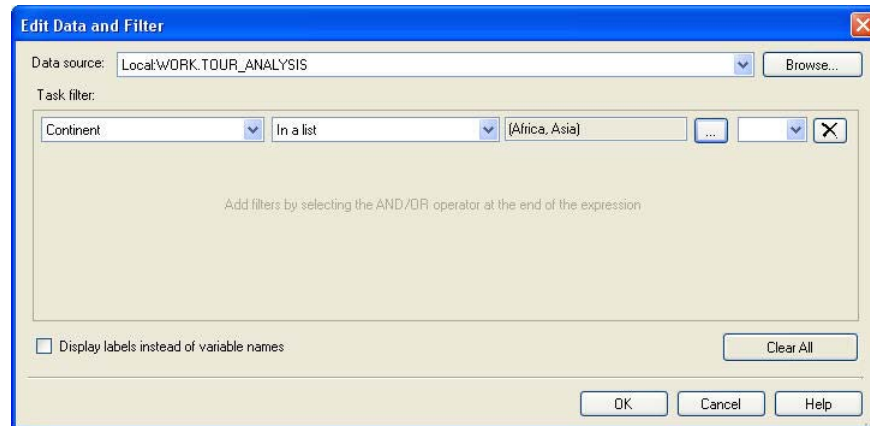
BIKS Travel

	Beach	Tour
Africa	74,346	1,146,023
Asia	487,600	2,650,959
North America	99,872	586,675
South America	.	1,599,534

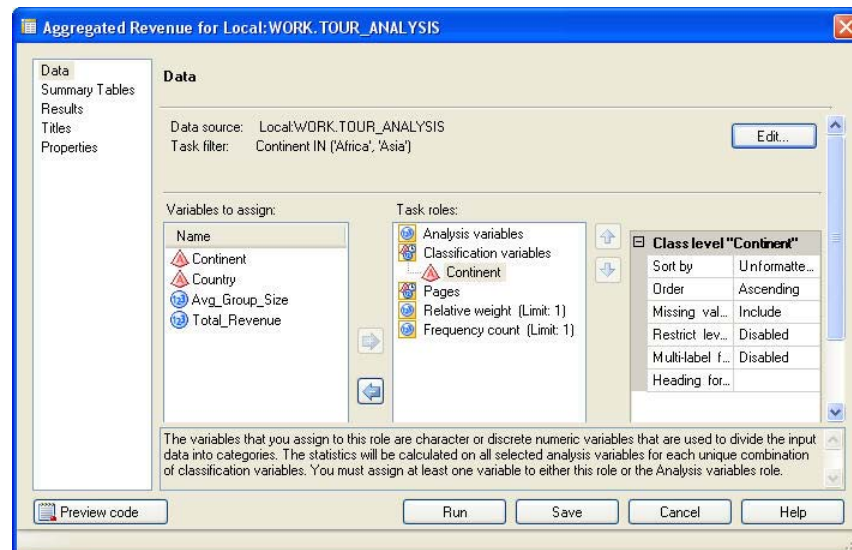
MODIFYING TASK INPUT DATA

SAS Enterprise Guide allows modifying the active table or adding filters within reporting and analysis tasks and within the wizards. To do so:

1. Open the Summary Tables task again and select the **Edit ...** button in the Data panel.
2. Use the **Browse ...** button to change the active table. The new active table does not contain the analysis variable and does not contain the classification variable "Trip Type".
3. Use the drop down lists to build a condition.



