Paper 28-27

# Web-enabling a Client/Server OLAP Application Using SAS/INTRNET® Software's MDDB Report Viewer

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## ABSTRACT

SAS/IntrNet's MDDB Report Viewer (MRV) enables users to obtain multidimensional reports and graphs via their web browsers. We chose to web-enable an existing client/server OLAP application using the MRV because of the appropriate fit, the expected quick conversion time, and the additional functionality provided. During the development effort we realized that we needed to customize the MRV in order to replicate an important feature of the client/server application. We also wished to alter the default appearance of the MRV. Qualex Consulting Services, Inc. provided the technical expertise in the development of these MRV enhancements.

## INTRODUCTION

This paper will discuss the conversion process, the challenges encountered, and some of the customizations created. Enhancements included embedding additional JavaScript to control overriding methods from the report layout page to the report viewer page, and controlling the look of the MRV pages by setting MRV macro variables, and overriding some of the standard MRV methods.

## BACKGROUND

Claims management of Fireman's Fund Insurance Company (FFIC) Home Office and Regional Offices have for years received static hard copy reports to track their operational activities and financial results. "Counts and Amounts" (C&A) was created in 1998 as a SAS V6.12 client/server OLAP tool to enable Claims management to research and explain these results. In late 2000, we decided to web-enable this application using SAS/IntrNet for these reasons:

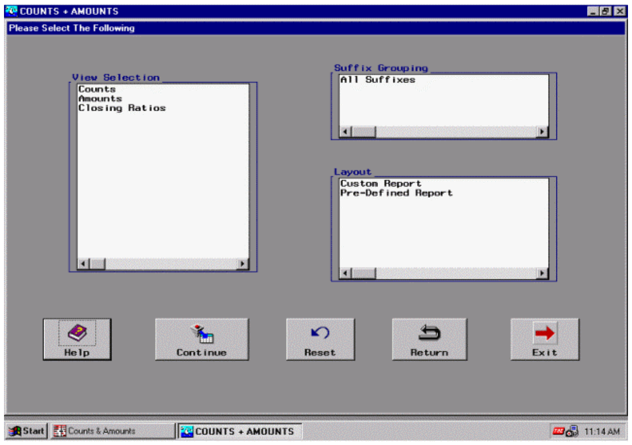
- Static reports began moving to the FFIC Intranet. We wanted C&A available on the web as well. A "Claims Information Page" was created so users would have "one-stop" shopping for static reports and the OLAP tool.
- Eliminate need for 400+ SAS NT workstation licenses for Base SAS, SAS/AF®, SAS/EIS®, etc. SAS/IntrNet is required on the web server and application server. Users only require a browser.
- Eliminate the overhead involved with each distribution of the client-side component.
- Wanted true thin-client application.

### THE CLIENT/SERVER APPLICATION

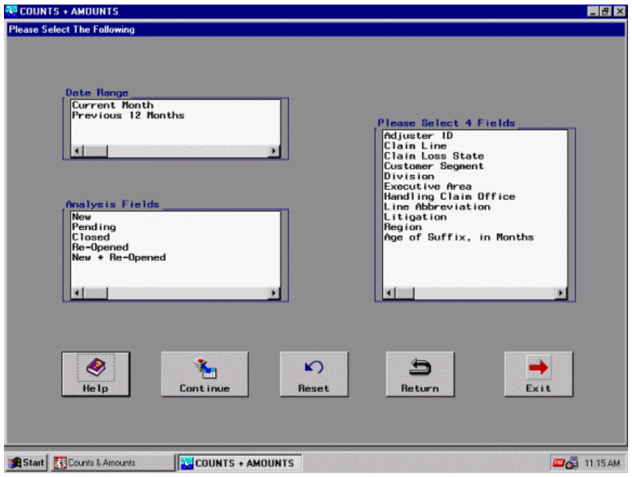
The server houses 27 MDDBs, 25 SAS Data Sets and 2 Formats catalogs. These data sources are refreshed monthly after the financial close of business. Each MDDB contains up to 24 months of claims activity. These combined data sources require approximately 40 GB of storage.

Each NT 4.0 client contains the GUI front-end which includes 7 AF Frame entries, 16 SCL entries, the EIS Metabase containing the MDDB descriptions and drilldown hierarchies, and 27 EIS Multidimensional Report definition entries.

