

Paper 146-27

Strategic Procurement: The SAS® Solution for Supplier Relationship Management

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ABSTRACT

The SAS Solution for supplier relationship management (SRM) is a Web- based application designed to help procurement professionals understand how corporate money is being spent and how suppliers are being used. A ranking component enables procurement staff to rank suppliers based on any set of available metrics. An optimization component computes an optimized supplier portfolio. Users can also perform ad hoc queries against the SRM warehouse.

This paper will identify the goals of strategic procurement and illustrate how the SAS Solution for SRM enables procurement professionals to achieve them. The Internet has changed the way people work. More and more SAS solutions and applications are Internet based.

Attention will be given in this paper to the technology used in implementing this Web-based solution.

INTRODUCTION

SAS for Supplier Relationship Management (SRM) is a **comprehensive solution** of software and services that enable a client to **collect, analyze and leverage** all aspects of their supplier data and purchasing history. SRM provides visibility into the client's supply base, spend history and usage patterns - critical information that **optimizes strategic sourcing activities**. The intention of this paper is to give a brief overview of a single module within Supplier Relationship Management and also some of the technology used.

SAS SRM SPEND ANALYSIS ARCHITECTURE

SAS SRM Spend Analysis tool, also known as Procurement Vision, is a data driven thin client web based application with all visual components made of Java Server Pages(JSP).

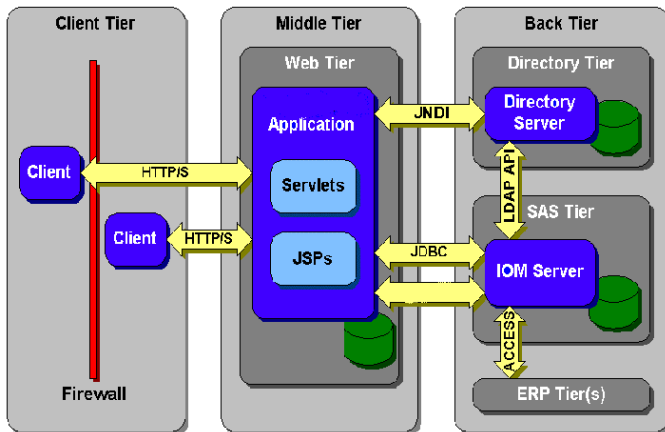


Figure 1 The Client Tier is a web browser. Currently only IE version 5 or later is supported.

The Middle Tier contains the web server and servlet engine. The Middle Tier is also where all the modules of the SAS SRM Solution will be loaded

The Back tier is your SAS Server. If an LDAP server is being used then it would also be in the Back Tier.

SAS SRM SPEND ANALYSIS

SAS SRM Spend Analysis works with summary data created from the procurement Warehouse. It allows you to view and relate any of the dimensions in the warehouse.

WHAT AM I BUYING AND FROM WHOM

The two most common dimensions in a procurement warehouse are Supplier and Commodity. These two dimensions allow you to answer the questions of what am I buying and from whom. Other dimensions may be defined within the procurement Warehouse to further explore the data. Other typical dimensions are Time, Geography, and Corporate Structure.

The **Supplier Dimension** is generally made up of one to many levels. If your data has been pre-processed by a vendor such as D&B® then D-U-N-S® numbers may have been assigned to your suppliers. If this is the case then you will have the parent child relationships of all your suppliers. This may show that you have many separate contracts negotiated with different children of a single parent corporation.

The **Commodity Dimension** is almost always made up of more than a single level. You may have your own commodity groupings or you may use a data providers commodity codes. If you use UNSPSC™ codes then typically you would have four levels in your commodity dimension.

By crossing the two dimensions, you can get a very clear picture of what you buy and from Whom. SAS SRM Spend Analysis gives you the ability to display these dimensions. Figure 2 shows how SAS SRM Spend Analysis module looks with the demo data provided with the software. For the purposes of clarity, the next several screenshots after Figure 2 will focus on the right hand side of the HTML page. This frame is called the Viewer.

