

New Visualization in V8.2

Himesh Patel and Sanjay Matange

ABSTRACT

Looking for a pain-free way to combine tables and graphs on the same page? Well, the search is over – with the new ODS RTF option, combining graphics and tables is easy. We did not quit there, now you can also print your client-side graphs and tables using the new ODS PRINTER option. Along with the enhancements we have made to ODS, we have added several new options to the existing SAS/GRAPH® procedures. This paper also highlights several new visualizations that are part of the solution based SAS products such as WebHound™, Enterprise Miner™, and WebAF™.

SAS/GRAPH ENHANCEMENTS

GCHART - HORIZONTAL AND VERTICAL BAR STATEMENTS

RANGE: By default, GCHART displays the midpoint values for each of the bars. When the RANGE option is specified, GCHART displays numerical range instead of the midpoint values.



Output 1

CREF: In addition to accepting a single color, the CREF option can now take a list of colors. Specifying a single color in parentheses applies that color only to the first reference line drawn with the REF= option. Specifying a reference color list applies those colors in sequence to successive lines drawn with the REF= option. The syntax of the color list is of the form (COLOR1 COLOR2... COLORn) or (COLOR1, COLOR2,... COLORn). CAUTOREF can be used in conjunction with CREF color list to color all the reference lines specified by the AUTOREF option.

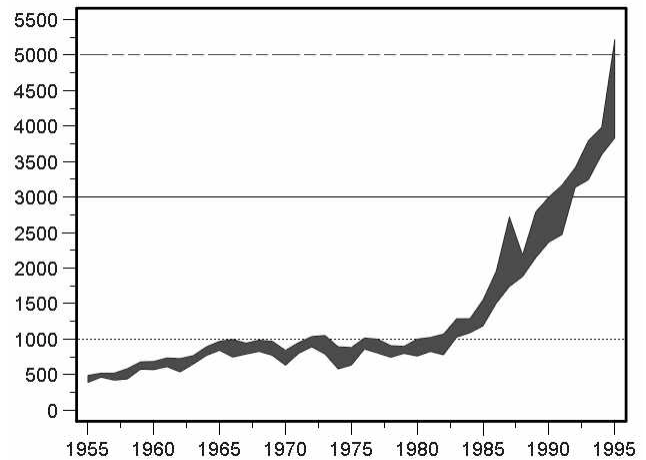
LREF: Just like CREF, the LREF option also takes a list of values that enables you to control line styles for each of the reference lines specified on the chart using the REF option. LAUTOREF can be used in conjunction with LREF line style list to set the line styles for all the reference line specified by the AUTOREF option.

GCONTOUR - PLOT STATEMENTS GPLOT – PLOT, PLOT2, BUBBLE AND BUBBLE2

STATEMENTS

CVREF / CHREF: Both of these options take a color list like the CREF option in GCHART. The color list applies colors sequentially to successive reference lines drawn with the HREF/VREF= option.

LHREF / LVREF: Both of these options take a list of line styles like the LREF option in GCHART. Specifying a line-style list applies line styles in sequence to successive reference lines drawn with the HREF/VREF= option. The syntax of the line style list is of the form (style1 style2... style3).



Output 2

In **Output 2** you can see that a reference line of line style was used to set the upper and lower limits. To generate this output following options were added to the GPLOT PLOT statement:

```
VREF=(1000 3000 5000)
LVREF=(2 1 32)
```

GMAP

WOUTLINE: Specifies the width, in pixels, of the outline for all outlined blocks in BLOCK maps and for the outline of the map areas in BLOCK, CHORO, and PRISM maps.

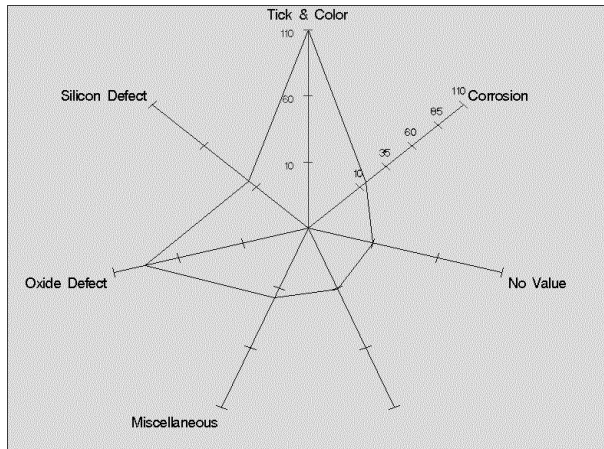
GRADAR STARAXIS AND AXIS STATEMENTS

The **AXIS** statement for GRADAR is the same format as the **AXIS** statement used for GCHART, GCONTOUR, and GPLOT. Each of the different procedures allows a different set of options for the **AXIS** statement. GRADAR supports the following axis options:

