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SAS® Output Delivery System ExcelXP Tagset: Customizing Cell Patterns, Borders, and Indention

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ABSTRACT

The SAS® Output Delivery System ExcelXP tagset offers the most flexible way to write SAS output to Microsoft Excel. Standard customizable options in the ExcelXP tagset handle most of the Excel formatting very well. However, given the ever-growing formatting features in Excel, there is always a need to go beyond what is available. This paper describes how to do some of the Excel formatting that requires modification of the standard ExcelXP tagset. Specifically, this paper concentrates on customizing cell patterns, borders, and indention.

INTRODUCTION

An ExcelXP tagset consists of events that write various sections of the final Excel document in XML format. The tagset parses the TAGATTR values and applies them through the various events. There are three different methods for customization of cell formats

- The value will directly affect the attributes for the cell e.g. Background color of the cell
- The value may go into a new style definition that the cell will then reference e.g. Customization the Cell pattern
- The value of TAGATTR= changes the XML for the row but not the cell e.g. Hidden

The approach used by the author in identifying and customizing the cell formats includes following steps

1. Creating an excel sheet with the cell formatting that needs to be customized and saving the sheet in XML format.
2. Identifying the section of XML that causes the cell formatting to take place.
3. Identifying the event within ExcelXP tagset that writes the XML section.
4. Creating a custom ExcelXP tagset that modifies that event.
5. Testing. Testing. Testing.

CUSTOMIZING CELL PATTERN

Although ExcelXP tagset offers multiple ways to format foreground and background of cell contents, a user may still find need for additional formatting. A typical situation in life science world is when a cell falls into 2 or more different categories. For e.g., A blood pressure measurement may be the first measurement and also may be the single largest amongst a series of measurements. The cell containing the value may be needed to have a background color of yellow to indicate first measurement and have gray dot patterns to indicate the largest measurement.

A new tagattr PATTERN needs to be defined.

```
DEFINE EVENT compile_regexp;
...
...
set $tagattr_regexp "/^([Ff][Oo][Rr][Mm][Aa][Tt]:|[Ff][Oo][Rr][Mm][Uu][Ll][Aa]:|";
set $tagattr_regexp $tagattr_regexp "[Rr][Oo][Tt][Aa][Tt][Ee]:|[Tt][Yy][Pp][Ee]:|";
set $tagattr_regexp $tagattr_regexp "[Hh][Ii][Dd][Dd][Ee][Nn]:|";
set $tagattr_regexp $tagattr_regexp "[Pp][Aa][Tt][Tt][Ee][Rr][Nn]:|";
set $tagattr_regexp $tagattr_regexp "[Mm][Ee][Rr][Gg][Ee][Aa][Cc][Rr][Oo][Ss][Ss]:)"/";
eval $tagattr_regexp prxparse($tagattr_regexp);

END;
```

Modify the event FONT_INTERIOR which writes the XML code for the cell interior to use the PATTERN passed on by the user.

```
DEFINE EVENT font_interior;
...
...
```

```

do /if cmp( htmlclass, "pagebreak");
  stop /if ^any( background, tagattr, foreground);
  put "<Interior";
  putq " ss:Color=" BACKGROUND;
  putq " ss:Pattern=" tagattr;
  putq " ss:PatternColor=" FOREGROUND /if (tagattr);
  put " />" NL;

else;

do /if background;
  put "<Interior";

  do /if ^cmp( background, "transparent");
    putq " ss:Color=" BACKGROUND;
    do /if $attrs["pattern"];
      set $pattern_override propcase($attrs["pattern"]);
      putq " ss:Pattern=" strip($pattern_override) /if exist( BACKGROUND);
    else;
      put " ss:Pattern=""Solid"" /if exist( BACKGROUND);
    done;
  done;

  put " />" NL;

  else /if cmp( htmlclass, "body");
    put "<Interior ss:Pattern=""Solid"" />" NL;
  done;
done;

END;

