WHAT'S NEW IN FOUNDATION SAS FOR 9.4

JUDY ORR LAWRENCE – SAS TRAINING SPECIALIST
AGENDA

- Languages
- Reporting
- SAS Enterprise Guide 6.1
- SAS Studio 3.1
NEW PROGRAMMING LANGUAGES

**DS2** - *New SAS proprietary programming language*
- Object-based syntax – user-defined methods and packages
- ANSI SQL data type support
- Embedded FedSQL in the SET statement
- Runs anywhere – Base, In-Database (via SAS Code Accelerator), HPA (via HPDS2)

**FedSQL** - SAS proprietary implementation of *ANSI SQL:1999* core standard
- Scalable, threaded, high-performance way to access, manage, and share relational data in multiple data sources
- Common SQL syntax across all data sources
DS2 OVERVIEW

DS2 is a new SAS proprietary programming language that is appropriate for advanced data manipulation and data modeling applications.
The syntax of the DS2 language intersects with the SAS DATA step but also includes additional data types, ANSI SQL types, programming structure elements, and user-defined methods and packages.
PROC DS2;
data _null_
method init();
dcl varchar(20) foo;
foo = '**> Starting';
put foo;
end;
method run();
set ds2_sas.banks;
put _all_
end;
method term();
dcl char(11) bar;
bar = '**> I quit!';
put bar;
end;
enddata;
run;
quit;
Packages

- User-defined: Create collections of re-usable, user-defined methods

Pre-defined:

- FCMP – Import PROC FCMP functions
- Hash / Hash Iterator
- Matrix – Do matrix math in DS2
- SQLStmt – Execute data-driven SQL statements from within a DS2 program
PROC DS2;
data _null_
method c2f(double Tc) returns double;
/* Celsius to Farenheit */
return (((Tc*9)/5)+32);
end;
method init();
dcl double Degc DegF;
do DegC=0 to 30 by 15;
  DegF=c2f(DegC);
  PUT DegC= DegF=;
end;
enddata;
enddata;
run;
quit;
proc ds2;
data sales (overwrite=YES);
  keep Customer_ID Total;
method run();
  set {select c.Customer_ID
       ,Total_Retail_Price
       from ds2_sas.order_fact f
       full join
           ds2_sas.customer_dim c
       on f.Customer_ID=c.Customer_ID
       order by 1};
  by customer_id;
  if first.customer_id then Total=0;
  Total+total_retail_price;
  if last.customer_id then output;
end; enddata;
run;quit;

EMBEDDED SQL IN DS2

Returns SQL result set as input stream

BY group processing on results
Move the DS2 code to the MPP database
DS2 WHY USE IT?

DS2 is beneficial in applications that
• need to use the extended data types
• can make use of packages and methods to re-use common functions or operations
• can utilize parallel processing (for computationally intense processes)
• require large data movement
ODS LAYOUT

Arrange ODS output objects exactly where you want them on a page, or use dynamic placement of objects by using a grid structure.

Product Sales for 1995 to 1998

To become the best of breed in the home furnishing market we need to stay customer-focused and maintain our high-level customer loyalty. Looking back over the last three years we can see how we leveraged our existing inventory.

- Canada generated good growth in the Home product type market
- Mexico extended their brand in the Desk product market
- USA had incredible growth in developing several new channels in the Sofa product sector.

We continue to collaboratively formulate one-to-one initiatives to increase our growth. As we compellingly drive next-generation ROI we need to drive our innovative experiences forward. The potential in our market is there for us to cultivate new growth.

<table>
<thead>
<tr>
<th>Country</th>
<th>Product Type</th>
<th>Predicted Sales</th>
<th>Actual Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Home Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Desk</td>
<td>$802,462</td>
<td>$790,534</td>
</tr>
<tr>
<td></td>
<td>Sofa</td>
<td>$898,174</td>
<td>$819,131</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>$1,700,636</td>
<td>$1,609,665</td>
</tr>
<tr>
<td>Office</td>
<td>Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair</td>
<td>$867,399</td>
<td>$782,129</td>
</tr>
<tr>
<td></td>
<td>Desk</td>
<td>$815,814</td>
<td>$806,078</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>$1,683,213</td>
<td>$1,588,207</td>
</tr>
<tr>
<td>Mexico</td>
<td>Product Type</td>
<td></td>
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<tr>
<td></td>
<td>Desk</td>
<td>$465,703</td>
<td>$505,408</td>
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<tr>
<td></td>
<td>Sofa</td>
<td>$599,823</td>
<td>$636,470</td>
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<tr>
<td></td>
<td>Subtotal</td>
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<td>$1,141,878</td>
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<tr>
<td>Office</td>
<td>Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair</td>
<td>$571,403</td>
<td>$513,390</td>
</tr>
<tr>
<td></td>
<td>Desk</td>
<td>$578,432</td>
<td>$561,075</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>$1,149,835</td>
<td>$1,074,465</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Desk</td>
<td>$2,453,194</td>
<td>$2,286,238</td>
</tr>
<tr>
<td></td>
<td>Sofa</td>
<td>$3,932,867</td>
<td>$3,558,351</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>$6,412,061</td>
<td>$6,844,589</td>
</tr>
<tr>
<td>Office</td>
<td>Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair</td>
<td>$2,575,603</td>
<td>$2,397,844</td>
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<tr>
<td></td>
<td>Desk</td>
<td>$2,585,199</td>
<td>$2,387,507</td>
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<tr>
<td></td>
<td>Subtotal</td>
<td>$5,160,802</td>
<td>$4,785,351</td>
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<tr>
<td>Total</td>
<td></td>
<td>$15,922,981</td>
<td>$15,008,182</td>
</tr>
</tbody>
</table>

