When you need to produce a grid of related graphs with minimum coding, PROC SGPANEL is hard to beat. But eventually you'll run into a situation that demands more precise control over the output. Perhaps there are unusual scaling/formatting requirements. Or information needs to be presented in a specific order. Or things need to be clarified via annotations or other markup. That's where the Graph Template Language (GTL) can help. In this paper, we'll see how GTL can be used to create a customized grid of time series plots from segments and measures found in the TOTARRESTS sample data set. This may be of interest to all skill levels. It requires Base SAS, SAS GTL, and the SAS Macro Facility on UNIX or the PC.

SO, WHAT'S THE BIG IDEA?

In *The Graph Template Language: Beyond the SAS/GRAPH® Procedures*, a SAS Global Forum 2012 paper, Jesse M. Pratt describes why it’s sometimes worth extra effort to create a more highly-customized data visualization using SAS’s Graph Template Language (GTL) instead of employing the easier-to-use SGPLOT and SGPANEL.

This short paper presents an example of how the GTL and macro techniques presented by Pratt can be combined with custom SAS functions (PROC FCMP) and new SAS 9.3 GTL features (transparency) to create a simple-but-information-rich lattice chart that presents data from SAS’s TOTARRESTS sample data set.

The devil is in the details (see Appendix for full code & output), but to summarize, to create the above image:

1. **PROC SGRENDER** was used to create a composite .png image containing the many charts.
2. **Layout Lattice** was used to define a grid of 30 charts – 5 rows of measures X 6 columns of age ranges.
3. The **seriesplot** statement was used to create each of the individual charts.
4. For each chart, **PROC FCMP** was used to run a DATA step to create macro variables containing the ending value for each measure, the Year-Over-Year change from the prior value (difference and %), and an indicator of whether this represents an increase or decrease (the **unicode** value for an up or down arrow).
5. An **entry** statement was used to display a Yahoo Finance stock quote-like summary for each chart containing:
   - An **eye-catcher arrow** indicating whether the final value is an increase/decrease over the prior year
   - The **difference** between the final value and the prior year’s value
   - The **percentage difference** between the ending value and the prior year’s value
6. A **drawtext** statement was used to prominently display the ending value for each measure on the “wall” of the series plot. SAS 9.3’s **transparency** option is used to prevent text from obscuring the plot lines and markers.
ABOUT THE DATA

Figure 2 - SAS Enterprise Guide TOTARRESTS Sample Data Set
http://support.sas.com/learn/statlibrary/statlib_eg4.2/data/totarrests.sas7bdat

REFERENCES, ACKNOWLEDGEMENTS, RECOMMENDED READING

✓ Pratt, Jesse M. The Graph Template Language: Beyond the SAS/GRAPH® Procedures.

✓ SAS. SAS(R) 9.3 Graph Template Language: Reference, Third Edition.
support.sas.com/documentation/cdl/en/grstatgraph/65377/HTML/default/viewer.htm#p0891gx3y0zqnxq1k9ijhv5xughi.htm

support.sas.com/pubscat/bookdetails.jsp?pc=63855.

CONTACT INFORMATION

Ted Conway resides in Chicago, Illinois. Spam filters notwithstanding, he can be reached at tedconway@aol.com.

