

Paper 038-2010

## SAS® Web Report Studio

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### ABSTRACT

For many users, the most common Web content will consist of SAS® reports. These are dynamic views of a SAS information map. Once an information map has been constructed, it can be displayed as a table or chart (or both) in a multi-page report. Web reports are created using SAS® Web Report Studio, a middle tier application that runs in a servlet container, that is, as a Web program. You do not need to have anything installed on your desktop except for Firefox or Internet Explorer. This paper will demonstrate how to create a complex Web report from SAS data or from an OLAP cube using the SAS Web Report Studio product in SAS® BI Server 9.2.

### INTRODUCTION

Traditional SAS DATA and PROC step programming has served us well for over 30 years. Anyone paying attention however will have noticed that SAS has introduced a great many new products that build on the older technologies but which provide another level of functionality via a Web interface. The documentation for these products consists of literally dozens of reference manuals, user guides, technical white papers and road maps, not to mention the online help. The intent of this paper is to describe some of these products and provide examples from the perspective of the SAS user.

SAS/IntrNet has been around for more than a decade, and provides a reasonable level of functionality for dynamic access to SAS data and reports. Web 2.0, however, is personal. The new SAS products are a sophisticated response to this change in approach. A “portal” in Web jargon is a site that provides customized content, including links to other sources, as well as allowing users to collaborate and share resources. The *SAS® Information Delivery Portal* is designed to let each user personalize the appearance and content of Web pages using SAS software. In order to support this level of customization, SAS has developed a set of Java Web applications which can be bundled together in different configurations. In particular, the *Enterprise Business Intelligence (EBI)* software suite includes all of the components necessary to build customized portals. Note that these products are available in various combinations and as usual the best resource for identifying what might be needed for your organization is your SAS sales representative.

Probably the most important of these new products is SAS Web Report Studio, designed to ease the load on IT departments by allowing end users to prepare and maintain routine reports. At the same time, it empowers users to create and design reports that meet their own individual needs. While this is probably a good idea, it all depends on what you mean by an “end user.” Experience suggests that managers and executives do not have the time or interest in learning how to create their own custom reports. In practice, the most common users are analysts and programmers, who are accustomed to developing content in PROC REPORT or PROC TABULATE. Long-time SAS users may feel frustrated by the Web Report Studio approach, since it is entirely point-and-click and does not offer the user much opportunity to get under the hood and tinker. Remember though, that the point of the application is to simplify and speed-up the process of getting and disseminating information. And for that, the Web Report Studio application can be extraordinarily effective, allowing analysts to create reports in a fraction of the time that the older batch approach required.

In addition, another required product is *SAS Information Map Studio*, a GUI application for creating information maps from OLAP cubes or underlying SAS or database tables. If the data source is one or more SAS datasets you can specify table joins but you can only have a single cube as a data source. The idea is that complex views of the data can be constructed by business users with no knowledge of SQL. There is a batch version of the interface, PROC INFOMAPS, which provides the same functionality in a more traditional SAS approach. The GUI is very simple to use, however, and would usually be the first choice for creating or modifying an Information Map.

Web Report Studio is a Java Web application for constructing SAS reports, based on using SAS Information Maps to display standardized tabulations and graphical presentations accessed via a client browser. Complex reports including tables and charts can be created by users with no Java programming skills, simply by using a standard point-and-click interface. There are actually two components included under this product: *SAS Web Report Studio*, used to create and edit reports, and *SAS Web Report Viewer* for displaying the results. The online documentation

*SAS Web Report Studio 4.2: User's Guide* includes detailed information about this product and how to use the many features (see the references at the end of the paper). This paper is intended as a brief introduction to SAS Web Report Studio and to using Information Maps.

## Getting Started Using the Report Wizard

The first step is to connect to the Web application. Web Report Studio, as noted above, is a Java Web application, accessed from a client browser. The URL will vary depending on your installation, but generally speaking you will need to log-in via TCP port 8080, as shown below, where *hostname* is the fully qualified name of your SAS Application server:

[http://hostname:8080/SASLogon/index.jsp?\\_sasapp=Web+Report+Studio+4.2&](http://hostname:8080/SASLogon/index.jsp?_sasapp=Web+Report+Studio+4.2&)

Login credentials will be supplied by you SAS administrator. After connecting to SAS Web Report Studio, the startup screen displays three options: create a report in Edit mode, use the Report Wizard, or use a template. The lower half of the form lists the existing reports that you can open.