4. The modified task window is displayed below. The Data panel shows the new input table and the task filter.



5. Modify the output destination in the Properties window and run the report.

BIKS Travel	
	N
Africa	2
Asia	3
Total (ALL)	5

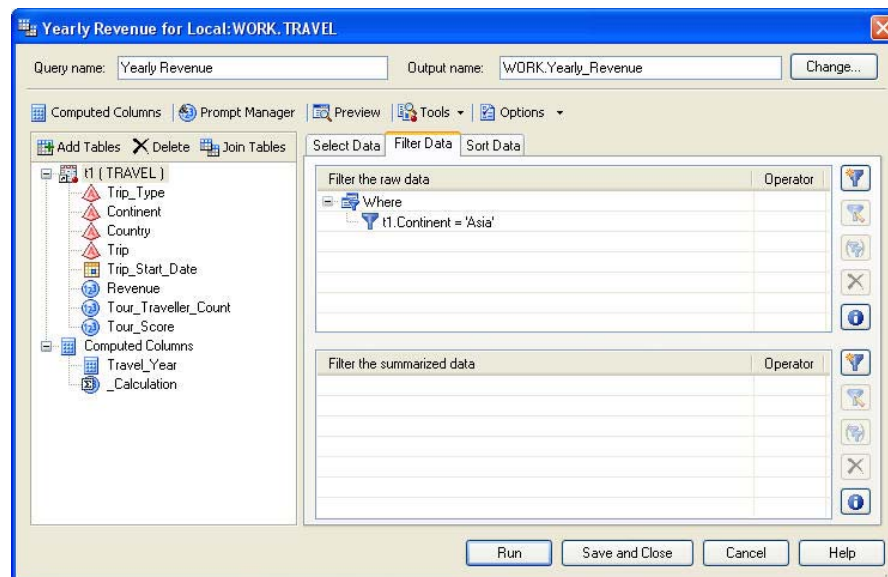
CREATING DYNAMIC WORK FLOWS

SAS Enterprise Guide enables building applications with parameters or prompts. This results in a higher ROI (return on investment) of your applications. Through the dynamic part of the application, less development is needed to fulfill the changing requirements of a larger user group.

Consider the process flow below: The “Travel” table is used as input to build another table that is used to generate a bar chart report.



The query named “Yearly Revenue” contains a filter, restricting the output to records for the African continent. Running the same process for another continent requires modifying the filter in the “Yearly Revenue” task. Your users do not know where they need to modify the process flow and they request a user-friendly solution.