1. COLOR
2. STYLE
3. WIDTH
4. Major Tick Marks
 - COLOR
 - HEIGHT
 - NUMBER
 - WIDTH

- 5. LABEL / VALUE
 - ANGLE
 - COLOR
 - FONT
 - HEIGHT
 - JUSTIFY
 - ROTATE

Using AXIS statements and assigning them to STARAXIS option will produce a radar chart shown in **Output 3**.



Output 3

Part of the code to generate this chart is shown in **EXAMPLE 1**.

```
axis1 color=red
      label=(color=blue
            font=centb
            'Tick & Color');
axis2 color=blue
      major=(color=red
            number=5)
      value=(color=black);
axis3 label=('No Value');
axis4 label=NONE;

proc gradar;
chart var/ staraxis=(axis1, axis2, axis3
                    axis4)

..... more statement options;
run;
```

Example 1

In **Example1** the STARAXIS statement was used to assign one or more axis definitions to the axis spokes in the radar chart. GRADAR displays axis spokes clockwise, starting at the 12 o'clock position. The axis definitions that are specified using the STARAXIS= option are assigned consecutively to the spokes, starting from the first spoke. For example, STARAXIS=(AXIS1, AXIS2, AXIS3,...) assigns the AXIS1 statement's definition to the first axis spoke (at the 12 o'clock position), the AXIS2 statement's definition to the second axis spoke, and the AXIS3 statement's definition to the third axis spoke. The axis definitions are assigned consecutively, and you cannot skip a spoke. For example, to assign a definition to the seventh spoke, you must also assign definitions to the first six spokes. However, you do not have to assign definitions to all of the spokes. Any remaining

axis spokes on the GRADAR chart are displayed with the default settings.

HTML: Just like the HTML option in the GCHART, GPLOT, and GMAP procedures the HTML option in GRADAR identifies the variable in the input data set whose values create links in the html file created by the ODS HTML statement.

HTML_LEGEND: This option works like the HTML option except that the links are associated with a legend value and point to the data or graph you want to display when the user drills down on the legend entry.

IMAGE SUPPORT FOR DEVICE=JAVAMETA

In V8.1, image support was added for SAS/GRAPH procedures, but the JAVAMETA device was not able to display these images. Beginning with V8.2, you can display images with the JAVAMETA device. Images used in the graphs for this device need to be specified with a URL of the form:

<http://www.myimage.com/myimage.gif>

The images should reside on the same server and location as the archive file metafile.zip.

ODS ENHANCEMENTS FOR SAS/GRAPH

Using graphs generated by SAS/GRAPH in documents produced by Microsoft Word, Excel and other PC programs is now much easier. You can use SAS/GRAPH to generate tables and graphs on the same page using ODS RTF. With the device set to ACTIVEX, you can embed a live control within the RTF document. You can modify the appearance of the graphs after they are generated. ODS PRINTER enables you to print your output directly to the specified printer location, and ODS PDF will allow you to generate a PDF file.

ODS RTF

ODS RTF is one of the biggest enhancements to SAS/GRAPH. In the past, users had to generate CGM or other format files from SAS, then import these files into Microsoft products. Currently, there is a 20-page document, TS-252X "Exporting SAS/GRAPH Output to Microsoft Office 97 for Windows 95 and Windows NT" that describes how to display your graphs in Microsoft products.

As shown in **EXAMPLE 2**, you can generate a rich text format (RTF) file with the ODS RTF statement that has an embedded ActiveX graph.

```
/* Specify Device of ActiveX */
goptions device=activex;

ods rtf file='<filename.rtf>';

proc gchart;
..... procedure statements...
run;
quit;

ods rtf close;
```

Example 2

The STARTPAGE option enables you to control page breaks. **Example 3** uses STARTPAGE=NEVER on the ODS statement which removes the page breaks in ODS output. In this case, it removes the page break between the table produced by PROC FREQ and bar chart. ActiveX graphs for RTF are system independent. You can generate a RTF file on MVS with a device of ACTIVEEX and port it over to PC to view it.