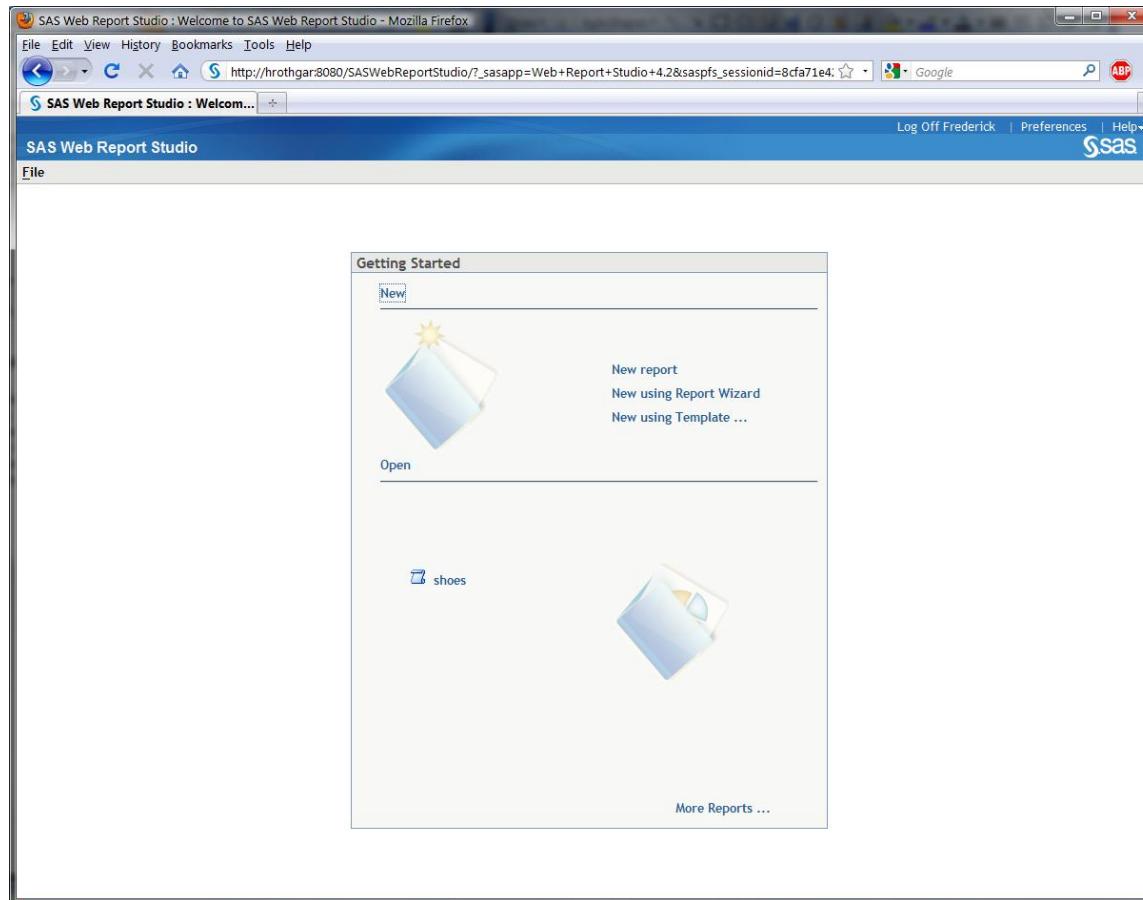
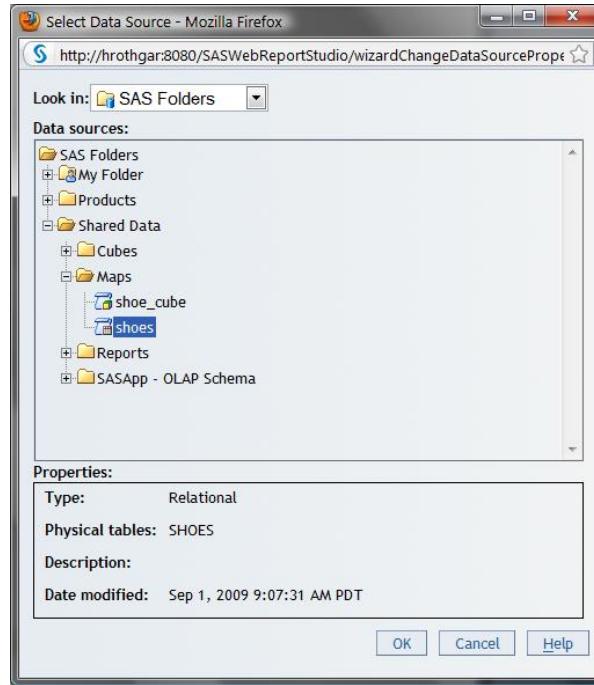


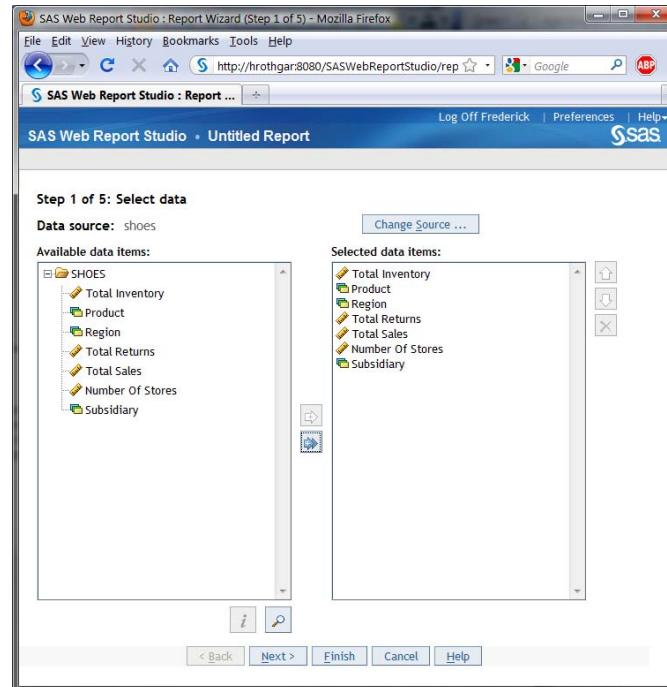
Figure 1. SAS Web Report Studio initial splash screen

*New using Report Wizard* is a good place to get started. By default, the Wizard opens with the data source set to the most recently used Information Map (see **Figure 2** below). You can change the source by clicking on the *Change Source* button, which brings up a file browser. The map based on the shoe sales table is selected.



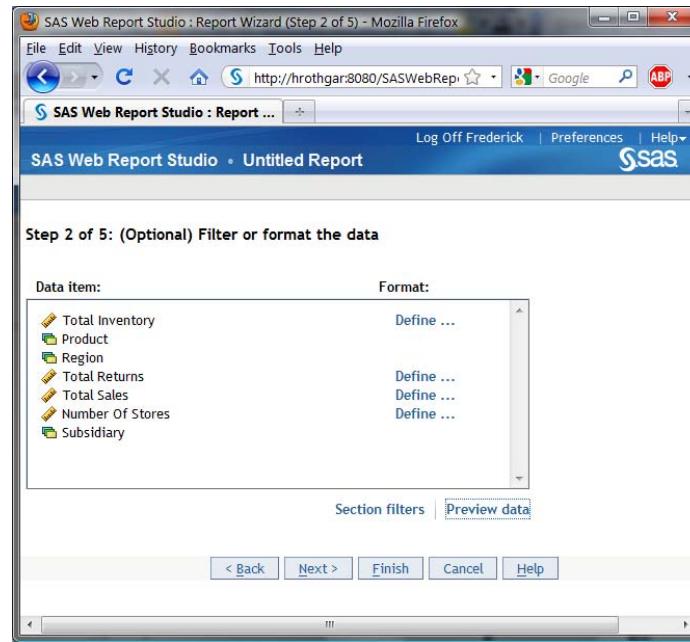
**Figure 2. Select Data Source**

Click the *OK* button to return to the Wizard. Click the double arrow button in the center to make all the items available for the report: you can of course select them individually, but there is no problem with having all of them available. Once you have selected the items, the *Next* button will be accessible (not grayed out).



**Figure 3. Report Wizard: Step 1**

In the second step, you are given a choice of filtering the data; this is the same as specifying a WHERE clause in SQL. No filters are selected, since for the moment we want to see all the data.