The following is an example of client/server C&A. From the initial screen the user selects one value from each of the list boxes.



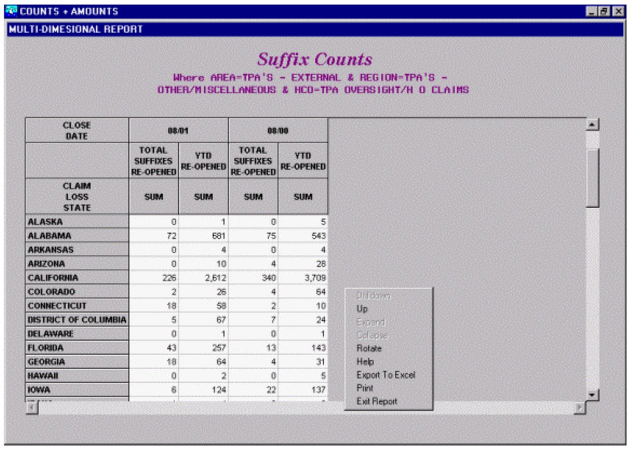
Next, the user is presented with this screen where they must select a date range, an analysis field and any four classification fields. Four classification fields **must** be chosen in the order of the desired drill path.



The MDDB to be used is determined by most of the selected list box values. The only exception is the four classification variables (fields). These values define the requested drill-down hierarchy for the MDDB.

If the user is satisfied with the selections made, the Continue button is clicked to get the multidimensional report. The values of the first classification variable in the hierarchy will appear on the left side of the report. The user can now begin drilling down or expanding the values to traverse the hierarchy. There are also options to Rotate the rows and columns and Download to Excel.

Below is a multidimensional report that has been drilled into 4 levels. Also activated is the popup box for further options. Details about this application's SCL customizations can be found in the WUSS 99 paper entitled "Manipulating SCL Lists Available Through EIS Classes To Customize A Multidimensional Report" by Jessica M. Gallegos and Matthew E. Westover.



Suffix Counts

Where AREA=TPA'S - EXTERNAL & REGION=TPA'S - OTHER/MISCELLANEOUS & HCO=TPA OVERSIGHT/H O CLAIMS

| CLOSE DATE | 08/01 | | 08/00 | |
|---|---|---|---|---|
| | TOTAL SUFFIXES RE-OPENED | YTD RE-OPENED | TOTAL SUFFIXES RE-OPENED | YTD RE-OPENED |
| CLAIM LOSS STATE | SUM | SUM | SUM | SUM |
| ALASKA | 0 | 1 | 0 | 5 |
| ALABAMA | 72 | 681 | 75 | 543 |
| ARKANSAS | 0 | 4 | 0 | 4 |
| ARIZONA | 0 | 10 | 4 | 28 |
| CALIFORNIA | 226 | 2,612 | 340 | 3,709 |
| COLORADO | 2 | 26 | 4 | 64 |
| CONNECTICUT | 18 | 58 | 2 | 10 |
| DISTRICT OF COLUMBIA | 5 | 67 | 7 | 24 |
| DELAWARE | 0 | 1 | 0 | 1 |
| FLORIDA | 43 | 257 | 13 | 143 |
| GEORGIA | 18 | 64 | 4 | 31 |
| HAWAII | 0 | 2 | 0 | 5 |
| IOWA | 6 | 124 | 22 | 137 |

## CONVERSION PROCESS

We simultaneously installed SAS Version 8.1 and SAS/IntrNet as part of the conversion process. We followed the online instructions from the SAS web site to set up the MRV, create the Repository Manager and convert the client/server's EIS metabase to Version 8.1.

### THE MRV, RELEASE 8.1

For a comprehensive description of the MRV, please refer to the SUGI 26 paper entitled "Dynamic Ad-hoc Reporting via the Web: Real World Comparison of the MDDB Report Viewer and AppDev Studio®" by Colin Harris.