```

Define a style based on the new tag attribute.

```

style yellowdots from data/background=yellow;
style yellowdots from yellowback/ tagattr="Pattern:Gray125";

```

Now consider the dataset below:

txtval	bp
None	138
First and Max	156
None	87

Table 1. Table used for Example1 and Example 2

If the following code is executed on the above table, the bp value of 156 will have a background color of yellow and a gray pattern with 12.5% gray.

```

ODS TAGSETS.CUSTOMEXCELXP STYLE=styles.slsrep10 options(sheet_name="Example 1");
PROC REPORT DATA=example1 NOWD;
  COLUMN txtval bp;
  DEFINE txtval / DISPLAY;
  DEFINE bp / DISPLAY;
  COMPUTE bp;
    IF txtval='First and Max' then CALL DEFINE("bp","style","STYLE=yellowdots");
  ENDCOMP;
RUN;
ODS tagsets.customexcelcp CLOSE;

```

	A	B	C	D	E	F	G	H	I	J	K
1	txtval	bp									
2	None	138									
3	Max	156									
4	None	87									
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											

Display 1. Excel Output with Customized Cell Pattern

CUSTOMIZING CELL BORDERS

The ExcelXP formatting for cell borders is limited in the sense that only one set of borders can be applied to all four borders of the cell. The cell borders default to CONTINUOUS if nothing is specified. The event that affects the border style is GET_BORDERSTYLE

```
DEFINE EVENT get_borderstyle;
  set $borderstyle borderrightstyle / if cmp( $border_position, "Left");
  set $borderstyle bordertopstyle / if cmp( $border_position, "Right");
  set $borderstyle borderbottomstyle / if cmp( $border_position, "Top");
  set $borderstyle borderleftstyle / if cmp( $border_position, "Bottom");
  set $borderstyle upcase($borderstyle);
  set $borderstyle $borderstyles[$borderstyle];

  do /if ^$borderstyle;
    set $borderstyle "Continuous" /if $borderwidth;
  done;
END;
```

Next define the styles that pass on the required borders to the tagset. The following code puts double border around the table and header, and a single border in between other columns.

```
style header_top_bottom from header /
  borderleftstyle=solid
  borderrightstyle=solid
  bordertopstyle=double
  borderbottomstyle=double;

style header_right from header /
  borderleftstyle=double
  borderrightstyle=solid
  bordertopstyle=double
  borderbottomstyle=double;

style header_left from header /
  borderleftstyle=solid
  borderrightstyle=double
```


Now apply the above code to a dataset below:

mhcat	val
Atrial Fibrillation	10(3%)
~~~Paroxysmal	6(2%)
~~~Persistent	1(1%)
~~~Permanane	1(1%)

**Table 2. Table used for Example3**

The result is

Obs	mhcat	val
1	Atrial Fibrillation	10(3%)
2	Paroxysmal	6(2%)
3	Persistent	1(1%)
4	Permanane	1(1%)

**Display 3. Excel Output with Customized Cell Indenting**

### INSERT A 'SOFT RETURN' IN CELL

Breaking the cell contents into multiple rows within the same cell can be achieved by inserting a 'soft return' in the cell contents. The idea is similar to the one used for cell indenting. Add a special character | (pipe) which is resolved to soft return in the XML output. Note that the ASCII code for soft return is 10.

