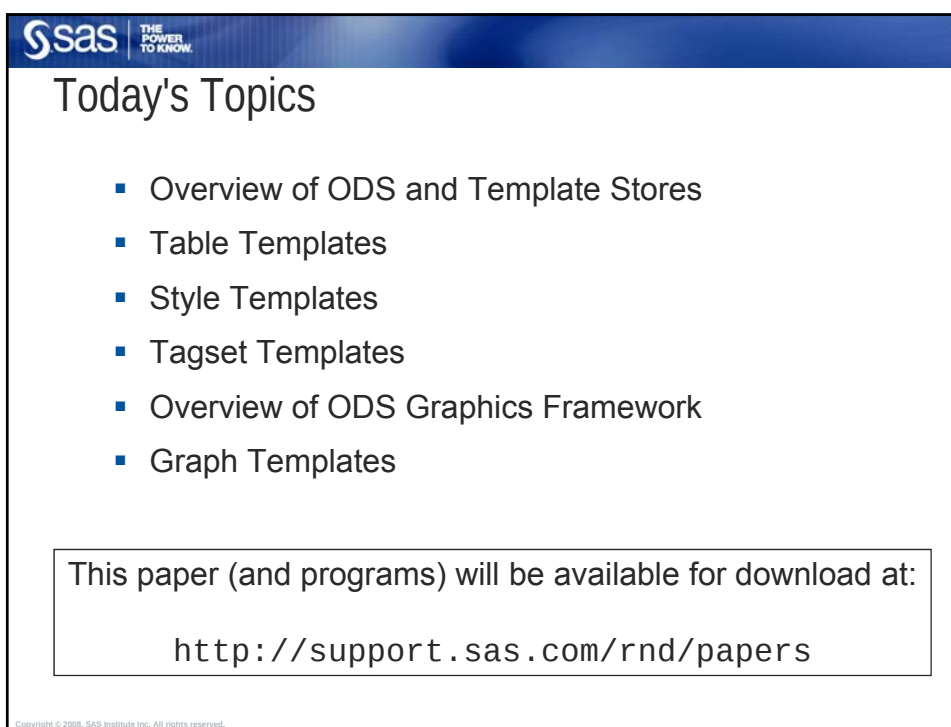




Guide to Template Gardening



Code to Study



Explanatory Information



Results

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ODS and Table Templates

- ODS Table templates are "data-centric" templates. The output objects created by these templates are tightly linked or bound to the SAS procedures for which they were designed. So, for example, PROC FREQ would never use a table template defined for PROC MEANS and vice versa.



Most SAS procedures use table templates to build tabular output objects.

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ODS and Style Templates

- ODS Style templates are "style-centric" templates. They contain a collection of style elements which are used to determine the style characteristics of the output objects when the output objects are routed to destinations that support style.

Style
Templates

ODS destinations that support style use style templates to set presentation and style characteristics for ODS output files and, in SAS 9.2 for Graph Output using the ODS Graphics Framework.

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ODS and Tagset Templates

- ODS Tagset templates are "destination-centric" or "markup language-centric" templates. They cause ODS to write specific text or markup language tags around SAS procedure or process output, based on the destination. Because these tagset templates all belong to the MARKUP family of destinations, they are also called markup templates or markup tagsets.

Tagset
Templates

ODS uses tagset templates to control the markup language tags written to ODS Markup output files (like HTML, LaTeX, CSV, etc)

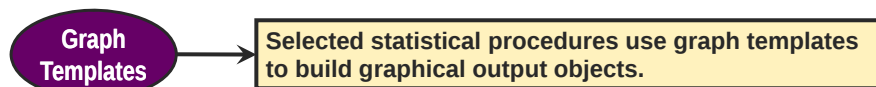
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ODS and Graph Templates

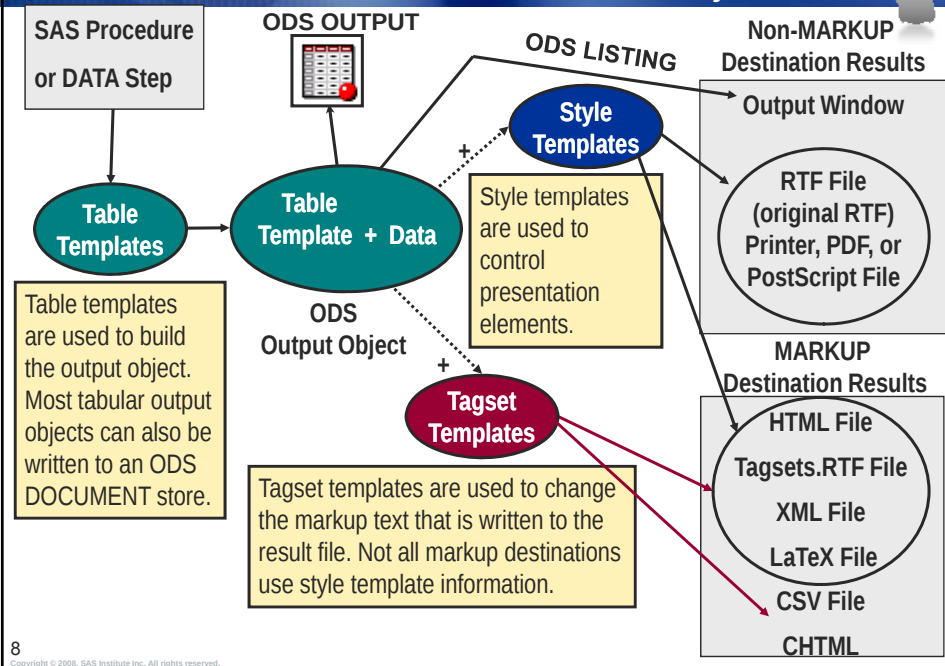
- ODS Graph templates are also "data-centric" templates. Data points are bound to the graph template to create graphic output. Components of the ODS Graphics Framework that utilize Graph templates are selected SAS/STAT procedures that support ODS Graphics and the new "SG" procedures.



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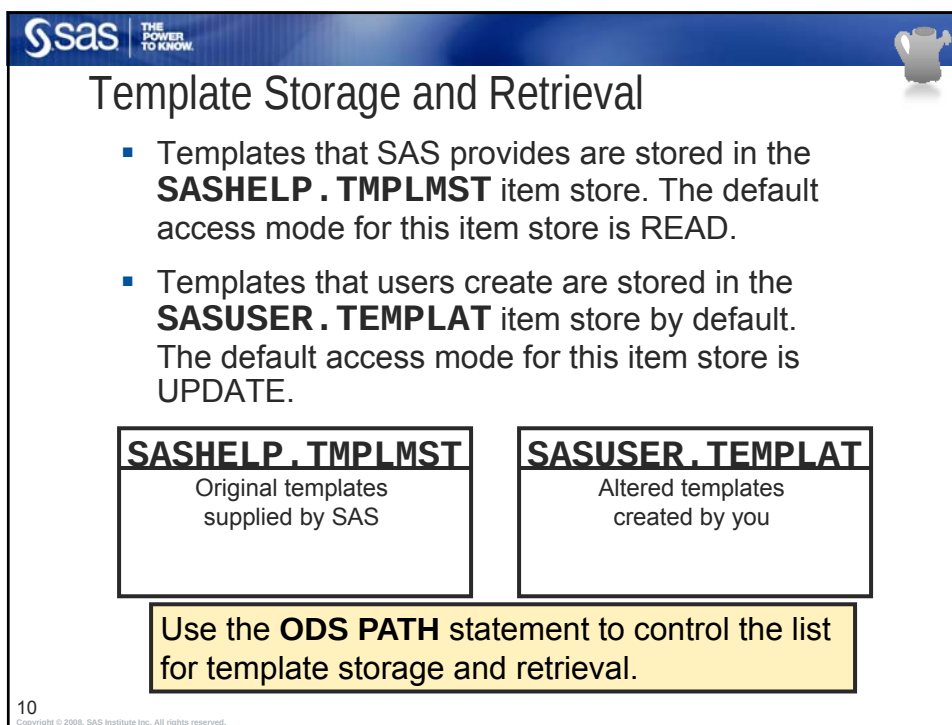
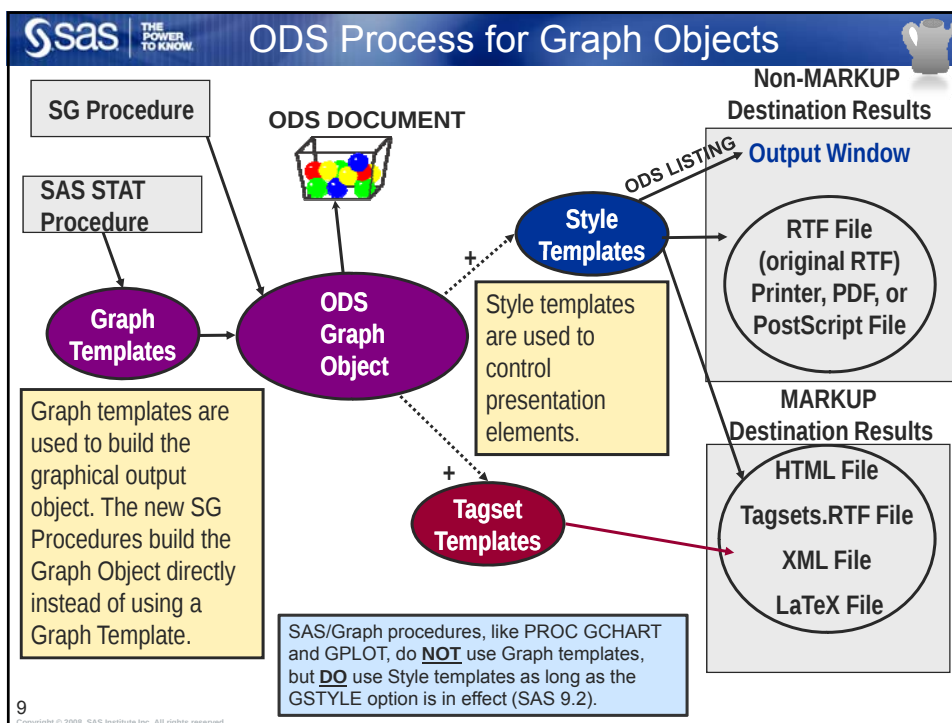