Generating a table and a graph on the same page is as easy as adding another option to ODS.

```
options printerpath=<printer location>;
options reset=all dev=activex;

ods rtf file='graph_table.rtf' startpage=never;

proc freq data=sashelp.class;
.....
run;

proc gchart;
Statements.....;
run;
quit;
ods rtf close;
```

Example 3

USING OTHER SAS/GRAPH DEVICES WITH ODS RTF

By default, if a device is not specified with ODS RTF then the default device of SASEMF is used. You can also use JPEG or PNG device.

ODS PRINTER AND PDF

To generate a PDF file, you can now use ODS PDF statement. Just like ODS RTF, you can use STARTPAGE option to remove the page breaks between tables and graphs. In V8.2, the ActiveX device is experimental for ODS PRINTER and PDF outputs. If you use the ACTIVEEX device with ODS PRINTER or PDF, an image is generated from the ActiveX control.

SAS/GIS® ENHANCEMENTS

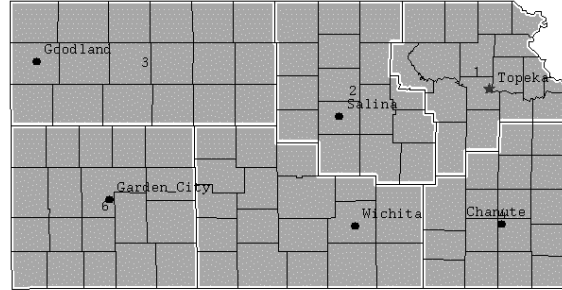
CREATE ACTIONS FROM PROC GIS

GIS actions are operations that are run interactively on selected features in the SAS/GIS map window. Prior to V8.2, the only way to create or modify actions was interactively using GIS graphical interface.

You can now use PROC GIS to create, update and delete all GIS map action types, e.g. SPATIAL, PROGRAM, COMMAND, BROWSE, REDISTRICKT, IMAGE, etc. Every parameter of each action type can be specified. This new capability greatly aids the creation of fully functional SAS/GIS maps in batch mode.

CLICKABLE GIS MAPS FOR HTML OUTPUT

Maps created with SAS/GIS can be displayed as a GIF image on a web page using ODS. If desired, polygonal areas on the map can be clickable from the web page. Separate URLs can be associated with each clickable map feature. Anything that can be pointed to with a URL can be linked.



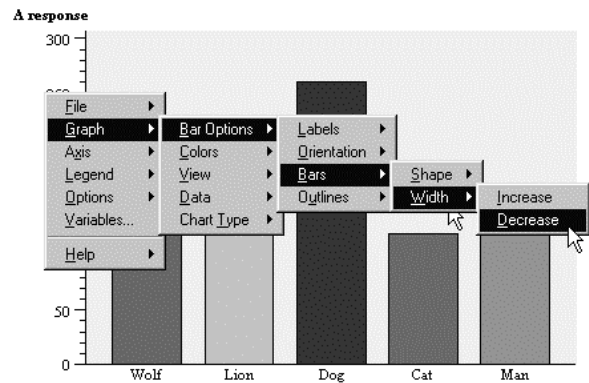
Output 4

Output 4 was created in batch using the PROC GIS. It shows the state of Kansas with county boundaries. The cities are displayed as points and are individually clickable. When selected, each city links to an URL showing the current weather in that city. The sample program for this example will be made available on the SAS technical support web site:

<http://www.sas.com/products/gis>

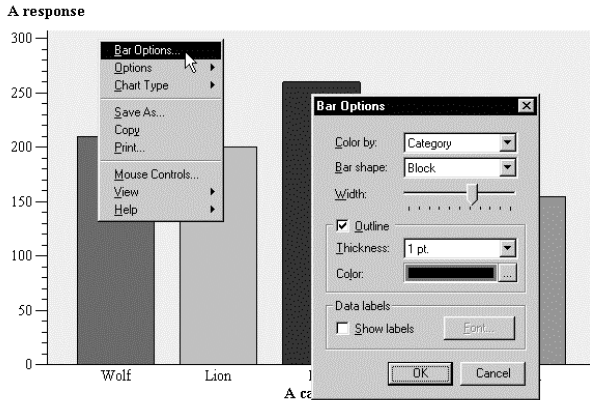
USER INTERFACE (UI) ENHANCEMENTS IN ACTIVEX CONTROL