**Figure 4. Report Wizard: Step 2**

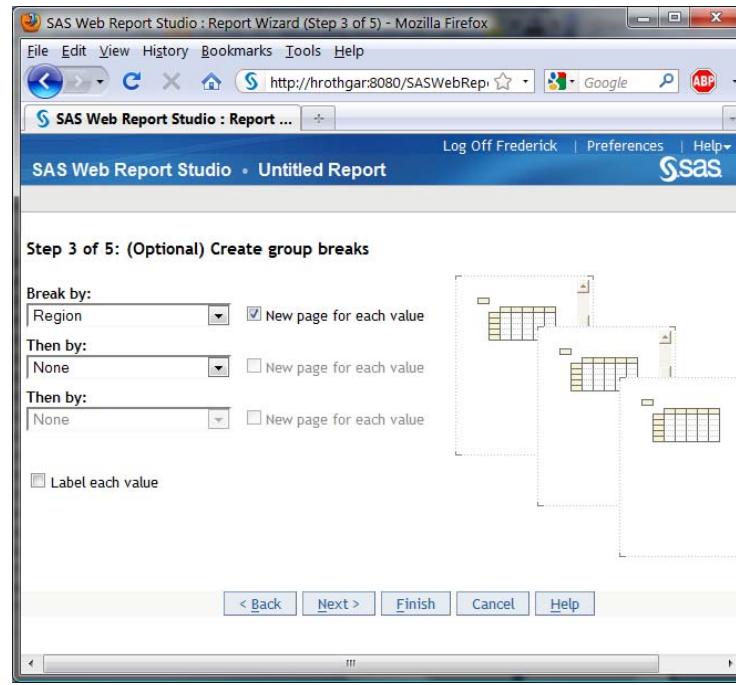
For the four measures, you can change the SAS display format by clicking on *Define*. One interesting option is the ability to preview the data and even export it to MS Office, as shown in **Figure 5**.

The screenshot shows a "Preview Data" window. The title bar reads "Preview Data - Mozilla Firefox". The URL in the address bar is "http://hrothgar:8080/SASWebReportStudio/previewWizardData.do". The window contains a table with the following data:

Total Inventory	Product	Region	Total Returns	Total Sales	Number Of Stores	Subsidiary
\$191,821	Boot	Africa	\$769	\$29,761	12	Addis Ababa
\$73,737	Boot	Africa	\$710	\$21,297	21	Algiers
\$18,965	Boot	Africa	\$229	\$4,846	20	Cairo
\$33,011	Boot	Africa	\$483	\$8,365	14	Johannesburg
\$105,370	Boot	Africa	\$700	\$19,282	24	Khartoum
\$70,736	Boot	Africa	\$553	\$13,921	16	Kinshasa
\$51,572	Boot	Africa	\$325	\$6,081	8	Luanda
\$66,017	Boot	Africa	\$844	\$16,282	25	Nairobi
\$9,576	Boot	Asia	\$80	\$1,996	1	Bangkok
\$160,589	Boot	Asia	\$1,296	\$60,712	17	Seoul
\$63,280	Boot	Canada	\$472	\$17,720	8	Calgary
\$240,132	Boot	Canada	\$1,472	\$40,213	25	Montreal
\$28,162	Boot	Canada	\$377	\$7,892	5	Ottawa
\$149,118	Boot	Canada	\$994	\$33,291	16	Toronto
\$882,080	Boot	Canada	\$9,160	\$286,497	31	Vancouver
		Central				
\$393,376	Boot	America/Caribbean	\$4,454	\$102,372	33	Kingston
\$162,033	Boot	Central America/Caribbean	\$1,775	\$34,660	17	Managua

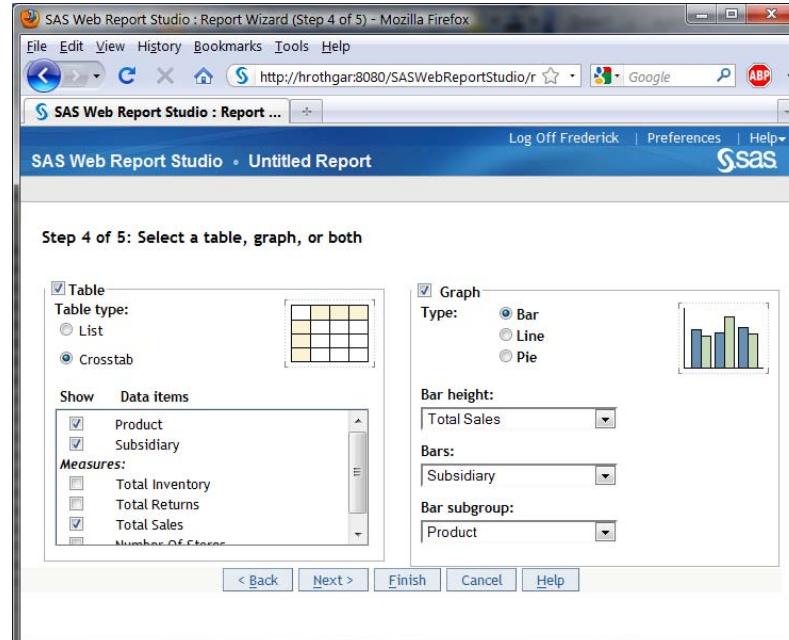
**Figure 5. Report Wizard: Preview Data**

The next step is to create *Group Breaks*; data from different categories. We want a new report page for each value of the variable region.