ODS Process for Tabular Objects



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ODS PATH Model Syntax

```
libname perm 'c:\permtmp\ods';

ods path perm.mytemps(update)
        work.mytemps(update)
        sasuser.templat(update)
        sashelp.tmplmst(read);
```

The **ODS PATH** statement establishes a list for template storage and retrieval:

- updated templates are stored in the first write-able template store in the list;
- template stores are searched, for retrieval purposes, in the order they appear on the ODS PATH statement.

The ODS PATH statement also supports the ability to "prepend" or "append" template stores to the current path list.

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Template Utility Programs

```
proc template;
```

Utility statements that go here include the **LIST** and **SOURCE** statements.

The **LIST** statement reveals the directories and objects in the template stores.

The **SOURCE** statement creates a copy of the decompiled template source code in the location of your choice.

```
run;
```

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Some Utility Programs

```
proc template;
  title '1) List a Particular Template Store';
  list / store=sasuser.templat;
run;

proc template;
  title '2) List One Template Folder';
  list Base;
  list Styles;
  list Tagsets;
  list StatGraph;
run;

proc template;
  title '3) List a particular Sub-Folder or Template';
  list Styles.Default;
  list Base.Contents;
  list Stat.Reg.Graphics;
run;
```

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demo1_utility_code.sas

More Utility Programs

```
proc template;
  title '4) Put the Template Source Code in the LOG';
  source Styles.Default;
  source Base.Summary;
  source Stat.Reg.Graphics.CooksD;
  source Tagsets.CSV;
run;

proc template;
  title '5) Put the Template Source Code in a file';
  source Styles.Default / file='c:\temp\default.tpl';
  source Base.Summary / file='c:\temp\summary.tpl';
run;
```

demo1_utility_code.sas

Utility Program Results



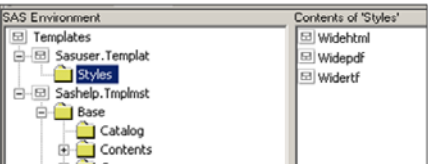
Interactive Window	LISTING Results															
 The screenshot shows the SAS Environment window with a tree view on the left and a 'Contents of 'Styles'' pane on the right. The tree view includes 'Templates', 'Sasuser.Templat', 'Sashelp.Tmplinst', and 'Base'. Under 'Sasuser.Templat', the 'Styles' folder is selected and expanded. The 'Contents of 'Styles'' pane lists 'Widehtml', 'Widepdf', and 'Widertf'.	1) List a Particular Template Store Listing of: SASUSER.TEMPLAT Path Filter is: * Sort by: PATH/ASCENDING <table><thead><tr><th>Obs</th><th>Path</th><th>Type</th></tr></thead><tbody><tr><td>1</td><td>Styles</td><td>Dir</td></tr><tr><td>2</td><td>Styles.Widehtml</td><td>Style</td></tr><tr><td>3</td><td>Styles.Widepdf</td><td>Style</td></tr><tr><td>4</td><td>Styles.Widertf</td><td>Style</td></tr></tbody></table>	Obs	Path	Type	1	Styles	Dir	2	Styles.Widehtml	Style	3	Styles.Widepdf	Style	4	Styles.Widertf	Style
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2	Styles.Widehtml	Style														
3	Styles.Widepdf	Style														
4	Styles.Widertf	Style														

Figure 1: Comparison of Interactive Template Browser versus LIST Statement Output

demo1_utility_code.sas

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Utility Program Results



list Base;	list Styles;																																																																																																																		
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Figure 2: Contents of Particular Folders or Directories in the Template Stores

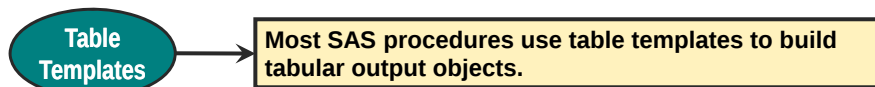
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ODS and Table Templates

- ODS Table templates are "data-centric" templates. The output objects created by these templates are tightly linked or bound to the SAS procedures for which they were designed. So, for example, PROC FREQ would never use a table template defined for PROC MEANS and vice versa.

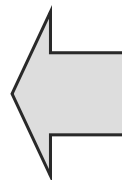


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PROC TEMPLATE to Define a Table Template

```
proc template;
  define table Base.Summary;
```



The syntax for TABLE templates will have a COLUMN statement and DEFINE/END blocks for specifying formats, labels and headers. A TABLE template is usually associated with a SAS procedure; however a custom TABLE template can be used with DATA_NULL_ to create tabular output.

```
end;
run;
```

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ODS TRACE Statement

- The ODS TRACE statement is used to provide information about output objects.

```
ods trace on;

proc means data=sashelp.shoes;
run;

ods trace off;
```

- A record of each output object is written to the SAS log.

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demo2_table_template.sas

Table Template

- A *table template* describes how to render the output for a tabular output object.
- A table template determines
 - the order of table headers and footers
 - the order of columns
 - the overall appearance of the output object that uses it.

```
Output Added:
-----
Name:      Summary
Label:     Summary statistics
Template:  base.summary
Path:      Means.Summary
Label Path: 'The Means Procedure'.'Summary statistics'
-----
```

ODS TRACE Output for PROC MEANS

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Changes for PROC MEANS



The MEANS Procedure

Analysis Variable : Sales Total Sales		
Region	N Obs	Sum
Africa	56	2342588.00
Asia	14	460231.00
Canada	37	4255712.00
Central America/Caribbean	32	3657753.00
Eastern Europe	31	2394940.00
Middle East	24	5631779.00
Pacific	45	2296794.00
South America	54	2434783.00
United States	40	5503986.00
Western Europe	62	4873000.00

Figure 5: HTML Output from PROC MEANS

The MEANS Procedure

Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00
Asia	14	460,231.00
Canada	37	4,255,712.00
Central America/Caribbean	32	3,657,753.00
Eastern Europe	31	2,394,940.00
Middle East	24	5,631,779.00
Pacific	45	2,296,794.00
South America	54	2,434,783.00
United States	40	5,503,986.00
Western Europe	62	4,873,000.00

Figure 6: Desired HTML Output from PROC MEANS

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Default Table Template Appearance

```
proc template;
  define table Base.Summary;
    dynamic clm pct one_var_name one_var_label one_var;
    column class nobis id type ways (varname) (label) (min) (max) (range) (n)
      (nmiss) (sumwgt) (sum) (mean) (uss) (css) (var) (stddev) (cv) (stderr)
      (t) (probt) (lclm) (uclm) (skew) (kurt) (median) (mode) (q1) (q3)
      (qrange) (p1) (p5) (p10) (p25) (p50) (p75) (p90) (p95) (p99);
    header h;

    define h:
      text "Analysis Variable : " one_var_name " " one_var_label;
      space = 1;
      just = C;
      print = one_var;
      spill_margin;
    end;

    . . . more code . . .
    define sum;
      header = "Sum";
      generic;
    end;
    . . . more code . . .
  end;
run;
```

The MEANS Procedure

Analysis Variable : Sales Total Sales		
Region	N Obs	Sum
Africa	56	2342588.00

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Code for New Table Template

```
ods path work.sumtemp(update)
      sasuser.templat(update)
      sashelp.tmplmst(read);
```

ODS PATH statement establishes the search path for the storage and retrieval of

```
proc template;
```

```
  edit base.summary;
```

```
  header h ;
```

```
  define h;
```

```
    text "Analysis Variable: " one_var_label;
```

```
    space = 1;
```

```
    just = C;
```

```
    style=Header{background=pink};
```

```
    print = one_var;
```

```
    spill_margin;
```

```
  end;
```

```
  define sum;
```

```
    header = "Sum";
```

```
    format=comma14.2;
```

```
    generic;
```

```
  end;
```

```
run;
```

The EDIT statement makes a copy of your template in memory and then applies the defined changes to this copy. (You can also cut and paste the entire template code from SASHELP.TMPLMST).