The user interface is one of the most important parts of interactive graphs. In V8.1 the ActiveX control menus had several levels of cascading. For example, to change one of the bar options, users had to go through 4 to 5 levels of menus. Usability studies done on the ActiveX control showed that the selections and options for the menus were not intuitive.



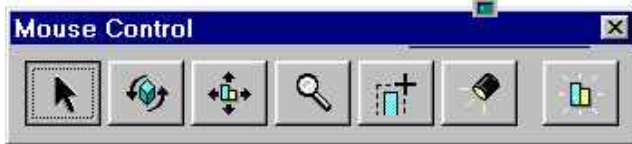
Output 5

Output 5 shows the number of cascading menus that you had to go through to change the width of the bars. The other options were also nested several levels deep.



Output 6

Output 6 shows the new V8.2 menu and dialog for changing bar options. To change the width of the bars you only have to select Bar Options. This opens a dialog that has slider to control the bar widths. As you move the slider, the changes are reflected in the graph immediately. Other options on this dialog enable you to control the shapes, colors, labeling etc. for the bar chart.



Output 7

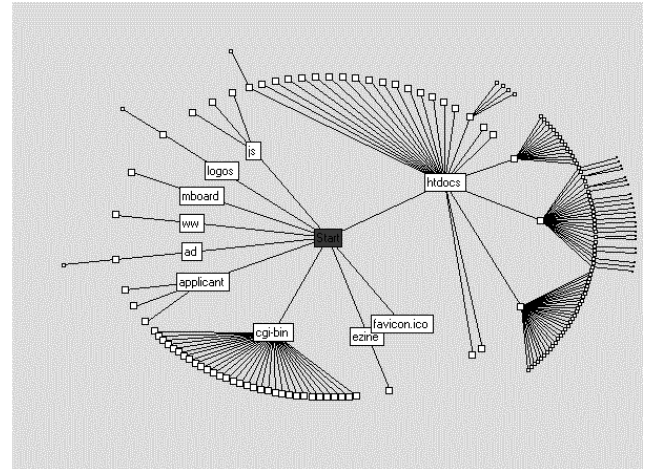
Output 7 shows the mouse control dialog that lets you control the rotation, panning, zooming, rubber band selection, lighting and resetting the view. Once the mouse control is selected, it is active until you make another selection. Select the ARROW button to go back to menu selection mode.

NEW VISUALIZATION COMPONENTS

New Java and AF visualization components have been built for use by SAS analytical products. These components have been integrated into these products.

JAVA TREEVIEW APPLET

The TreeView applet is designed to visualize a large hierarchical data such that "context and focus" are retained all the time. The applet places the root node at the center of the view and places successive levels of child nodes around the root node in circles of increasing radius. Child nodes of an intermediate parent node are grouped close to the parent.



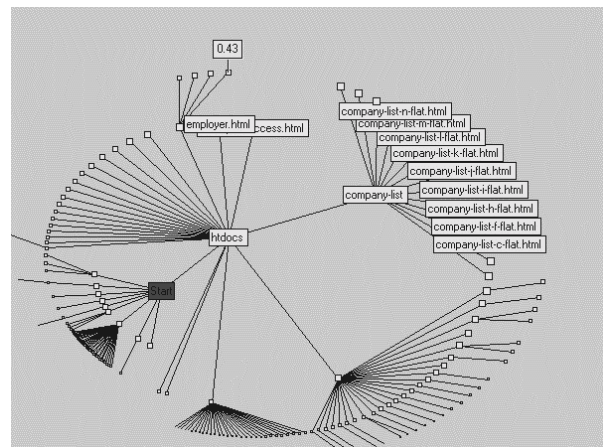
Output 8

An exponential view transformation is used to display the tree, which ensures that the entire tree is always displayed. Nodes and links at the center of the view port are displayed with normal magnification, while nodes and links near the outer edge of the tree are compressed. A "level of detail" strategy allows nodes further away from the center to be displayed with reduced details.