Briefly, the MRV (Release 8.1) is composed of three web pages:

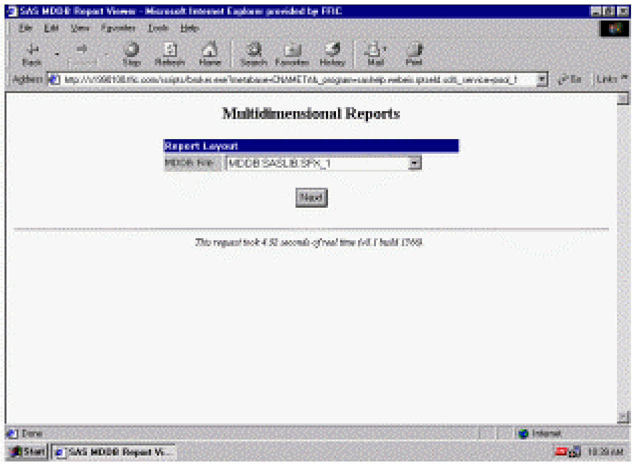
1. MDDB Definition Page
2. Report Layout Page, which includes choosing the report's 'Down' and 'Across' dimensions
3. Multidimensional Report Page

The MRV offered additional functionality, e.g., placing multiple analysis variables on a report, subsetting the report on filter classification variable(s), and producing drillable graphs (of the first analysis variable on the report).

The following sections contrast the default 'out of the box' MRV web pages with the customized ones.

### MDDB DEFINITION PAGE

Here the user selects an MDDB from the pull down menu. The default page:


SAS MDDB Report Viewer - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address
Go Links
Done
Internet
Start
SAS MDDB Report Vi...

Multidimensional Reports

Report Layout

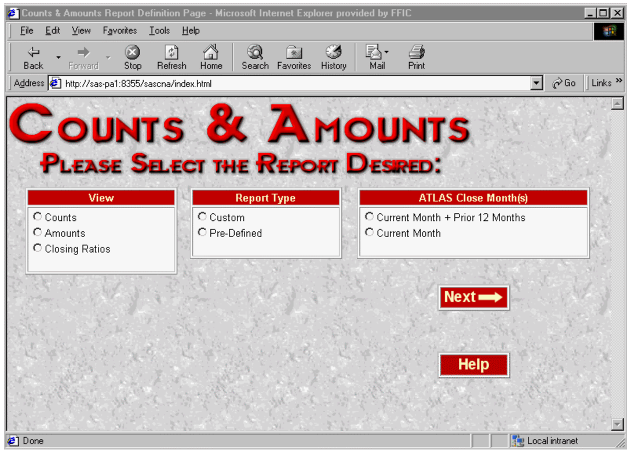
MDDB File: MDDB SASLIB.SFX_1

Next

*This request took 4.50 seconds of real time (v8.1 build 1769)*

Custom MDDB Definition Page:

We chose to create our own MDDB Definition Page using HTML and JavaScript. The values selected from the radio buttons are used to select the appropriate MDDB.


Counts & Amounts Report Definition Page - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address http://sas-pa1:8355/sascna/index.html
Go Links
Done
Local intranet

COUNTS & AMOUNTS

PLEASE SELECT THE REPORT DESIRED:

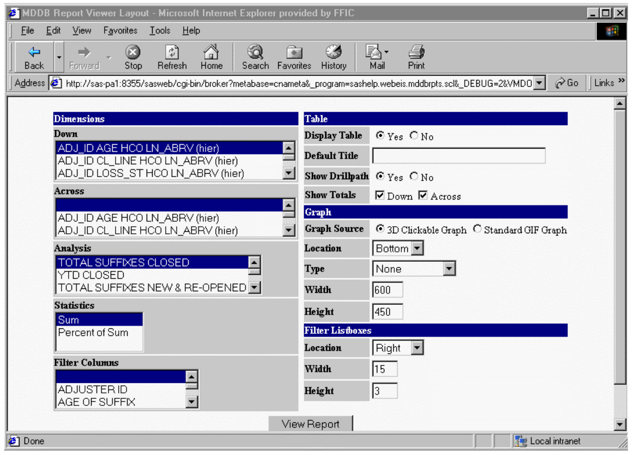
| View | Report Type | ATLAS Close Month(s) |
|---|---|---|
| ○ Counts | ○ Custom | ○ Current Month + Prior 12 Months |
| ○ Amounts | ○ Pre-Defined | ○ Current Month |
| ○ Closing Ratios | | |