This DEFINE statement for the header only changes the header text to use the variable label. Then the style of the header is specified and the background color is changed to pink (from the style template default).

The default DEFINE block for the SUM statistic is copied here and the FORMAT statement specifies the format for the SUM statistic.

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demo2_table_template.sas

Code for New Table Template

```
ods html path='c:\temp' (url=none)
         file='means2.html'
         style=styles.sasweb;
```

```
proc means data=sashelp.shoes sum;
```

```
  var sales;
```

```
  class region;
```

```
run;
```

```
ods _all_ close;
```

When this PROC MEANS is executed, the TABLE template for BASE.SUMMARY from the first item store in the ODS PATH list is the one used for this PROC MEANS step. The ODS PATH list will stay in effect until reestablished or the SAS session ends.

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demo2_table_template.sas



Results with New Table Template

```
ods html path='c:\temp' (url=none)
      file='means2.html'
      style=styles.sasweb;
```

```
proc means data=sashelp.shoes sum;
var sales;
```

ods
run

The MEANS Procedure

Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00

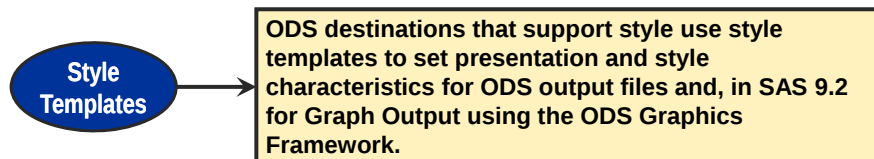
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demo2_table_template.sas



ODS and Style Templates

- ODS Style templates are "style-centric" templates. They contain a collection of style elements which are used to determine the style characteristics of the output objects when the output objects are routed to destinations that support style.

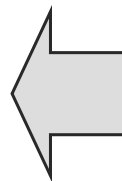


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PROC TEMPLATE to Define a Style Template

```
proc template;  
  define style styles.mystyle;
```



The syntax for STYLE templates is different from the syntax for TABLE templates. The statements between the main DEFINE/END will be STYLE, CLASS or other style template syntax.

```
end;  
run;
```

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Style Templates

- A *style template*
 - describes how to render the presentation aspects of a report
 - determines the overall appearance of the reports that use it
 - determines style attributes such as
 - colors
 - fonts
 - graphic images
 - margins and output size
 - borders.

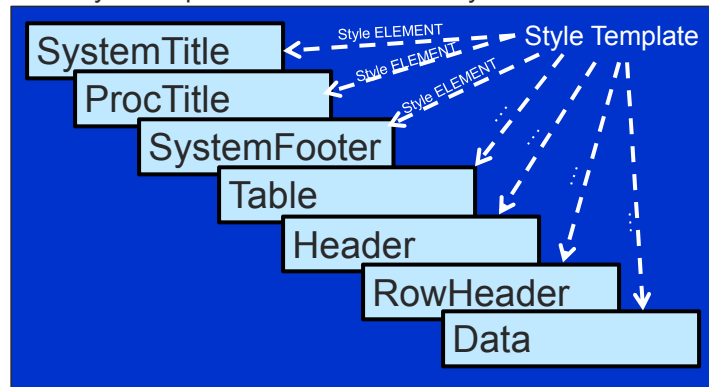
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Style Template Concepts: Style Elements

Style Template is a collection of style ELEMENTS



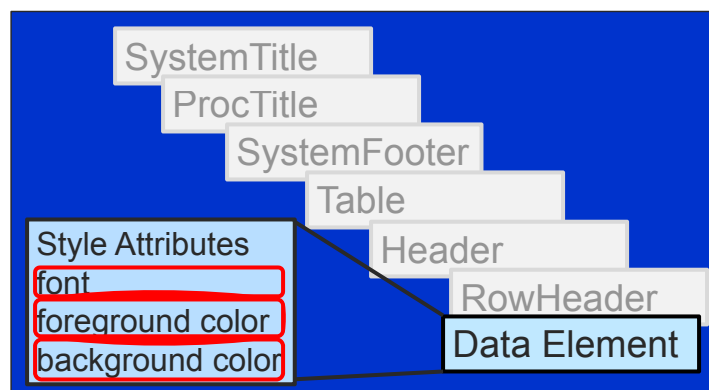
A **STYLE** template is a collection of style **ELEMENTS**. The style elements, conceptually, represent major table and output components, such as SystemTitle or Header.

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Style Template Concepts: Style Attributes



Each style **ELEMENT** is a collection of style **ATTRIBUTES**. The style attributes represent the individual presentation and output characteristics that can be changed. Style elements their style attributes may work differently in different destinations.

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Desired Output

The MEANS Procedure

Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00
Asia	14	460,231.00
Canada	37	4,255,712.00
Central America/Caribbean	32	3,657,753.00
Eastern Europe	31	2,394,940.00
Middle East	24	5,631,779.00
Pacific	45	2,296,794.00
South America	54	2,434,783.00
United States	40	5,503,986.00
Western Europe	62	4,873,000.00

Although all the headers could have been changed to pink in the TABLE template, this kind of change is best left to a STYLE template.

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demo3_table_style_template.sas

New Style and Table Template Code

```
proc template;
  define style styles.pink;
    parent=styles.sasweb;
    style Header /
      font_face = "Courier"
      font_weight = bold
      foreground = white
      background = pink;
  end;
run;
```

Style Template

All table and column headers automatically use the **Header** style element from the active style template.

```
proc template;
  edit base.summary;
  header h;
  define h;
    text "Analysis Variable: "
    one_var_label;
    space = 1;
    just = C;
    print = one_var;
    spill_margin;
  end;

  define sum;
    header = "Sum";
    format=comma14.2;
    generic;
  end;
end;
run;
```

Table Template

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demo3_table_style_template.sas

New Style and Table Template Code



```
ods html path='c:\temp' (url=none)
      file='means_pink.html'
      style=styles.pink;

proc means data=sashelp.shoes sum;
  var sales;
  class region;
run;

ods _all_ close;
```

As with the previous example, the TABLE template comes from the first template store in which the BASE.SUMMARY template is found. The STYLE template must be explicitly referenced in the STYLE= option on the ODS invocation statement. The STYLE template could be in a different template store or the same template store as the TABLE template.

demo3_table_style_template.sas

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Results Using Both Templates



The MEANS Procedure

Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00
Asia	14	460,231.00
Canada	37	4,255,712.00
Central America/Caribbean	32	3,657,753.00
Eastern Europe	31	2,394,940.00
Middle East	24	5,631,779.00
Pacific	45	2,296,794.00
South America	54	2,434,783.00
United States	40	5,503,986.00
Western Europe	62	4,873,000.00

The STYLE template change for all the table Headers is used. The TABLE template change for the SUM format is used.

demo3_table_style_template.sas

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ODS and Tagset Templates

- ODS Tagset templates are "destination-centric" or "markup language-centric" templates. They cause ODS to write specific text or markup language tags around SAS procedure or process output, based on the destination. Because these tagset templates all belong to the MARKUP family of destinations, they are also called markup templates or markup tagsets.

Tagset
Templates

ODS uses tagset templates to control the markup language tags written to ODS Markup output files (like HTML, LaTeX, CSV, etc)

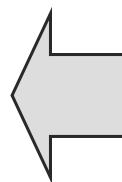
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PROC TEMPLATE to Define a Tagset Template

```
proc template;
  define tagset SpecialTags;
```



For TAGSET templates, you would have DEFINE EVENT blocks which would provide the type of markup to be written as various events were sent from SAS to Output Destination Agent (ODA) for every open destination.

```
end;
run;
```

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Tagset Templates

- A *tagset template*

- describes how SAS procedure or process output should be "marked up" with markup language tags
- provides a syntax to define how SAS events should be handled (or how tags should be written based on the SAS event being processed)
- can be invoked, like any ODS destination, with a 2-level name:

ODS TAGSETS.MYTAGSET

- can be invoked via the ODS MARKUP destination:

ODS MARKUP TAGSET=MYTAGSET

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What is a Tagset Template?