FOCUS AND CONTEXT

The TreeView applet provides for interaction with the tree such that more details of any area of the tree can be displayed, while retaining the full view of the tree. In Output 9, the Root node has been pulled towards the bottom left of the view. This causes the tree to be displayed such that the nodes to the bottom left are compressed, and the nodes to the top-right are magnified as they come towards the center of the view.

Also, more details of the nodes to the top left are displayed, including node names, etc. A data tip can also be displayed showing relevant information (see top node). The TreeView applet allows many additional properties links and nodes, including link color, URL links for nodes, and JavaScript function calls. This component is used in the V8.2 WebHound product.



Output 9

XML INPUT

Input data for the tree is provided in the form of XML script. The data can be in a separate XML file, or the XML script can be directly embedded in the HTML file. An XML code snippet is shown in **Example 4**.

```
<NodeLinkDiagram>
<Action>Home</Action>
<NodeStyles>
<NodeStyle ID ="0">
<labelBackColor>red</labelBackColor>
<labelTextColor>blue</labelTextColor>
</NodeStyle>
</NodeStyles>
<Nodes>
<Node>
<ID>0</ID>
<label>Start</label>
<url>CWFrame2.html</url>
<tip></tip>
</Node>
<Node>
<ID>1</ID>
<label>logos </label>
<tip>0.7 </tip>
</Node>
...
</Nodes>
<Links>
<Link>
<fromNode>0</fromNode>
<toNode>100</toNode>
<color>black</color>
</Link>
...
</Links>
</NodeLinkDiagram>
```

Example 4

DS2TREE MACRO

A TreeView HTML generator macro, DS2TREE, is available in V8.2. This macro generates an HTML file with a scripted TreeView applet. **Example 5** shows a sample of the DS2TREE macro, with various parameters.

```
data myorg;
input name $ empno mgrno deptname $25. deptcode $; cards;
Peter 2620 1420 Documentation DOC
Linda 6915 1420 Research and Dev R&D
Maria 1320 1420 Legal LGL
Vince 1420 1750 Executive EXE
Jim 6710 6915 Quality Assurance QA
Nancy 22560 6915 Quality Assurance QA
...
;
run;

%ds2tree(ndata=myorg,
```

```
archive=&archive, htmlfile=&htmlroot.sample.html,
nid=empno,
nparent=mgrno,
ntip=deptname,
nlabel=name,
ncolor=deptcode,
ncolfmt=$nodecol.,
height=500, width=600, cutoff=1.0,
septype=none, center=y,
brtitle=SAS TreeView Sample,
ttag=header 2, tcolor=navy,
tface=%str(Arial,Helvetica,sans-serif), ftag=header 4,
fcolor=navy, fface=%str(Arial,Helvetica,sans-serif));
```

Example 5

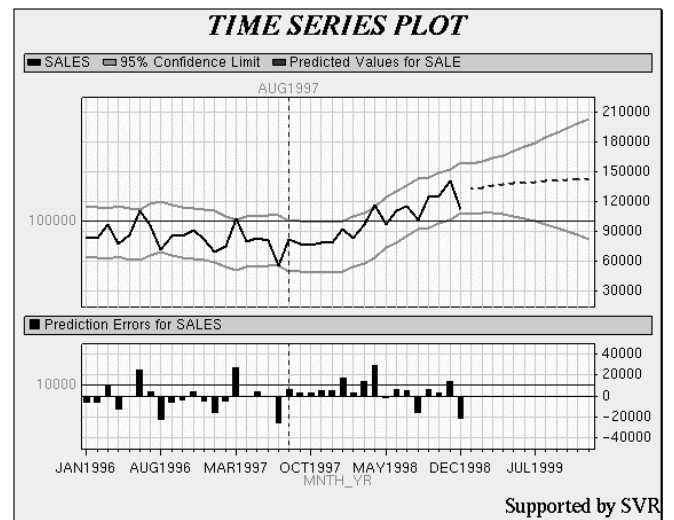
NID=EMPNO and NPARENT=MGRNO specify the names of the variables in the data set that represent the child and parent nodes, respectively.

NTIP=DEPTNAME and NLABEL=NAME specify the names of the variables in the data set to be used for the floating tool tips and the node names, respectively.