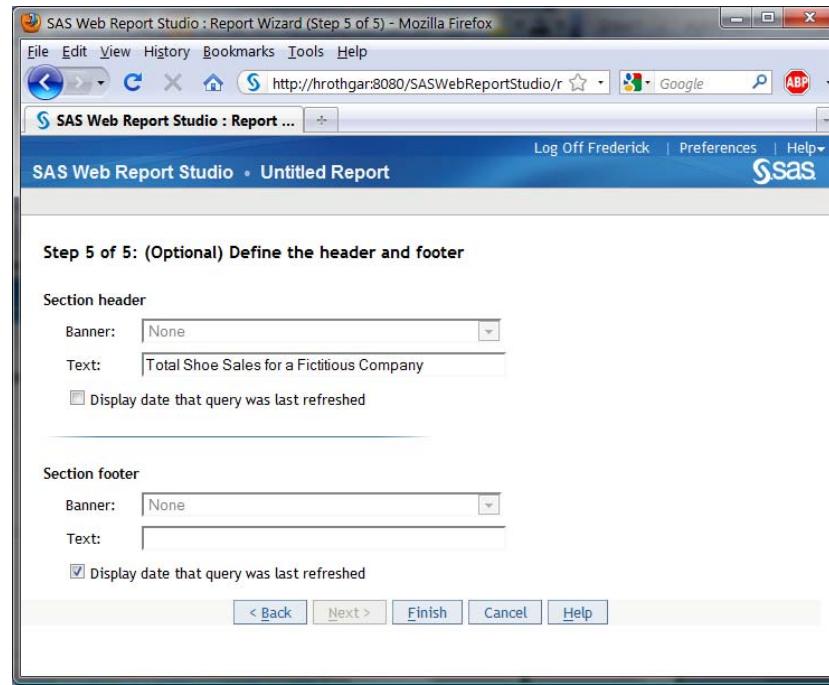
**Figure 6. Report Wizard: Step 3**

Next, there is a required choice of a graph, a table or both. Choose both, and select the items to be displayed. A crosstab table is selected that will show sales by product and subsidiary. The graph will display the same data as the table, in a bar chart.



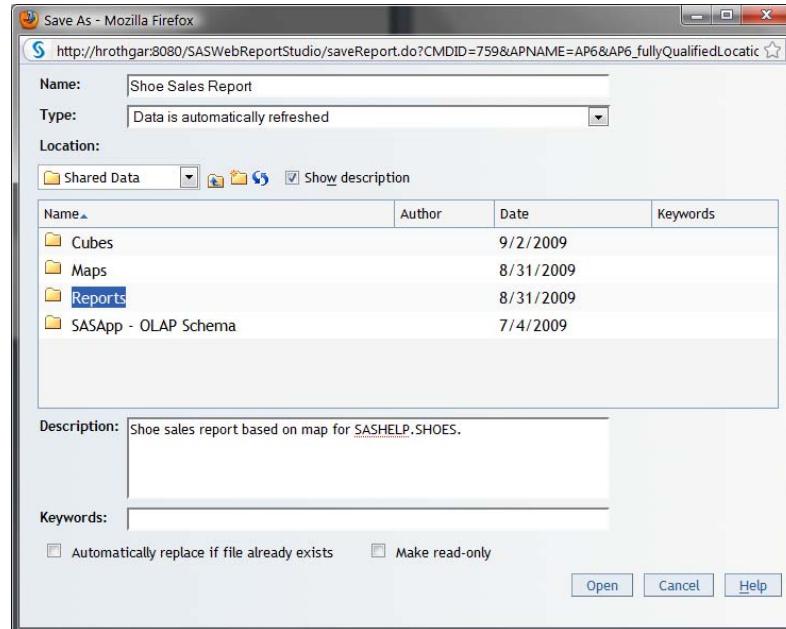
**Figure 7. Report Wizard: Step 4**

Finally, we can choose header and footer labels. The banner is specified in the theme, which will be discussed later. For now, we can add a title and put the date in the footer.



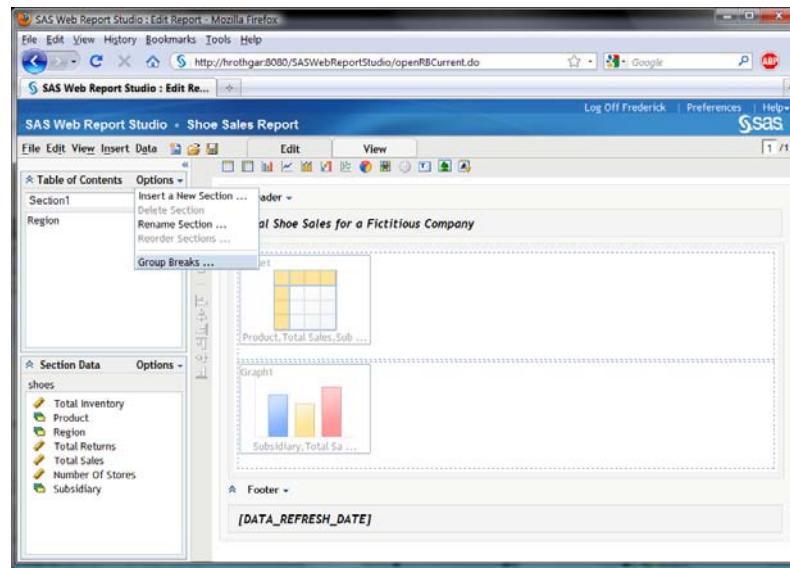
**Figure 8. Report Wizard: Step 5**

Click *Finish* to generate the report. This opens the report in Edit mode for any further tweaks. At this point it is a good idea to save the report by selecting *File>Save* from the main menu. This brings up a *Save As* dialog with various options as shown. A name and description have been added; the report will be saved in the Shared Data/Reports metadata location. The report will now be available to any user with permission to access this folder.



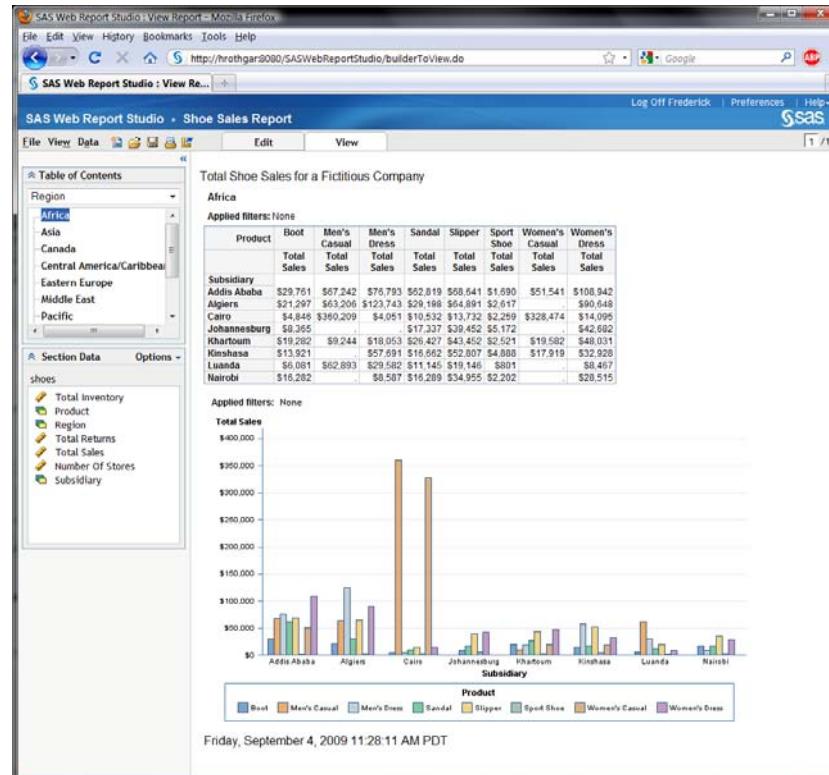
**Figure 9. Save Report**

After saving the report you are returned to Web Report Studio Edit mode.