- A tagset template is just a way of writing markup text or tags around SAS data set rows and columns or SAS procedure or Data Step output. 
- Tagset templates used by the SAS XML Libname Engine generally write XML markup (although you can produce other types of markup, such as HTML) around SAS data set rows and columns. 
- Tagset templates used by ODS can produce files with markup tags for HTML, XML, troff, LaTeX, WML, or Microsoft Office around SAS procedure or Data Step output. 

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Desired Outputs



Desired Output 1

The MEANS Procedure	
Analysis Variable: Total Sales	
Region	N Obs
Africa	56
Asia	14
Canada	37
United States	40
Western Europe	62

Desired Output 2

The MEANS Procedure		
Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00
Asia	14	460,231.00
Canada	37	4,255,712.00

The FREQ Procedure				
Product	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Boot				
Sandal				
Slipper	15	33.33	45	100.00

Make the background for the MEANS procedure title pink. Although Output 1 could be accomplished with a STYLE template, Output 2 can only be accomplished with a TAGSET template change.

Do not change how the FREQ procedure title is styled.

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Default Procedure Title Markup Tags

```
<div class="c_ProcTitle">The MEANS Procedure</div>
```

```
.ProcTitle
{font-family: Arial, Helvetica, sans-serif;
 font-size: x-small;
 font-weight: normal;
 font-style: normal;
 color: #003399;
 background-color: #FFFFFF;}
```

The MEANS Procedure

Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00

demo4 table style tagset.sas

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Code for Output 1

```
proc template;
  define tagset tagsets.PT;
    parent=tagsets.html4;
    define event proc_title;

      put '<div class="c Header">';
      put '>';
      put VALUE ;
      put "</div>" NL;
    end;
    image_formats = "png,gif,jpg,svg,xml";
    output_type = "html";
  end;
run;
```

For this change, only the <DIV> tag markup text written by the PROC_TITLE event needs to change to point to the Header class selector instead of the ProcTitle class selector.

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demo4_table_style_tagset.sas

Using TAGSETS.PT Template

```
ods tagsets.pt path='c:\temp' (url=none)
  file='means_pt.html'
  style=styles.pink;

proc means data=sashelp.shoes sum;
  var sales;
  class region;
run;

ods _all_ close;
```

The custom TAGSET template is used in the ODS invocation. An alternate way to invoke this tagset template would be:
ODS MARKUP TAGSET=PT FILE='means_pt.html' style=styles.pink;

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demo4_table_style_tagset.sas



Output 1 Results

The MEANS Procedure		
Analysis Variable: Total Sales		
Region	N Obs	Sum
Africa	56	2,342,588.00
Asia	14	460,231.00
Canada	37	4,255,712.00
Central America/Caribbean	32	3,657,753.00
Eastern Europe	31	2,394,940.00
Middle East	24	5,631,779.00
Pacific	45	2,296,794.00
South America	54	2,434,783.00
United States	40	5,503,986.00
Western Europe	62	4,873,000.00

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demo4_table_style_tagset.sas



Code for Output 2

```
proc template;
  define tagset tagsets.PT_alt;
    parent=tagsets.html4;
    define event proc_title;
      do / if index(VALUE, 'MEANS') gt 0;
        put '<div class="c Header"';
      else;
        put '<div class="c ProcTitle"';
      done;

      put '>';
      put VALUE ;
      put "</div>" NL;
    end;
    image_formats = "png,gif,jpg,svg,xml";
    output_type = "html";
  end;
run;
```

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demo4_table_style_tagset.sas



Results for Output 2

Make the pink background for the MEANS procedure title.

HTML Tags Created by TAGSET template

```
<div class="c Header">The MEANS Procedure</div>
<div class="c ProcTitle">The FREQ Procedure</div>
```

Do not change how the FREQ procedure title is styled.

The MEANS Procedure				
Analysis Variable: Total Sales				
Region	N	Obs	Sum	
Africa	56		2,342,588.00	

The FREQ Procedure				
Product	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Boot	15	33.33	15	33.33
Sandal	15	33.33	30	66.67
Slipper	15	33.33	45	100.00

Desired Output 2

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ODS and Graph Templates

- ODS Graph templates are also "data-centric" templates. Data points are bound to the graph template to create graphic output. Components of the ODS Graphics Framework that utilize Graph templates are selected SAS/STAT procedures that support ODS Graphics and the new "SG" procedures.

Graph Templates

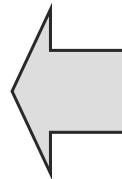
Selected statistical procedures use graph templates to build graphical output objects.

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PROC TEMPLATE to Define a Graph Template

```
proc template;  
  define statgraph xxxxxxxx.yyyyyyyy;
```



For GRAPH templates, you would have LAYOUT blocks which define the graph areas and graph objects to be created when the graph template is bound to the graph data.

```
end;  
run;
```

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GraphTemplates

- A *graph template*
 - describes how selected SAS/STAT procedures should produce graphic images using ODS GRAPHICS ON/OFF syntax which utilizes predefined graph templates.
 - can be created with custom graph template language syntax to design statistically-oriented graph templates which can be rendered with the SGRENDER procedure.
 - relies on style templates (instead of GOPTIONS) to specify presentation characteristics of the graph image (such as colors, fonts, etc).
 - is one component of the ODS Graphics Framework.

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Statistical Procedures that Support ODS Graphics in SAS 9.2

Base SAS *	SAS/STAT			SAS/QC *	SAS/ETS
CORR	ANOVA	KDRIGE2D	PRINCOMP	ANOM	ARIMA
FREQ	BOXPLOT	LIFEREG	PRINQUAL	CAPABILITY	AUTOREG
UNIVARIATE	CALIS	LIFETEST	PROBIT	CUSUM	ENTROPY
	CLUSTER	LOESS	QUANTREG	MACONTROL	EXPAND
	CORRESP	LOGISTIC	REG	PARETO	MODEL
	FACTOR	MCMC	ROBUSTREG	RELIABILITY	PANEL
	FREQ	MDS	RSREG	SHEWHART	RISK
	GAM	MI	SEQDESIGN		SIMILARITY
	GENMOD	MIXED	SEQTEST		SYSLIN
	GLIMMIX	MULTTEST	SIM2D		TIMESERIES
	GLM	NPAR1WAY	TCALIS		UCM
	GLMSELECT	PHREG	TRANSREG		VARMAX
	KDE	PLS	TTEST		X12
			VARIOGRAM		

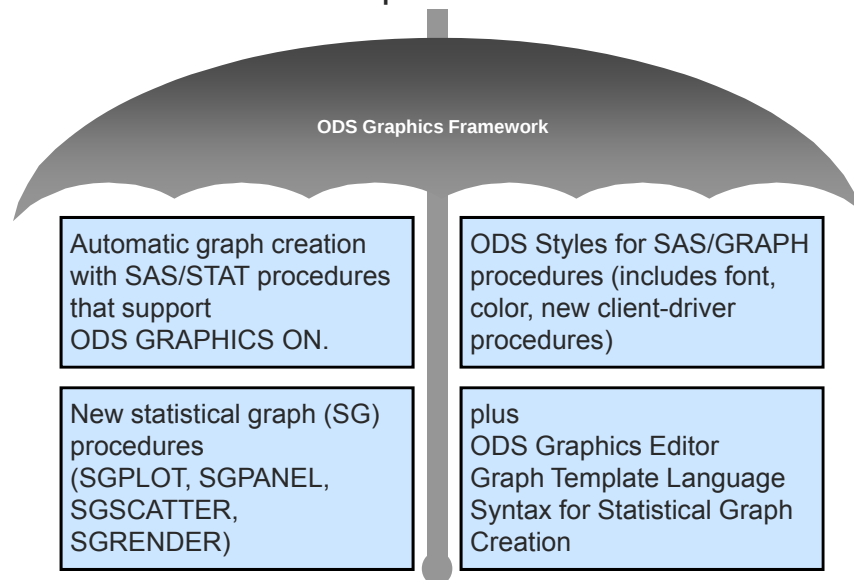
* experimental in SAS 9.2

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What is the ODS Graphics Framework?