For details of all the available parameters, see documentation for the TreeView HTML Generator.

AF TIME SERIES COMPONENT

The Time Series component is designed for interactive visualization of data collected over time. Multiple chart areas can be used to show univariate or multivariate data against a common time axis.



Output 10

Multiple chart areas can be specified with easy-to-use method calls. All chart areas are stacked vertically, with one common horizontal time axis. Each chart area can display plots of multiple response variables. Attributes such as join type, marker shape, marker color, etc. can be set for each plot.

Reference lines can be specified for individual chart areas. Vertical reference lines span across all the charts. The plot allows for

zooming and panning of data using an intuitive zoom-scroll bar. The SCL code shown in **Example 6** was used to set up the time Series Chart. This component is used in the V8.2 Enterprise Miner product.

```
time1._addChartArea(chartID, .);
time1._addAnalysisVariable(chartID, plotID, "AIR");
...
time1._setMarkerShape(chartID, plotID, "SQUARE");
time1._setMarkerJoinType(chartID, plotID, "NONE");
time1._setMarkerColor(chartID, plotID, "red");
```

Example 6

GRAPH APPLET

Several enhancements were made to improve the appearance of graphs and to make it more consistent with SAS/GRAPH output. Some of the major enhancements to the applet include:

1. PIE charts
 - The LABEL option labels donut holes.
 - The Matchcolor option matches label colors with the associated slice.
 - You can use the EXPLODE option to explode a pie.
 - The ASCENDING and DESCENDING option to order pie slices by statistics value.
 - The GROUP option displays multiple pies in a single applet.
 - ACROSS and DOWN options control the layout of grouped pies.
 - The NOGROUPHEADERS option suppresses group headings.
 - The labeling of pie slices has been improved.

2. Bar charts
 - The CAXIS option controls the color of axis.
 - The ASCENDING and DESCENDING option to order the bars.
 - The MIDPOINT option allows you to specify midpoint values for the bars. The midpoint list will depend on the type of chart variable.
 - The NOZERO option suppresses any midpoints for which there are no corresponding values of the chart variable.
 - The SPACE option specifies the amount of space between individual bars or between the bars within each group.
 - For grouped bars, ordering for character and numeric data has been improved.

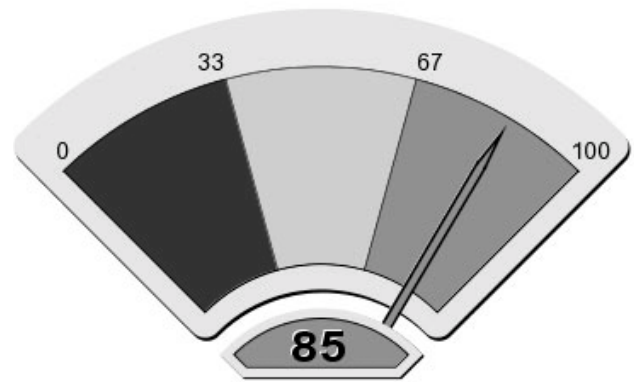
3. Plot Charts
 - The BUBBLE chart creates bubble plots in which a third variable is plotted against two variables represented by the horizontal and vertical axes; the value of the third variable controls the size of the bubble.
 - The PLOT2 statement produces one or more plots with the vertical axis on the right side of the graph against which a second dependent variable can be plotted.
 - The OVERLAY option places all the plots that are generated by the PLOT statement on one set of axes.
 - The HREVERSE option reverses the order of the values.

- STEP, RLCLM and SPLINE interpolations support.
- Support for multiple legends with PLOT2 statement.

NLS enhancements to graph applet includes support for menus in Danish, German, Spanish, French, Hungarian, Italian, Norwegian, Polish and Swedish languages.