**Figure 10. Edit Report**

Click on the *Table of Contents Options* link to bring up the *Rename Section* dialog to change the name from Section1 to Region. Then select the *View* tab to display the report as it will appear in a browser. Be patient while the report is created. Large datasets will take a while, which is why it is a good idea to use an OLAP cube as a data source. After a few moments, the report should appear.



**Figure 11. Sample Report**

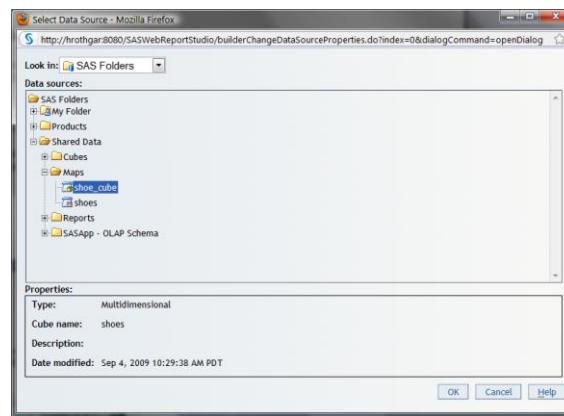
As requested, we see a crosstab and a bar chart of summary data. Web Report Studio is doing the aggregation for you. In the next section, we shall see how to use pre-summarized data to speed up the results.

## Building a Web Report from an OLAP Cube

In the next example, some of the power and flexibility of Web Report Studio will be demonstrated. Three new concepts will be explored:

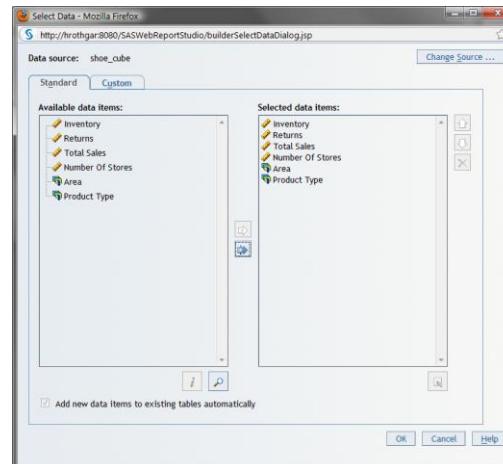
- Using an OLAP cube as the data source for a Web Report
- Adding computed expressions
- Manually adding sections to a report

Start by opening Web Report Studio in a browser window as before, log in and select *New report* from the splash screen. In the main menu in the Edit pane, click on *Data>Select Data*. (Initially this is the only choice that is not grayed out from the drop down menu.) Click on *Change Source* to see a list of the available Information Maps. This brings up a navigation tree that points to the last data source used.



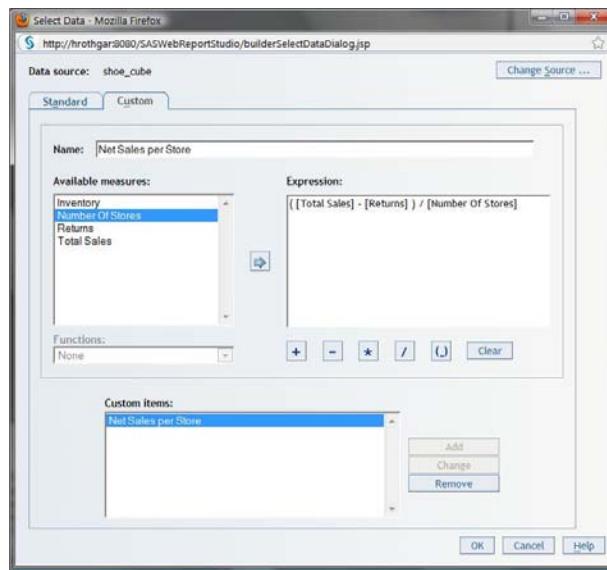
**Figure 12. Select Data Source**

Highlight the desired map as shown and click *OK*. This will return you to the *Data Source* screen. Click the double arrow to select all of the items. (As before, you can select all or just some of them, but there is no reason not to have them all available.)



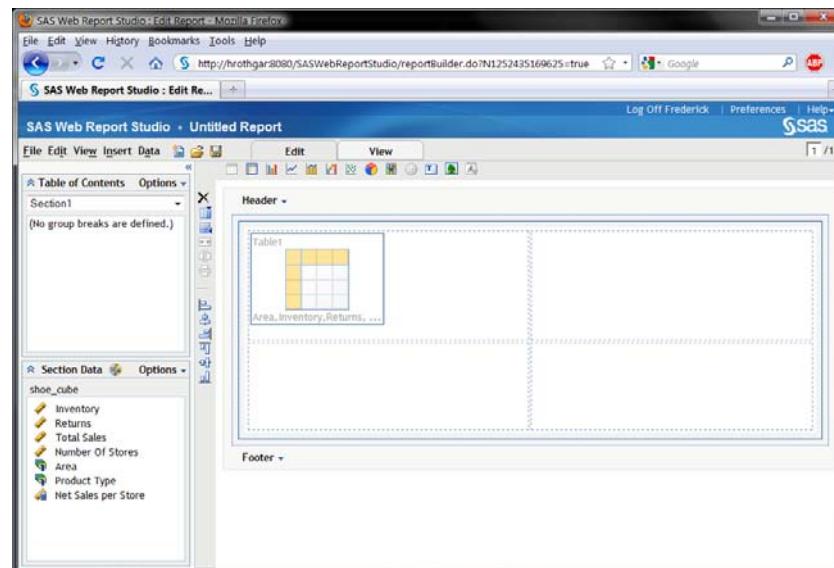
**Figure 13. Select Data Items**

Remember, this is aggregate data, so the total sales is likely to be affected by the number of stores; also, for decision support purposes, it would be useful to remove returns from sales. Web Report Studio allows the user to add expressions that are mathematical functions of the measures. Click on the *Custom* tab and supply a name, such as "Net Sales per Store". Use the operator buttons to construct an expression; the arrow button in the center moves a selected measure to the *Expression* panel. Now (important note), click the *Add* button to copy the expression to the *Custom Items* panel. If you do not explicitly add the expression you will not be able to use it. In the example below, the *Add* and *Change* buttons are deselected, which is the default behavior after an expression has been added; only *Remove* is available.