Orion Distribution Solutions is a multi-national next-generation company. We seamlessly evolve exceptional global solutions for our worldwide markets. We progressively innovate our products with “outside the box” thinking. Orion efficiently targets reliable methods of distribution to ensure process-centric customer service.

Orion Distribution Solutions
12 Elm Street
Oakdale, SD
ODS REPORT WRITING INTERFACE (RWI)

Create and manipulate predefined ODS objects in a DATA step to create highly customized output.

Regional Home Sales by Quarter

<table>
<thead>
<tr>
<th>Country</th>
<th>United States</th>
<th>Mexico</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>Bed</td>
<td>$176,920</td>
<td>$154,870</td>
<td>$164,873</td>
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<tr>
<td>Sofa</td>
<td>$134,873</td>
<td>$144,765</td>
<td>$157,735</td>
</tr>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>Bed</td>
<td>$124,375</td>
<td>$146,873</td>
<td>$162,542</td>
</tr>
<tr>
<td>Sofa</td>
<td>$141,543</td>
<td>$135,543</td>
<td>$145,873</td>
</tr>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>Bed</td>
<td>$121,234</td>
<td>$119,857</td>
<td>$154,234</td>
</tr>
<tr>
<td>Sofa</td>
<td>$125,984</td>
<td>$132,871</td>
<td>$139,245</td>
</tr>
</tbody>
</table>

“We always energistically synergize team driven collaboration and idea-sharing in our global business markets.”

— Oliver D Smith, CEO
NEW OUTPUT DELIVERY SYSTEM (ODS) - DESTINATIONS

**ODS EPUB** - Create SAS reports as e-books that can be read with Apple iBooks e-book reader on iPad and iPhone.

**ODS POWERPOINT** – Create Microsoft PowerPoint slides that combine text and SAS reports.

**ODS HTML5** – Create HTML5 output for SAS reports to support delivery to any web browser that is HTML5-compatible.

**ODS Package** - Fortunately, SAS can read and write ZIP files directly. Ever since SAS 9.2, we've been able to create ZIP files with ODS PACKAGE. Beginning with SAS 9.4, we can read ZIP content by using FILENAME ZIP.
Patterns of Diabetes

The GAM Procedure
Dependent Variable: logCP
Smoothing Model Component(s):
  spline(Age)  spline(BaseDeficit)

Regression Model Analysis
Parameter Estimates

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.48141</td>
<td>0.05120</td>
<td>28.93</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear(Age)</td>
<td>0.01437</td>
<td>0.00437</td>
<td>3.28</td>
<td>0.0024</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear(BaseDeficit)</td>
<td>0.00067</td>
<td>0.00247</td>
<td>3.27</td>
<td>0.0025</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Smoothing Model Analysis
Fit Summary for Smoothing Components

| Smooth-     | Parameter | DF | GCV   | Unique Obs |
| Smooth-     | Parameter |    |       |            |
| Component   | DF        |    |       |            |
| spline(Age) | 3.00000   | 0.011675 | 31   |
| spline(BaseDeficit) | 3.00000 | 0.00247 | 36   |

Sales of Diabetes Supplies

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>CHI-Square</th>
<th>Pr &gt; CHI-Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>spline(Age)</td>
<td>3.00000</td>
<td>6.150761</td>
<td>0.02605</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>spline(BaseDeficit)</td>
<td>3.00000</td>
<td>0.061270</td>
<td>0.00395</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

Annual Worldwide Sales by Country

- Total Sales by Country
- Sales by Country

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Patterns of Diabetes

The GAM Procedure

Dependent Variable: logCP

Smoothing Model Component(s): spline(Age) spline(BaseDeficit)

Regression Model Analysis
Parameter Estimates

| Parameter    | Parameter Estimate | Standard Error | t Value | Pr > |t| |
|--------------|--------------------|----------------|---------|------|---|
| Intercept    | 1.48141            | 0.05120        | 28.93   | <.0001 |
| Linear(Age)  | 0.01437            | 0.00437        | 3.28    | 0.0024 |
| Linear(BaseDeficit) | 0.00807        | 0.00247        | 3.27    | 0.0025 |
Patterns of Diabetes

The GAM Procedure
Dependent Variable: logCP
Smoothing Model Component(s): spline(Age) spline(BaseDeficit)