The screenshot shows the Procurement Vision 2.3 interface. On the left is a navigation pane with 'Commodity Hierarchy', 'Supplier Hierarchy', 'Suppliers', and 'System Hierarchy'. The main area displays a table with the following data:

UN/SPSC2	Spend	Current Year Spend	Spend Delta
Totals	\$235,031,856	\$303,025,720	6,799,786,924,713,17E7
Tools And General Machinery	\$20,710,983	\$25,074,262	4363278,53840265
Structures Building And Construction Components And Su	\$61,955,014	\$75,280,505	1,3285490930203708E7
Service Industry Machinery Equipment And Supplies	\$7,907	\$9,249	1442,2526060755972
Published Products	\$2,837,605	\$3,014,002	176396,6499999999
Printing Photographic And Audio Visual Equipment And S	\$1,937,287	\$2,424,991	487703,6736024136
Power Generation And Distribution Machinery And Access	\$10,008,028	\$18,454,927	844689,32500003
Plastic Rubber And Elastomeric Materials	\$501,354	\$623,735	122380,18112821085
Paper Materials	\$27,772	\$35,141	7368,998549419615
Office Equipment Accessories And Supplies	\$544,032	\$677,050	133017,8235325362
Medical Equipment Accessories And Supplies	\$21,738	\$26,066	4327,559279548521
Material Handling Conditioning And Storage Machinery A	\$13,410,704	\$14,000,000	589295,3403314017
Manufacturing Components And Supplies	\$44,356,616	\$53,819,616	948300,51308991
Lighting And Electrical Accessories And Supplies	\$98,724	\$104,921	6196,632798929044
Laboratory Measuring Observing And Testing Equipment	\$13,055,962	\$22,557,015	9501052,86000003
Industrial Manufacturing And Processing Machinery And	\$5,101,423	\$6,532,135	1430712,674999999
Industrial Chemical And Gas Materials	\$505,367	\$559,933	454566,9949999999
Furniture Furnishings Domestic Appliances And Consumer	\$256,457	\$369,692	113235,2100000002
Fuels Fuel Additives Lubricants And Anti Corrosives Ma	\$360,941	\$615,442	254501,2299999999
Electronic Components And Supoles	\$15,873,661	\$25,073,337	9192676,8149999994

Figure 2

WHAT AM I BUYING?

Figure 3 shows a list of UNSPSC2 commodity codes. This is the highest level of commodity code and you can see from the Viewer all your purchases fall into 25 categories. Each row is a link except the total row. When you click on a row you drilldown to the next level of commodity code. Drilldown on Manufacturing Components and Supplies.

UN/SPSC2	Current Year Spend
Totals	\$303,029,720
Structures Building And Construction Components And Su	\$75,280,505
Manufacturing Components And Supplies	\$53,819,616
Communications Computer Equipment Peripherals Componen	\$36,163,297
Tools And General Machinery	\$25,074,262
Electronic Components And Supplies	\$25,073,337
Laboratory Measuring Observing And Testing Equipment	\$22,557,015
Power Generation And Distribution Machinery And Access	\$18,454,927
Distribution And Conditioning Systems Equipment And Co	\$15,900,953
Material Handling Conditioning And Storage Machinery A	\$14,000,000
Industrial Manufacturing And Processing Machinery And	\$6,532,135
Published Products	\$3,014,002
Printing Photographic And Audio Visual Equipment And S	\$2,424,991
Industrial Chemical And Gas Materials	\$959,933
Office Equipment Accessories And Supplies	\$677,050
Defense Law Enforcement Security And Safety Equipment	\$661,374
Plastic Rubber And Elastomeric Materials	\$623,735
Fuels Fuel Additives Lubricants And Anti Corrosives Ma	\$615,442

Figure 3

Figure 4 shows the Viewer frame after the drilldown. It now shows the UNSPSC4 commodity codes that make up the components of Manufacturing Components and Supplies.