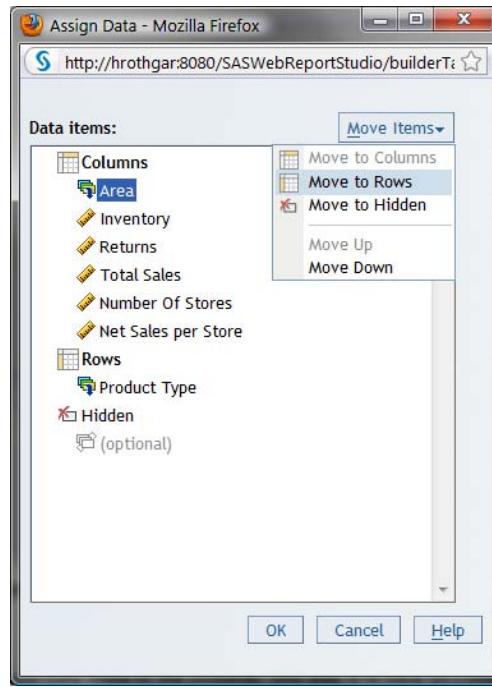
**Figure 14. Adding a Custom Expression**

Click *OK* to return to the Edit screen. Note that the *Section Data* panel now includes the new measure. There is a series of icons that appear under the Edit and View tabs. Tool tips are available to identify which is which. Click on the second from the left *Insert Crosstab*, as shown.



**Figure 15. Insert Crosstab**

There are several ways to add data items to the crosstab; one way is to click on *Data>Assign Data* from the main edit menu, or you can right click on the table placeholder. Either way, you should see a chooser dialog.



**Figure 16. Arrange Data Items**

By clicking on *Move Items*, as shown, you can choose which fields go in the rows or columns. For the initial section, the Area dimension can be moved to the rows while two measures Net Sales per Store and Number of Stores can be the columns. (You can highlight more than one item at a time to move.) Click on the View tab and you should see something like the following.

Region	Subsidiary	Net Sales per Store	Number Of Stores
Africa	Bangkok	4,264.10	532
Asia	Seoul	7,323.73	59
	Tokyo	1,133.00	1
Canada		9,335.56	442
Central America/Caribbean		6,550.75	539
Eastern Europe		6,090.34	379
Middle East		13,664.73	397
Pacific		6,235.01	356
South America		3,889.77	632
United States		8,516.67	617
Western Europe		7,325.93	642

**Figure 17. Web Report of Shoe Sales OLAP Cube**

Notice the difference from the first example, which was based on a table not a cube: next to each region name are two icons, a plus sign (expand) and a down arrow (drill down). In the example, Asia has been expanded to show the values for the three subsidiaries in the region.

The drill-down arrow displays just the row level observations for the region, in this case Africa. Note the “breadcrumb” trail at the top of **Figure 18**, allowing you to return to the aggregate display.

Subsidiary	Net Sales per Store	Number Of Stores
Addis Ababa	6,985.52	65
Algiers	3,790.47	101
Cairo	8,133.19	88
Johannesburg	2,138.16	51
Khartoum	2,528.75	71
Kinshasa	3,414.89	56
Luanda	4,459.57	30
Nairobi	1,461.09	70

**Figure 18. Drill-down to detail observations.**

Save the report! Be careful typing the name of the report, since there is no way to change it without using SAS Management Console. Click on *File>Save as* from the Web Report Studio Edit menu (not the browser menu).

Name	Author	Date	Keywords
Shoe Sales Report 2	frederick	9/8/2009	
Shoe sales report based on map for OLAP Cube			
Shoe Sales Report	frederick	9/4/2009	
Shoe sales report based on map for SASHELP.SHOES.			

**Figure 19. Saving the Report**

To sort the table rows, right click on the column heading and choose *Sort Columns Data*. You can do this either from the Edit tab or the View tab. **Figure 20** shows that Net sales per Store are highest in the Middle East and lowest in South America.

	Net Sales per Store	Number of
Region		
Middle East	13,664	
Canada	9,335	
United States	8,616	
Western Europe	7,325	
Asia	6,912	
Central America/Caribbean	6,550	
Pacific	6,235.01	356
Eastern Europe	6,090.34	379
Africa	4,264.10	532
South America	3,689.77	632

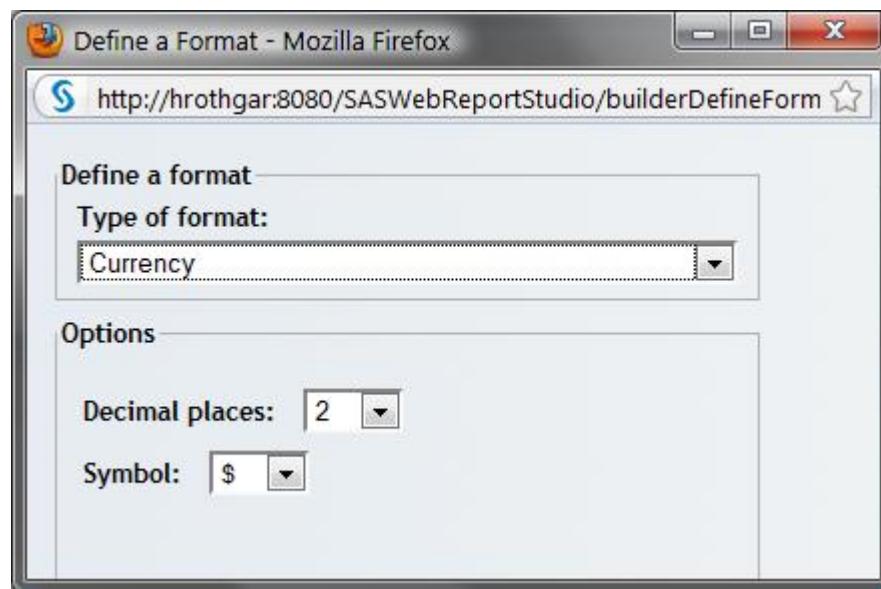
**Figure 20. Sort table by rows**

## Formatting the Report

Back in the 1970s, during the Neolithic period of computing, a programmer and caving enthusiast named Will Crowther invented a text-based game called "Adventure". The point of the game was to explore an underground cavern and to collect the treasures you find there. This was arguably the ancestor of today's multi-player role-playing games. Adventure is memorable for many of its prompts, but perhaps the most famous is "You are in a maze of twisty little passages, all alike." There was also a magic word "Xyzzy" to teleport the player to another location in the maze.