Next

Help

### REPORT LAYOUT PAGE

The beauty of the Report Layout Page is that it is populated with the metabase specific to the MDDB. Report and/or graph appearance options are also available. The default page:


MDDB Report Viewer Layout - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address http://sas-pa1:8355/sasweb/cgi-bin/broker?metabase=cnameta&_program=sashelp.webeis.mddbrpts.scl&_DEBUG=2&VMDO
Go Links
View Report
Done
Local intranet

**Dimensions**

Down
- ADJ_ID AGE HCO LN_ABRV (hier)
- ADJ_ID CL_LINE HCO LN_ABRV (hier)
- ADJ_ID LOSS_ST HCO LN_ABRV (hier)

Across
- ADJ_ID AGE HCO LN_ABRV (hier)
- ADJ_ID CL_LINE HCO LN_ABRV (hier)

Analysis
- TOTAL SUFFIXES CLOSED
- YTD CLOSED
- TOTAL SUFFIXES NEW & RE-OPENED

Statistics
- Sum
- Percent of Sum

Filter Columns
- ADJUSTER ID
- AGE OF SUFFIX

| Table | |
|---|---|
| Display Table | [✓ Yes] No |
| Default Title | |
| Show Drillpath | [✓ Yes] No |
| Show Totals | [✓ Down] [✓ Across] |
| **Graph** | |
| Graph Source | [✓ 3D Clickable Graph] Standard GIF Graph |
| Location | Bottom |
| Type | None |
| Width | 600 |
| Height | 450 |
| **Filter Listboxes** | |
| Location | Right |
| Width | 15 |
| Height | 3 |

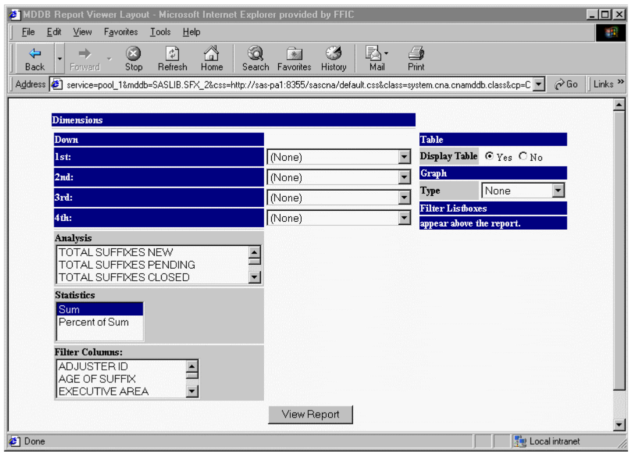
The metabase populates the boxes on the left side of the page. Under the Dimensions Area, the Down and Across Sections each contain the displayed hierarchies in the metabase, as well as the classification variables that compose the hierarchies. The Analysis variables are the numeric measures stored with the hierarchies (or calculated from the stored measures). The Statistics are the ones requested for the Analysis variables, and those derived from the requested ones. The Filter Columns are the classification variables and are used to subset the report.

We found the default page too busy for our typical user and researched possible alternatives for customization. The MRV components that can be customized are the:

- MRV class, instance variables, and methods
- MRV macro variables and global variables
- MRV Cascading Style Sheets.

We used all of these components as well as HTML and JavaScript to customize the Report Layout Page.

Custom Report Layout page:
Discussion of some of the overrides to create this page follows in the CUSTOMIZATIONS section.


MDDB Report Viewer Layout - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address
Go Links
View Report
Done
Local intranet

service=pool_1&mddb=SASLIB.SFX_2&css=http://sas-pa1:8355/sascna/default.css&class=system.cna.cnamddb.class&cp=C

Dimensions

| Down | |
|---|---|
| 1st: | (None) |
| 2nd: | (None) |
| 3rd: | (None) |
| 4th: | (None) |