UN/SPSC4	Current Year Spend
Totals	\$53,819,616
Hardware	\$22,843,782
Bearings Bushings Wheels And Gears	\$11,037,278
Housings Cabinets And Casings	\$6,089,978
Actuators	\$5,655,611
Rope Chain Cable Wire And Strap	\$2,976,276
Paints Primers And Finishes	\$2,253,399
Adhesives And Sealants	\$1,796,651
Gaskets And Seals	\$817,414
Abrasives	\$173,878
Industrial Optics	\$173,477
Extrusions	\$1,873
Forgings	\$0

Figure 4

Drilldown on Hardware to show the components of the UNSPSC4 code Hardware

Figure 5 shows the Viewer frame after the drilldown. It now shows the UNSPSC6 commodity codes that make up the components of Hardware. As you can see, the spend values in the Viewer are getting smaller and the commodity is getting more specific. There is one more drill level available. Drilldown on Washers to see the most granular level of detail available.

UN/SPSC6	Current Year Spend
Totals	\$22,843,782
Screws	\$789,012
Bolts	\$339,812
Nuts	\$8,309,752
Washers	\$713,770
Springs	\$362,660
Nails	\$5,572
Anchors	\$5,517
Rivets	\$229,713
Mounting Hardware	\$4,323,415
Miscellaneous Fasteners	\$2,734,969
Brackets And Braces	\$1,471,402
Hooks	\$57,639
Casters And Wheels	\$153,365
Miscellaneous Hardware	\$2,478,699
Clamps	\$274,412
Couplings	\$594,073

Figure 5

Figure 6 shows the Viewer frame after the drilldown. It now shows the UNSPSC8 commodity codes that make up the components of Hardware.

UN/SPSC8	Current Year Spend
Totals	\$713,770
Shim Washers	\$654,879
Locking Washers	\$34,231
Flat Washers	\$24,628
Thrust Washers	\$33

Figure 6

The Current View window is the upper left frame in SAS SRM Spend Analysis. It displays all the dimensions and allows you to see how you've drilled through each. Expand the Commodity Hierarchy in the Current View window to see the complete drill path you've taken. Figure 7 shows the Current View Frame.

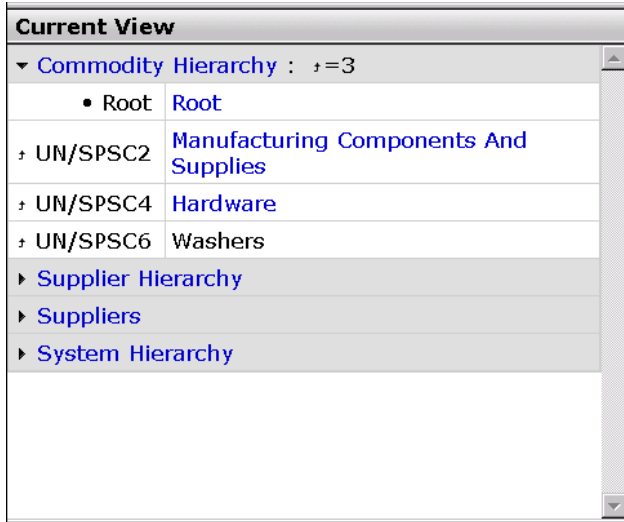


Figure 7

All values displayed in the Current View frame are links so you can navigate up through the dimension by clicking on them. If you wanted to navigate all the way back to the top of the dimension then you would click on root. This would set the dimension back to its original state.

WHO AM I BUYING IT FROM?

Using the combo box in the toolbar of the Viewer frame, switch the dimension to the Supplier Hierarchy.

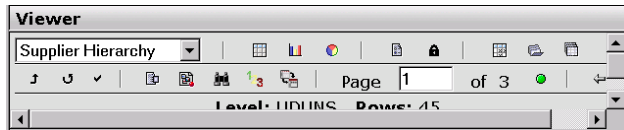


Figure 8

The Viewer frame now contains a list of suppliers but what is most important is that it contains a list of suppliers that you use to supply Hardware. Hardware was the last drilldown done in the Commodity Hierarchy. Figure 9 contains the list of suppliers.