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Template Source Code Linked to a Procedure

```
define statgraph Stat.PrinComp.Graphics.ScorePlot;
  dynamic ellipsePlot XVar YVar YVAR_label XVAR_label YVAR_slabel
    XVAR_slabel _Major _Minor legendTitle legendOpt Title2;
  BeginGraph;
    entrytitle "Component Scores";
    if (ELLIPSEPLOT AND (LEGENDOPT = 0))
      entrytitle TITLE2;
    endif;
    layout overlayequated / equatetype=fit common
      yaxisopts=(label=YVAR_LABEL shortlabel=YVAR
        offsetmax=0.05) xaxisopts=(label=XVAR_LABEL
        thresholdmin=1.0 thresholdmax=1.0);
    if (ELLIPSEPLOT)
      EllipseParm semimajor=_MAJOR semiminor=
        xorigin=_XMEAN yorigin=_YMEAN / name="e
        _LEVEL name="ConfLevel" legendlabel="El
    endif;
    scatterplot y=YVAR x=XVAR / datalabel=L1 freq=FQ rolname=( tip1=N
      _id2=L2 _id3=L3 _id4=L4 _id5=L5 _id6=L6 _id7=L7 _id8=L8 _id9=L9
      _id10=L10 _id11=L11 _id12=L12 _id13=L13 _id14=L14 _id15=L15
      _id16=L16 _id17=L17 _id18=L18 _id19=L19 _id20=L20) tip=(y x
      datalabel _tip1 _id2 _id3 _id4 _id5 _id6 _id7 _id8 _id9 _id10
      _id11 _id12 _id13 _id14 _id15 _id16 _id17 _id18 _id19 _id20);
    if (LEGENDOPT)
      discretelegend "ConfLevel" / title=LEGENDTITLE;
    endif;
  endlayout;
EndGraph;
end;
```

The graph template definition starts with a BEGINGRAPH statement and ends with an ENDGRAPH statement. Layout areas start with a LAYOUT statement and end with an ENDLAYOUT statement.



About LAYOUT Statements

- The LAYOUT statement allows you to specify the arrangement of graph components. Within a LAYOUT statement block, you can specify
 - plot statements,
 - text statements, and
 - other layout statements (enables nested layouts of graph components, such as side by side graphs, or legend boxes).
- All of the statements that are within the layout block apply to that statement's layout area. Each statement can specify one or more options to modify the layout's appearance.



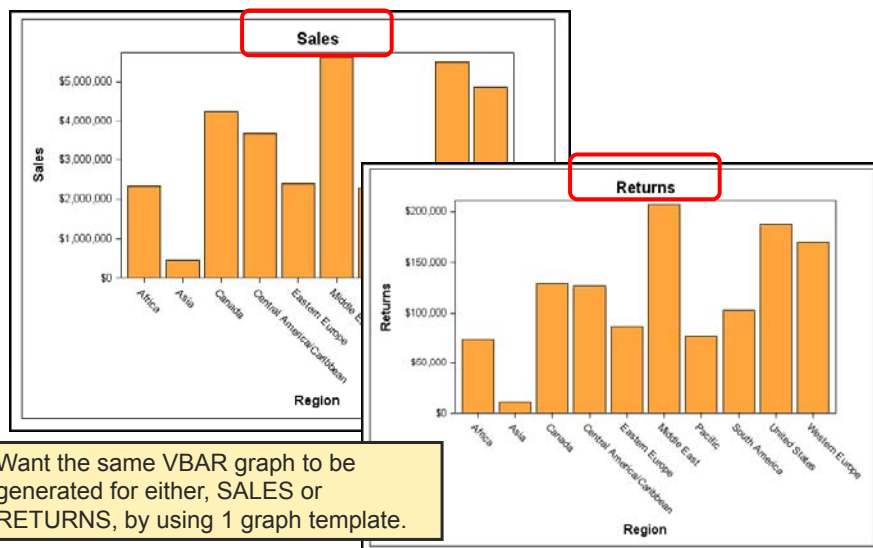
LAYOUT Types

- There are three types of layouts allowed:
 - GRIDDED
 - use the LAYOUT GRIDDED statement to specify any number of areas and arrange them in any way, mixing different sized areas in any arrangement. It is the most general layout statement and can achieve any layout arrangement.
 - OVERLAY
 - use the LAYOUT OVERLAY statement to create one graph area with one set of axes. One or more graphs can be added to this area. The graphs will be overlaid and share the same set of axes.
 - LATTICE
 - use the LAYOUT LATTICE statement to display multiple graphs that are best viewed with a common data range along one or more axes, even when the data ranges may be different in the underlying data.

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Desired Output



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Code for Graph Template

```
ods path work.sumtemp(update)
      sasuser.templat(update)
      sashelp.tmplmst(read);

proc template;
define statgraph graph.regsales;
  mvar _wanty;
  begingraph;
    entrytitle _WANTY;
    layout overlay /
      xaxisopts=(label="Region")
      yaxisopts=(label=_WANTY)
      cycleattrs=true;
    barchart x=region y=_wanty;
  endlayout;
endgraph;
end;
run;
```

Dynamic macro variable will be supplied at execution time.

demo5_statgraph_template.sas

Using the SGRENDER Procedure

```
ods html path='c:\temp' (url=None)
         gpath='c:\temp' (url=None)
         file='demo5.html'
         style=styles.sasweb;

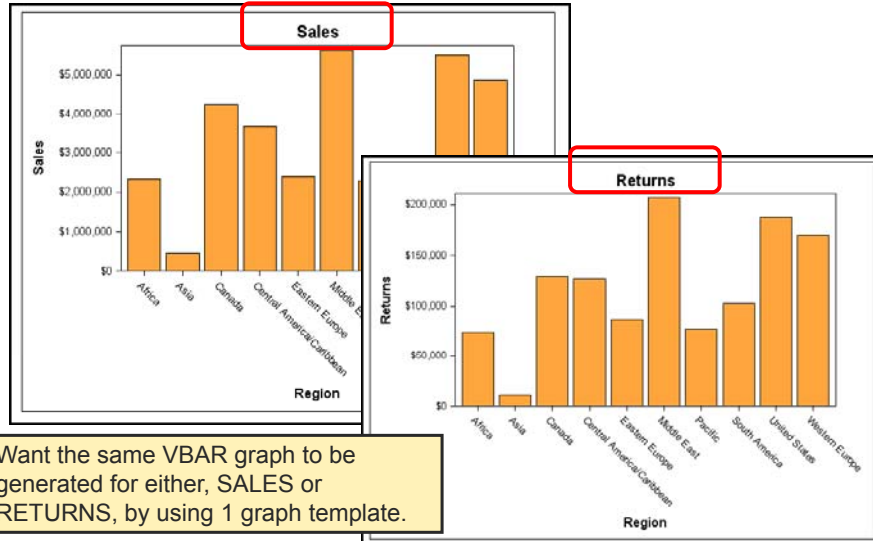
%let _wanty = Sales;
proc sgrender data=sashelp.shoes
  template=graph.regsales;
run;

%let _wanty = Returns;
proc sgrender data=sashelp.shoes
  template=graph.regsales;
run;

ods _all_ close;
```

demo5_statgraph_template.sas

Results



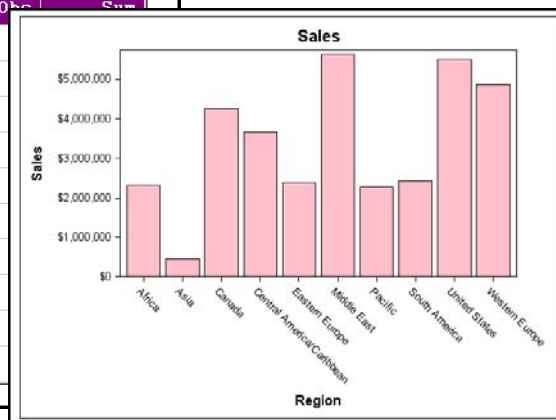
demo5_statgraph_template.sas

Desired Output 2



The MEANS Procedure

Analysis Variable: Total Sales		
Region	N	Obs
Africa		
Asia		
Canada		
Central America/Caribbean		
Eastern Europe		
Middle East		
Pacific		
South America		
United States		
Western Europe		



demo6_all_template.sas

Use CSS File with Style Template

```
.PinkHdr
{font-family: Courier, Courier New, serif;
font-size: medium;
font-weight: bold;
font-style: normal;
color: black;
background-color: pink;}
.Header
{font-family: Courier, Courier New, serif;
font-size: medium;
font-weight: bold;
font-style: normal;
color: white;
background-color: purple;}
.RedPT
{font-family: Arial, Helvetica, sans-serif;
font-size: large;
font-weight: bold;
font-style: italic;
color: red;
background-color: white;}
```

chgstyle.css

Final ODS PATH Statement

```
ods path work.sumtemp(update)
      sasuser.templat(update)
      sashelp.tmplmst(read);
```

The ODS PATH statement creates a template store in a temporary location. In order to make the template store reside in a permanent location, you would need to issue an ODS PATH statement to a permanent SAS library.