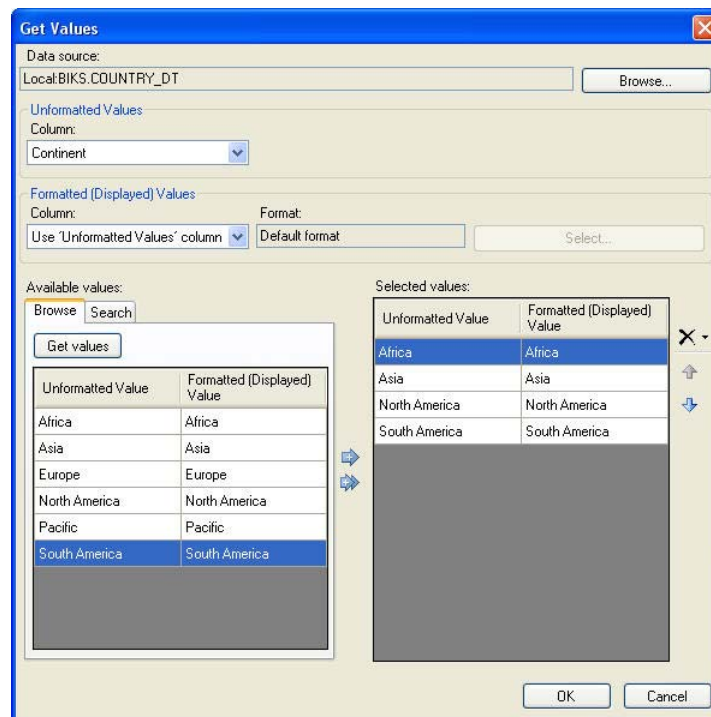


DEFINING PROMPTS

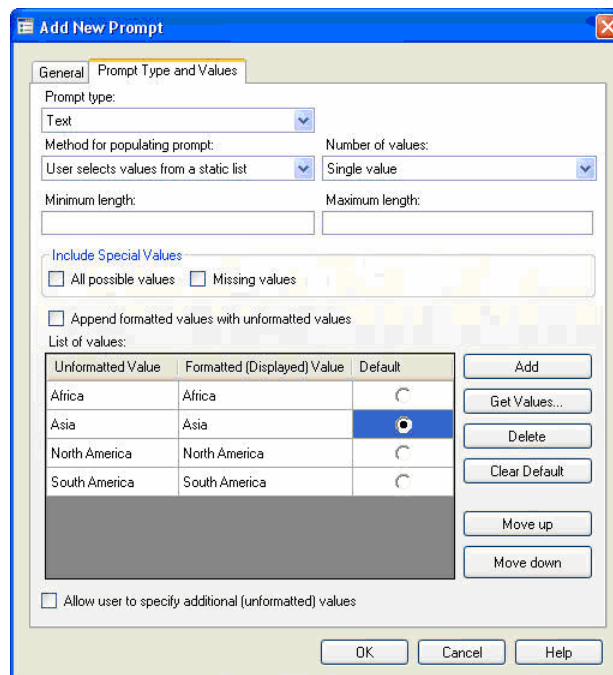
To define prompts:

1. Open the Prompt Manager window and select the **Add** button to define a new prompt. The Edit Prompt window opens with two tabs.
2. Specify a name for the prompt and a text to display to the user, when prompting for input. Specify additional parameters, for example requesting a non-blank value.

- Indicate in the second tab how you expect input from the user: single values or multiple values, free-style input or values from a list, etc. In this example the user must select values from a list that is created from the content of the variable "Continent" from the table "Country_DT". Notice that you can remove values from the list.



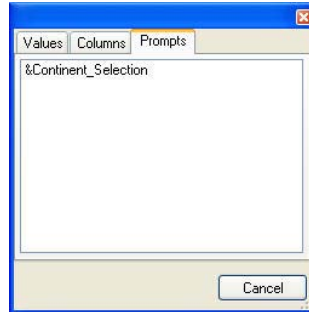
- Optionally assign a default value.



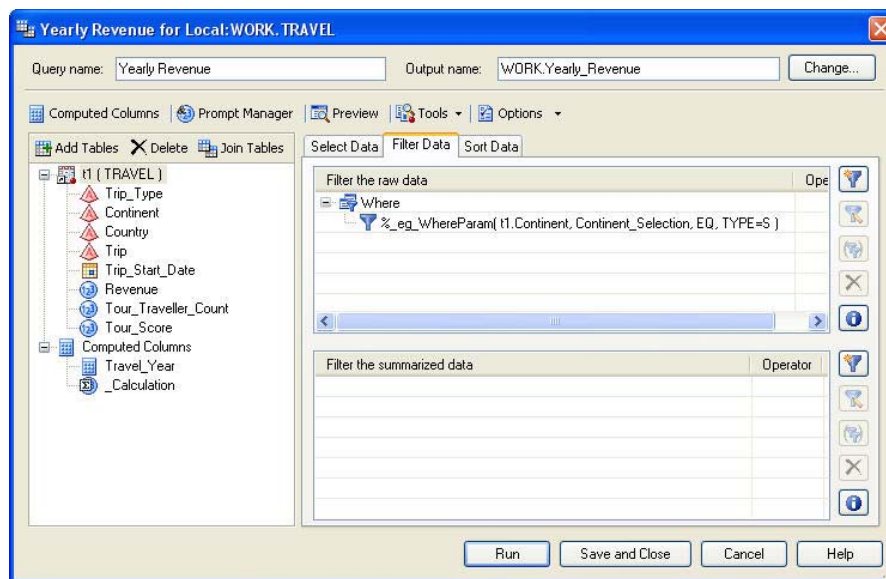
USING PROMPTS

To use prompts:

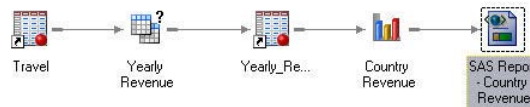
1. Select the query “Yearly Revenue”, and open the Filter Data tab. Select the filter condition to modify it.
2. Select the Prompts tab from the **Value** drop down list.