```
map = %NRSTR("<>&|");
mapsub = %NRSTR("/&lt;/&gt;/&amp;/&#10;/");
```

Now apply the above code to a dataset below:

stmt
This is statement1 of row1 This is statement2 of row1
This is statement1 of row2 This is statement2 of row2 This is statement3 of row2
This is statement1 of row3

**Table 3. Table used for Example4**

The result is

	A	B	C	D	E	F	G	H	I	J
1	1	Obs stmt								
2	2	1 This is statement2 of row1								
3	3	2 This is statement3 of row2								
4	4	3 This is statement1 of row3								
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										

**Display 4. Excel Output with Multiple rows per cell**

## CONCLUSION

In this paper we have explored a drop in the ocean of what ExcelXP tagset has to offer. The capabilities of user defined TAGATTR are endless and this is what makes the ExcelXP really flexible. The approach of looking at XML and investigating the section that generates that XML in ExcelXP tagset is all that is needed to make the ExcelXP tagset truly extensible. Thank you SAS® for putting this excellent tool in the hands of developers!!!

## REFERENCES

- DelGobbo, Vincent. 2009. "More Tips and Tricks for Creating Multi-Sheet Microsoft Excel Workbooks the Easy Way with SAS®." *Proceedings of the SAS Global 2009 Conference*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/resources/papers/proceedings09/152-2009.pdf>.
- Gebhart, Eric. 2010. "ODS ExcelXP: Tag Attr Is It! Using and Understanding the TAGATTR= Style Attribute with the ExcelXP Tagset." *Proceedings of the SAS Global 2010 Conference*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/resources/papers/proceedings10/031-2010.pdf>.

## CONTACT INFORMATION

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## APPENDIX

```

DATA example1;
LENGTH txtval $100;
INPUT bp $ txtval $ &;
DATALINES;
138 None
156 First and Max
87 None
;

DATA example3;
LENGTH mhcat $20 val $7;
INPUT mhcat $1-20 val $21-26;
DATALINES;
Atrial Fibrillation 10 (3%)
~~~Paroxysmal      6 (2%)
~~~Persistent      1 (1%)
~~~Permanane       1 (1%)
;

DATA example4;
LENGTH stmt $100;
INPUT stmt $ &;
DATALINES;
This is statement1 of row1|This is statement2 of row1
This is statement1 of row2|This is statement2 of row2|This is statement3 of row2
This is statement1 of row3
;

%macro CreateCustomExcelXP;
ods path work.templat(update)
sasuser.templat(update)
sashelp.tmplmst(read);

PROC TEMPLATE;
 DEFINE STYLE styles.slsrep10;
 parent = styles.default;
 style header/
 font_weight = bold
 font_face=Arial
 font_size=10pt
 foreground = black
 background=white
 borderstyle=hidden
 borderleftstyle=hidden
 borderrightstyle=hidden
 bordertopstyle=hidden
 borderbottomstyle=hidden
 borderleftcolor=black
 borderrightcolor=black
 bordertopcolor=black
 borderbottomcolor=black
 borderleftwidth=1px
 borderrightwidth=1px
 bordertopwidth=1px
 borderbottomwidth=1px;

 style header_top_bottom from header /
 borderleftstyle=solid
 borderrightstyle=solid
 bordertopstyle=double
 borderbottomstyle=double;