UDUNS		Current Year Spend
Totals		\$713,770
<input type="checkbox"/>	Lkj Corp	\$226,858
<input type="checkbox"/>	Parsons Inc	\$133,517
<input type="checkbox"/>	Arista Steel	\$107,194
<input type="checkbox"/>	Varina Corp	\$86,405
<input type="checkbox"/>	Northstar Products Inc	\$55,336
<input type="checkbox"/>	Rcon Electric Dist	\$31,446
<input type="checkbox"/>	Kob International	\$16,994
<input type="checkbox"/>	Delhi Enterprises	\$11,901
<input type="checkbox"/>	Consolidated Systems Mfg	\$10,920
<input type="checkbox"/>	Spaceage Industries	\$4,400
<input type="checkbox"/>	Mobility Power Co	\$4,024
<input type="checkbox"/>	Enoble Marketing	\$3,865
<input type="checkbox"/>	Wilder Pipe Supply Co	\$2,285
<input type="checkbox"/>	Open Springs Inc	\$2,231
<input type="checkbox"/>	Jeffco Corp	\$1,807
<input type="checkbox"/>	British Electric Plc	\$1,793
<input type="checkbox"/>	Delta Electronics Company	\$1,567
<input type="checkbox"/>	Machine Manufacturing	\$1,546
<input type="checkbox"/>	Verimetal	\$1,518
<input type="checkbox"/>	American Machine Co	\$1,439

Figure 9

According to the table in Figure 9, there are 45 suppliers of the various types of Washers. This may be an area for consolidation. Sort the table by descending Current Year Spend by clicking on the Current Year Spend header.

UDUNS		Current Year Spend
Totals		\$713,770
<input type="checkbox"/>	Detail Plastic Manufacturi	\$1
<input type="checkbox"/>	Fastner Distribution Corp	\$2
<input type="checkbox"/>	Gavco	\$4
<input type="checkbox"/>	C G Inc	\$24
<input type="checkbox"/>	Holden Industries	\$25
<input type="checkbox"/>	Ken Bolt Screw Co	\$28
<input type="checkbox"/>	Hi Teck Products	\$31
<input type="checkbox"/>	Osprey Communications	\$33
<input type="checkbox"/>	Reliable Bolt Supply Manuf	\$67
<input type="checkbox"/>	Kingston Plc	\$71
<input type="checkbox"/>	Thunder Fabrication	\$71
<input type="checkbox"/>	Parts Electric Supply	\$132
<input type="checkbox"/>	Kipper Industries	\$138
<input type="checkbox"/>	Morris Inc	\$185
<input type="checkbox"/>	Uniform Tooling Mfg	\$186
<input type="checkbox"/>	Hearn General	\$299
<input type="checkbox"/>	Nacr Electronics	\$307
<input type="checkbox"/>	Ball Electronics	\$309
<input type="checkbox"/>	P P Painting	\$402
<input type="checkbox"/>	Pullman Ulc	\$406

Figure 10

Some of the suppliers have a very small spend amount. These suppliers may be a target for consolidation or possibly these purchases should be made with a pcard.

UDUNS		Current Year Spend
Totals		\$713,770
<input type="checkbox"/>	Detail Plastic Manufacturi	\$1
<input type="checkbox"/>	Fastner Distribution Corp	\$2
<input type="checkbox"/>	Gavco	\$4
<input type="checkbox"/>	C G Inc	\$24
<input type="checkbox"/>	Holden Industries	\$25
<input type="checkbox"/>	Ken Bolt Screw Co	\$28
<input type="checkbox"/>	Hi Teck Products	\$31
<input type="checkbox"/>	Osprey Communications	\$33
<input type="checkbox"/>	Reliable Bolt Supply Manuf	\$67
<input type="checkbox"/>	Kingston Plc	\$71
<input type="checkbox"/>	Thunder Fabrication	\$71
<input type="checkbox"/>	Parts Electric Supply	\$132
<input type="checkbox"/>	Kipper Industries	\$138
<input type="checkbox"/>	Morris Inc	\$185
<input type="checkbox"/>	Uniform Tooling Mfg	\$186
<input type="checkbox"/>	Hearn General	\$299
<input type="checkbox"/>	Nacr Electronics	\$307
<input type="checkbox"/>	Ball Electronics	\$309
<input type="checkbox"/>	P P Painting	\$402
<input type="checkbox"/>	Pullman Llc	\$406

Figure 11

FILTERS

In addition to the ability to drill into the data, you can also filter the data. Add a filter to see if any supplier of Hardware is also Bankrupt. The Filter Builder is located in the lower left frame of SAS SRM Spend Analysis.