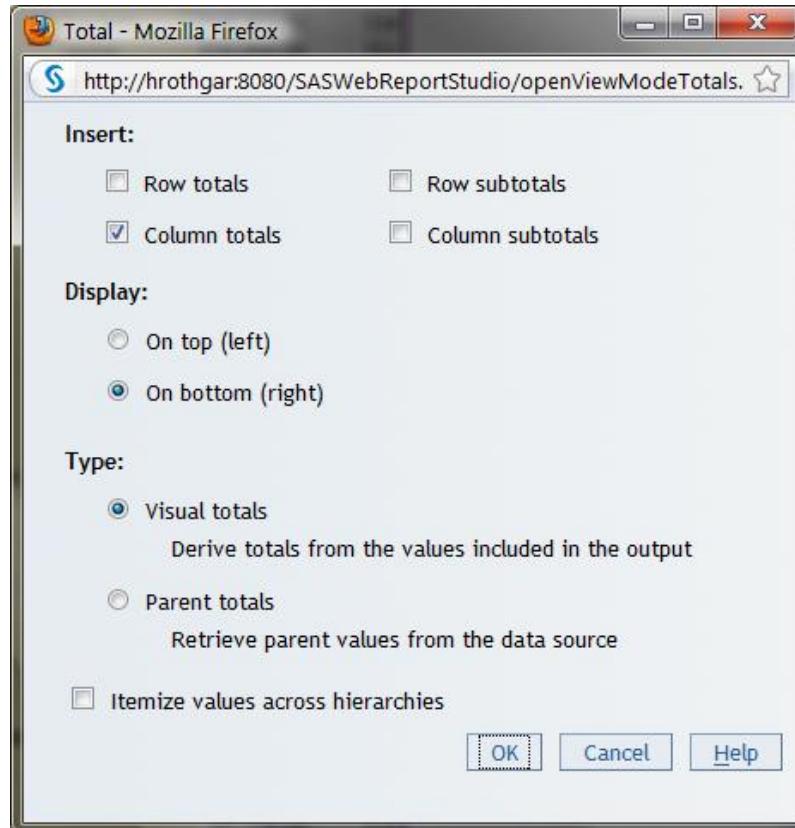
Formatting reports in Web Report Studio is a lot like playing Adventure, with surprises around each corner. There are lots of options. Start by renaming the section "Overall" as shown in the first example. (From the Edit tab, select *Options>Rename Section* in the Table of Content panel.) Then click on *View* on the edit menu and uncheck *Applied Filters* and *Data Panel* to remove these elements, and choose *Report Style>Festival*. Right click on the Region column heading and select *Expand All*.

To add or change the display format for a measure, switch to the Edit tab (not the View tab), right click on the variable label in the *Section Data* panel and select *Format*. This will bring up a dialog that allows you to select a format for the measure.



**Figure 21. Formatting a Measure**

To add a total row or column, right click on the table (in Edit or View mode) and choose *Total*. This will bring up a form that allows you to select row or column totals and their location on the resulting table.



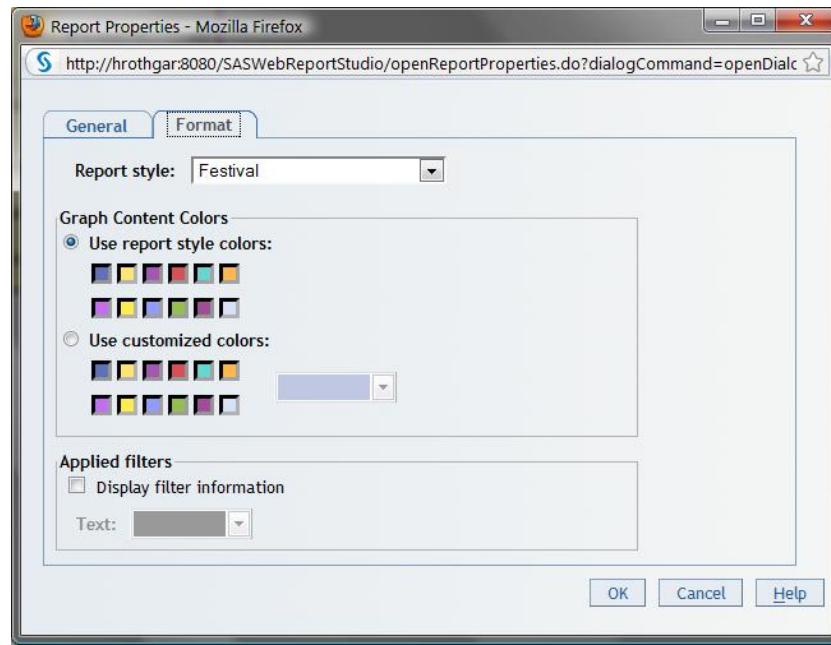
**Figure 22. Adding Totals to a Report**

The resulting report should now look like the following. Note that the total row for Net Sales per Store is the average, while for Number of Stores it is the sum. Web Report Studio automatically uses the correct statistic for the totals.

Region	Subsidiary	Net Sales per Store	Number Of Stores
Middle East	Tel Aviv	\$18,368.70	134
	Dubai	\$12,066.08	153
	Al-Khobar	\$10,158.02	110
	Vancouver	\$16,216.64	193
Canada	Montreal	\$4,480.38	115
	Toronto	\$4,079.54	76
	Ottawa	\$3,854.90	29
	Calgary	\$2,049.17	29
United States	New York	\$11,011.50	131
	Chicago	\$10,053.75	150
	Los Angeles	\$7,739.13	92
	Minneapolis	\$7,538.04	141
	Seattle	\$5,738.37	103
Western Europe	Copenhagen	\$12,857.56	52
	Madrid	\$11,371.06	17
	Heidelberg	\$8,873.34	105
	Lisbon	\$8,766.81	99
	Paris	\$7,006.43	86
	London	\$6,500.88	113
	Geneva	\$4,557.05	95
	Rome	\$3,622.09	75
Asia	Seoul	\$7,323.73	59
	Bangkok	\$3,220.60	5
	Tokyo	\$1,133.00	1
Central America/Caribbean	Kingston	\$9,904.86	218
	San Juan	\$5,860.36	105
	Managua	\$3,544.20	113
	Mexico City	\$3,454.01	103
Pacific		\$6,235.01	356
Eastern Europe		\$6,090.34	379
Africa		\$4,264.10	532
South America		\$3,689.77	632
Total		\$7,102.69	4,601

**Figure 23. Shoe Sales with Report Style (Partially expanded)**

In addition to the four standard report styles (Plateau, Seaside, Meadow and Festival), you can change report styles and colors by going to *File>Properties* and selecting the *Format* tab.