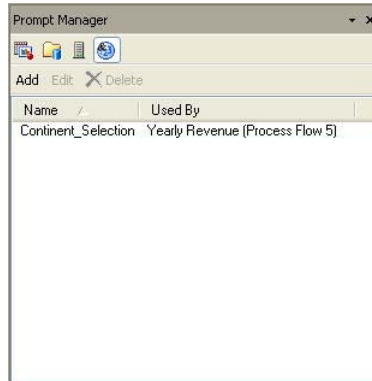
3. Select the prompt.
4. Review the modified filter.



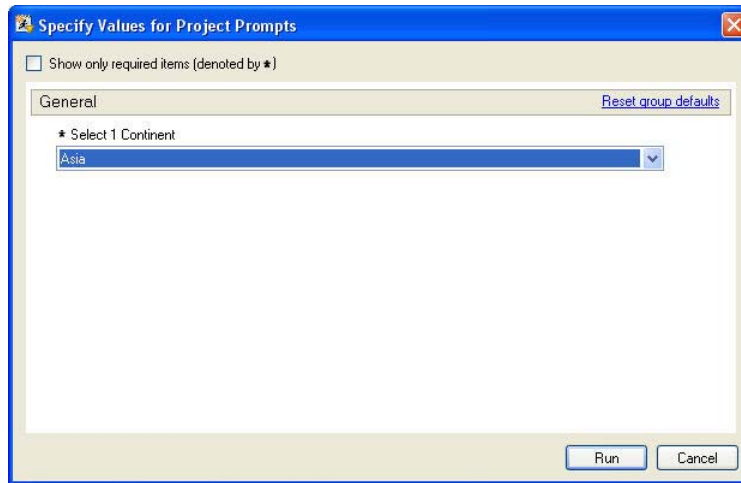
5. Notice that the process flow changed the icon of the task “Yearly Revenue” which now has a question mark.



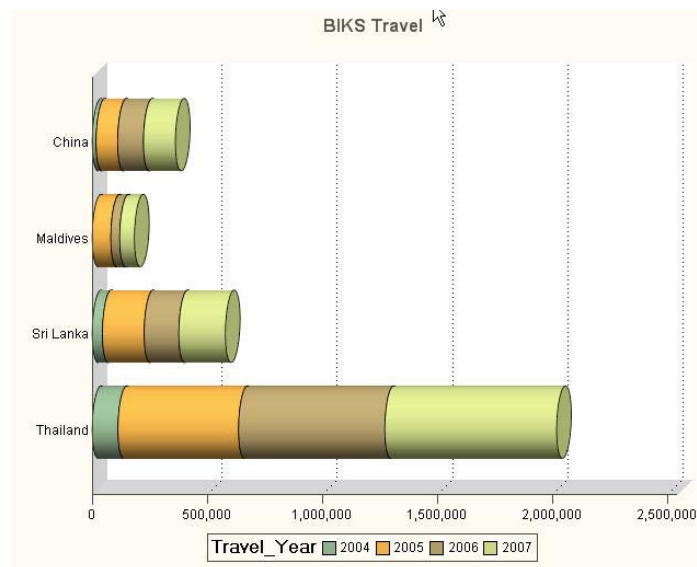
- Notice that the Prompt Manager window contains one parameter, with the information where the parameter is used.



- Run the branch, starting from the table "Travel". You will be prompted for a continent value.



- Select a value or keep the default value from the selection list and run the report.