Analysis: TOTAL SUFFIXES NEW, TOTAL SUFFIXES PENDING, TOTAL SUFFIXES CLOSED

Statistics: Sum, Percent of Sum

Filter Columns: ADJUSTER ID, AGE OF SUFFIX, EXECUTIVE AREA

Table — Display Table [✓ Yes] No

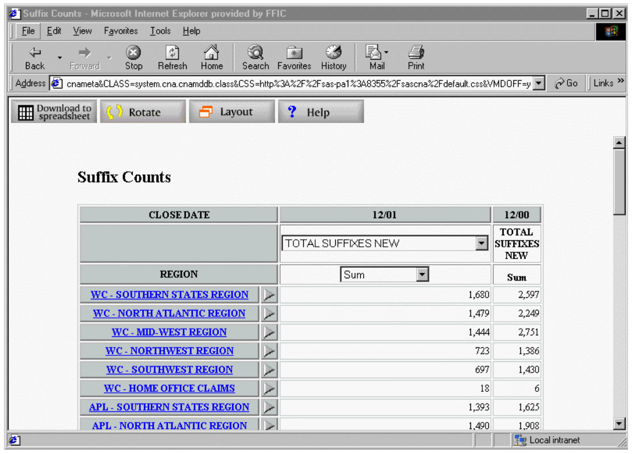
Graph — Type: None

Filter Listboxes appear above the report.

## MULTIDIMENSIONAL REPORT PAGE

The multidimensional report is created from the parameters gathered from the Report Layout Page.

The default Multidimensional Report Page:

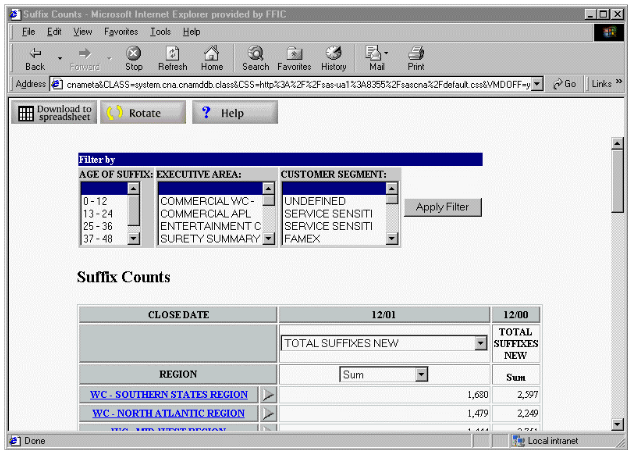

Suffix Counts - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address
Go Links
Download to spreadsheet
Rotate
Layout
Help
Local intranet

cnameta&CLASS=system.cna.cnamddb.class&CSS=http%3A%2F%2Fsas-pa1%3A8355%2Fsascna%2Fdefault.css&VMDOFF=y

Suffix Counts

| CLOSE DATE | 12/01 | 12/00 |
|---|---|---|
| | TOTAL SUFFIXES NEW | TOTAL SUFFIXES NEW |
| REGION | Sum | Sum |
| WC - SOUTHERN STATES REGION | 1,680 | 2,597 |
| WC - NORTH ATLANTIC REGION | 1,479 | 2,249 |
| WC - MID-WEST REGION | 1,444 | 2,751 |
| WC - NORTHWEST REGION | 723 | 1,386 |
| WC - SOUTHWEST REGION | 697 | 1,430 |
| WC - HOME OFFICE CLAIMS | 18 | 6 |
| APL - SOUTHERN STATES REGION | 1,393 | 1,625 |
| APL - NORTH ATLANTIC REGION | 1,490 | 1,908 |

Custom Multidimensional Report page:
Discussion of some of the overrides to create this page follows in the CUSTOMIZATIONS section.


Suffix Counts - Microsoft Internet Explorer provided by FFIC
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address
Go Links
Download to spreadsheet
Rotate
Help
Apply Filter
Done
Local intranet

cnameta&CLASS=system.cna.cnamddb.class&CSS=http%3A%2F%2Fsas-ua1%3A8355%2Fsascna%2Fdefault.css&VMDOFF=y

Filter by

| AGE OF SUFFIX: | EXECUTIVE AREA: | CUSTOMER SEGMENT: |
|---|---|---|
| 0 - 12 | COMMERCIAL WC - | UNDEFINED |
| 13 - 24 | COMMERCIAL APL | SERVICE SENSITI |
| 25 - 36 | ENTERTAINMENT C | SERVICE SENSITI |
| 37 - 48 | SURETY SUMMARY | FAMEX |

Suffix Counts

| CLOSE DATE | 12/01 | 12/00 |
|---|---|---|
| | TOTAL SUFFIXES NEW | TOTAL SUFFIXES NEW |
| REGION | Sum | Sum |
| WC - SOUTHERN STATES REGION | 1,680 | 2,597 |
| WC - NORTH ATLANTIC REGION | 1,479 | 2,249 |

## OVERRIDE CHALLENGES

These are examples of the overrides we had (or chose) to make.