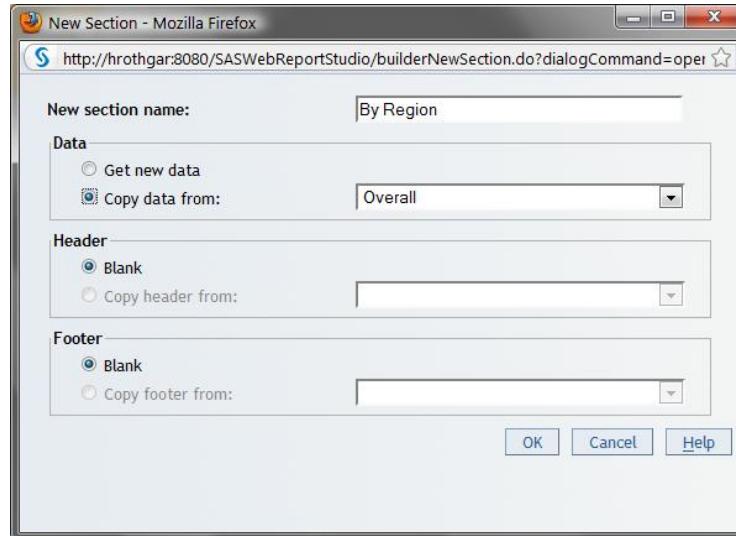


**Figure 24. Modify Report Format**

You can change the default report style by clicking on *Preferences* in the upper right of the title bar and selecting the *Report Creation* tab. Finally, an organization can develop a custom theme for all Web Applications. The details of this are beyond the scope of this discussion, but see “Administering SAS Web Application Themes” in the *SAS 9.2 Intelligence Platform: Web Application Administration Guide*.

### Adding a New Section

The easiest way to create new report tabs is to open the Edit tab and click on *Insert>New Section* from the Web Report Studio edit menu. This brings up a handy section wizard that allows you to clone previous report sections.

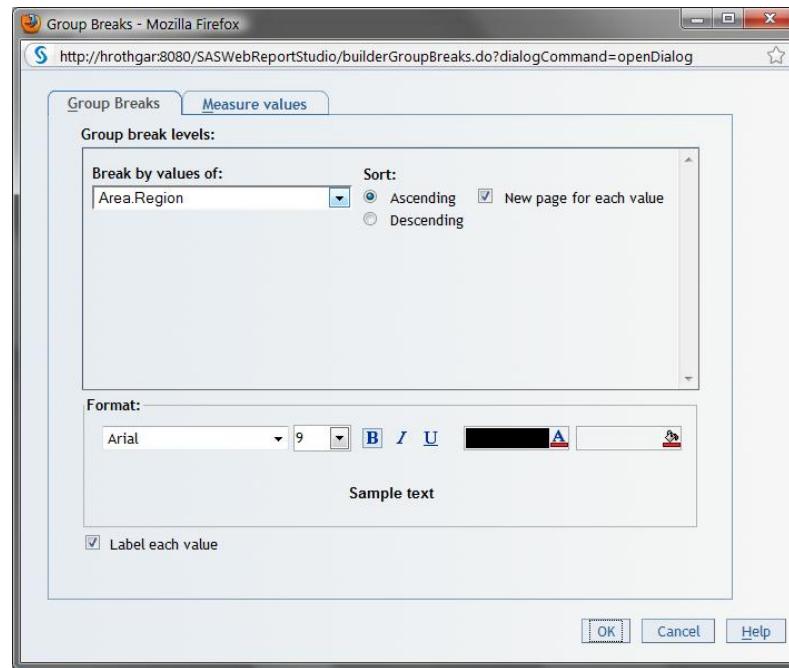


**Figure 25. Adding a Report Section**

Drag a table icon to the report palette and right click on the table to select *Assign Data*. Move Product Type to rows

and Net Sales per Store and Number of Stores to the column dimension.

Next, click on *Table of Contents Options* and choose *Group Breaks*.



**Figure 26. Add Group Breaks**

You should now get a new report page for each region. After sorting by columns, the report should look like the following, complete with a table of contents. As you can see, sandals are not a big seller in the US.

Product	Men's Casual	Women's Casual	Slipper	Men's Dress	Women's Dress	Boot	Sport Shoe	Sandal
	\$17,161.62	\$14,592.36	\$12,637.88	\$10,102.13	\$8,927.03	\$5,440.27	\$856.76	\$504.39
	77	36	74	93	118	79	117	23

**Figure 27. Report by Region**

There are many more options in Web Report Studio, which are described in detail in the *User's Guide*. For now, this should be enough to get started with building dynamic Web sites.

## CONCLUSION

In conclusion, SAS Web Report Studio is a powerful and complex tool for creating customized analytic reports. For many users, it can be a viable alternative to the older SAS/InterNet technology. Setting up and maintaining SAS BI Server is a significant commitment of time and resources, but once the server has been configured, users with a modicum of training in the application can create individual and shared reports with a minimum of time and effort. Web Report Studio provides two major advantages over batch programming with PROC FREQ, PROC REPORT or PROC TABULATE. First, the client need only have a Web browser such as IE8 or Firefox 3. It is not necessary to install PC SAS on the client. Second, users do not need to learn the syntax for these procedures. Instead, tabulations can be prepared using a (somewhat) intuitive graphical user interface. SAS has positioned this product for managers and executives, but in reality it will be of most value to SAS programmers who want to take advantage of using a Web application to design and quickly disseminate reports.

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- SAS Institute Inc. 2009. *SAS® Information Map Studio 4.2: Getting Started with SAS® Information Maps*. Cary, NC: SAS Institute Inc. <http://support.sas.com/documentation/cdl/en/imsgs/61225/PDF/default/imsgs.pdf>.

See also the on-line product documentation for SAS Web Report Studio at  
<http://support.sas.com/documentation/onlinedoc/wrs/changereportbldg42/>.

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## RECOMMENDED READING

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