demo6_all_template.sas

Final Style Template

```
proc template;
  define style styles.special;
    parent=styles.sasweb;
    import 'chgstyle.css';
    class GraphColors /
      'gdata12' = cxDDD17E
      'gdata11' = cxB7AEF1
      'gdata10' = cx336699
      'gdata9' = beige
      'gdata8' = graycc
      'gdata6' = blue
      'gdata7' = green
      'gdata4' = red
      'gdata5' = purple
      'gdata3' = yellow
      'gdata2' = cyan
      'gdata1' = pink;
  end;
run;
```

demo6_all_template.sas

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Final Table Template

```
proc template;
  edit base.summary;
  header h ;
  define h;
    text "Analysis Variable: " one_var_label;
    space = 1;
    just = C;
    style=PinkHdr;
    print = one_var;
    spill_margin;
  end;
  define sum;
    header = "Sum";
    format=comma14.2;
    generic;
  end;
end;
run;
```

demo6_all_template.sas

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Final Tagset Template

```
proc template;
  define tagset tagsets.PT;
    parent=tagsets.html4;
    define event proc_title;
      put '<div class="c RedPT"' ;
      put '>';
      put VALUE ;
      put "</div>" NL;
    end;
    image_formats = "png,gif,jpg,svg,xml";
    output_type = "html";
  end;
run;
```

demo6_all_template.sas

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Using All the Templates

```

TAGSET → ods tagsets.PT path='c:\temp' (url=none)
        gpath='c:\temp' (url=none)
        file='sum_pt.html'
STYLE → style=styles.special;

TABLE → {
  proc means data=sashelp.shoes sum;
  var sales;
  class region;
  output out=work.sales sum=sumsale;
run;
}

GRAPH → {
  %let _wanty = Sales;
  proc sgrender data=sashelp.shoes
    → template=graph.regsales;
  run;
  %let _wanty = Returns;
  proc sgrender data=sashelp.shoes
    → template=graph.regsales;
  run;
}

ods _all_ close;
```

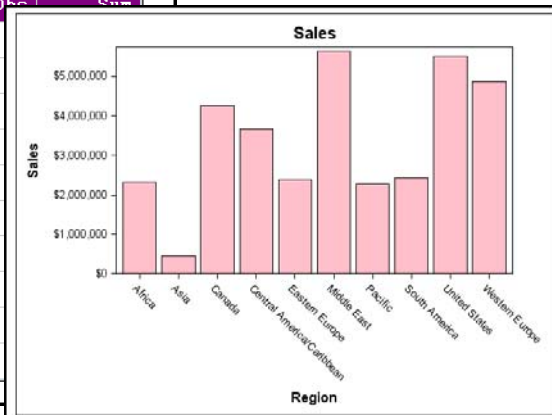
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Results for Output 2

The MEANS Procedure

Analysis Variable: Total Sales		
Region	N	Obs
Africa		
Asia		
Canada		
Central America/Caribbean		
Eastern Europe		
Middle East		
Pacific		
South America		
United States		
Western Europe		



demo6_all_template.sas

Your Turn



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<http://support.sas.com/rnd/papers>

(Search by paper title, not by author.)

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Bonus Section: More About Templates



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ODS and Table Templates

- ODS Table templates are "data-centric" templates. The output objects created by these templates are tightly linked or bound to the SAS procedures for which they were designed. So, for example, PROC FREQ would never use a table template defined for PROC MEANS and vice versa.

Table
Templates

Most SAS procedures use table templates to build tabular output objects.

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ODS TRACE Statement

- The ODS TRACE statement is used to provide information about output objects.

```
ods trace on;  
  
proc means data=sashelp.shoes;  
run;  
  
ods trace off;
```

- A record of each output object is written to the SAS log.

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demo2_table_template.sas



Table Template

- A *table template* describes how to render the output for a tabular output object.
- A table template determines
 - the order of table headers and footers
 - the order of columns
 - the overall appearance of the output object that uses it.

```
Output Added:
-----
Name:      Summary
Label:     Summary statistics
Template:  base.summary
Path:      Means.Summary
Label Path: 'The Means Procedure'.'Summary statistics'
-----
```

ODS TRACE Output for PROC MEANS

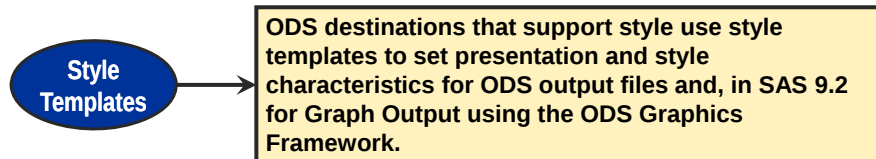
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ODS and Style Templates

- ODS STYLE templates are "style-centric" templates. They contain a collection of style elements which are used to determine the style characteristics of the output objects when the output objects are routed to destinations that support style.



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SAS Predefined Style Templates

Templates in Styles Folder			
Analysis*	Education*	Normal*	Theme
Astronomy*	Electronics*	Printer	Torn*
Banker*	Festival*	Rsvp*	Watercolor*
BarrettsBlue	Gears*	RTF	blockPrint*
Beige	Journal*	Sasweb	fancyPrinter
Brick	Magnify*	Science*	sansPrinter
Brown	Meadow*	Seaside*	sasdocPrinter
Curve*	Minimal	Sketch*	serifPrinter
D3d	Money*	Statdoc	
Default	NoFontDefault	Statistical*	

* SAS®9 only

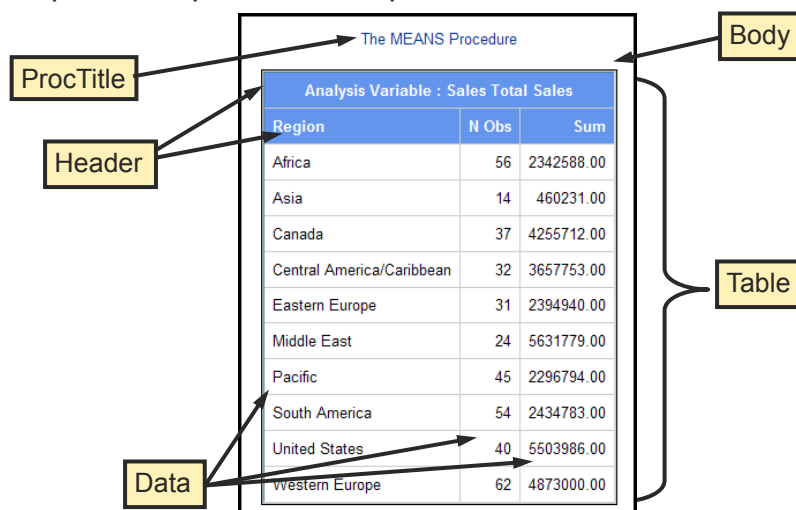
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Style Elements

A *style element* is a collection of style attributes that apply to a particular part of the output.



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Table/Cell Style Attributes

Attribute	Sample Values
FOREGROUND BACKGROUND	white, red, yellow, black cxFFFFF, cxFF0000, cxFFFF00, cx000000 h000FF00, h07880FF, h0B480FF, h0000000

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Table/Cell Style Attributes

Attribute	Sample Values
FONT_FACE	Times "Times New Roman" Arial Helvetica Courier 'Courier New' "Arial, Helvetica, Helv"

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Table/Cell Style Attributes

Attribute	Sample Values
FONT_SIZE	5, 10 pt, 1 cm, 0.25 in
FONT_STYLE	italic, roman
FONT_WEIGHT	medium, bold, light
FONT_WIDTH	compressed, narrow, wide

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Table/Cell Style Attributes

Attribute	Sample Values
FONT	('Arial, Helvetica, Helv', 2) ("Times, Times New Roman", 3 cm, bold) (Verdana, 4, bold italic) ('Courier New, Courier', 2, italic)

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Table/Cell Style Attributes

Attribute	Sample Values
CELLWIDTH CELLHEIGHT	150, 2 in, 5 cm, 20%
JUST	left, center, right l, c, r
VJUST	top, middle, bottom t, m, b
URL	'www.sas.com' "http://support.sas.com" 'C:\Char.html'

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Table/Cell Style Attributes

Attribute	Definition
PREIMAGE POSTIMAGE BACKGROUNDIMAGE	'C:\Confidential.jpg' "airplane.jpg"
PREHTML POSTHTML	"<HR size=3>" ' SAS Web Page'
PRETEXT POSTTEXT	'This is a draft.' "Continue"