1. Remove the Layout Button on the Report Page.
2. Set the Across dimension to a single variable.
3. List the Classification Variables that define the Down dimension.
4. Create a Default Title from the MDDB name.
5. Place the graph below the report.
6. Place the filter list boxes above the report.

Determining how to get started became a daunting task given the extensive list of MRV components!

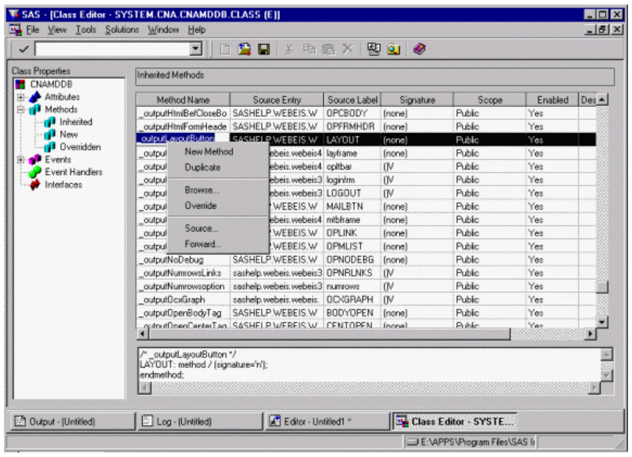
## CUSTOMIZATIONS

In order to customize the MRV we first need a bit of background on how the MRV works. The MRV class (SASHELP.WEBEIS™, WEBEIS) is a child of the (SASHELP.FSP.OBJ) class. The child always retains the inherited methods of the parent class. The output from these methods is in the form of HTML streamed directly to the requesting browser. As hinted above, the trick is to identify which method(s) need to be overridden. It makes sense that in order to deliver the desired output, it is first necessary to determine the output we need to override.

Once you have identified the method you wish to override there are four possibilities:

1. Output nothing—simply do not execute the method.
2. Perform some processing *prior* to the method executing.
3. Perform some processing *after* the method executes.
4. Execute your own processing in lieu of the method you wish to override, i.e., write your own method.

The override process begins by first creating a subclass of the Multidimensional Report Viewer class, SASHELP.WEBEIS.WEBEIS. (See SAS System Help for details on Creating a Subclass.) The subclass contains all of the inherited methods from the parent class. Using the Class Editor, right click the method to be overridden and select 'Override' from the popup menu.



| Method Name | Source Entry | Source Label | Signature | Scope | Enabled | Des |
|---|---|---|---|---|---|---|
| _outputHtmlBefCloseBo | SASHELP.WEBEIS.W | OPCBODY | (none) | Public | Yes | |
| _outputHtmlFormHeade | SASHELP.WEBEIS.W | OPFRMHDR | (none) | Public | Yes | |
| _outputLayoutButton | SASHELP.WEBEIS.W | LAYOUT | (none) | Public | Yes | |
| _output | ebeis.webeis4 | layframe | (none) | Public | Yes | |
| _output | ebeis.webeis4 | opltbar | ()V | Public | Yes | |
| _output | ebeis.webeis3 | loginfrm | ()V | Public | Yes | |
| _output | ebeis.webeis3 | LOGOUT | ()V | Public | Yes | |
| _output | .WEBEIS.W | MAILBTN | (none) | Public | Yes | |
| _output | ebeis.webeis4 | mtbframe | (none) | Public | Yes | |
| _output | .WEBEIS.W | OPLINK | (none) | Public | Yes | |
| _output | .WEBEIS.W | OPMLIST | (none) | Public | Yes | |
| _outputNoDebug | SASHELP.WEBEIS.W | OPNODEBG | (none) | Public | Yes | |
| _outputNumrowsLinks | sashelp.webeis.webeis3 | OPNRLNKS | ()V | Public | Yes | |
| _outputNumrowsoption | sashelp.webeis.webeis3 | numrows | ()V | Public | Yes | |
| _outputOcxGraph | sashelp.webeis.webeis. | OCXGRAPH | ()V | Public | Yes | |
| _outputOpenBodyTag | SASHELP.WEBEIS.W | BODYOPEN | (none) | Public | Yes | |
| _outputOpenCenterTag | SASHELP.WEBEIS.W | CENTOPEN | (none) | Public | Yes | |

```
/* _outputLayoutButton */
LAYOUT: method / (signature='n');
endmethod;
```