ORNOT	Variable	Action	Value
<input checked="" type="checkbox"/>	Bankrupt	=	Yes

Figure 12

Two suppliers of Hardware are bankrupt. This might be even more reason to consolidate and move this spend to another supplier. You are also spending several hundred thousand dollars with one of them. See Figure 13.

UDUNS		Current Year Spend
Totals		\$229,089
<input type="checkbox"/>	Open Springs Inc	\$2,231
<input checked="" type="checkbox"/>	Lkj Corp	\$226,858

Figure 13

Check the checkbox next to the supplier LKJ Corp. This adds this supplier to all future where clauses. Using the combo box in the Viewer toolbar, switch the dimension back to the Commodity Hierarchy. This will show you exactly what hardware you are purchasing from LKJ Corp. See Figure 13

UN/SPSC8		Current Year Spend
Totals		\$226,858
<input type="checkbox"/>	Shim Washers	\$226,858

Figure 14

Comparing the spend in Figure 14 with the spend for Shim Washers in figure 6 you see LKJ Corp supplies you with almost 30 percent of your Shim Washers. It might be a good idea to find an alternate supplier. What else do you purchase from LKJ Corp? Switch to the commodity hierarchy and navigate back up to the top of the Hierarchy using the Drillup button on the toolbar or the Current View frame. The checkmark on the Supplier Hierarchy will still be in effect so all lists will be subset for LKJ Corp. This will show you a list of all commodities being purchased from this bankrupt supplier.

UN/SPSC2		Current Year Spend
Totals		\$251,015
<input type="checkbox"/>	Manufacturing Components And Supplies	\$226,858
<input type="checkbox"/>	Power Generation And Distribution Machinery And Access	\$24,157

Figure 15

Just one other commodity category is displayed in Figure 14 so the damage this supplier could cause would not be much greater than we saw in figure 13.

HOW IT ALL WORKS

Each time you do a Drilldown, Drillup, switch a dimension, hide or display a column, login or logout, Spend Analysis is generating SQL queries. All code generated is submitted to the SAS System through the IOM interface available in SAS® Integration Technologies. SAS/IT facilitates client/server communication across multiple vendor architectures by supporting multiple client/server interoperability standards

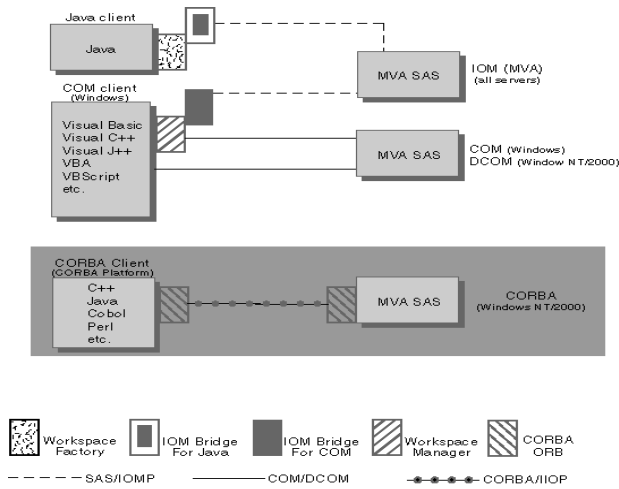


Figure 16

SUBMITTING QUERIES

There are two types of queries made by SAS SRM Spend Analysis. Those that don't require SAS System PROCEDURE or DATA Steps and those that do.