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Table Style Attributes

Attribute	Sample Values
BORDERCOLOR	black, cx000000, h0000000
BORDERWIDTH CELLSPACING CELLPADDING	0, 7, .1 in, 1 cm
RULES	ALL, COLS, GROUPS, NONE, ROWS
FRAME	ABOVE, BELOW, BOX, HSIDES, LHS, RHS, VOID, VSIDES
OUTPUTWIDTH	150, 3 in, 20 cm, 80%

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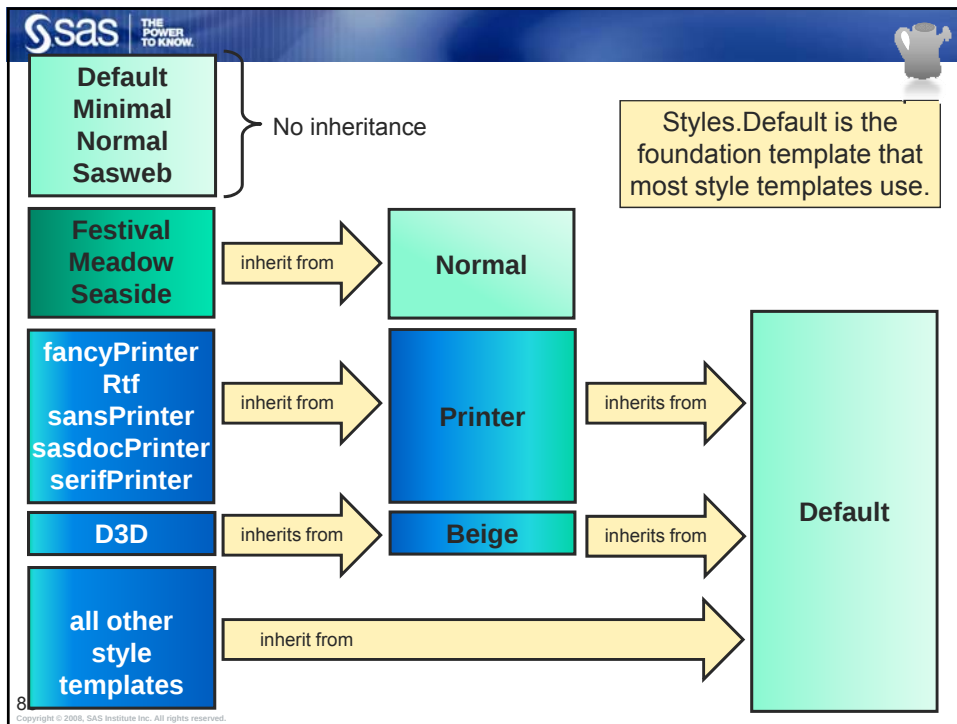


Document Style Attributes

Attribute	Sample Values
TOPMARGIN BOTTOMMARGIN LEFTMARGIN RIGHTMARGIN	8, 0.25 in, 1 cm, 12 mm
LINKCOLOR VISITEDLINKCOLOR	black, cx000000, h0000000
PAGEBREAKHTML	' ' "<HR size=3>"

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SAS THE POWER TO KNOW.

ODS and Tagset Templates

- ODS Tagset templates are "destination-centric" or "markup language-centric" templates. They cause ODS to write specific text or markup language tags around SAS procedure or process output, based on the destination. Because these tagset templates all belong to the MARKUP family of destinations, they are also called markup templates or markup tagsets.

Tagset Templates → ODS uses tagset templates to control the markup language tags written to ODS Markup output files (like HTML, LaTeX, CSV, etc)

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What is Markup?

- The concept of "markup" is as simple as a teacher with a red pencil "marking up" a student's paper or a copyeditor "marking up" page proofs with editing symbols.

Symbol	Meaning	Example
or or or or or	delete	take it out
⌋	close up	print as <u>one</u> word
⌋	delete and close up	close up
^ or > or ^	caret	insert here <i>(something)</i>
#	insert a space	put on [#] here
eg#	space evenly	space evenly ^ where indicated
stet	let stand	let marked text stand as set
tr	transpose	change <u>order</u> <u>the</u>

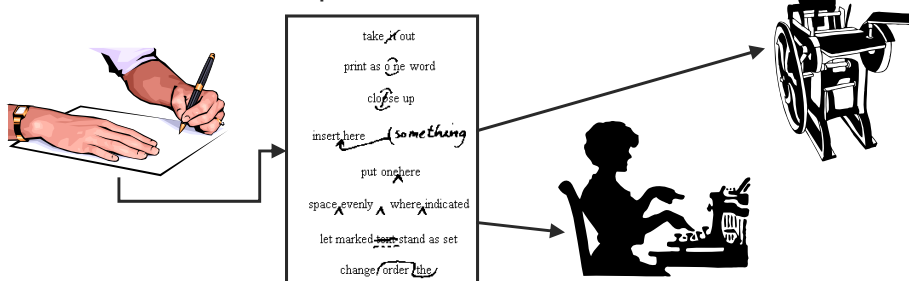
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Using Markup

- Markup adds meaning to text (or content).
- Markup has to be defined before it can be used.
- Once the markup definition is known, the text or content that contains markup can be handled by an appropriate person, program or automated process.



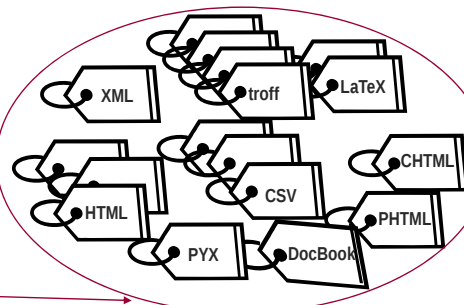
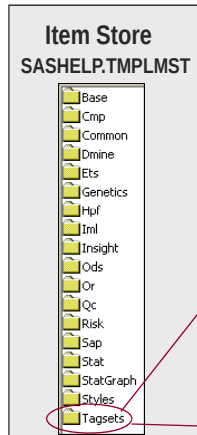
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Item Store for SAS Templates

- Tagset templates are stored in the SASHELP.TMPLMST item store. This is the location for all the templates provided by SAS for use with both ODS and the SAS XML Libname Engine (SXLE).



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What Makes Tagsets Tick?

- The core component of the tagset template is the **event**.
 - An event is a discrete unit of information that is being sent by a SAS process to ODS or SXLE for handling.
 - The event being sent depends on the SAS process. For example, PROC PRINT can send a SYSTEMTITLE event for handling, but a SAS data set would never send a SYSTEMTITLE event for handling.
 - In most cases, the way the event is handled is that markup tags are written around the data carried in the event.

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What Is An Event?

- Events are linked to how SAS processes output files. For a single procedure ODS job step:
 - SAS creates the output object and sends the output object to ODS. (Style information might be added to the output object information.)
 - Then, ODS does the following:
 - opens the output destination
 - starts the output document
 - writes the system titles, if any
 - writes the table header
 - writes the table rows (one row at a time)
 - writes the system footnotes, if any
 - closes the output document
 - closes the output destination

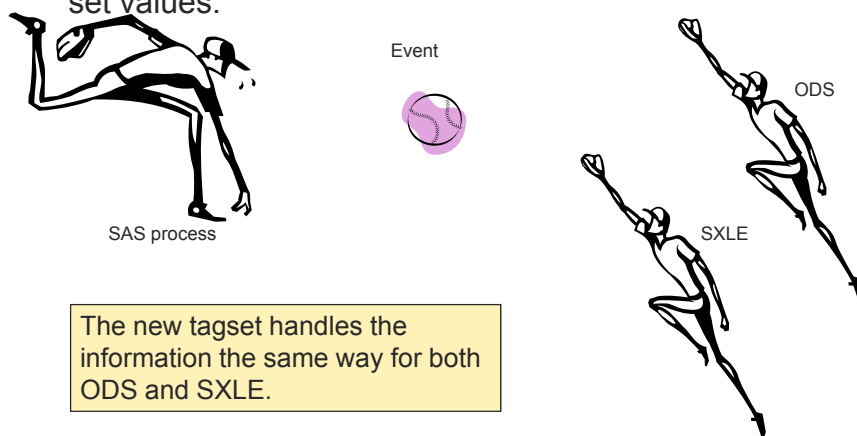
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Events and Tagsets

- Based on the unit of output being processed, SAS sends an “event” to the Output Destination Agent (ODA) for ODS or to SXLE in order for the correct markup to be added to the output results or the data set values.