This will remove the method from the ‘Inherited’ folder and place it in the ‘Overridden’ folder under ‘Methods’ within the Class Editor. Edit the Source Label and Source Entry to reflect the name of the Section Label and SCL program containing the method override code. See the ‘MDDB Report Viewer: Advanced Customizations’ online documentation for referencing the subclass.

Now that the subclass has been instructed to override the method, an SCL program must be either created or edited. The source code must contain a section with its label identical to the Source Label in the subclass.

The following examples include either:

- excerpts from the SCL program used for customizing the MRV, or
- an explanation of the logic used for the customization.

**EXAMPLE 1**

Remove the ‘Layout’ button from the Multidimensional Report Page.

**BACKGROUND:**

The ‘Layout’ button is part of the main report page. Its function is to return the user to the layout page. When the user selects the ‘Layout’ button the MRV re-initializes the layout page by running SASHELP.WEBEIS.MDDBRPTS.SCL. This process can take longer than expected as the menus must all be repopulated from the metabase. We found it more efficient if the user returns to the layout page by selecting the ‘Back’ arrow on their browser. Removing the ‘Layout’ button leaves the user with no other choice. The code to remove the ‘Layout’ button is trivial.

| | |
|---|---|
| Method to be overridden: | _outputLayoutButton |
| Method Source Label: | LAYOUT |
| MRV Macro Variable to be set: | -none- |

**SCL CODE:**

```
LAYOUT:
method;
endmethod;
```

This section produces no output therefore the ‘Layout’ button is not displayed.

**EXAMPLE 2**

Set the Across dimension to a single variable.

**BACKGROUND:**

A key requirement for this application is that the across variable must always be the ‘Close Date’ (end_dt), which is a SAS date formatted as Month/Year.

| | |
|---|---|
| Method to be overridden: | _outputAcrossList |
| Method Source Label: | OPACROSS |
| MRV Macro Variable to be set: | ac |

In this override, the _outputAcrossList method is never executed. Instead, when the method is invoked we write an HTML form tag assigning a name/value pair of “ac=END_DT”. The Across Dimension list box is not created. A new method (WRITE) was created to deliver the text string to the HTML file.

**SCL CODE:**

```
OPACROSS:
method;

call send
(_self_,'WRITE','<INPUT TYPE="hidden"
NAME="ac" value="END_DT">');

endmethod;

WRITE:
method text_content $;

output_file_id=htmlfile_;

rc=fput(output_file_id,text_content);

endmethod;
```

**EXAMPLE 3**

List the Classification Variables that define the Down dimension.

**BACKGROUND:**

The ‘Down’ list box was being populated with every hierarchy in the metabase. This forced the user to search through over 300 hierarchies to make a selection. To better serve the user, we overrode the ‘Down’ list box with JavaScript. The override creates four pull down menus—the user selects a classification field in 1 to 4 menus. As a field is chosen from a menu, that field is removed from the remaining menus. No longer was the user required to choose 4 fields! This override allowed us to greatly simplify the process for the users. Most of the time in the client/server tool, they didn’t really need to drill to 4 levels, but were required to request 4 fields due to the MDDB designs.

| | |
|---|---|
| Method to be overridden: | _outputDownList |
| Method Source Label: | OPDOWN |
| MRV Macro Variable to be set: | d |

Now the override has to find the first available hierarchy that satisfies the 1 – 4 fields. Due to the complexity of this logic we are not publishing the SCL and JavaScript. Contact us for more information.

**EXAMPLE 4**

Create a Default Title from the MDDB name.