JSP IOM EXAMPLE – SUBMITTING SQL THROUGH JDBC

The vast majority of queries submitted in SAS SRM Spend Analysis fall into this category. These JSP's generally collect information, a query is built and sent to the Back Tier for processing. The results are then used to re-draw the HTML for the next screen. The example in figure 17 is not actual source code for SAS SRM Spend Analysis but example of how to submit a query when PROCEDURE or DATA step code isn't needed.

```
<%@ page import="
  java.sql.*,
  java.util.*,
  java.util.Date,
  java.text.SimpleDateFormat,
  com.sas.iom.SAS.IWorkspace,
  com.sas.iom.WorkspaceFactory,
  com.sas.rio.*"
%>
<%@ page errorPage="errorpage.jsp" %>
<html> <head><title>Accessing DATA sets via
JDBC</title>
</head> <body> <h2>Accessing DATA sets via
JDBC via Java Server Pages</h2>
<br><br>
<%
WorkspaceFactory wfactory = new
WorkspaceFactory();
Properties prop = new Properties();
IWorkspace ws=null;
Connection connection = null;
Statement statement = null;
```

```
String SQL=null;
prop.put("host", "mktstrml.pc.sas.com");
prop.put("port", "5310");
prop.put("transcodingPreference", "server");
prop.put("userName", "CARYNT\sasdemo");
prop.put("password", "sasdemo1");
prop.put("protocol", "bridge");
try
{
ws = wfactory.createWorkspaceByServer(prop);
Properties jdbcProperties = new Properties();
jdbcProperties.put("userName", "CARYNT\sasdemo");
jdbcProperties.put("password", "sasdemo1");
jdbcProperties.put("librefs", "pvmeta
'e:\\SRM\\allaccess\\webserver\\3.0\\demodat
a\\metadata'");
connection = new
MVAConnection(ws.DataService(), jdbcProperties
);
statement = connection.createStatement();
ResultSet rs = statement.executeQuery("select
* from pvmeta.columns");
while(rs.next())
{
out.println(rs.getString("desc") + "<br>");
}
rs.close();
}
catch(Exception e)
{
out.println("Make Connection:" +
e.getMessage());
}
finally
{
}
}
try
{
if (connection != null)
connection.close();
if (statement != null)
statement.close();
}
catch (Exception e)
{
System.out.println(e);
out.println("Error"+e);
}
} //finally
%>
</body>
</html>
```

Figure 17

JSP IOM EXAMPLE – SUBMITTING SAS PROCEDURE CODE

Some Queries require SAS system PROCEDURES or DATA steps to be executed. The example in figure 18 is not source code from SAS SRM Spend Analysis but is an example of how to submit PROCEDURE or DATA step code.

```
<%@ page import=" java.util.*,
java.sql.*,
com.sas.iom.SAS.IWorkspace,
com.sas.srm.security.*,
com.sas.servlet.util.*,
com.sas.srm.common.*"
%>
<%@ include
file="../../includes/CommonJSPDirectives.jsp"
%>
<html>
<head>
</head>
<body>
<%
CustomDataHook PVHook = new
CustomDataHook((User)
session.getAttribute("PVUser"));
// Get the shared workspace for this user
IWorkspace ws = PVHook.getWorkspace();
String filename="";
String fileref="";
String localhost="";
int port;
SocketListener socket=null;
try
{
// Setup our output socket
socket = new SocketListener();
port = socket.setup();
socket.start();
localhost =
(java.net.InetAddress.getLocalHost()).getHost
Address();
fileref = " SOCKET " + localhost + ":" +
port + " ";
ws.LanguageService().Submit("title
'Procurement Vision'");
ws.LanguageService().Submit("title1
'Users of System'");
ws.LanguageService().Submit("filename
sock " + fileref);
ws.LanguageService().Submit("ods html
body=sock style=sasweb;" +
"proc means data=pvtrans.requestlog
noprint;" +
" class username;" +
" id daterequested;" +
" var querytime;" +
" output out=totals sum=totaltime;" +
"proc print data=totals label noobs ; " +
"var username daterequested totaltime
_freq_;" +
"label totaltime= 'Total Time for/All
Queries Made ' " +
"daterequested = 'Last/Accessed'" +
"_freq_ = 'Number of/Data Queries'" +
"username = 'User';" +
"run;" +
"ods html close;");
socket.write(out);
}
catch (Exception e)
{
e.printStackTrace();
```

```
}
/* you must do this destroy on the
CustomDataHook object when you are done. */
/* This cleans up internal resources and
adjusts some counters that enable */
/* object sharing which allows SRM apps
to know when to kill some of the shared
*/
/* internals.
*/
PVHook.destroy();
%>
</body></html>
```

Figure 18

CONCLUSION

SAS SRM Spend Analysis is a good tool for you to do simple "OLAP" like analysis of you procurement data. It can help you identify what you spend and with whom. In addition, it is a good example of mixing several different types of technologies to create a sophisticated web based tool.

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