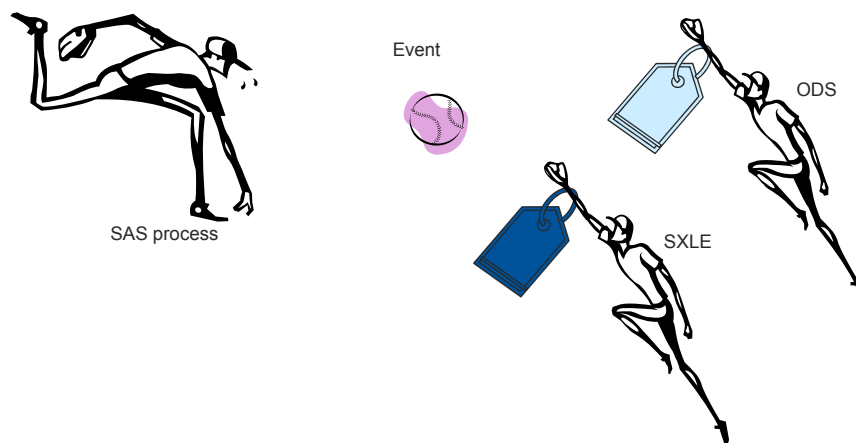
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Events and Tagsets

- When tagset templates were first introduced in SAS 8.2, SXLE and ODS had separate and different tagset templates.



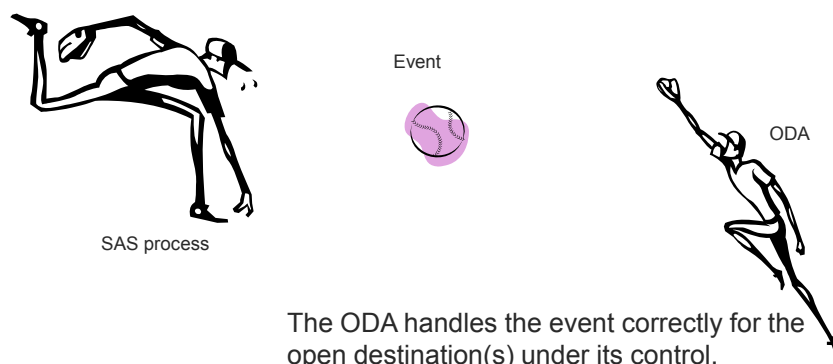
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Events and Tagsets

Based on the unit of output being processed, SAS sends an event to the Output Destination Agent (ODA).



The ODA handles the event correctly for the open destination(s) under its control.

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Events Carry Information

Event

The **EVENT**, being sent by SAS, is a discrete unit of information or a collection of information that is tied to one particular piece of the SAS process.



The event has a name and the event carries information, named **EVENT VARIABLES**.

For example, your SAS program has the following:

```
title 'My Title';
```

Event variables

System_Title Event



```
class="SystemTitle"
value="My Title"
colcount="1"
just="c"
```

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ODS and Graph Templates

- ODS Graph templates are also "data-centric" templates. Data points are bound to the graph template to create graphic output. Components of the ODS Graphics Framework that utilize Graph templates are selected SAS/STAT procedures that support ODS Graphics and the new "SG" procedures.

Graph
Templates

Selected statistical procedures use graph templates to build graphical output objects.

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Statistical Procedures that Support ODS Graphics in SAS 9.2

Base SAS *	SAS/STAT			SAS/QC *	SAS/ETS
CORR	ANOVA	KDRIGE2D	PRINCOMP	ANOM	ARIMA
FREQ	BOXPLOT	LIFEREG	PRINQUAL	CAPABILITY	AUTOREG
UNIVARIATE	CALIS	LIFETEST	PROBIT	CUSUM	ENTROPY
	CLUSTER	LOESS	QUANTREG	MACONTROL	EXPAND
	CORRESP	LOGISTIC	REG	PARETO	MODEL
	FACTOR	MCMC	ROBUSTREG	RELIABILITY	PANEL
	FREQ	MDS	RSREG	SHEWHART	RISK
	GAM	MI	SEQDESIGN		SIMILARITY
	GENMOD	MIXED	SEQTEST		SYSLIN
	GLIMMIX	MULTTEST	SIM2D		TIMESERIES
	GLM	NPAR1WAY	TCALIS		UCM
	GLMSELECT	PHREG	TRANSREG		VARMAX
	KDE	PLS	TTEST		X12
			VARIOGRAM		

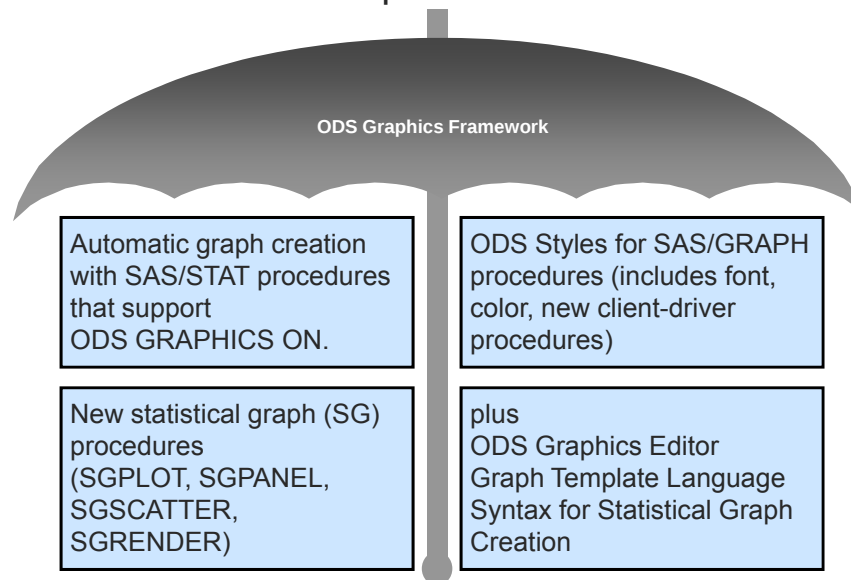
* experimental in SAS 9.2

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What is the ODS Graphics Framework?



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Template Source Code Linked to a Procedure

```
define statgraph Stat.PrinComp.Graphics.ScorePlot;
  dynamic ellipsePlot XVar YVar YVAR_label XVAR_label YVAR_slabel
    XVAR_slabel _Major _Minor legendTitle legendOpt Title2;
  BeginGraph;
    entrytitle "Component Scores";
    if (ELLIPSEPLOT AND (LEGENDOPT = 0))
      entrytitle TITLE2;
    endif;
    layout overlayequated / equatetype=fit common;
      yaxisopts=(label=YVAR_LABEL shortlabel=YVAR
        offsetmax=0.05) xaxisopts=(label=XVAR_LABEL
        thresholdmin=1.0 thresholdmax=1.0);
      if (ELLIPSEPLOT)
        EllipseParm semimajor=_MAJOR semiminor=
          xorigin=_XMEAN yorigin=_YMEAN / name="e
            _LEVEL name="ConfLevel" legendlabel="El
      endif;
      scatterplot y=YVAR x=XVAR / datalabel=L1 freq=FQ rolname=( tip1=N
        _id2=L2 _id3=L3 _id4=L4 _id5=L5 _id6=L6 _id7=L7 _id8=L8 _id9=L9
        _id10=L10 _id11=L11 _id12=L12 _id13=L13 _id14=L14 _id15=L15
        _id16=L16 _id17=L17 _id18=L18 _id19=L19 _id20=L20) tip=(y x
        datalabel _tip1 _id2 _id3 _id4 _id5 _id6 _id7 _id8 _id9 _id10
        _id11 _id12 _id13 _id14 _id15 _id16 _id17 _id18 _id19 _id20);
      if (LEGENDOPT)
        discretelegend "ConfLevel" / title=LEGENDTITLE;
      endif;
    endlayout;
  EndGraph;
end;
```

The graph template definition starts with a BEGINGRAPH statement and ends with an ENDGRAPH statement. Layout areas start with a LAYOUT statement and end with an ENDLAYOUT statement.



About LAYOUT Statements

- The LAYOUT statement allows you to specify the arrangement of graph components. Within a LAYOUT statement block, you can specify
 - plot statements,
 - text statements, and
 - other layout statements (enables nested layouts of graph components, such as side by side graphs, or legend boxes).
- All of the statements that are within the layout block apply to that statement's layout area. Each statement can specify one or more options to modify the layout's appearance.



LAYOUT Types

- There are three types of layouts allowed:
 - GRIDDED
 - use the LAYOUT GRIDDED statement to specify any number of areas and arrange them in any way, mixing different sized areas in any arrangement. It is the most general layout statement and can achieve any layout arrangement.
 - OVERLAY
 - use the LAYOUT OVERLAY statement to create one graph area with one set of axes. One or more graphs can be added to this area. The graphs will be overlaid and share the same set of axes.
 - LATTICE
 - use the LAYOUT LATTICE statement to display multiple graphs that are best viewed with a common data range along one or more axes, even when the data ranges may be different in the underlying data.

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