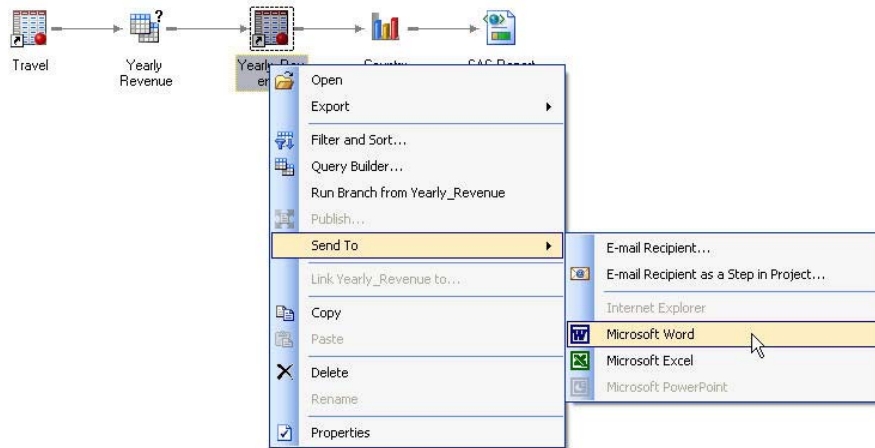
SHARING AND DISTRIBUTING RESULTS

You can share results in the form of SAS stored processes that can be used in for instance SAS Add-In for Microsoft Office or in Web Report Studio.

SAS Enterprise Guide is integrated with Microsoft Windows Scheduler, enabling to schedule tasks for automatic execution.

Results can be exported easily to Adobe Acrobat, Microsoft Excel or Microsoft Word. To do so:

1. Select the result of the “Yearly Revenue” task; press the right mouse button and select the **Send to** option.

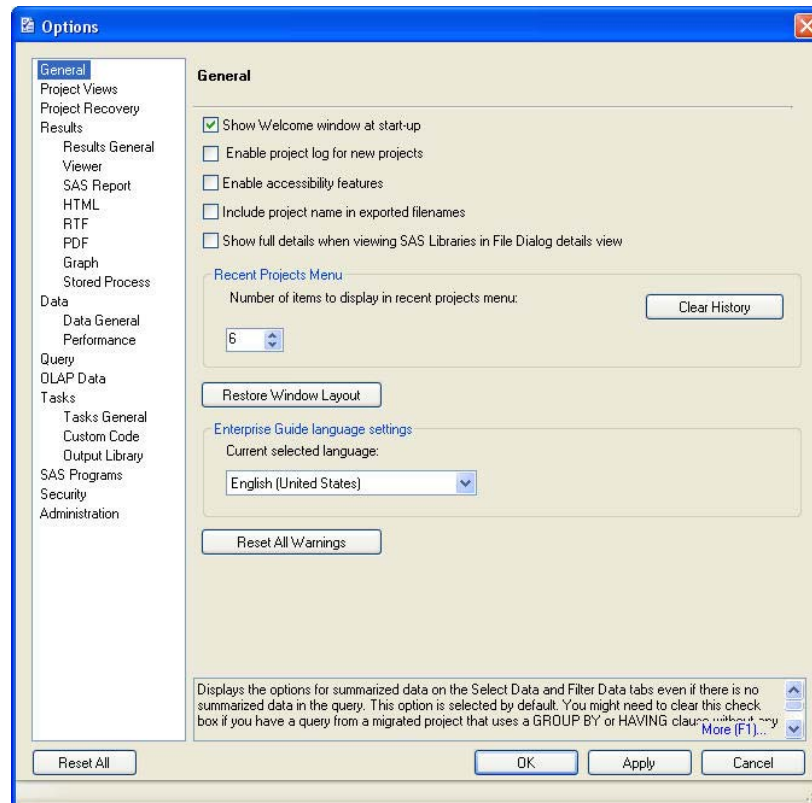


2. Select **Microsoft Word** from the selection list. The content of the table is written to a new Word document.

CUSTOMIZING THE SAS ENTERPRISE GUIDE ENVIRONMENT

Through **Tools – Options ...** you can completely customize your SAS Enterprise Guide Environment. Options include:

- automatically open the result of a task in the Workspace or not
- open third party data as is or import them first into SAS tables
- allow SAS Enterprise Guide to join tables automatically or not
- specify default output destinations
- specify default output libraries
- ...



CONCLUSION

SAS® Enterprise Guide® provides a point-and-click interface for transparent access to the power of SAS®. Business analysts can:

- use intuitive wizards to build tasks in a process flow diagram
- access almost any data type
- use an advanced query builder for data manipulation
- build descriptive reports and graphs
- use the full range of analytics in SAS
- build, share and distribute results in almost any format
- access and visualize OLAP data sources.

CONTACT INFORMATION

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