**BACKGROUND:**

Even though the Report Layout Page contains a text entry box for a report title, we felt the user could mistakenly enter the wrong title. For example, they may have requested a ‘Counts’ report, but put ‘Amounts’ in the title. Since the name of the MDDB directly relates to the report being generated, we used its value to create the title. The text box is completely removed from the Report Layout page.

| | |
|---|---|
| Method to be overridden: | _outputDefltTitleOption |
| Method Source Label: | OPDEFTTL |
| MRV Macro Variable used: | mddb |
| MRV Instance Variable: | deftitle_ |
| MRV Macro Variable to be set: | dt |

**SCL CODE:**
```
OPDEFTTL:
method;

/* Create the default title for  */
/* the report based on the value */
/* of the mddb MRV variable.     */

 mddb=symget('mddb');
 id=left(scan(mddb,2,'_')); /*=1,2,3*/

 select (id);

   when (1) deftitle_= 'Suffix Counts';
   when (2) deftitle_= 'Suffix Amounts';
   when (3) deftitle_= 'Closing Ratios';

end;

 call send
(_self_,'WRITE','<INPUT TYPE="hidden"
NAME="dt" value="'!!deftitle_!!'">');

endmethod;
```

**EXAMPLE 5**
Place the graph below the report.

**BACKGROUND:**
During User Acceptance Testing, we encountered errors if the Graph Location was set to the Top or Left of the Report.

| | |
|---|---|
| Method to be overridden: | _outputGraphLocOption |
| Method Source Label: | OPGLOCOP |
| MRV Macro Variable to be set: | gl |

As seen in Example 2, when the method is invoked we write an HTML form tag assigning a name/value pair of “gl=1”.

**SCL CODE:**
```
OPGLOCOP:
method;

call send
(_self_,'WRITE','<INPUT TYPE="hidden"
NAME="gl" value="1">');

endmethod;
```

**EXAMPLE 6**
Place the filter list boxes above the report.

**BACKGROUND:**
Choosing filters can be very tricky! The user has to know values that intersect; otherwise they will get an error. We feel it safest if users always filter before they start to drill down. Putting the filter list box above the report increases the chances for a successful report.

| | |
|---|---|
| Method to be overridden: | _outputSubsetLocOption |
| Method Source Label: | OPSUBLOC |
| MRV Macro Variable to be set: | ssl |

As seen in Example 2, when the method is invoked we write an HTML form tag assigning a name/value pair of “ssl=3”.

**SCL CODE:**
```
OPSUBLOC:
method;

call send
(_self_,'WRITE','<INPUT TYPE="hidden"
NAME="ssl" value="3">');

endmethod;
```

Many other methods were overridden to obtain our final C&A MRV application. These examples have demonstrated some of the easier coding techniques used for overriding the default MRV.

**CAUTION WHEN USING THE MRV METHOD OVERRIDES!**
Many of these methods can be called from more than one of the MRV SCL programs. Although not demonstrated in these examples, it is good practice to consider the effect of your override in each program. Refer to the ‘Flow of Control of the MDDB Report Viewer Class’ online documentation for a general description of each program’s flow.

## CONCLUSION
Web-enabling C&A by using the MRV quickly proved to deliver multidimensional reports through the FFIC Intranet. Our users have benefited from and are thrilled with the additional functionality that it provides. We didn’t anticipate the amount of customization that would be required to make the tool user-friendly and fit our existing MDDB structures. Some of the overrides proved to be quite challenging and complex.

## REFERENCES
Harris, Colin (2001), “Dynamic Ad-hoc Reporting via the Web: Real World Comparison of the MDDB Report Viewer and AppDev Studio®”, *Proceedings of the Twenty-sixth Annual SAS Users Group International Conference*, Paper 184-26

Gallegos, Jessica M. and Westover, Matthew E. (1999), “Manipulating SCL Lists Available Through EIS Classes To Customize A Multidimensional Report”, *WUSS ’99 Proceedings,* Pages 21-24

SAS Institute Inc. Web Site URLs for online documentation:

**MDDB Report Viewer**
http://www.sas.com/rnd/web/intrnet/mddbapp/index.html

**SAS/IntrNet Documentation Index**
http://www.sas.com/rnd/web/intrnet/sitemap.html

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## CONTACT INFORMATION
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