Regression Model Analysis
Parameter Estimates

<table>
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<tr>
<th>Parameter</th>
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<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
</tr>
</thead>
<tbody>
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<td>0.05120</td>
<td>28.93</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Linear(Age)</td>
<td>0.01437</td>
<td>0.00437</td>
<td>3.28</td>
<td>0.0024</td>
<td></td>
</tr>
<tr>
<td>Linear(BaseDeficit)</td>
<td>0.00807</td>
<td>0.00247</td>
<td>3.37</td>
<td>0.0025</td>
<td></td>
</tr>
</tbody>
</table>

Smoothing Model Analysis
Fit Summary for Smoothing Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Smoothing Parameter</th>
<th>DF</th>
<th>GCV</th>
<th>Num Unique Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spline(Age)</td>
<td>0.995582</td>
<td>3.000000</td>
<td>0.11675</td>
<td>37</td>
</tr>
<tr>
<td>Spline(BaseDeficit)</td>
<td>0.995299</td>
<td>3.000000</td>
<td>0.012437</td>
<td>39</td>
</tr>
</tbody>
</table>

Smoothing Model Analysis
Analysis of Deviance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Chi-Square</th>
<th>Pr &gt; ChiSq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spline(Age)</td>
<td>3.0000</td>
<td>0.150761</td>
<td>12.2605</td>
<td>0.0065</td>
</tr>
<tr>
<td>Spline(BaseDeficit)</td>
<td>3.0000</td>
<td>0.081273</td>
<td>6.6095</td>
<td>0.0854</td>
</tr>
</tbody>
</table>
SAS ENTERPRISE GUIDE 6.1


- **Improved programmer productivity** - new Log Summary window, which lists all the errors, warnings, and notes that were generated when the program ran, as well as related line numbers and a sample of the affected code.

- **Documentation** – can add **Sticky Notes** for more information to a process flow or to specific objects in the process flow.

- **Integration** - The first maintenance release for SAS Enterprise Guide 6.1 (which shipped in December 2013) provides integration with SAS Visual Analytics 6.2 and 6.3. Because of this integration, you can open and refresh reports that were created using SAS Visual Analytics Designer and SAS Visual Analytics Explorer. You can also save a SAS Visual Analytics report with your SAS Enterprise Guide project.
Using SASHELP DICTIONARY tables for first look at data makeup

- SASHELP VCOLUMN
- Column descriptions
- SAS Report - Column descriptions
- Data Description

- SASHELP VTABLE
- Data Description
- SAS Report - Data Description
34  Data temp;
35  set SASHELP.shoes;
36  run;

NOTE: There were 395 observations read from the data set SASHELP.SHoes.
NOTE: The data set WORK.TEMP has 395 observations and 7 variables.
NOTE: DATA statement used (Total process time: 0.00898 seconds)

Log Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Line</th>
<th>Affected Code</th>
<th>Log Line</th>
<th>Program Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE: There were 395 observations read from the data set SASHELP.SHoes.</td>
<td>14</td>
<td>run;</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>NOTE: The data set WORK.TEMP has 395 observations and 7 variables.</td>
<td>15</td>
<td>run;</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>NOTE: DATA statement used (Total process time: 0.00898 seconds)</td>
<td>16</td>
<td>run;</td>
<td>36</td>
<td>4</td>
</tr>
</tbody>
</table>
WHAT IF THERE ARE ERRORS IN THE SAS LOG

Select how much or how little of the log you want to see.
OTHER NEW FEATURES

CHECK THE OBSERVATIONS QUICKLY

- NOTE: There were 52 observations read from the data set SASHELP.SHOES.
- NOTE: The data set WORK.BOOT has 52 observations and 7 variables.
- NOTE: DATA statement used (Total process time):
- NOTE: There were 343 observations read from the data set SASHELP.SHOES.
- NOTE: The data set WORK.BOOT_NOT has 343 observations and 7 variables.
- NOTE: DATA statement used (Total process time):
- NOTE: There were 52 observations read from the data set WORK.BOOT.
- NOTE: There were 343 observations read from the data set WORK.BOOT_NOT.
- NOTE: The data set WORK.ALL has 395 observations and 7 variables.
- NOTE: DATA statement used (Total process time):
SAS 9.4
BASE SAS

SAS STUDIO 3.1

- Write and run SAS code through a web browser
- Included with Base SAS 9.4
- Access data files, libraries and existing programs
- Submit code from a variety of devices, IPAD, MAC, Windows desktop, Laptop
- SAS Studio processes the SAS code on a SAS server and returns results to the browser
- Functionality similar to Enterprise Guide:
  - Code generating tasks
  - Auto-complete for SAS procedures
  - Process Flows

Tutorial - Getting Started with SAS Studio
http://support.sas.com/training/tutorial/studio/get-started.html
SAS Studio 3.1
LEARN MORE

*Training* - DS2 Programming: Essentials
https://support.sas.com/edu/schedules.html?id=1798&ctry=US

*Papers* - Parallel Data Preparation with the DS2 Programming Language (.pdf)

*Documentation* - SAS® Enterprise Guide® 6.1

*Tutorial* - Getting Started with SAS Studio
http://support.sas.com/training/tutorial/studio/get-started.html
THANK YOU!

JUDY.ORRLAWRENCE@SAS.COM