```

```
style header_right from header /
 borderleftstyle=double
 borderrightstyle=solid
 bordertopstyle=double
 borderbottomstyle=double;

style header_left from header /
 borderleftstyle=solid
 borderrightstyle=double
 bordertopstyle=double
 borderbottomstyle=double;

style data from data /
 font_face=Arial
 font_size=10pt
 foreground = black
 background=white
 borderstyle=hidden
 borderleftstyle=hidden
 borderrightstyle=hidden
 bordertopstyle=hidden
 borderbottomstyle=hidden
 borderleftcolor=black
 borderrightcolor=black
 bordertopcolor=black
 borderbottomcolor=black
 borderleftwidth=1px
 borderrightwidth=1px
 bordertopwidth=0px
 borderbottomwidth=0px;

style data_left from data /
 borderleftstyle=double
 bordertopstyle=hidden
 borderbottomstyle=hidden
 borderrightstyle=solid;

style data_right from data /
 borderleftstyle=solid
 bordertopstyle=hidden
 borderbottomstyle=hidden
 borderrightstyle=double;

style data_center from data /
 borderleftstyle=solid
 borderrightstyle=solid
 bordertopstyle=hidden
 borderbottomstyle=hidden;

style data_bottom from data /
 borderbottomstyle=double;

style yellowback from data/
 background=yellow;

style yellowdots from yellowback/
 tagattr="Pattern:Gray125";

END;

define tagset TAGSETS.CUSTOMEXCELP;
 parent=tagsets.EXCELP;
```

```

DEFINE EVENT get_borderstyle;
 set $borderstyle borderrightstyle / if cmp($border_position, "Left");
 set $borderstyle bordertopstyle / if cmp($border_position, "Right");
 set $borderstyle borderbottomstyle / if cmp($border_position, "Top");
 set $borderstyle borderleftstyle / if cmp($border_position, "Bottom");
 set $borderstyle upcase($borderstyle);
 set $borderstyle $borderstyles[$borderstyle];

 do /if ^$borderstyle;
 set $borderstyle "Continuous" /if $borderwidth;
 done;
END;

DEFINE EVENT compile_regexp;
 set $currency_sym "\" $currency;
 set $currency_sym "\"$\" /if ^$currency_sym;
 set $decimal_separatorsym $decimal_separator;
 set $decimal_separatorsym "\" /if ^$decimal_separatorsym;
 set $decimal_separatorsym "\" $decimal_separator /if cmp($decimal_separator, ".");
 set $thousands_separatorsym $thousands_separator;
 set $thousands_separatorsym "," /if ^$thousands_separatorsym;
 set $thousands_separatorsym "\" $thousands_separator /if cmp($thousands_separator,
 ".");
 set $punctuation $currency $thousands_separator %NRSTR("%");
 set $integer_re "\d+";
 set $sign_re "[+-]?";
 set $group_re "\d{1,3}(?:" $thousands_separatorsym "\d{3}) *";
 set $whole_re "(?:" $group_re "|" $integer_re ")";
 set $exponent_re "[eE]" $sign_re $integer_re;
 set $fraction_re "(?:" $decimal_separatorsym "\d*");
 set $real_re "(?:" $whole_re $fraction_re "|" $fraction_re $integer_re "|"
$whole_re ")";
 set $percent_re $sign_re $real_re %NRSTR("%");
 set $scinot_re $sign_re "(?:" $real_re $exponent_re "|" $real_re ")";
 set $cents_re "(?:" $decimal_separatorsym "\d\d)";
 set $money_re $sign_re $currency_sym "(?:" $whole_re $cents_re "|" $cents_re "|"
$whole_re ")";
 set $number_re "/^(?:" $real_re "|" $percent_re "|" $scinot_re "|" $money_re
")\Z/";
 eval $number prxparse($number_re);
 set $tagattr_regexp "/^([Ff][Oo][Rr][Mm][Aa][Tt]:|[Ff][Oo][Rr][Mm][Uu][Ll][Aa]:|";
 set $tagattr_regexp $tagattr_regexp "[Rr][Oo][Tt][Aa][Tt][Ee]:|[Tt][Yy][Pp][Ee]:|";
 set $tagattr_regexp $tagattr_regexp "[Hh][Ii][Dd][Dd][Ee][Nn]:|";
 set $tagattr_regexp $tagattr_regexp "[Pp][Aa][Tt][Tt][Ee][Rr][Nn]:|";
 set $tagattr_regexp $tagattr_regexp
"[Mm][Ee][Rr][Gg][Ee][Aa][Cc][Rr][Oo][Ss][Ss]:) /";
 eval $tagattr_regexp prxparse($tagattr_regexp);
 eval $cm_re prxparse("/[0-9]*[cC][mM]/");
 eval $in_re prxparse("/[0-9]*[iI][nN]/");
 eval $mm_re prxparse("/[0-9]*[mM][mM]/");
 eval $px_re prxparse("/[0-9]*px/");
 eval $pt_re prxparse("/[0-9]*pt/");
END;

DEFINE EVENT font_interior;

 do /if any(font_face, font_size, font_weight, foreground);
 put "<Font";
 do /if font_face;
 set $fontFace font_face;

 do /if contains(font_face, "Courier");
 set $fontFace tranwrd($fontFace,"sans-serif, ","");
 end;
 end;
 end;