TRADEMARKS

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brand and product names are trademarks of their respective companies.
**COMPLETE SAS CODE**

```sas
libname l 'C:\Program Files\SAS\9.3\SASEnterpriseGuide\5.1\Sample\Data';

/*==> Rename totarrests SAS dataset variables & compute percentages of totals; */
%macro renameVars;
  proc sql;
  create table totarrests as
  select Year, Population0, TotalArrests0, ArrestRate0
  %do i=1 %to 5;
   , age&i.pop as Population&i, age&i as Arrests&i, age&i.rate as ArrestRate&i
  %end;
  %do i=0 %to 5;
   , Population&i/Population0 as PctPopulation&i, Arrests&i/Arrests0 as PctArrests&i
  %end;
  from l.totarrests;
%mend;
%renameVars;

/*==> Find ending value for specified var and YOY change (Absolute & % Differences); */
%let lastvar=?; %let pctchg=?; %let delta=?; %let updown=?;
%macro getdelta;
  %let yvar = %sysfunc(dequote(&yvar));
  call symput("lastvar",compress(vvalue(&yvar)));
  saveval=*&yvar;
  prev=n-1;
  set totarrests point=prev;
  pctchg=(saveval-&yvar)/&yvar;
  call symput("pctchg",compress(put(pctchg,percentn7.1)));
  &yvar=saveval-&yvar;
  if &yvar=0 | &yvar=. then call symput("updown","0020");  * Space (no change);
  else if &yvar<0 then call symput("updown","25BC");  * Down arrow;
  else                      call symput("updown","25B2");  * Up arrow;
  stop;
run;
%mend;

/*==> Define function to permit %getdelta macro calls from PROC SGRENDER; */
proc fcmp outlib = sasuser.ds.functions;
function GetDeltas(yvar $);
  rc = run_macro('getdelta', yvar);
  return(rc);
endsub;
run;

option cmplib = (sasuser.ds);

/*==> Define/generate one chart (SeriesPlot - y-axis Metric X x-axis Year); */
%macro CreateOneChart(YVAR);
  cell;
  cellheader;
  %let rc=%sysfunc(getdeltas(&yvar));
  entry textattrs=(size=19pt) halign=left " " halign=right {unicode "&UPDOWN"x} &delta. (pctchg.);
  endcellheader;
  layout overlay /
     yaxisopts=(label=" " labelattrs=(color=black) tickvalueattrs=(size=14pt color=black))
     xaxisopts=(label=" " labelattrs=(color=black) tickvalueattrs=(size=14pt color=black));
  drawtext textattrs=(size=56pt color=black) "&lastvar" /
     width=100 drawspace=WALLPERCENT widthunit=percent
     xspace=wallpercent yspace=wallpercent x=50 y=50 justify=center transparency=.80;
  seriesplot x=Year y=&YVAR / lineattrs=(color=black thickness=1.5px) display=(markers)
     MARKERATTRS=(SYMBOL=circlefilled color=black size=10px);
  endlayout;
endcell;
%mend;
```
COMPLETE SAS CODE (CONTINUED)

```sas
%macro CreateAllCharts;
proc template;
%let Segments=1|2|3|4|5|0; %let Metrics=Population|PctPopulation|Arrests|PctArrests|ArrestRate;
define statgraph mygraphs.example;
begingroup / designwidth=4050px designheight=2000px border=false;
layout lattice / backgroundcolor=white opaque=true columns=6 border=false;
entrytitle textattrs=(size=36pt weight=bold) "Arrest Statistics 1970-1999";
entrytitle textattrs=(size=24pt weight=bold) " ";
column2headers;
entry textattrs=(size=24pt weight=bold) "Ages 0-14";
entry textattrs=(size=24pt weight=bold) "Ages 15-17";
entry textattrs=(size=24pt weight=bold) "Ages 18-20";
entry textattrs=(size=24pt weight=bold) "Ages 21-24";
entry textattrs=(size=24pt weight=bold) "Ages 25+";
entry textattrs=(size=24pt weight=bold) "Total";
endcolumn2headers;
rowheaders;
entry textattrs=(size=24pt weight=bold) "Population" / rotate=90;
entry textattrs=(size=24pt weight=bold) "% Population" / rotate=90;
entry textattrs=(size=24pt weight=bold) "Arrests" / rotate=90;
entry textattrs=(size=24pt weight=bold) "% Arrests" / rotate=90;
entry textattrs=(size=24pt weight=bold) "Arrest Rate" / rotate=90;
endrowheaders;
sidebar / align=top; entry textattrs=(size=18pt) " "/ valign=center; endsidebar;
%do r=1 %to 5;
%do c=1 %to 6;
%CreateOneChart(%scan(&Metrics,&r,'|')%scan(&Segments,&c,'|'));
%end;
%end;
endlayout;
endgraph;
end;
run;
proc sgrender data=totarrests template="mygraphs.example";
run;
%mend;

*==> Create file containing grid of charts (Arrests.png);
ods graphics on / antialias antialiasmax=10000 reset imagename="sampleGTLchart";
ods listing gpath="c:\temp";
%CreateAllCharts;
run;
```
Figure 3 - GTL Lattice Chart


<table>
<thead>
<tr>
<th>Age Group</th>
<th>Population</th>
<th>% Population</th>
<th>Arrests</th>
<th>% Arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>58,429,000</td>
<td>21.4%</td>
<td>771,711</td>
<td>5.5%</td>
</tr>
<tr>
<td>15-17</td>
<td>11,767,000</td>
<td>4.3%</td>
<td>1,669,701</td>
<td>11.9%</td>
</tr>
<tr>
<td>18-29</td>
<td>11,898,000</td>
<td>4.4%</td>
<td>2,034,510</td>
<td>14.5%</td>
</tr>
<tr>
<td>21-24</td>
<td>14,158,000</td>
<td>5.2%</td>
<td>1,680,167</td>
<td>13.4%</td>
</tr>
<tr>
<td>25+</td>
<td>1,079,000</td>
<td>0.1%</td>
<td>257,440</td>
<td>0.8%</td>
</tr>
<tr>
<td>Total</td>
<td>128,850,000</td>
<td>0.0%</td>
<td>27,287,800</td>
<td>100%</td>
</tr>
</tbody>
</table>

Poster and Video Presentations
SAS Global Forum 2013