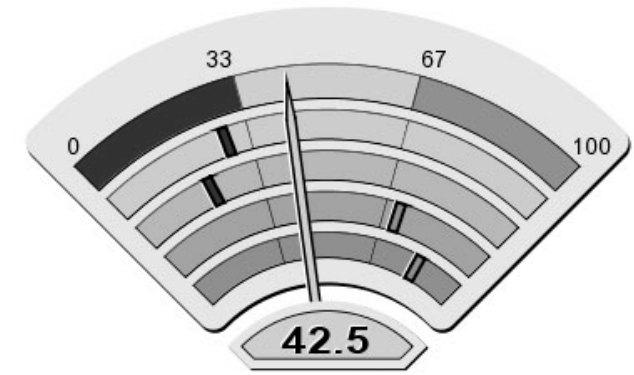
RANGEVIEW COMPONENT IN WEBAF

The RangeView Object is based on the SAS/AF® Critical Success Factor (CSF) component that was first released in Version 7. It is a business tool that enables Java applications to visually analyze success or failure based on some data value, within given ranges of values. The Swing RangeView is based on the old WebAF RangeView but has a completely new design (both visually and internally).



Output 11

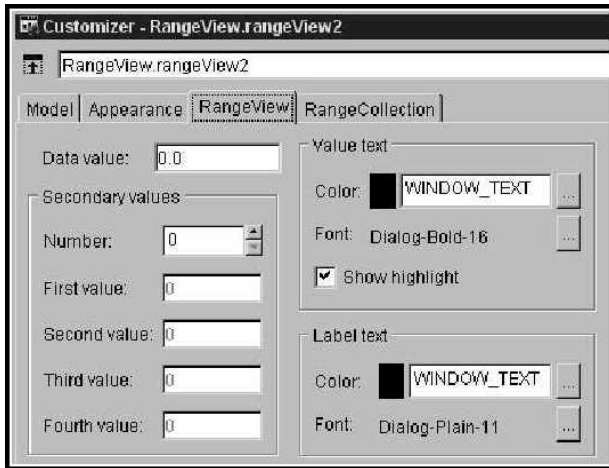
Output 11 shows a simple CSF generated from Version 2 of WebAF.



Output 12

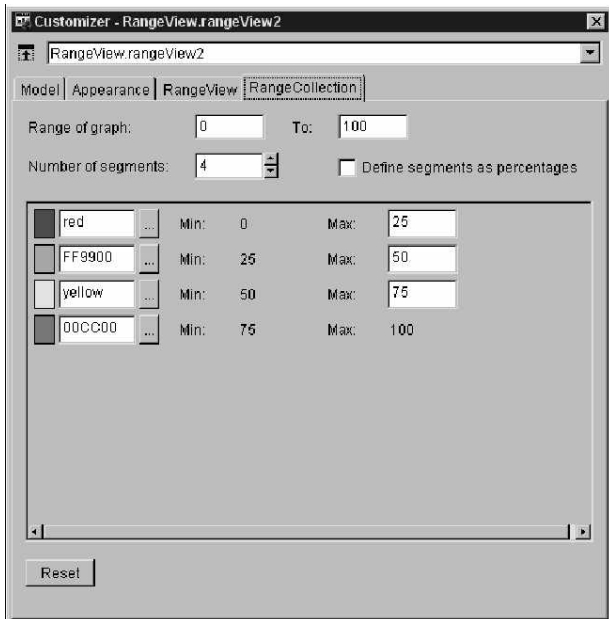
Output 12 shows a CSF with two history bands. In addition to indicating a current value, the new CSF can display from 1 to 4 previous values on *history bands*. The history bands show past data points relative to the current value. The top most band indicates the current value, with the actual data value displayed at the base of the needle. Just below the band indicating the current value is the previous value, indicated by a small marker on a solid gray band. Lower bands show previous data points, with the bottom most band

showing the oldest value.



Output 13

The customizer, as show in **Output 13** for CSF, enables you to set the current value, the number of history bands, and their values. It also lets you set the color and fonts for the text and values for the history bands.



Output 14

Output 14 shows the customizer for the Range collections. This will give user ability to control colors and values for the ranges.

CONCLUSION

Version 8.2 introduces several new enhancements to SAS/GRAPH software. Using ODS RTF with device of ActiveX enables you to generate tables and graphs on the same page. You can generate RTF file with ActiveX device on any operating

system. In addition to the procedure enhancements, several new solution based visualizations have been added to other SAS products such as the TreeView applet to WebHound product, the Time Series plot to Enterprise Miner software and the CSF component and Java server pages to WebAF.

CONTACT INFORMATION

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

Himesh Patel (Himesh.Patel@sas.com)
Sanjay Matange (Sanjay.Matange@sas.com)
SAS Campus Drive
Cary, North Carolina 27513

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