```

```

 set $fontFace tranwrd($fontFace," sans-serif","");
 set $fontFace tranwrd($fontFace,"sans-serif","");
 done;
 set $fontFace tranwrd($fontFace,"SAS Monospace, ","");
 set $fontFace tranwrd($fontFace,"SAS Monospace","");
 set $fontFace tranwrd($fontFace,"'", "");
 set $fontFace tranwrd($fontFace," ,", "");
 set $fontFace strip($fontFace);
 set $fontname scan($fontFace,1,"");
 set $fontname strip($fontname);
 eval $count 1;
 unset $tmp_fontFace;
 do /while ^cmp($fontname, " ");
 stop /if missing($fontname);
 iterate $bad_fonts;
 do /while _value_;
 do /if cmp($fontname, _value_);
 unset $fontname /if cmp($fontname, _value_);
 stop;
 done;
 next $bad_fonts;
 done;

 do /if $fontname;
 set $tmp_fontFace $tmp_fontFace ", " /if $tmp_fontFace;
 set $tmp_fontFace $tmp_fontFace $fontname;
 unset $fontname;
 done;

 eval $count $count +1;
 set $fontname scan($fontFace,$count,"");
 set $fontname strip($fontname);
done;
set $fontFace $tmp_fontFace;
eval $comma index($fontFace,",");
eval $comma_index $comma;
eval $comma_count 0;
set $tmp_fontFace $fontFace;

do /while $comma > 0;
 eval $comma $comma +1;
 eval $comma_count $comma_count +1;
 do /if $comma_count = 3;
 eval $comma_index $comma_index -1;
 set $fontFace substr($fontFace,1,$comma_index);
 stop;
 done;

 set $tmp_fontFace substr($tmp_fontFace,$comma);
 eval $comma index($tmp_fontFace,",");
 eval $comma_index $comma_index + $comma;
done;

 putq " ss:FontName=" strip($fontFace);
 unset $fontFace;
done;

do /if font_size;

 trigger get_font_height;
 putq " ss:Size=" $font_height;

```

```

else;
 eval $font_height 0;
done;

eval $row_height 0;

do /if $font_height;
 eval $row_height $font_height + $row_height_fudge;
done;

do /if $row_height = 0;
 eval $row_height 12 + $row_height_fudge;
done;

do /if cmp(htmlclass, "data");
 stop /if $data_point_size;
 set $data_point_size $font_height;
done;

set $tmp lowercase(htmlclass);

do /if contains($tmp, "systemtitle");
 set $have_title_style "True";

 do /if cmp($row_heights["Title"], "0");
 set $row_heights["Title"] $row_height;
 done;

done;

do /if contains(htmlclass, "SystemFooter");
 set $have_footer_style "True";

 do /if cmp($row_heights["Footer"], "0");
 set $row_heights["Footer"] $row_height;
 done;
done;

do /if cmp(htmlclass, "byline");
 set $have_byline_style "True";

 do /if cmp($row_heights["Byline"], "0");
 set $row_heights["Byline"] $row_height;
 done;
done;

do /if cmp(htmlclass, "header");
 stop /if $header_point_size;
 set $header_point_size $font_height;
 do /if cmp($row_heights["Table_head"], "0");
 set $row_heights["Table_head"] $row_height;
 done;

 do /if cmp($row_heights["Parskip"], "0");
 set $row_heights["Parskip"] $row_height;
 done;

```

```

done;

put " ss:Italic="1"" /if cmp(FONT_STYLE, "italic");
put " ss:Bold="1"" /if cmp(FONT_WEIGHT, "bold");
putq " ss:Color=" FOREGROUND /if ^cmp(foreground, "transparent");

do /if text_decoration;
 put $textdecoration["underline"] /if cmp(text_decoration,
"underline");
 put $textdecoration["strikethrough"] /if cmp(text_decoration,
"strikethrough");
 put $textdecoration["overline"] /if cmp(text_decoration, "overline");
 put $textdecoration["blink"] /if cmp(text_decoration, "blink");
done;

put " />" NL;

do /if $debug_level >= 1;
 putlog "CLASS: " htmlclass;
 iterate $row_heights;
 do /while _name_;
 putlog _name_ ": " _value_;
 next $row_heights;
 done;

done;

done;

do /if cmp(htmlclass, "pagebreak");
 stop /if ^any(background, tagattr, foreground);
 put "<Interior";
 putq " ss:Color=" BACKGROUND;
 putq " ss:Pattern=" tagattr;
 putq " ss:PatternColor=" FOREGROUND /if (tagattr);
 put " />" NL;

else;

 do /if background;
 put "<Interior";

 do /if ^cmp(background, "transparent");
 putq " ss:Color=" BACKGROUND;
 do /if $attrs["pattern"];
 set $pattern_override propcase($attrs["pattern"]);
 putq " ss:Pattern=" strip($pattern_override) /if exist(
BACKGROUND);
 else;
 put " ss:Pattern=""Solid"" /if exist(BACKGROUND);
 done;
 done;

 put " />" NL;

 else /if cmp(htmlclass, "body");
 put "<Interior ss:Pattern=""Solid"" />" NL;
 done;

done;

END;

```

```

 map = %NRSTR("<>&|~");
 mapsub = %NRSTR("/</>/&/
/ /");

 END;

RUN;
quit;

%MEND CREATECUSTOMEXCELXP;

%CreateCustomExcelXP;

ODS TAGSETS.CUSTOMEXCELXP FILE="example.xls" STYLE=styles.slsrep10
OPTIONS (EMBEDDED_TITLES= "YES" EMBEDDED_FOOTNOTES = "YES");
ODS TAGSETS.CUSTOMEXCELXP STYLE=styles.slsrep10 options(sheet_name="Example 1");

PROC REPORT DATA=example1 NOWD;
COLUMN txtval bp;
DEFINE txtval / DISPLAY;
DEFINE bp / DISPLAY;

COMPUTE bp;
 IF txtval='First and Max' THEN CALL DEFINE("bp","style","STYLE=yellowdots");
ENDCOMP;
RUN;

ODS TAGSETS.CUSTOMEXCELXP STYLE=styles.slsrep10 options(sheet_name="Example 2");
PROC REPORT DATA=example1 NOWD;
COLUMN txtval bp;
DEFINE txtval/DISPLAY STYLE(HEADER)=header_right STYLE(COLUMN)=data_left;
DEFINE bp / DISPLAY STYLE(HEADER)=header_left STYLE(COLUMN)=data_right;
COMPUTE bp;
 IF bp=87 then do;
 CALL DEFINE(_ROW_, "STYLE", "STYLE={borderleftwidth=1px borderrightwidth=1px
borderbottomSTYLE=double borderbottomwidth=1px}");
 CALL DEFINE(_COL_, "STYLE", "STYLE={borderrightstyle=double
borderrightwidth=1px}");
 END;
ENDCOMP;

COMPUTE txtval;
 CALL DEFINE(_COL_, "STYLE", "STYLE={borderleftstyle=double borderleftwidth=1px}");
ENDCOMP;
RUN;

ODS TAGSETS.CUSTOMEXCELXP STYLE=styles.slsrep10 options(sheet_name="Example 3");
proc print DATA=example3;
RUN;

ODS TAGSETS.CUSTOMEXCELXP STYLE=styles.slsrep10 options(sheet_name="Example 4");
proc print DATA=example4;
RUN;

ODS tagsets.customexcelxp CLOSE;

```